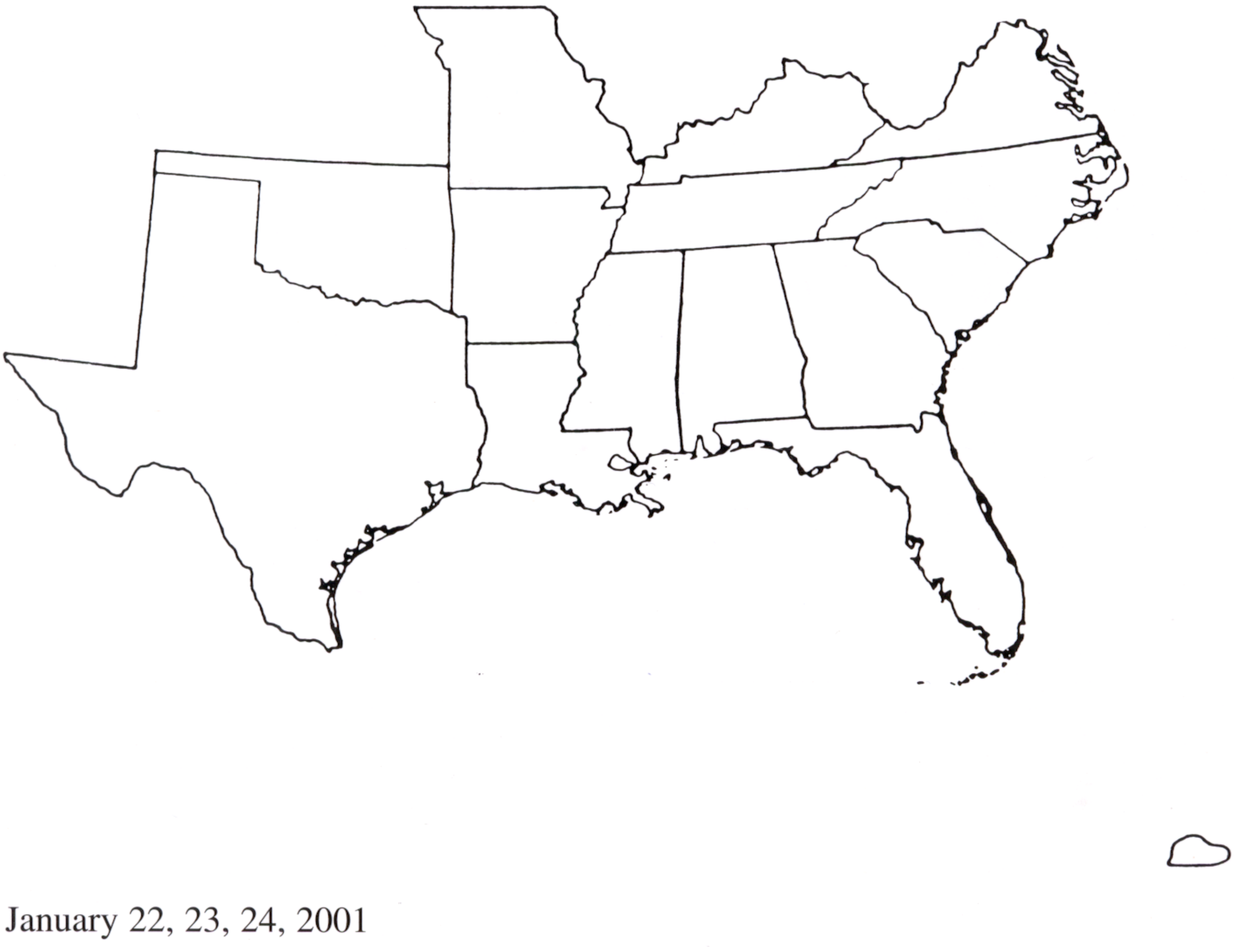
CD Contents for 2002

Proceedings Southern Weed Science Society

"New Century: New Opportunities" 54th Annual Meeting



January 22, 23, 24, 2001

Biloxi, Mississippi USA SWSPBE

PROCEEDINGS

SOUTHERN WEED SCIENCE SOCIETY

NEW CENTURY: New Opportunities

55th Annual Meeting

Servicing Agriculture In:

ALABAMA	**MISSOURI**
ARKANSAS	**NORTH CAROLINA**
FLORIDA	**OKLAHOMA**
GEORGIA	**SOUTH CAROLINA**
KENTUCKY	**TENNESSEE**
LOUISIANA	**TEXAS**
MISSISSIPPI	**VIRGINIA**

PUERTO RICO

January 28, 29, and 30, 2002
Hyatt Regency
Atlanta, Georgia

ISSN:0362-4463

PREFACE

These PROCEEDINGS of the 55th Annual Meeting of the Southern Weed Science Society contain papers and abstract of presentations made at the annual meeting. These papers and abstracts are indexed according to subject matter and authors. A list is also included giving the common and trade or code names, chemical names and manufacturers of all herbicides mentioned in the publication. Other information in these PROCEEDINGS includes: biographical data of recipients of the SWSS Distinguished Service, Outstanding Educator, Outstanding Young Weed Scientist, and Outstanding Graduate Students awards; the RESEARCH REPORT; lists of officers and committee members; minutes of all business meetings; and lists of registrants attending the annual meeting, sustaining members, charter members, and contributors to the SWSS Endowment Foundation.

Only papers presented at the meeting and submitted to the Editor in the prescribed format for printing are included in the PROCEEDINGS. Papers may be up to five pages in length and abstracts are limited to one page. Papers and abstracts exceeding these limits will be published but the authors will be charged $15 per page for each paper the contribution exceeds these limits. Invitational papers are not subject to these page charges.

Authors are required to submit an original, two copies and a diskette copy of the file prepared according to the prescribed format. If a contribution is not submitted in a suitable form for publication, it may be retyped by the Editor at a charge of $25.00 or it may not be printed in the PROCEEDINGS. Some papers may be returned to the author for retyping if time permits.

The use of commercial names in the PROCEEDINGS does not constitute an endorsement, nor does the non-use of similar products constitute a criticism, by the Southern Weed Science Society.

Additional copies of the 2002 PROCEEDINGS and of some prior year editions of the PROCEEDINGS AND RESEARCH REPORTS are available. Also, copies of the SWSS RESEARCH METHODS IN WEED SCIENCE (3rd edition, 1986), and the SWSS WEED IDENTIFICATION GUIDES are available. This document is also available in PDF format at the SWSS web site (www.swss.ws). For information concerning the availability and cost of these publications, contact Mr. R. A. Schmidt, Business Manager, Southern Weed Science Society, 1508 West University Avenue, Champaign, IL 61821-3133.

Peter A. Dotray, Editor
Southern Weed Science Society

TABLE OF CONTENTS

REGULATIONS AND INSTRUCTIONS FOR PAPERS AND ABSTRACTS TO BE PUBLISHED IN THE PROCEEDINGS OF THE SOUTHERN WEED SCIENCE SOCIETY

Regulations

1. Only papers presented at the conference will be published in the Proceedings. An abstract or paper must be submitted for each presentation at the time the presentation is made.

2. Persons wishing to present a paper(s) at the conference must submit a title submission form(s) to the program chairman before the established deadline as announced in the call for papers.

3. Facilities will be provided for using 2 x 2-in. slides in presentations at the conference.

4. Terminology in presentations and publications shall generally comply with standards accepted by the Weed Science Society of America. English or metric units of measurement may be used. The approved common names of herbicides as per the latest issue of Weed Science should be used. It is not necessary to give the chemical name since this will be given in the Herbicide Appendix. If no common name has been assigned, the code name or trade name may be used and the chemical name should be shown in parenthesis if available. Common names of weeds and crops as approved by the Weed Science Society of America should be used.

   Where visual ratings of crop injury or weed control efficacy are reported, it is suggested that they be reported as a percentage of the untreated check where 0 equals no weed control or crop injury and 100 equals complete weed control or complete crop kill. Where a rating scale is used, a 0-10 scale is suggested using the above guidelines.

5. Abstracts shall not be longer than one page, and papers shall not be longer than five pages unless the author agrees to pay $15 for each additional page. Invitational papers are exempt from page charges.

6. A person may not serve as senior author for more than two articles in a given year.

7. Papers and abstracts are to be prepared in accordance with the instructions and format attached before they will be accepted for publication. Papers not prepared in accordance with these instructions will be returned to the author for retyping.

8. Papers and abstracts are due at the time the presentation is made!

Instructions to Authors

Prepare an original typed copy and two photocopies of the completed paper or abstract and a diskette copy of the file as it to appear in the PROCEEDINGS. It is the responsibility of each author to submit their disk/abstract in **READY FOR PUBLICATION** condition.

Submit the original (**unfolded**) and two copies to the section chairman at the time the paper is presented along with a diskette copy of the file. The authors should submit a list of key words or phrases on the form provided. Publication will me made using desktop publishing software. SWSS will not retype or make typographical corrections on papers/abstracts submitted for the Proceedings. If a paper is more than one page long, lightly pencil page numbers in the upper right hand corner of each page. On the back of the first page of a paper or abstract, lightly pencil the paper numbers also. Do not type in page numbers or staple pages together. At the end of each session, the section chairman is to immediately carry the original and copies of all papers presented in that section to the Editor in the Press Room. One of the photocopies is needed by the Editor and the other is for the Press.

Typing Instructions-Format

1. (a) Margins, spacing, etc.: Use 8-1/2 x 11" white bond paper. **Leave 1" margins on all sides.** Use 10 point type with a ragged right margin; do not justify and **do not use hard carriage returns** in the body of the text. Single space with double space between paragraphs and major divisions. **Do not indent paragraphs.** See example below.

   (b) Computer disk: Use an IBM Compatible System (MS/DOS). Submit on 3-1/2" diskettes and submit only one abstract per diskette. Store file in one of the following software packages or formats: 1) WordPerfect, 2) Microsoft Word, or 3) ASCII. If abstract or paper contains graphs or figures, they must be in WordPerfect Graphics (WPG) and be black and white. Label diskette giving 1) title of abstract, 2) abstract number, 3) author, 4) sections; 5) daytime phone, and 6) file format. If you do not have access to compatible software, secretarial assistance in available at $25.00 per abstract. Contact Peter A. Dotray, 806-742-1634 or p-dotray@tamu.edu.

2. Content:

   Abstracts - Title, Author(s), Organization(s), Location, the heading ABSTRACT, text of the Abstract, and Acknowledgments. Use double spacing before and after the heading, ABSTRACT.

   Papers - Title, Author(s), Organization(s), Location, Abstract, Introduction, Methods and Materials (Procedures), Results and Discussion, Literature Citations, Tables and/or Figures, Acknowledgments.

Each section of an abstract or paper should be clearly defined. The heading of each section should be typed in the center of the page in capital letters with double spacing before and after.

Pertinent comments regarding some of these sections are listed below:

Title - All in capital letters. Start at the upper left hand corner leaving a one-inch margin from the top and all sides.

Author(s), Organization(s), Location - Start immediately after title. Use lower case except for initials, first letters of words, etc. Do not include titles, positions, etc. of authors.

Example: WEED CONTROL SYSTEMS IN SPRINKLER-IRRIGATED RICE. K.H. Akkari, R.F. Talbot, J.A. Ferguson and J.T. Gilmour; Department of Agronomy, University of Arkansas, Fayetteville, AR 72701.

ABSTRACT

First line of abstract begins at left margin. **Do not indent paragraphs**.

Acknowledgments - Show as a footnote at the end of the abstract (not end of page) or the bottom of the first page of papers.

Literature Citations - Number citations and list separately at the end of the text.

Tables and Figures - Place there after literature citations. Single space all tables. Tables should be positioned vertically on the page. Figures must be black and white photographs or pen and ink drawings on white bond paper. Store charts, graphs, figures, etc., as WPG files on diskette with abstract and enclose a printed copy. Charts and figures must be in black and white. Check your exported WPG files for accuracy.

2002 Distinguished Service Award-Academia

Alan C. York

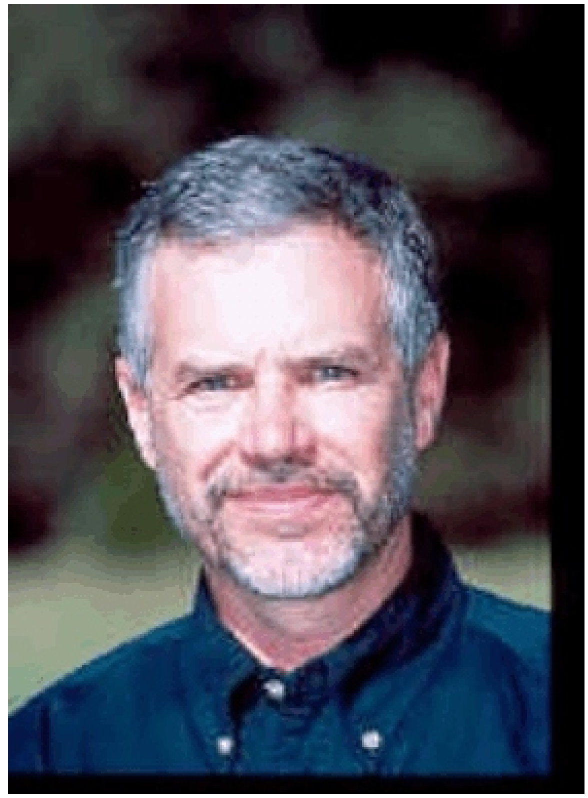
Alan York is a William Neal Reynolds Professor in the Crop Science Department at North Carolina State University (NCSU). He received his BS and MS degrees in Crop Science from NCSU in 1974 and 1976, respectively, and his PhD in agronomy from the University of Illinois in 1979. He has served on the faculty at NCSU since that time. His primary responsibility is in extension, but he is actively involved in applied weed management research for agronomic crops. He has served as major advisor for 24 graduate students, and he taught a weed science course for 14 years.

Dr. York has served on the following SWSS committees: Membership, Public Relations, Continuing Education, Graduate Student Contest, Research, Placement, Display, Program, Local Arrangements, and Long Range Planning. He currently serves on the Board of Directors as the CAST representative. He also has served on a number of committees for the Weed Science Society of North Carolina (WSSNC) and has held each office in that society. He has served as an associate editor for *Weed Technology* and *Peanut Science*, and he is currently a technical editor for the *Journal of Cotton Science*.

Dr. York is the recipient of the WSSA Outstanding Extension Award, the SWSS Outstanding Young Weed Scientist Award, the Cotton Foundation Cotton Extension Education Award, the WSSNC Distinguished Service Award, the NCSU Outstanding Extension Service Award, and the Epsilon Sigma Phi State Distinguished Service Award.

2002 Distinguished Service Award-Industry

Bobby Watkins

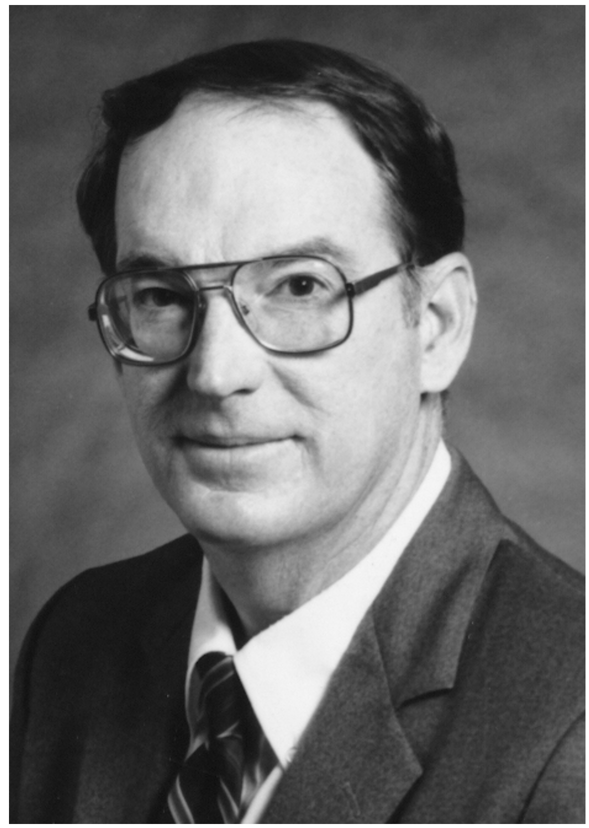


Robert M. (Bobby) Watkins was born in Aberdeen, Mississippi in 1950. Reared on a family owned cotton farm, he learned to despise weeds at an early age from the business end of a hoe handle. He attended Mississippi state University and received the B.S. degree in animal science in 1973 and M.S. degree in agronomy in 1974. He was employed as A research Agriculturalist with American Cyanamid in 1974 and has been promoted to Principal Field Research Agriculturalists with American Cyanamid in 1999 and still holds the title with BASF. He has received numerous recognitions within American Cyanamid for his pioneering research in weed science, including four U.S. patents. He served on the organizing committee and is a charter member of the Mississippi Weed Science Society. He has served on numerous committees for MWSS and SWSS. He is recipient of the Industry Award and Distinguished Service Award for MWSS. He and wife, Martha, have two children, Amelia and Will.

2002 Outstanding Educator Award

Thomas F. Peeper

Thomas F. "Tom" Peeper is a Professor of Weed Science in the Plant and Soil Sciences Dept. at Oklahoma State Univ. in Stillwater. He was raised in Apache, OK, where he worked in his father's farm equipment business and helped his brothers raise wheat and cattle. After receiving his BS and MS from Oklahoma State, he served his country as a U.S. Army Officer for three years, including a tour of duty in Vietnam with the First Cavalry Division.



He completed his Ph.D. at North Carolina State Univ. in 1975 and was a field development manager for Velsicol Chemical Company until 1976 when he accepted a newly created faculty position at Oklahoma State Univ. as the project leader for Small Grains Weed Science. His research has focused on integrated management of weeds in wheat in the Southern Great Plains, including chemical, cultural, and biological methods. His research has been very strongly supported by the Oklahoma Wheat Commission, the Oklahoma Wheat Research Foundation, Industry Cooperators, EPA, USDA, and by many individual wheat growers. With his students he has published 55 refereed journal articles, over 140 abstracts and co-authored three book chapters. Although Dr. Peeper has no extension appointment, he has authored or co-authored several extension publications including a recipient of the ASA's Educational Materials Award in 2001. He has emphasized on-farm research and grower involvement throughout his career.

He has served as major advisor for 43 graduate research assistants, and as a committee member for 17 others. He is an advocate of interdisciplinary research and of stimulating thesis projects. He is proud of his former student assistants, who include faculty members at Cameron, Kansas State, Mississippi State, Oklahoma State, and Texas A & M Universities, USDA scientists, and many other successful agricultural professionals. He has served for many years as a faculty advisor to the OSU Agronomy Club, which has been named the outstanding club in the USA by the American Society of Agronomy for 13 consecutive years. He holds a joint research-teaching appointment and teaches both undergraduate and graduate level courses.

He served as Editor of the SWSS Newsletter from 1984-89, on the SWSS Board of Directors from 1989-91, as trustee and then President of the SWSS Endowment Foundation in 1999-2000, as chairman of 8 various SWSS committees, and as a member of many others. He has served on several WSSA committees and as an Associate Editor for Weed Technology for 12 years.

2002 Outstanding Young Weed Scientist Award

Peter A. Dotray

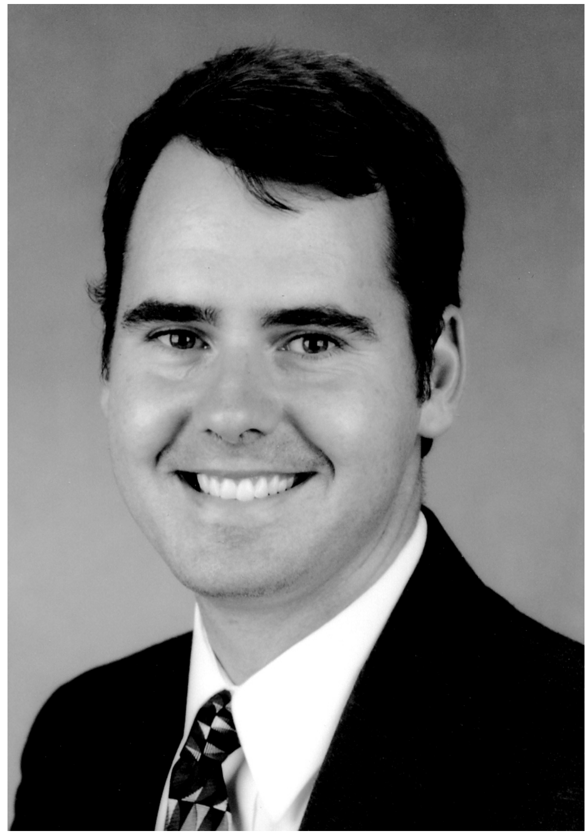
Peter Dotray is an Associate Professor of Weed Science with Texas Tech University, Texas Agricultural Experiment Station, and the Texas Agricultural Extension Service. He is a native of Minneapolis, Minnesota, and received his B.S. degree in Agronomy from the University of Minnesota at St. Paul and his M.S. degree in Agronomy from Washington State university at Pullman. He received a Ph.D. in Agronomy from the University of Minnesota and started his three-way appointment in Lubbock in 1993. Peter has conducted weed control research cotton, peanut, corn, soybean, grain sorghum, and turf grass seed production, although emphasis has been place on cotton and peanut weed control. In addition to weed control responsibilities, Peter has responsibilities in teaching and as an Extension Weed Specialist in District 2, which contains 20 counties on the Texas Southern High Plains. Peter has served as the major advisor or co-advisor of nine graduate students and has served 17 graduate committees. Peter currently has eight graduate students in progress. He has authored or coauthored 131 abstracts and proceedings, 17 journal articles, 22 technical publications and popular articles, and has given over 260 seminars and presentations at grower meetings.

Peter has been very active in the Southern Weed Science Society, the Western Society of Weed Science (WSWS), the North Central Weed Control Conference (NCWCC), and the Weed Science Society of America (WSSA). He was the Graduate Student Club Chair at the NCWCC, served on the Herbicide Resistant Weeds Committee and Chair of the Basic Sciences at the WSWS, and served on the Extension Committee and Weed Loss Committee for the WSSA. Peter joined the SWSS in 1993 and has served on the following committees: Display (Chair), Local Arrangements, Newsletter Information, Outstanding Graduate Student Award, Placement, Southern Weed Contest, Student Program, Terminology, and Weed Scientist of the Year Award. He has served as Chair of the Beltwide Cotton Conference-Weed Science Conference, President of Gamma Sigma Delta-Texas Tech Chapter, President of the West Texas Agricultural Chemicals Institute, and is currently the President of the American Society of Agronomy-Texas Chapter.

2002 Outstanding Graduate Student Award (Ph.D.)

William A. Bailey

William Anthony Bailey is the son of Lester and Barbara Bailey of Carthage, NC. He attended Union Pines High School and graduated in 1989. Andy was a member of FFA in high school. In 1991, he graduated with an Associate of Applied Science Degree in Landscaping Gardening from Sandhills Community College in Pinehurst, NC. In 1993, he received another Associates of Applied Science Degree in Agriculture f rom North Carolina State University, Raleigh. In 1995, he received an Associate Degree in Pre-Agriculture from Sandhills Community College. In 1997, he graduated summa cum laude with a Bachelor of Science Degree in Agronomy from North Carolina State University. Andy began graduate school at North Carolina State University immediately after graduation in 1997 and received a Master of Science Degree in Weed Science in 1999. In 1999 he received a Cunningham Fellowship to continue graduate work toward a Ph.D. degree at Virginia Tech and will graduate in Summer of 2002.



Throughout his graduate career, Andy has bee a member of the American Peanut Research and Education Society, North Carolina Weed Science Society, Northeastern Weed Science Society, Southern Weed Science Society, and Weed Science Society of America. Andy is also a member of Phi Kappa Phi and Gamma Sigma Delta honor fraternities. Andy as authored or co-authored 5 referred journal articles and 34 abstracts.

2002 Outstanding Graduate Student Award (M.S.)

Scott B. Clewis

Scott B. Clewis was raised in Whiteville, NC and obtained B. S. degrees in Microbiology and Biology from North Carolina State University. Upon graduation, Scott worked as a temporary Research Technician in tobacco entomology at North Carolina State University. In 1998, Scott took his first Weed Science class and decided to enter graduate school. In April 1999, he entered a Master of Science program in Weed Science at North Carolina State University under the direction of John Wilcut. His thesis research dealt with the biology of *Ambrosia artemisiifolia* in peanut and new technologies in weed management in strip- and conventional-tillage cotton and peanut. He later accepted a Agricultural Research Technician II position at North Carolina State University. His responsibilities include coordinating and conducting weed management research in cotton, peanut, corn, tobacco, and soybean; as well as field, laboratory and greenhouse studies along with assisting his project leader in training of graduate students and part-time workers. As a Master of Science candidate, he won first place in the SWSS graduate student poster contest and second place in NCWSS graduate student poster contest. He has presented his work at numerous professional meetings, field days, and industry training sessions. Scott completed his M. S. in Weed Science with a minor in entomology in December 2001. He authored three journal articles (in press in *Weed Science* (2) and *Weed Technology*) and has one manuscript currently in revision and another in revision where he is a co-author. Since 1999, Scott has authored or co-authored 14 abstracts. Scott is continuing his education and has entered a Ph. D. program in Weed Science at North Carolina State University.

SOUTHERN WEED SCIENCE SOCIETY 2001-2002
OFFICERS AND EXECUTIVE BOARD

100. SOUTHERN WEED SCIENCE SOCIETY OFFICERS AND EXECUTIVE BOARD

100a. OFFICERS
President – J. E. Street – 2003
President Elect – J. W. Wells – 2004
Vice President – W. W. Witt – 2005
Secretary-Treasurer – D. W. Monks – 2002
Editor – D.B. Reynolds – 2002
Immediate Past President – L. L. Whatley – 2002

100b. ADDITIONAL EXECUTIVE BOARD MEMBERS
Member-at-Large – C. T. Bryson – 2003
Member-at-Large – J. E. Driver – 2003
Member-at-Large – E. P. Webster – 2004
Member-at-Large – R. C. Scott – 2004
Representative to WSSA – B. J. Brecke – 2002
Representative to CAST – A. C. York – 2002

100c. EX-OFFICIO BOARD MEMBERS
Constitution and Operating Proc. – G. D. Wills – 2003
Business Manager – R. A. Schmidt
Forestry Representative – S. M. Zedaker – 2004
Student Representative – C. Arnold – 2002

101. SWSS ENDOWMENT FOUNDATION

101a. BOARD OF TRUSTEES – ELECTED
D. Prochaska – President – 2002
H. R. Smith – Vice-President – 2003
T. J. Monaco – Secretary 2004
J. C. Banks – 2005
R. M. Hayes – 2006

101b. BOARD OF TRUSTEES – EX-OFFICIO
D. Monks (SWSS Secretary-Treasurer)
W. W. Witt (SWSS Finance Committee Chair)
R. A. Schmidt (SWSS Business Manager)
G. D. Wills (SWSS Constitution & Operating Procedures Committee Chair)

102. AWARDS COMMITTEE, PARENT (STANDING) – *The Parent Awards Committee shall consist of the immediate Past President as Chairperson and each Subchairperson of the Award Subcommittees.*

B. J. Brecke	2002	B. W. Bean	2002
J. D. Green	2002	L. L. Whatley*	2003
S. Senseman	2002	T. C. Mueller	2003

The Awards Subcommittees shall each consist of six members including the subchairman, serving staggered 3 year terms with two rotating off each year.

102 a. Distinguished Service Award Subcommittee

B. J. Brecke*	2002	P. Dotray	2003	D. M. Simpson	2004
E. C. Murdock	2002	T. R. Murphy	2003	T. L. Smith	2004
S. K. Rick	2002				

102 b. Outstanding Young Weed Scientist Award Subcommittee

J. W. Boyd	2002	T. C. Mueller*	2003	D. Sanders	2004
E. F. Eastin	2002	H. D. Skipper	2003	A. A. Rhodes	2004
J. R. Martin	2002	H. P. Wilson	2003		

102 c. Weed Scientist of the Year Award Subcommittee

B. W. Bean*	2002	C. W. Swann	2003	D. R. Shaw	2004
G. N. Rhodes	2002	T. Whitwell	2003	M. L. Wood	2004
W. W. Witt	2002				

102 d. Outstanding Educator Award Subcommittee

R. C. Scott	2002	J.D. Burton	2003	A. Wiese	2004
S. Senseman*	2002	M. Schraer	2003	T. Crumby	2004
R. E. Talbert	2002				

102 e. Outstanding Graduate Student Award Subcommittee

J. A. Dusky	2002	E.S. Hagood	2003	W. Wells	2004
E. P. Prostko	2002	R. H. Walker	2003	S. Garris	2004
J. D. Green*	2002				

103. COMPUTER APPLICATIONS COMMITTEE (STANDING)

S. Askew	2003	T. C. Mueller	2003	S. Senseman	2003
A. C. Bennett	2003	D. B. Reynolds*	2003	W. K. Vencill	2003
T. Whitwell	2003				

104. CONSTITUTION AND OPERATING PROCEDURES COMMITTEE (STANDING)

G. D. Wills*	2003	J. A. Dusky	2003	R. M. Hayes	2003

106. FINANCE COMMITTEE (STANDING) – *Shall consist of the Vice President as Chairperson and President-Elect, Secretary-Treasurer, Chairperson of the Sustaining Membership Committee, and others if the President so chooses, with the Editor serving as ex-officio member.*

J. W. Wells	2002	D.W. Monks	2002	J. C. Holloway	2004
D. Reynolds (Ex-Off)	2002	W. W. Witt*	2003	D. Poston	2004

107. HISTORICAL COMMITTEE (STANDING)

T. R. Dill*	2003	C. D. Elmore	2004
A. Rankins	2003	G. D. Wills	2004

108. LEGISLATIVE AND REGULATORY COMMITTEE (STANDING)

E. F. Eastin	2002	G. MacDonald	2003	J. W. Everest	2004
K. Melton	2002	C. E. Snipes	2003	M. Locke	2004
W. Odle	2002			M. M. Kenty	2004
D. G. Shilling*	2002				

109. LOCAL ARRANGEMENTS COMMITTEE – 2002 (STANDING)

Chairperson – V. Hawf
Audio Visual – B. Vencill
Registration – D. Bridges
Meal Functions – M. Braxton
Room Setup – C. Johnson III
Information Booth and Message Center – T. Grey
Spouses Program – T. Murphy
Signs and Exhibits – E. Prostko
Graduate Students and Room Registration – S. Culpepper
Public Relations Liaison – S. Brown
Placement Liaison – T. Webster
Equipment Storage and Security – D. Haines

110. LONG RANGE PLANNING COMMITTEE (STANDING) – *Shall consist of eight members serving staggered 2-year terms with four new members coming on the committee each year. The Chair shall be the Vice-Chair from appointment the year before. The four new members shall include the Vice-Chairperson who is the Immediate Past President and the current recipients of the Outstanding Young Weed Scientist Award and both Distinguished Service Awards.*

D. S. Murray*	2002	L. L. Whatley**	2003
W. W. Witt	2002	R. L. Ratliff	2003
T. N. Hunt	2002	R. M. Hayes	2003
F. Yelverton	2002	J. D. Byrd, Jr.	2003

111. MEETING SITE SELECTION COMMITTEE (STANDING) – *Shall consist of six members and the business manager. The members will be appointed by the president on a rotating basis of one each year and shall serve six-year terms. The Chairperson will rotate to the senior member within the geographical area for the meeting being considered.*

T. C. Mueller	2002	H. R. Smith	2004	R. L. Ratliff	2006
R. E. Alpee	2003	J. D. Byrd, Jr.	2005	A. Klosterboer*	2007
R. A. Schmidt (Ex-Off)					

112. NOMINATING COMMITTEE (STANDING) – *Be composed of the Past President as Chairperson in addition to nine individuals each chosen to represent one of the three different geographical areas and different disciplines of the Society. The members will serve staggered 3-year terms with 3 new members going on each year.*

S.O. Duke	2002	H. D. Skipper	2003	L. L. Whatley*	2004
J. D. Green	2002	J. Groninger	2003	B. Watkins	2004
C.D. Youmans	2002	J. L. Griffin	2003	S. Hagood	2004

113. PLACEMENT COMMITTEE (STANDING)

T. A. Baughman*	2002	M. McClelland	2003	C. D. Youmans	2004
T. Heap	2002	S. Murdock	2003	J. A. Kendig	2004
E. R. Johnson	2002				

114.PROGRAM COMMITTEE – 2002 (STANDING) – *Shall consist of the President-Elect as Chairperson and the Program Sectional Chairpersons as the remaining members.*

Chairperson W. Wells
1. Agronomic Crops . . . . P. Dotray
2. Turf, Pasture & Rangeland . . . . W. Wells
3. Horticultural Crops . . . . R. Jain
4. Forest Vegetation Management . . . . T. Harrington
5. Utility, Railroad & Highway Rights-of-Way, Industrial Sites . . . . M. Boyles
6. Biological, Aquatic & New Weed Problems . . . . G. Cloud
7. Ecological & Physiological Aspects . . . . D. R. Shaw
8. Educational & Regulatory . . . . D.L. Jordan
10. Developments from Industry . . . . B. Bean
11. Application of herbicides . . . . T. Baughmann
11. Soil & Environmental Aspects . . . . R. L. Ratliff
12. Research Posters . . . . S. Senseman

115. PROGRAM COMMITTEE – 2003 (STANDING)

Chairperson . . . . W. W. Witt
1. Agronomic Crops . . . . K. N. Reddy
2. Turf, Pasture & Rangeland . . . . D. K. Robinson
3. Horticultural Crops . . . . A. S. Culpepper
4. Forest Vegetation Management . . . . S. A. Knowe
5. Utility, Railroad & Highway Rights-of-Way, Industrial Sites . . . . D. Montgomery
6. Ecological, Physiological & Biological Aspects . . . . N. R. Burgos
7. Educational & Regulatory . . . . A. Rankins
8. Developments from Industry . . . . J. A. Mills
9. Application of Herbicides . . . . J. R. Martin
10. Soil & Environmental Aspects . . . . J. H. Massey
11. Research Posters . . . . T. C. Mueller

116. PUBLIC RELATIONS COMMITTEE (STANDING)

B. Besler	2002	J.C. Banks	2003	R. C. Scott	2004
C. T. Koger	2002	N. Burgos*	2003	D. Poston	2004
B. Zutter	2002				

117. RESEARCH COMMITTEE (STANDING) – *Shall consist of the Vice President as Chairperson and the remaining members as Section Chairpersons for the following sections: (1) Chemical and Physical Properties of New Herbicides, (2) Extension Publication s (3) Economic Losses Due to Weeds, and (4) Weed Survey – Southern States. Section Chairpersons shall be appointed by the Chairperson for a period of 3 years.*

W. W. Witt*		2002
E. P. Webster	Economic Losses Due to Weeds	2003
J. D. Byrd	State Extension Weed Control Publications	2003
T. M. Webster	Weed Survey - Southern States	2003
V. L. Ford	Chemical & Physical Properties of New Herbicides	2003

118. RESOLUTIONS AND NECROLOGY COMMITTEE (STANDING)

M.C. Boyles	2002	L. Cargill	2003	M. E. Kurtz	2004
M. Nespeca	2002	D. Gealy	2003	G. L. Schwarzlose	2004
S. M. Zedaker*	2002				

119. SALES COORDINATION COMMITTEE (STANDING)

W. C. Johnson*	2002	M. DeFelice	2003	D. L. Jordon	2004
C. Mosely	2002	J. A. Driver	2003	B. Kline	2004
		W. L Barrentine	2003		

120. SOUTHERN WEED CONTEST COMMITTEE (STANDING)

C. T. Bryson	R. M. Hayes	T. C. Mueller	J. F. Stritzke
C. B. Corkern	J. A. Kendig	L. R. Oliver	J. A. Tredaway
P. A. Dotray	M. L. Ketchersid	M. G. Patterson	W. K. Vencill
J. A. Dusky	R. T. Kincade	D. B. Reynolds	E. P. Webster*
J. W. Everest	V. B. Langston	S. Senseman	T. Whitwell
J. L. Griffin	W. Mitchem	D. R. Shaw	W. W. Witt
E. S. Hagood	D. W. Monks	D. G. Shilling	A. Sciumbato (student rep)

121. STUDENT PROGRAM COMMITTEE (STANDING)

J. V. Altom	2002	D. Simpson	2003	T. D. Scott	2004
M. E. Kurtz	2002	R. B. Lassiter	2003	T. Heap	2004
S. K. Rick**	2002	W. J. Grichar	2003	S. M. Schraer	2004
C. D. Youmans	2002	T. Baughman	2003	T. McKinney	2004
C. Arnold	2002	G. Stapleton*	2003		

122. SUSTAINING MEMBERSHIP COMMITTEE (STANDING)

J. V. Altom	2002	R. L. Ratliff*	2003	T. Holt	2004
T. R. Clason	2002	C. E. Walls	2003	B. Minton	2004
C. H. Slack	2002			K. L. Smith	2004

123. TERMINOLOGY COMMITTEE (STANDING)

Deletion pending

124. WEED IDENTIFICATION COMMITTEE (STANDING)

J. W. Boyd	2002	M. L. Ketchersid	2003	J. D. Green	2004
C. T. Bryson*	2002			M. DeFelice	2004
T. M. Webster	2002				

124 a. Herbicide Resistant Weeds Subcommittee

W. L. Barrentine	M. L. Fischer	J. A. Kendig*	R. Smeda
M. Barrett	J. L. Griffin	C. C. Kupatt	J. D. Smith
T. A. Bewick	K. K. Hatzios	J. J. LeClair	R. E. Talbert
J. D. Burton	R. M. Hayes	E. C. Murdock	W. K. Vencill
J. M. Chandler	D. Johnson	R. L. Nichols	G. R. Wehtje
S. O. Duke	J. W. Wilcut	T. F. Peeper	

125. CONTINUING EDUCATION UNITS COMMITTEE (SPECIAL)

D. Dippel	R. Rivera*	J. Snodgrass	A. C. York

126. MEMBERSHIP COMMITTEE (SPECIAL)

J. D. Byrd	W. N. Kline	T. R. Murphy	G. Stapleton
R. B. Cooper	M. Locke*	T. F. Peeper	
S. O. Duke	J. H. Miller	B. D. Sims	J. W. Wilcut

127. EXTERNAL FUNDING COMMITTEE (SPECIAL)

J. R. Bone*	J. H. Miller	T. F Peeper	W. W. Witt
J. L. Griffin	L. R. Oliver	D. G. Schilling	A. D. Worsham

* Chair
**Vice-chair

Minutes for SWSS Board Meeting
Hyatt Regency, Atlanta, GA
June 2 and 3, 2001

President Joe Street called the meeting to order at 1:32 p.m. on June 2, 2001. Attendance included Past President Laura Whatley, President-Elect Jerry Wells, Vice President Bill Witt, Student Representative Thomas Barber, Editor Dan Reynolds (arrived on June 3), Board Members-at-Large Barry Brecke, Charles Bryson, Bob Scott, Eric Webster, Business Manager Bob Schmidt, Secretary Treasurer David Monks, Constitution and Operating Procedures Chair Gene Wills and Tim Harrington (sitting in for Shep Zedaker, Forestry Representative). Virginia and Larry Hawf from the Local Arrangements Committee were also present.

Agenda
The agenda was presented by Joe Street and approved by the Board.

Minutes
The minutes from the 2001 SWSS meeting in Biloxi, MS were presented by David Monks and then approved with minor changes.

Business Managers Report
Business Manager Bob Schmidt highlighted information relating to membership, income, educational guides and other information relating to the society. He also reported that Weed ID set 7 was delivered last week to him.

WSSA Report
Barry Brecke reported that a survey of membership (WSSA) found displeasure in the weekend meeting time and several suggestions have come forward to possibly improve this situation. However, it is difficult to change since contracts have been signed for several years preventing changing the time frame of the meeting. He also reported that a Weed Tech task force looked at the format and scope of Weed Technology. The task force felt that format and scope were fine but suggested that the Editorial committees from Weed Tech and Weed Science meet and further differentiate differences in the two journals. He also reported that the 9th edition of the Herbicide Handbook is in press and will be available in November or December. Approval of common names of herbicides will be by ISO.

Graduate Student Organization
Thomas Barber highlighted the graduate students' plans for their luncheon at the annual meeting in 2002. They will be having a speaker who can relate the history of SWSS and WSSA. The Board encouraged the organization to consider selecting an advisor. Thomas Barber also indicated that the organization would like to develop a procedure for replacing officers should one leave. The Board encouraged them to do develop the procedure if they so desired.

Awards
Laura Whatley encouraged nominations of members for awards.

Nominations
Laura Whatley indicated that there are a number of offices that will need to be filled at the next election including Vice President, Cast Representative, Secretary-Treasurer, and WSSA Representative.

Joe Street charged Laura Whatley and her committee with developing an award to recognize industry either by adding an award or opening an existing one up to include industry.

Program
Jerry Wells indicated that the theme for the 2002 meeting will be "Feeding the World" with emphasis on past, present and future. He indicated that he is working with Dan Reynolds so that submission of titles and abstracts will be done electronically this year. Papers will be done as in the past since tables are difficult to transmit intact.

A discussion of the use of LCD projectors at the 2002 annual meeting. There was a motion that the Forestry session be allowed to use LCD projectors at the annual meeting as an experiment except for this sessions students in the graduate student contest. All other sessions except the general session will be required to use 2 by 2 slides. The motion carried unanimously. The Board noted that Paper presentations in all sessions including those using LCD projectors must be on time, this is critical since the judges for the graduate student contest must move among different sessions.

The instructions to authors in the MOP needs to be consistent. The MOP should be consistent to read that there is a charge for pages in papers over 5 (pages).

Site Selection
Tom Mueller presented the Site Selection Committee report and recommended either Sheraton Music City in Nashville or the Peabody Hotel in Memphis. Concern was expressed over the lack of dining establishments at or near the Sheraton in Nashville. This topic was tabled until the next day.

Atlanta Hyatt Regency
The SWSS Board walked through the facilities reserved for the 2002 annual meeting of the Southern Weed Science

Society.

Weed ID Committee
Weed ID Set 7 has been received by Bob Schmidt. Set 8 is written and is now being reviewed. The committee is in the process of selecting photographs for the Photo CD. Forest Weeds subcommittee will be giving a photo CD to Bob Schmidt to serve as a voucher for the images in the Forest Plants of the Southeast and their Wildlife Uses. Charles Bryson has the interactive keys except for about 30 weeds. A graduate student will be completing the descriptions for the 30 weeds.

Meeting recessed at 5:07 p.m.

Meeting was called to order at 7:08 a.m.

Editor's Report
The proceedings for the 2001 annual meeting is almost complete, only a few committee reports are lacking.

Computer Applications Committee
Dan Reynolds made the report concerning this committee. He proposed the committee be made up of 8 committee members and a web editor. Committee members would be appointed for a 4-year term and the web editor would be appointed to a 2 year term from the committee after serving at least 1 year on the committee. A motion was made to establish a 8 member plus a web editor
Computer Applications Committee. The motion passed unanimously.

Site Selection
Tom Mueller highlighted the advantages of going to the Peabody Hotel and Sheraton Music City. He had more information on the Sheraton Music City and recommended that SWSS meet at this hotel. He also expressed concern with regard to restaurant facilities in or near the hotel for meals during the meeting. Tom Mueller also indicated that box lunches (approximate cost of $15 to $20) could be brought in and made available for meeting. The Board felt, that because of the lack of restaurant facilities possibly making it difficult for members to dine during the meeting, this property was unacceptable. A motion was made for the SWSS 2004 annual meeting to be held at the Peabody Hotel in Memphis. The motion passed unanimously.

Research Committee
Bill Witt reported that a research report has not existed for many years. The report currently lists common and troublesome weeds, and estimated losses due to weeds (by state). Bill Witt the group of faculty that contribute to the report and most were supportive of continuing the report. He recommended to continue the report and maybe evaluate it at a later date. He did not have a recommendation for a name change of the committee.

Vacancies on the Executive Board
There was concern on how to fill the vacancy if the President of the Society could not serve the duration of the term. The question was asked should the President-elect and Vice President move up or should the President-elect become President and also hold the office of President-elect (several scenarios were discussed). Constitution and Operating Procedures Chair Gene Wills will bring to the next Board meeting drafts of procedures for the MOP addressing the above concern.

Committees
Gene Wills read the proposed changes with regard to committees which will be sent to membership for a vote.

Advertising in Newsletter
Bill Witt (Finance) will have a proposed policy on advertising in the SWSS newsletter to present at the January 2002 annual meeting.

Finance Committee
Bill Witt asked why the annual meeting of SWSS often loses money. Bob Schmidt indicated that it was due to graduate student rooms and banquet tickets at the annual meeting. Also, he indicated that the cost of the Proceedings to members has not covered the cost of printing and postage since 1993. Based on this information three motions were made. A motion was made that the Proceedings of the 2002 annual meeting in Atlanta be available only on CD. Bill Witt made the motion, Laura Whatley seconded the motion and it passed unanimously. The second motion was made to raise registration fees for members at the annual meeting beginning in 2002 to $150 which would cover membership, proceedings of the annual meeting and the banquet at the annual meeting. Bob Scott made the motion, Bill Witt seconded it and it passed unanimously. [note: this is the first time in 3 years that registration fees have increased]. A motion was then made to increase graduate student registration to $60. Eric Webster made the motion, Bob Scott seconded it and it passed unanimously. It was also discussed that notification of the annual meeting would go out to the membership by mail and it would point membership to the web site for forms for the meeting.

Kids Journey to Understanding Weeds
The Board felt that this has been an important activity to educate children on weeds. It has been well received thus far. The Board would like to know the long range plans of this group. A motion was made to support the Kids Journey to

Understanding Weeds in the amount of $1000. Bob Schmidt will send a check to President Joe Street for him to include with a letter to them.

Forest Plants of the Southeast
It was discussed by the Board to discount the book so that bookstores would sell it. Bob Schmidt has approximately 3000 books left. There were concerns expressed about discounting the book since it is already underpriced. Some Board members felt that handling costs of the book was 10 to 20 % so felt that the book could possibly be discounted. However, the Board felt that the current pricing structure is adequate at this time and did not support discounting the book further.

Budget
Bob Schmidt presented the budget for the upcoming year. After brief interaction, Barry Brecke made a motion to accept the budget as presented, Randy Wells seconded it and the motion passed unanimously.

Old WSSA Publications
A motion was made to put a notice in the newsletter that old WSSA publications will no longer be available after September 30 at which time they will be destroyed. They are currently available for $5.00 which covers shipping and handling. The motion passed unanimously.
[The reasoning behind this was to save money on storage of these publications].

A motion to adjourn was made at 9:30 by Charles Bryson, seconded by Laura Whatley and the motion passed unanimously.

Minutes for SWSS Board Meeting
Hyatt Regency, Atlanta, Ga.
January 27, 2002

President Joe Street called the meeting to order at 1:30 p.m. on January 27, 2002. Attendance included Thomas Barber (Graduate Student Representative), Barry Brecke (WSSA reprentative), Charles Bryson (Board Member-at-Large), Jackie Driver, (Board Member-at-Large), John Harden (Vice President Elect), Virginia and Larry Hawf (Local Arrangements committee), David Monks (secretary/treasurer), Tom Mueller (secretary/treasurer elect), Dan Reynolds (Editor), Bob Schmidt (Business manager), Jerry Wells (President Elect), Joe Street (President), Alan York (CAST representative), Bob Scott (Board Member-at-Large), Eric Webster (Board Member-at-Large), Laura Whatley (Past President), Gene Wills (Constitution and Operating Procedures Chair), Bill Witt (Vice-President, and Shep Zedaker (Forestry representative).

Minutes
David Monks gave this report. A motion was made by Bill Witt to accept the minutes. Laura Whatley seconded the motion and the motion carried unanimously.

Secretary/Treasurer Report
David Monks gave this report. Jackie Driver made a motion to accept the Secretary/Treasurer Report. David Monks seconded the motion. The motion passed unanimously. Laura Whatley moved that Tom Mueller become the newsletter editor in addition to secretary/treasurer which begins at the end of the current SWSS annual meeting. (note: this motion does not move newsletter editor responsibilities to secretary/treasurer responsibilities) Charles Bryson seconded the motion. The motion passed with two in opposition.

Editors Report
The report was given by Dan Reynolds. He is in the process of checking with companies putting the proceedings of SWSS annual meeting on CD. Currently Omnipress does this for the Beltwide Cotton meeting. Total price would be approximately $5900 ($8.45 each). Laura Whatley encouraged Dan Reynolds to request a few more bids. A motion was made by Laura Whatley stating that SWSS solely go to electronic proceedings on a CD, beginning with the 2003 meeting. The motion was seconded by Jackie Driver and the motion carried unanimously. Charles Bryson made a motion to put the proceedings for the 2002 meeting on CD with enough hard copies printed as needed (determined by the Business Manager at registration). Barry Brecke seconded the motion and the motion carried unanimously. Dan Reynolds moved that abstracts, committee reports, papers, key words and symposium reports for the annual meeting be only submitted online. This would also include general session speakers abstracts or papers. Barry Brecke seconded the motion. The motion passed unanimously. Dan Reynolds made another motion to amend the MOP to instruct the program chair to assign numbers to symposium and general session speaker's papers so that they can be submitted via the web. Laura Whatley seconded the motion and it carried unanimously.

Local Arrangements
The report was given by Virginia Hawf. There was some discussion about members being bumped to other hotels. The Hyatt made some concessions for members bumped to other hotels.

Business Management Report
This report by Bob Schmidt. He highlighted membership, pre-registration and other pertinent topics.

Awards Committee Report
It was discussed that submissions of nominee packages for awards are to be retained and considered for 3 years as the MOP states. A motion was made by Bill Witt to accept this report as submitted. Barry Brecke seconded the motion and it passed unanimously.

Program Committee
Jerry Wells complimented Virginia Hawf on Local Arrangements Committee activities. He indicated that there were 295 papers plus the symposium. He also noted that there was a room misprint in the program, and that two papers were cancelled and three papers were changed to posters.

Sales Coordinating committee
C. Johnson II inquired about further discounting the "Forest Plants of the Southeast and their Wildlife Uses" book for bulk sales. The board is not in favor of further discounts at this time.

Long Range Planning committee
Don Murray led a discussion of the survey of the membership that was conducted.

Weed ID Set 2
Bob Scott made a motion to initiate reprinting of set 2 of Weed ID Guide. Dan Reynolds seconded the motion and the motion carried unanimously.

The Board discussed Helms Briscoe and their work with SWSS. After some discussion, a motion was made to strike

the sentence from the MOP on the first paragraph on page 36. This would allow the current site selection chair the opportunity to employ
the services of Helms Briscoe but not require them to do so. The motion passed with only one member of the Board in opposition.

The board meeting was adjourned at approximately 5:05 p.m.

The Board reconvened on Jan. 28, 2002 at 10:01 a.m.

Computer Applications Committee
Dan Reynolds reported. The committee will look at the use of LCD projectors for the future. They will see how successful they are at WSSA annual meeting in February 2002 and in the Forestry section of SWSS annual meeting to determine their possible use. The committee will make a recommendation at the summer board meeting regarding use of LCD projectors at annual meetings. The committee requested $1,000 per year for this committee to support its activities. The motion was passed unanimously. Dan also reported that a new domain (www.swss.ws) was purchased and is on the Mississippi State server. The committee will be revising the instructions on the MOP to reflect the new Web Requirements for online submission of papers, titles, etc.

Finance Committee
Bill Witt made a motion that SWSS continue to support the Inter Mountain Ag Foundation's "A Childs Understanding of Weeds at $1,000. Laura Whatley seconded the motion and the motion passed unanimously. The Finance Committee recommended the reprinting of SWSS ID set 2. There were two bids from printers. The Finance Committee recommends that the choice of the printer be left up to Arlyn Evans and Charles Bryson. The Finance Committee made a recommendation to support the request of the Local Arrangements committee for $50 to support their activities. The Finance Committee also made recommendations with regard to advertisement in the newsletter. The following recommendations were made: 1) advertisement would be accepted and that all advertisement should be related to Weed Science, 2) it should be reciprocal with other nonprofit organizations such as the other Weed Science societies, 3) for Weed Science related issues for nonprofit, non reciprocal organizations then up to ¼ page will be free, 4) For profit organizations and all other organizations ¼ page of advertisement will be $250, ½ will be $500 and 1 page per issue will be $1,000. Where Advertisement falls into categories is left up to the Editor of the newsletter. Bill Witt made a motion to adopt recommendations from the Finance committee, Whatley seconded the motion and the motion passed unanimously.

Research Committee
There was discussion about a problem with conducting the survey on economic losses from weeds. Laura Whatley asked Ron Hedburg about use of these data on research report. He indicated that information on economic losses due to weeds is critical. Bill Witt recommended the continuation of data collection and Whatley suggested exploring the possibility of grant support for this activity.

Membership Committee
There was much discussion on reestablishing SWSS as a primary meeting for the industry. A discussion on how to make the SWSS annual meeting more attractive and to evaluate the meeting format. Ideas to broaden SWSS were also discussed.

Resolution and Necrology Committee
The board unanimously approved development of resolutions for William Lambert and Walt Mitchell.

Director of Science Policy
Rob Hedburg reported and indicated he is interested in SWSS issues. He inquired as to who in the society was an expert on pesticide drift. He also indicated the desire to improve exposure of Weed Science by making an ARS category similar to other disciplines such as soils etc. He is working closely with the Legislative and Regulatory Committee of SWSS. He also expressed interest in obtaining a list of experts on the technical areas in Weed Science.

Endowment's External Funding committee
There was a discussion on external funding and activities such as raffles, liability of such activities and graduate students selling raffle tickets for these activities. The committee will bring this topic to the Finance committee.

Complementary rooms for SWSS Board
This item was tabled until the Board reconvened on Thursday morning.

The board adjourned at approximately 12:00 noon.

Minutes of Winter Board Meeting
Atlanta, GA
January 31, 2002

The meeting was called to order at 7:00 AM by President Jerry Wells.

Those in attendance were Peter Dotray (Editor), Tim Murphy (WSSA Representative), Bob Schmidt (Business Manager), Jim Barrentine (Board Member), Shep Zedaker (Forestry Board Member Representative), Jackie Driver (Board Member), Bob Scott (Board Member), Joe Street (Past President), Eric Webster (Board Member), Charles Bryson (Board Member), Gene Wills (Constitution and Operator Procedures Chair), Jerry Wells (President), Bill Witt (President Elect), Eric Scherder (Student Representative), John Harden (Vice President), Tom Mueller (Secretary-Treasurer).

Local arrangements Chair Virginia Hawf presented a report to the board. Discussion points included:

A. Consider carefully aspects of contract obligations given the changes in the room block and meeting requirements of the SWSS.
B. Consider selecting a single option for presentation of visual images in oral presentations, and perform adequate training of moderators to facilitate proper use of projection equipment
C. Local arrangements solicited funds for refreshment breaks and to augment SWSS endowment funding of student luncheon. Some discussion about these procedures.....
D. 46 people were "bumped" from the Hyatt hotel to other hotels, with a substantial portion being greatly inconvenienced by this action.

Site Selection:
Wells will clarify status of currently appointed site-selection committee members and appoint as appropriate to fill the committee and clarify chairmanship.

Student Board Report:
Scherder reported on student comments about using LCD for contest, with concerns about standardization of file size, use of animation, and availability of sufficient backup equipment.
Witt informed board of plans to accept only LCD (no slides, no overheads) based on previous experience of North Central and WSSA.
Barrentine moved and Bryson seconded to use exclusively LCD at 2003 meeting given a further review of contract terms allowing this activity at no additional cost to SWSS. Motion carried.

Long Range Planning Committee

Discussion centered around need for longer terms for committee members and for chairman to provide more continuity. Street moved and Webster seconded to have past presidents from the previous 5 years to serve on the committee, and that the chairman will be appointed as needed by the president to a 3 yr term. Motion carried.

Discussion about sale of mailing lists. Schmidt informed group that he currently sells the list only to the Purdue Weed Science Short course.

Discussion on paying for board member rooms and allocation of comp rooms

Street moved and Scott seconded to change MOP to reflect paying for board member rooms only at summer board meetings. Motion carried. Discussion note: These rooms are often provided as comp rooms to SWSS. Additionally, discussion encouraged use of comp rooms by highest ranking officer(s), business manager, and local arrangements chair.

Student representation on committees:

Discussion was centered on involving students on committees. Witt noted that students can serve on any committee, and all committee meetings are open to all members. Others thought a structured involvement may encourage more student involvement. Street moved and Murphy seconded to add a student member to the placement and add a student to the student program committee, each to a 1 year term. Motion passed.

Witt suggested student board write a letter to endowment board (Ray Smith, Chair) and ask for student representation on the Endowment Board.

Mueller discussed procedures of student organization. Scherder was requested to bring copy of student MOP to summer board meeting.

Banquet:

Positive comments about 2002 banquet, with encouragement provided to keep brief.

Program, 2003 Meeting

Witt discussed ideas for symposia, with potential ideas being one focused on graduate students (expectations after graduation, professional development, etc), and perhaps one on invasive species. Discussion involved flexibility of program chair to assign papers to alternate sections and even from paper sessions to poster section if needed. Wittt requested clarification of procedures on this matter at summer board meeting.

Discussion involved encouraging the public relations committee to more strongly emphasize CEU points to the surrounding geographical area to aid in attendance...

Discussion on action item to encourage greater use of trade names and English units (ie amount formulated product per acre) to make presentations more "user friendly"

Several aspects of the student oral/poster contest were briefly discussed. Mueller will bring formal report to summer board meeting concerning suggestions from student program committee to alter MOP in this area.

Witt moved, Zedaker seconded to appoint incoming Vice President to serve as a liaison to student association. Motion passed.

Discussion on moving student luncheon to a time adjacent to planned symposium focusing on graduate students. Scherder noted some difficulty in students needing to give talks soon after lunch in current format.

Consider survey on change of meeting date. Wells expressed concern that without clear direction from membership this may not be a wise time to move the meeting. Discussion urged long-range planning committee to provide recommendation to board.

Business Manager report on 2002 meeting:

Schmidt announced:

attendance of 456 at the Atlanta meeting, 337 full members, 119 students
423 proceedings requested (186 for hard copy book)
banquet attendance = 275 (guarantee), 254 actual (this was 58% of tickets sold).
Board needs to consider hard copy proceedings issue at summer board meeting

Summer Board meeting dates:

First option based on board member schedules was June 1-2, second choice = June 8-9. Meeting start time will be 1:00 PM on Saturday, end time noon on Sunday. (Note: substantial travel time needed to reach airport from hotel). Location of meeting = Adams Mark Hotel, Houston, TX.

Deadline for Newsletter = March 15, 2002 for May Newsletter
Address for Newsletter editor

Tom Mueller
252 Ellington Plant Science Building
2431 Center Drive
Knoxville, TN 37996
865-974-8805 (voice)
865-974-7997 (FAX)
tmueller@utk.edu (Email strongly encouraged, very strongly encouraged).

Respectfully submitted,

Tom Mueller
Secretary-treasurer.

BUSINESS MANAGERS REPORT - Bob Schmidt January 22, 2002

Southern Weed Science Society

Business Manager's Report

Membership as of December 31

	2001	2000	1999	1998	1997	1996	1993
Members and Sustaining Members	510	527	559	662	661	637	756
Students	126	131	136	136	120	139	103
Totals	636	658	695	798	781	776	879

Research Methods to date

Expense $38,003 Income $41,146

Weed Identification Guide to date

Expense $444,005 Income $762,530

697 ID #7 order forms mailed to people who had ordered in the last 5 years - 185 had moved
519 ID #7 order forms mailed to members from 97,98,99,2000 who are not current members
653 ID #7 order forms mailed to current members and student

Weeds of the United States and Canada CD-ROM vs 1,2,2.1

Expenses $29,001 Income $148,530

Forest Plants of the Southeast and Their Wildlife Uses

Expenses $104,051 Income $118,001

Good Laboratory Practice for the Field

Registration	
Basic	17
Advance	22
FTM/eFTN	10
Quality Assurance	14

Preregistration

	2002	2001	2000	1999	1998	1997	1996	1995
Members	226	248	249	261	285	292	282	331
Students	80	87	115	116	74	74	63	67
Total	306	335	364	377	359	365	345	398
Percentage of final	68%	68%	76%	75%	59%	60%	60%	56%
Total Attendance	450 est	492	476	501	601	584	566	703

EDITORS REPORT - Daniel B. Reynolds

Summary of Progress: The 2001 Proceedings contained 396 pages. This was a decrease of 36 pages over the Proceedings from 2000. The Proceedings contained all executive board minutes, committee reports, business managers' report, general session presentations, presidential address, award winners, research report, abstracts, and full papers. The abstracts and full papers are available via the web from the SWSS home page (www.swss.ws). Following is the distribution of number of presentations and number of pages.

Section	**Number Presented**	**Number of Pages**	**Number of Papers**
Minute of Executive Board, Committee Reports, etc.		61	
General Session	3	3	1
Weed Management in Agronomic Crops	85	58	1
Weed Management in Turf, Pasture, and Rangeland	27	18	0
Weed Management in Horticultural Crops	8	6	0
Forest Vegetation Management	27	44	9
Ecological & Physiological Aspects of Weed Management	23	12	0
Developments from Industry	10	6	1
Soil & Environmental Aspects of Weed Science	14	10	0
Posters	92	60	2
Symposiums	6	12	2
State Extension Publications, Weed Survey, Economic Losses, Index		44	
Indexes, Registrants, etc		62	
Total Abstracts & Papers	295	229	16
Total - Other		167	
Grand Total	**295**	**396**	**17**

Objective(s) for Next Year: Develop new submission guidelines for all items on the web. To have submission of all abstracts, committee reports, general session speakers, papers, and symposiums as online submissions only.

Recommendation or Request for Board Action: 1) Accept OmniPress's quote and print 100 hardcopies and 700 CDs of the 2002 Proceedings. 2) Make all submission mandatory via the web with a deadline of 5:00 P.M. (CDT) on the Friday prior to the annual meeting. 3) Instruct program chair to assign numbers to symposium & general session speakers to allow web submission.

Finances (if any) Requested: I have no additional requests at this time. The costs associated with the web publications should already be covered by the funds available for the Computer Application Committee.

Respectfully Submitted: Daniel B. Reynolds, Editor

SECRETARY-TREASURER'S REPORT - Presented by David Monks

Ballots were mailed to Southern Weed Science membership to vote on proposed changes to the constitution of the Southern Weed Science Society. The proposed changes were to delete the SWSS Terminology committee, and to change the Continuing Education Committee from an ad hoc committee to a standing committee of the Southern Weed Science Society. There were 94 ballots casts and both proposed changes passed near unanimously.

Ballots for election of the officers of Vice President, Secretary-Treasurer, WSSA Representative, CAST Representative, and Endowment Foundation were mailed out in October with a November 15, 2000 deadline. Ballots returned by November 15, 2000 were tabulated and the officers elected for 2001 are John Harden - Vice president, Tom Mueller – Secretary Treasurer, WSSA Representative – Tim Murphy, CAST representative – Jim Barrentine, and Endowment Foundation Trustee – Eric Prostko. A total of 247 ballots were cast with the highest number of votes being cast for WSSA representative and the Endowment Trustee. The number of ballots cast in 2001 was essentially the same number of ballots cast the previous year.

The net worth of the Southern Weed Science Society as of September 30, 2001 is $244,174.92. Year end report, audit and tax form preparation were done by Lafferty and Associates, Champaign, IL.

COMMITTEE REPORTS

Committee Number: 101 **Committee Name**: SWSS Endowment Foundation

Net worth as of September 30, 2001 - $244,174.92

Contributions received since 2001 meeting:

Laura Whatley
Jim Bone
Robert M. Hayes
David L. Jordan
Donald E. Moreland
Ralph S. Baker
Robert E. Eplee
Joy J. Smith, Jr.
Ron Talbert

Contributions received with registration for 2002 meeting:

Carroll Walls
Phil Banks
Joe Street
Jim Barrentine
Laura Whatley

Total of 10 buttons sold on 2002 preregistration

Certificates of Deposit

Amount	Rate	Maturity
$61,033	3.87%	6/03
$18,155	5.40%	1/02
$14,709	6.20%	4/02
$13,676	5.60%	4/05
$10,903	3.00%	11/02
$15,688	6.00%	7/03
$60,000	6.90%	6/03
$30,000	4.25%	1/06

Good Laboratory Practices 2001 income $5,930.58

Good Laboratory Practices registration for 2002
17 Basis
22 Advance
10 RTM/eFTN
14 QA

Committee Number: 102 **Committee Name**: Awards Committee, Parent (Standing)

Summary of Progress: After carefully reviewing the nomination packages, the awards committee subcommittees selected the following award winners:

Distinguished Service Award, Academia—Alan York, North Carolina State

Distinguished Service Award, Industry—Bobby Watkins, BASF

Outstanding Educator—Tom Peeper, Oklahoma State

Outstanding Graduate Student, M.S.—Scott Clewis, North Carolina State

Outstanding Graduate Student, Ph.D.—Andy Bailey, Virginia Tech

Outstanding Young Weed Scientist—Peter Dotray, Texas A & M

Despite strong efforts to solicit nominations, there were no nominees for the Weed Scientist of the year award.

Objective(s) for Next Year: Encourage members to nominate outstanding individuals for these awards; have nominees in all award categories.

Recommendation or Request for Board Action: None

Finances (if any) Requested: None

Respectively submitted:
B.J. Brecke
J.D. Green
S. Senseman
B. W. Bean
T.C. Mueller
L.L. Whatley, Chair

Committee Number: 104 **Committee Name:** Constitution and Operating Procedures Committee (Standing)

SUMMARY OF PROGRESS: At the annual meeting of the SWSS Executive Board in January and at the Summer Meeting in June 2001, suggestions for changes in the SWSS Operating Procedures were presented to the Executive Board. Following the Summer Board Meeting all approved revisions and all directives for changes by the Executive Board were made in the SWSS Manual of Operating Procedures (MOP). Also, the Executive Board submitted a mail ballot to the SWSS membership to change the SWSS Constitution to 1) Delete the Terminology Committee and 2) Change the Continuing Education Committee from an *ad hoc* to a Standing Committee. These changes were approved by a large majority of the SWSS membership. During August 2001, the revised edition of the MOP was submitted for distribution on the SWSS Web Site, http://www.weedscience.msstate.edu/swss/.

OBJECTIVE(S) FOR NEXT YEAR: To continue with a timely revision of the SWSS Manual of Operating Procedures following the Summer Meeting of the SWSS Executive Board and placing the revised Procedures on the SWSS Web Site.

FINANCES REQUESTED: None

RESPECTIVELY SUBMITTED:
J. A. Dusky, R. M. Hayes, and G. D. Wills, Chairperson

Committee Number: 106 **Committee Name:** Finance Committee (Standing)

The Finance Committee reviewed the financial status of the Southern Weed Science Society and found it to be sound. Income from the sales of weed identification publications continues to support the activities of our Society.

The Finance Committee submitted several items to the Board of Directors for consideration. The Committee approved the continuing support of the Inter Mountain Ag Foundation's publications "A Child's Understanding of Weeds". The Board allocated $1000 for this support. The Committee also recommended the reprinting of SWSS ID Set #2. Two bids were received and we recommended that the selection of the printer be left to the discretion of Arlyn Evans and Charles Bryson. Further, the Committee recommended that the Society provide $50 to the Public Relations to support their activities.

The Committee developed a policy on advertising in the SWSS Newsletter and submitted it to the Board for action. The following policy was adopted by the Board: (a) advertising should be allowed in the Newsletter but all advertising must be related to weed science; (b) reciprocal advertising with other nonprofit organizations, such as the other weed science societies, will be allowed; (c) for weed science related issues for nonprofit, non-reciprocal organizations then up to 1/4 page of advertising will be free; (d) advertising by organizations for profit, and all other organizations, shall be at the rates of $250 for 1/4 page, $500 for 1/2 page, and $1000 for one page and these rates are for each issue of the Newsletter. The Newsletter Editor is responsible for determining into which category each advertisement will be placed.

The Finance Committee recognizes the need for Sustaining Memberships and encourages SWSS members to solicit other potential candidates as Sustaining Members. This Committee also urges that the registration fees for the annual meeting be large enough to cover the costs of the annual meeting.

Respectfully submitted: William W. Witt, Chair
D. W. Monks
D. B. Reynolds
J. W. Wells
J. C. Holloway
D. Poston

Committee Number : 110 **Committee Name:** Long Range Planning (Standing)

Summary of Progress:
The committee will try to make this report brief; however, we would like to include the results of the membership survey so that this Board and future Boards can revisit the results of this survey.

Business Manager, Bob Schmidt, sent out a 17 question questionnaire to 653 members and 519 former members (those who did not attend 2001, but who did attend in 2000, 1999, 1998, 1997, or 1996). The current members returned 160 questionnaires (25%), and the former members returned 32 questionnaires (6%). Obviously, some of the questionnaires sent to the former members were undeliverable because of outdated addresses. Several respondents, both current members and former members, wrote some very thoughtful suggestions and I will include those with this report.

There did not appear to be an overwhelming attendance trend by location. Accessability of airport and hotel seemed to be important but then some suggestions recommended sites which have poor accessability. There was a mixed bag when the question regarding meeting time was asked; however, January still seems to be the month of choice. One suggestion given by phone was to move the meeting to a Tuesday, Wednesday, and Thursday time during the week of Martin Luther Kings celebration. We might get good hotel rates and it would distance our meeting time from that of WSSA. It would however, put our meeting closer to the Beltwide Cotton Conference. Actually some of the most thought provoking suggestions were made in the discussion section of the survey – these are difficult to summarize and they will be shown individually.

The committee believes that the survey was worthwhile; however, summarizing the results were very complicated – there simply is not a few select findings that can be reported. The membership of this Society is extremely diverse with their opinion on any given question – maybe that is why this Society is so strong.

Current Members (160 responses) Former Members (32 responses)

Are you a member who regularly attends SWSS (4 out of 5 years)?

127	Yes
32	No

Are you a former member or a member who only occasionally (every second or third year) attends SWSS?

14	Yes
18	No

How long have you been a member of SWSS?

16	Less than 5 years
33	Between 6 and 10 years
60	Between 11 and 20 years
48	Greater than 20 years

How long had you been a member of SWSS?

5	Less than 5 years
8	Between 6 and 10 years
6	Between 11 and 20 years
8	Greater than 20 years

Were you a member of SWSS as a student?

86	Yes
73	No
10	Yes
20	No

Were you a student at a school outside the states affiliated with SWSS?

25	Yes
133	No
5	Yes
26	No

In the last 10 years, which of the SWSS annual meetings have you attended? (check all that apply)

130	Biloxi (2001)	112	Memphis (1995)
112	Tulsa (2000)	108	Dallas (1994)
124	Greensboro (1999)	104	Charlotte (1993)
126	Birmingham (1998)	100	Little Rock (1992)
114	Houston (1997)	100	San Antonio (1991)
114	Charlotte (1996)		
0	Biloxi (2001)	10	Memphis (1995)
11	Tulsa (2000)	12	Dallas (1994)
7	Greensboro (1999)	13	Charlotte (1993)
9	Birmingham (1998)	11	Little Rock (1992)
15	Houston (1997)	17	San Antonio (1991)

13 Charlotte (1996)

Which of the following best describes your source of employment?

68	Company	10	Self employed
8	US government	5	Retired
42	University research	3	Student
28	University extension	3	Other
7	Company	3	Self employed
2	US government	4	Retired
7	University research	0	Student
5	University extension	7	Other

How would you characterize the importance of the meeting site when considering attending SWSS?

123 I would attend anywhere in the "southern region"
4 I will only attend when the meeting is in my part of the region (eastern, central, or western)
7 I would only attend the meeting if it were within driving distance
25 I will probably continue attending on an irregular basis

comments: Travel restrictions last few years have impacted my attendance. / For most, I think they prefer an easy- to-reach place with local activities. / But like central locations, easy access. / Try to select locations that are not so out of the normal travel patterns like Biloxi & Tulsa. Neither of these areas are airline hubs and have to be reached by small commuter flights. Then there is a long shuttle or cab ride. Hub cities would be an improvement. / Depends on resources and other conflicts. / I would attend anywhere in the "southern region" EXCEPT TULSA. / In my opinion - I have been a research scientist with industry for 19 years - the meeting location for any meeting is of upmost importance for attendance. I would like to see SWSS rotated between a "set" of "desirable" locations - i.e. New Orleans, Atlanta, Nashville, Orlando, Memphis, maybe a couple of others. This has been my experience for many meetings over many years - and most people will not admit that the location effects their decision but it does. Also, stop worrying about the cost of the hotel - people will complain but will find a way to come.

7 I would attend anywhere in the "southern region"
0 I will only attend when the meeting is in my part of the region (eastern, central, or western)
7 I would only attend the meeting if it were within driving distance
19 I will probably continue attending on an irregular basis

How would you characterize the importance of the meeting site when considering sending your graduate students to SWSS?

36 I would send my students anywhere in the "southern region"
1 I will send my students only when the meeting is in my part of the region
6 If the meeting is close enough to drive they can attend
98 Not applicable because I am a graduate student or I do not have graduate students
18 left blank
1 I would send my students anywhere in the "southern region"
1 I will send my students only when the meeting is in my part of the region
3 If the meeting is close enough to drive they can attend
19 Not applicable because I am a graduate student or I do not have graduate students

What would your feelings be regarding the changing of our meeting time (time of year) to conflict less with other meetings such as the Beltwide Cotton Meeting and WSSA? Rank the following 1 to 5.

15 Very opposed to changing to a time other than January
33 Opposed to changing to a time other than January, but would probably continue attending SWSS regardless of time
56 I think it is time to consider moving our meeting to a time other than January to conflict less with other, larger meetings
10 I am more likely to attend SWSS if it is moved to conflict less with the current January/February meetings
52 Really don't have a strong opinion one way or the other

comment: Hard to tell. If you change it, it might conflict with something else so it probably shouldn't be changed. May alter it by a week so that it doesn't interfere with Beltwide.

1 Very opposed to changing to a time other than January
1 Opposed to changing to a time other than January, but would probably continue attending SWSS regardless of time
4 I think it is time to consider moving our meeting to a time other than January to conflict less with other, larger meetings
4 I am more likely to attend SWSS if it is moved to conflict less with the current January/February meetings
22 Really don't have a strong opinion one way or the other

Below are some optional meeting times (months), rank them in order of the likeliness of you attending SWSS (1 being the most likely and 9 being the least likely) .

January took more votes for keeping as the # 1 choice. (By more than 3:1 than the runner up - Feb.) Several mentioned a different week in January would be better. April/August/December nearly tied for last place. comment: Inclement weather makes travel difficult in Dec, Jan, & Feb.

January most votes as # 1 choice. December got more last place votes.

Would you be in favor of extending the length of our meeting to run from Monday at noon (the current starting time) to Thursday noon (adding a half a day)?

20	Yes	6	Yes
137	No	22	No

comments: Depends on what is added./ Professional time is too short now. Consider removing banquet. By the time Wednesday noon comes around we've done about all the socializing we need to and it's time to "blow & go". / yes - If additional programs are added to attract more attendees. Most people will still leave the day before meeting ends.

Would you be in favor (are you more likely to attend) of having the meeting run all day Tuesday, Wednesday, and Thursday?

50	Yes	8	Yes
17	No	4	No
82	Leave it where it is	13	Leave it where it is

Rank the following criteria in the order of importance (1 being the most important to 5 being the least important) to retain your attendance or regain your attendance to SWSS.

(most important/least important)

74/10	Meeting time (month)
26/21	Meeting location (particular city)
10/37	Meeting region (eastern, central, western)
19/73	Change the meeting format or content
9/4	Meeting time (month)
7/2	Meeting location (particular city)
5/2	Meeting region (eastern, central, western)
3/11	Change the meeting format or content

Feel free to add any comments in this free space that you feel would 1) improve SWSS, 2) serve its members best, or 3) result in an improvement in membership.

Many sessions are too much "what herb kills what weed" versus being real weed science.

More, informative symposia./Increase participation of 'basic' weed science research./We need more questions & discussion of papers presented, especially graduate papers - they are not challenged by the audience./Get graduate students out of the halls & into paper presentations.

I plan to "make time" to attend SWSS unless it conflicts with WSSA or another national or international meeting.

We should consider doing a joint meeting with NCWSS occasionally. Could hold meeting in December sometimes, January others, or a third time different from the traditional Dec & Jan. Question: Do we send membership renewal notices to folks who miss attending an annual SWSS meeting? We should!

I am not in favor of extending a day. Students miss enough classes as it is. Also, many would still check out the day before. We are less likely to encounter bad weather if we stay away from January/February.

I'd like to see more symposia and less 15 minute talks. Many could be posters.

Explore combined or joint meetings with other regional societies, e.g. Northeast or NCWSS. We should admit (rather than deny) that membership is declining due to industry downsize/mergers/consolidation. Also decline in graduate student enrollment. Solution: Be happy with membership we have or else merge with other regional societies.

Meetings are well done; cost & meeting content most affect my decision to attend.

Probably should have asked how many former members that are colleagues no longer attend because they no longer are involved in weed science. Is the problem with SWSS just a reflection of industry? I think adding the GLP training is good. Explore other professional training opportunities to enhance meeting, such as publication workshop.

Atlanta is great. Tulsa is boring. NC is good strategically but tired of having meetings in the same location. Pick big cities with easy airport access, but no airport hotels. Like Atlanta, Orlando, Houston, Dallas, New Orleans, Memphis.

Up until 3 years ago, papers and abstracts were submitted camera ready and the Proceedings were published by mid-summer. Now, papers and abstracts are submitted electronically and the Proceedings are not being published until late winter. Members who do not attend the annual banquet should not be required to subsidize those that do attend. Hotels chosen for meetings are too expensive.

With the decrease in companies (i.e. sustaining members) and the increase in the global aspect of weed science, I believe it would be prudent to consider consolidating the regional weed science organizations into a joint meeting with the WSSA. Have joint sessions as well as concurrent regional breakouts with associated banquets.

Add a section for consultants.

I believe that we need more invited presentations and volunteered posters. A coordinated symposium on “Roundup-Ready Cotton” is preferable to a program that reads like, “the effect of Roundup on weed X in state Y”.

One of the problems with meeting in January is the bad weather we often encounter trying to get to or from the meeting. Could we take a hard look at an early April meeting or an October meeting? Another thing hurting attendance is our meeting times. Anymore, many people just won’t be away from home on Saturday or Sunday just for a meeting they don’t have to attend anyway.

University faculty & graduate student numbers are decreasing; companies and number of company reps are decreasing; if we want to maintain or increase numbers we will need to emphasize producers and dealer/service personnel. To do this the meeting format would need to be much more producer oriented.

I would like to see more student involvements. Many of our students feel “disassociated” from the society and will not remain faithful members.

Promote IPM by encouraging other or more participation or biocontrol, mechanical, and other non-chemical weed control techniques.

More symposium opportunities, and extend meeting by ½ day if need to allow for symposia. Do not start meetings on Sunday like that horrible decision that WSSA made. Have competitive grants for meeting travel from Endowment Fund for para-professionals to attend: county agents, senior technical personnel, etc.

January meetings are always difficult form the standpoint of weather problems - would like to see some consideration of changing. I like fall (October/November).

Recommend that “Dev. from Industry” be given a higher priority regarding timing & room size and timed to not coincide with other major sessions (it used to be done). Being self-employed, would prefer region rotation to locations in central region every other year. This way travel costs would be lowered for everyone.

Move the awards banquet to an awards luncheon on the second day.

In my case, my attendance was governed by my employer. They would only allow limited people to go to meetings and encouraged us to attend a variety of meetings. Therefore, I had to make a choice each year about which might be the BEST meeting for me to attend. Consequently, I seldom attend the same meeting more than once every 3-4 years and it has nothing to do with the operation of the SWSS. Those meetings I attended I found to be helpful and useful to my career.

I don’t have the cotton influence but see how the Beltwide would interfere with the SWSS.

Less grad student papers - more professionals.

Unless I am surprised, I think the survey responses will be much like this one in that you will hear from those that attend and not from those you are trying to recruit. Therefore, I think the answers you get back will be skewed. If there could be some way to survey those former members who have not attended in several years to find out why they don’t attend would be helpful.

If meeting is held in larger city with airport hub the expense of getting in and out could be reduced.

SWSS is less & less relevant. Company reps used to network with me at SWSS; now they attend Beltwide instead. Why go to Beltwide and see 10 papers on Roundup Ready cotton and 2 weeks later go to SWSS to see the same 10 papers on RR crops. Physiology section has been dead for years. To survive, the meeting needs to reach out to include different groups (invasive people, aquatics) and become more popular (Extension, grower friendly).

Need to find a way to reduce the almost maniacal competitive intensity of the delta schools!!

Being a research based society, I’m not sure where trade shows fit in (if at all) but they do give attendees a different format of information exchange. Increase opportunities for both Extension and teaching personnel to have inputs into the society, i.e. get our Ext. Pest Coord. active and get more Ext. Specialists to make presentations.

I like it the way it is, but am open to change. Let's meet in New Orleans or San Juan PR.

#1)Have at least ½ day for free time with optional adventures. #2)Add some more time and topics for discussion of issues, i.e. panels or round table groups or forums. #3)Also, continue sessions but have program chair pick out and arrange some of the talks volunteered in this type of venue as #2. #4)Work toward more variety, include consultants, producers, topics that interest salesmen, distributors, dealers, media, non-weed scientist, applicators.

There are fewer industry reps in the south than 5 years ago. The south probably lost more reps than the midwest. Due to expenses & time to attend other internal & external meetings, it is harder to make all functions.

Have a joint meeting with WSSA followed by "break-out" concurrent sessions from each region, i.e. larger meeting and one less meeting.

Cheaper hotels - smaller cities - no more than $75-85/night.

Meeting on Tuesday-Thursday the third week of January would address several issues: avoid weekend travel; avoid conflict with Martin Luther King holiday; greatly reduce room rates with better selection of locations.

No new information in forestry herbicides; same 6 speakers giving the same papers each year.

Try to select locations that are not so out of the normal travel patterns like Biloxi & Tulsa. Neither of these areas are airline hubs and have to be reached by small commuter flights. Then there is a long shuttle or cab ride. Hub cities would be an improvement. Try to coordinate more with the NAICC. Tues-Wed-Thur would allow GLP/QA training on Monday all day and still allow enough travel over the weekend to make both meetings.

More commercial participation.

I sometimes wonder whether SWSS wants to be an academic society or more of a "working group", solving problems in various areas. Maybe have a list of desired research projects rather than 20 papers on what is essentially the same subject.

Consider a February date.

Move the meeting to mid-January, Tuesday thru Thursday and I will attend all meetings in Texas or close by.

State and WSSA eventually cover what I need. SWSS may have found the level of attendance of need.

E, Cent, & W should not include fringe areas such as Tulsa. A major hardship to please a few people!
Determine central area, based on membership location. Go E & W to nearest location - consider food sources within walking distance.

Make as much effort as possible to group presentations by commodity so that there are fewer papers on a topic given at same time in two sections. Make travel as convenient as possible – easy airport access, close to airport, places to eat quickly close by, etc.

Fewer companies, fewer people, and lower budgets have all helped contribute to lower numbers at SWSS.

I suggest begin meeting Tuesday noon-1:00pm to Thursday noon. Finish with awards luncheon. Travel funding and time management are limited.

Meeting location/time are not the reason I have not been attending the SWSS meetings. Corporate mergers/downsizing has increased our territory size and added other responsibilities. This results in "not enough time" to do everything! Also, budgets have been reduced resulting in less non-company related travel.

I live in Illinois but am still a member of SWSS. Unfortunately, my job does not allow me to attend the meeting since it is not in my area.

I will attend the days that fit my schedule. Banquet Monday night.

By sticking mainly to a row-crop program, we are losing other groups such as turf, rangeland, aquatics, forestry, right-of-way consultants. What can we do?

Let's go to cities where family can go w/member to have some fun/mini vacation - Tulsa in January??? It doesn't have to be DisneyWorld every year, but someplace similar. San Antonio, Jeckle Island; if in January, somewhere we can get out & "walk the beach".

We seem to be attracting those interested in the "science of weeds". There are many more interested in weed control. What are our objectives - to attract more people to the meetings or to be a weed science society? It is difficult for some of us to realize that everyone is not interested in the science of weeds. Another question might be directed toward our industry members. "How many from your company requests and are approved for travel to SWSS?" Some seem to be cutting back on the number of attendees from the company.

I think we must consider expanding to accommodate other groups like NCWSS and perhaps others. I think decline is due to mergers etc. and reductions at university level in the crops area.

Try to capture groups that are not attending - such as invasive species scientists, invasive species scientists, biocontrol scientists, aquatic weed people, etc.

I am satisfied with present times, format, etc. However, I will still continue to attend if meeting times or other parameters change. I understand that changes may be needed to regain and/or increase membership.

Membership in the SWSS reflects the changes in the industry. Research on weeds needs to reflect solutions to problems. Content of research needs to change, but I have no crystal ball. The society needs to be open to new research directions.

How about a meeting schedule of all day Tuesday, Wednesday, and ½ day Thursday? The ½ day may raise attendance at the banquet.

By far the most important consideration is the scientific content. All logistical matters are trivial next to this. I want to support SWSS, but each year I have to question the value. The excellent policy of SWSS to support student attendance reduces most concerns about meeting location or timing.

Believe location is the most important of attracting & retaining attendance. Believe we should focus on cities with some appeal, i.e. Memphis, Biloxi - maybe it is better to stick with 3 sites.

For those who present more than 1 paper, scheduling them on the same day may help. At least, I would prefer this to help preclude conflicts with other meetings or obligations. I have picked up the responsibility for weed control in wildlife food plots. Several other weed scientists are working in this area, and it will likely increase in importance in the future. With our current meeting format, there really is not a category for such papers. I put mine in agronomic crops for our next meeting. Just a comment for your consideration.

I work in cotton and most of the cotton papers are a repeat of what is at the Beltwide cotton conference. I feel the SWSS is moving forward on a "business as usual" format instead of drilling deep into current issues, i.e. biotech, public acceptance, regulations, etc.

Attendance is based more on available funding and management approval to travel out-of-state.

I have participated in only 1 SWSS meeting, the reason being that January is extremely busy & full of meetings that I need to participate in. If this meeting was during a different month I would be much more likely to participate in it.

I haven't attended because I hadn't been doing much herbicide work - now that has changed again and I would like to attend more often. Due to budgets, I have to pick the most appropriate meetings to attend.

I am self-employed and every dollar I spend on meetings comes out of my income. The meetings need to be held in places where we can get cheap airfare and a reasonably priced hotel. The time of the meeting (January) and the expense is why I have stopped attending.

January is the start of a new business year right after Christmas. It's busy and already jam packed with other meetings. Meeting content has gotten stale. While I understand the desire to pass the meetings around to different cities many are not good places to visit. The best turnout at these meetings seems to occur when they can be combined w/holidays.

More information on application techniques – such as aerial application. Industry austerity programs have really decreased attendance and will probably worsen with each company merger.

If you want attendance, have a more informative meeting that meets the needs of a broader base of people. For too many years the SWSS has been dominated by university personnel and graduate students that only try to impress each other. Offer a meeting that answers "real world" problems and offer CCA credits and you will get a crowd.

Need more involvement from the ag-chem manufacturing companies. My primary justification in attending the meeting is to interact with as many sponsors as possible.

Love the meeting. Hope to attend more often in future. Forestry section is great!

Regarding meeting format: look at Western.

I enjoyed attending annual meetings when employed. I liked the earlier years program because information presented was somewhat practical & useful. In later years, presentations are more technical & graduate student motivated & information not very useful to assist farmers.

I stopped attending because of budget restraints in state government and the information (although very good) was not directly a benefit to the job we do. I would attend every year were it not for the above considerations we find necessary.

I live in north - warm nice place in January is a drawing card.

My participation is becoming more limited by reduced industry commitment to university-based research in forestry. Peer attendance by industry is making this just another meeting for academics, duplicating the Biennial Southern Silviculture meetings.

The only reason I do not attend any more is because I have gone through the merger and no longer work for private industry. NCDOT does not pay for me to attend these meetings. I really miss attending them.

I'm a rep in Indiana & the information at the SWSS is not very relevant to my job. Between NCWSS, ASTA, IPSA, WSSA, & SWSS, there are a lot of meetings in Nov-Feb. Finally, weed science is becoming less important to my job, & seed & entomology more important.

More symposia for graduate education. Attract prominent people for general session.

I have not been attending SWSS meetings recently simply because I resided in a state that was outside of the southern region. I have recently moved and will likely start attending the meetings again.

Objectives for Next Year:
I guess this will depend on the wishes of the Board. This committee should be challenged each year to provide helpful suggestions to the Board to help make this a "better" society.

Recommendations or Requests for Board Action:
We would suggest that another questionnaire with a narrower focus be sent out to the membership. A short questionnaire may be needed annually if for no other reason, it allows the members a forum to express their thoughts and concerns. Some may do this in writing rather than bring it up under New Business in the Society Business Meeting. An annual survey could be done with fewer, more specific questions and this survey could be accomplished through the list server. The survey should not have open ended questions such as "other" or "specify". Information gained from this type of question may be valuable, but it is difficult to summarize. Another excellent suggestion made was to add a space, line, blank, etc. on our annual meeting registration form that would allow for a person to pay a membership due and receive the Newsletter and all other mailings. Right now, if they do not attend the meeting, they must make an extra effort to contact Bob to pay their membership due.

Finances (if any) Requested: None

Respectively Submitted:
J. D. Byrd, Jr., R. M. Hayes, T. N. Hunt, R. L. Ratliff, W.W. Witt, F. Yelverton, L.L Whatley, D.S. Murray, Chairperson

Committee Number: 112 **Committee Name:** Nominating Committee (Standing)

Summary of Progress: After ranking all candidates, the following nominees were selected:

Vice-President: Susan Rick, DuPont
John Harden, BASF

Representative to CAST: Jim Barrentine, University of Arkansas
Mike Chandler, Texas A & M University

Representative to WSSA: Tim Murphy, University of Georgia
Neil Rhodes, University of Tennessee

Secretary-Treasurer: Tom Mueller, University of Tennessee
Scott Senseman, Texas A & M University

SWSS Endowment Foundation: Tom Holt, BASF
Eric Prostko, University of Georgia

Objective(s) for Next Year: Solicit nominations, rank nominees, and prepare a solid slate of officers and representatives for membership to vote on.

Recommendation or Request for Board Action: None

Finances (if any) Requested: None

Respectively submitted:

S.O. Duke
J.D. Green
C.D. Youmans
H.D. Skipper
J. Groninger
J.L. Griffin
B. Watkins
S. Hagood
L.L. Whatley, Chair

Committee Number: 114 **Committee Name:** Program Committee: 2001 (Standing)

Summary of Progress:

The theme of the 55th annual Southern Weed Science Society Meeting in Atlanta, GA will be: "Feeding the World in the 21st Century. The theme is a back to basics reminder of the importance of our discipline. Our guest speaker will be Alex Avery, Director of Research and Education, Center for Global Food Issues, Hudson Institute, Indianapolis, IN. He will speak on "The Changing Role of US Agriculture in World Food Production." Dr. Joe Street's presidential address will be "Seeds of Change."

A total of 88 posters will be included in this year's poster section and 207 papers make up the 10 paper sections. There is also a forestry symposium: Intensive Pine Management with Herbicides: State of the Art, Recent Trends, and Needed Research" with 6 invited speakers. Presentations on LCD projectors were allowed in the Forestry Section to gain experience in utilizing the technology for this meeting.

Fifty-four graduate students entered the Graduate Student Contest. Sue Rick chaired the Student Program Committee and organized the judging of the contest.

Respectfully submitted:
Committee Chair: Jerry W. Wells
Chair Phone: 336-632-6324
Chair e-mail: jerry.wells@syngenta.com
Committee Members:
Peter Dotray, Wayne Wells, Rakesh Jain, Tim Harrington, Mark Boyles, David Shaw, David Jordan, Brent Bean, Todd Baughmann, Randy Ratliff, and Scott Senseman

Committee Number: 116 **Committee Name**: Public Relations Committee (Standing)

Summary for 2001 and Action Plan for 2002

Committee Chair: Nilda R. Burgos
phone: (479) 575-3984
e-mail: nburgos@uark.edu

Committee members:

Besler, B.	2002
Koger, C. T.	2002
Zutter, B.	2002
Banks, J. C.	2003
Burgos, N. R.	2003
Scott, R. C.	2004
Poston, D.	2004

Recommendations for Board of Action:

Specify the term of membership in the Press Relations committee.
The Manual of Operating Procedures does not specify the term of membership/service for the Press Relations committee. We do not know how long we are supposed to serve in this committee after we become members. How long does one serve as chair? Listed members have years beside their names. Does it mean that membership expires at the end of the year indicated? When did they start being a member?

Finances requested: $50.00

For tapes, films, film development, reprint of pictures

Summary of progress:

Worked with Steve Brown, the local arrangement committee counterpart, in arranging for photo coverage of events at the meeting as well as for contacting local TV and newspaper for possible coverage of some event at the meeting. Steve Brown had contacted some TV stations in Atlanta, but did not get any indication of interest. Phone calls had been made and fax messages sent to WSB TV and The Atlanta Journal newspaper regarding the upcoming SWSS meeting. So far, there is no indication of interest.

The committee will meet on Monday, 1:00 to 3:00 p.m., at Techwood room to discuss committee assignments and activities. This will be the first committee meeting under the current chairmanship.

Committee members and the PR counterpart for local arrangements will split documentation assignments to cover as many events at the SWSS conference as possible.

Action plan for 2002:

1. An article about the GLP training 2002 will be submitted to the SWSS, WSSA, and ASA newsletters. The same thing will be done for SWSS awardees and student contest winners.

2. Videotape and photographs will be taken during the SWSS conference, originals of such, will be turned over to the Historical Committee once appropriate articles have been released.

3. Articles about significant events, such as the Weed Contest, will be submitted to appropriate print media outlets other than the society newsletters.

Committee Number: 117 **Committee Name:** Resolutions and Necrology (Standing)

Summary of Progress: Two necrology reports were submitted (William Lambert and Walt Mitchell). No resolutions were submitted to the committee for consideration.

Objective(s) for Next Year: Initiate a web-based necrology and resolutions reporting system as suggested by Past President Laura Whatley. Continue necrology reports and consider/draft resolutions as requested by the membership or the Executive Board.

Recommendation or Request for Board Action: The committee asks that the Board approve expenditures or request necessary action by the webmaster to set up the reporting system mentioned above. The committee also asks the board to approve the necrology resolutions listed below.

Necrology Resolutions:

WHEREAS William Douglas Lambert, 43 of Talihina, Oklahoma served with distinction as an instructor at Eastern Oklahoma State College, and,

WHEREAS Mr. Lambert was near completion of a Ph.D. in Weed Science from Oklahoma State University at the time of his death and was a contributor to the weed science profession,

THEREFORE, BE IT RESOLVED that the officers and the membership of the Southern Weed Science Society hereby take special note of the loss of our coworker William Douglas Lambert on September 16, 1999, and by copy of this resolution, we express to his family and friends our sincere sympathy and appreciation for his contributions.

WHEREAS Walter H “Walt” Mitchell, 54 of Vicksburg, Mississippi served with distinction as a sales and development representative for DuPont for 25 years, and

WHEREAS Walt Mitchell worked tirelessly to promote and develop Assure, Canopy and Classic for soybean weed control, Harmony Extra for weed control in wheat, Ally herbicide for pastures, Londax in rice, Accent for the control of Johnsongrass in corn, and Staple herbicide in Cotton, and

WHEREAS Walt Mitchell was recognized as the Outstanding Industry Contributor in 1992 by the Mississippi Weed Science Society,

THEREFORE, BE IT RESOLVED that the officers and the membership of the Southern Weed Science Society hereby take special note of the loss of our coworker Walter H. Mitchell on September 16, 2001, and by copy of this resolution, we express to his family and friends our sincere sympathy and appreciation for his contributions.

Respectively Submitted:

M. C. Boyles, L. Cargill, D. Gealy, M. E Kurtz, M. Nespeca, G. L. Schwarlose,

S. M. Zedaker, Chairperson.

Committee Number: 119 **Committee Name**: Southern Weed Contest Committee

Committee Chair: Eric P. Webster

Chair Phone: (225) 578-5976

Chair e-mail: ewebster@agctr.lsu.edu

Committee Members:

J. L. Griffin	T. C. Mueller	T. Whitwell	C. T. Bryson	L. R. Oliver	S. Kelly
W. W. Witt	S. Senseman	E. S. Hagood, Jr.	M. G. Patterson	A. Kendig	R. M. Hayes
D. B. Reynolds	D. R. Shaw	P. Dotray	V. B. Langston	D. S. Murray	T. A. Baughman
A. Rankins	W. K. Vencill	J. W. Everest	D. Miller	J. Tredaway	G. MacDonald
B. Williams	J. Barrentine	T. Webster	J. Wilcut	Frank Carey	J. Wilcut
B. McCarty	B. Scott	R. Lassiter	C. Corkern		
E. P. Webster, Chairperson					

Recommendation or Request for Board Action: None

Finances (if any) Requested: (None). Sustaining members for 2001 ($2,000+) - Aventis, BASF, DowAgro, FMC, and Syngenta; (1,000-1,999) - Bayer, Bell Inc., Dupont, Griffin, and Valent; ($1-999) – Helena, PBI Gordon, and Rohm and Haas.

Summary of Progress:

The 22nd annual Southern Weed Contest was held August 7, 2001 at the Louisiana State University AgCenter Scott Research, Extension, and Education Center near Winnsboro, LA. Drs. Steve Kelly and Donnie Miller and the entire staff of the Scott Center did an excellent job providing the students with a challenging day. The weed identification, herbicide symptomology, sprayer calibration, and the field problem solving were well prepared and challenging to all of the contestants. The mystery event involved identifying “farmer” collected and preserved weeds, and recommending a weed control program based on the collected weeds for soybean production.

A total of 44 contestants from 8 universities competed this year. Universities represented were the University of Arkansas, University of Florida, University of Kentucky, Louisiana State University, Mississippi State University, University of Tennessee, Texas A&M University, and Texas Tech University. The Weed Contest Committee would like to encourage every university affiliated with the Southern Weed Science Society to attend the 2002 contest.

Winning teams and individuals were as follows:

Team Awards:

1st Mississippi State University ($500)

2nd University of Arkansas ($300)

3rd Louisiana State University ($200)

Individual Awards:

1st	Tom Barber, Mississippi State University ($400)
2nd	Trey Koger, Mississippi State University ($250)
3rd	Jason Bond, University of Arkansas ($100)
4th	Greg Steele, Texas A&M University ($75)
5th	Chris Leon, Louisiana State University ($50)
6th	Eric Walker, University of Arkansas
7th	Nathan Buehring, Mississippi State University
8th	Jeff Edwards, University of Arkansas
9th	Daniel Stephenson, University of Arkansas
10th	Eric Scherder, University of Arkansas

The traveling "Broken Hoe" trophy was presented to the Mississippi State University at the awards banquet. Plaques and cash awards were also presented to winning teams and individuals, and contestants with the highest scores within each event were also recognized. This was an excellent contest for students to demonstrate their knowledge and talent.

Action Plan for 2002: The 2002 Southern Weed Contest will be hosted by Dr. Chris Corkern at the Monsanto Research Farm near Stoneville, MS. I am sure that Chris and the staff of the Monsanto Research Farm will have a great and competitive contest.

Committee Number: 121 **Committee Name:** Student Program Committee Report (Standing)

In the fall we worked with Jerry Wells to coordinate the schedule to accommodate the judging of the student contests. We have 52 total students participating in the two contests. There are 32 students in the paper contest and 20 in the poster contest. There will be 4 paper sections and 2 poster sections with 7 to 10 students per section. Several sections had to be combined to have enough students per the MOP guidelines of 8-12 students per sections. All papers in the contest are scheduled to be given either Tuesday afternoon or Wednesday morning to allow sufficient time for the judges to finish the score sheets.

Section 1a: Agronomic Crops 7 students

Section 1b: Agronomic Crops and Soil & Environmental Aspects 8 Students

Section 2: Education and Regulatory Aspects, Application technology & Weed Management in Turf, Pasture and Rangeland 8 Students

Section 6: Physiological and Biological Aspects 9 Students

Section 11a: poster 10 Students

Section 11b: poster 10 Students

Students were sent a letter in November that acknowledged their participation in the contest and instructed them on the number of abstracts, etc. needed. They were also sent the appropriate copy of the judging form. Robert Schmidt was sent a list of all students giving papers or posters for their reimbursement for hotel expenses. There are 98 total students participating in the 2002 meeting.

Vice chairman Greg Stapleton contacted SWSS members late fall seeking 30 judges plus alternates. Judges will be given their packets and instructions on Tuesday morning at the judges' breakfast.

A final report with winners will be available after the 2002 meeting.

Respectfully submitted,

Susan Rick

Student Program Committee Chair

SWSS Student Program Committee Report

January 31, 2002

Contest results:

The student poster and paper contest were conducted at the 55th annual meeting of the SWSS held in Atlanta, GA. Fifty two students participated in the contests; 32 in the paper and 20 in the poster. Ninety eight students participated in the meeting by giving either papers or displaying their research in a poster.

The results of the contests were as follow:

Section 1A. Agronomic Crops

1st place: Italian ryegrass control in wheat with mesosulfuron-methyl. H. L. Crooks and A. C. York, Crop Science Dept., NC State Univ., Raleigh, NC.

2nd place: Clearfield rice tolerance and red rice control with imazethapyr on course soils in Texas. B. V. Ottis, J. H. O'Barr, G N McCauley, J. M. Chandler. TX Agricultural Experiment Station, College Station, TX.

Section 1B. Agronomic Crops and Soils and Environmental Aspects of Weed Science.

1st place: Cotton phytotoxicity with trifloxysulfuron as influenced by soil moisture, temperature and tank mixes. J. W. Branson, K. L. Smith, R. C. Namenek, J. L. Barrentine. Univ. of Arkansas, Southeast Research and Extension Center, Monticello, AR, Dept of Crop, Soil and Environmental Science, Univ. of AR, Fayetteville.

2nd place: Evaluation of mesotrione in no-till corn programs. G. R. Armel, H.P. Wilson and T. E. Hines. Dept of Plant Pathology, Physiology and Weed Science, VA Ploytechnic Institute and State Univ. Painter, VA.

Section2. Education and Regulatory Aspects, Application Technology and Weed Management in Turf, Pasture, and Rangeland.

1st place: Effects of postemergence herbicides on centipedgrass seed production. J. A. Ferrell, T. R. Murphy, W. K. Vencil. Dept of Crop and Soil Science. Univ. of GA, Athens and Griffin, GA.

2nd place: Effects of 2,4-D formulation on spray droplet size. A. S. Sciumbato and S. A. Senseman. TX Agricultural Experiment Station, College Station, TX. J. B. Ross, Dept of Entomology, Plant Pathology and Weed Science, Las Cruces, N.M. T. C. Mueller, Univ. of Tennessee. Knoxville, TN.

2nd place: Perennial ryegrass tolerance and annual bluegrass control in overseeded bermudagrass. T. W. Gannon, F. H. Yelverton and L. S. Warren. Dept of Crop Science. NC State Univ. Raleigh, NC.

Section 6. Physiological and Biological Aspects of Weed Control

1st place: Glyphosate inhibits pollen and anther development in glyphosate-resistant cotton. W. A. Pline, R. Viator, K. L. Edmisten, J. W. Wilcut, J. F. Thomas and R. Wells. Dept of Crop Science, NC State Univ. Raleigh, NC.

2nd place: Physiological factors influencing the management of torpedograss. R. M. Tenpenny, D. L. Sutton, G. E. MacDonald. Dept of Agronomy. Univ. of Florida, Gainsville, FL.

Section 11 A. Poster.

1st Place: Effect of glyphosate on pollen development of glyphosate-resistant crops and selected weed species. W. T. Thomas, W. A. Pline, R. Viator, J. W. Wilcut, K. L Edmisten, and R. Wells. Dept of Crop Science, NC State Univ., Raleigh, NC.

2nd Place: Isolation of distinguishable classification features for pitted morningglory (Ipoomea lacucea) from hyperspectral remote sensing data. T. H. Koger, D. R. Shaw, L. M. Bruce, W. B. Henry, and F. S. Kelley. Dept of Plant and Soil Sciences, MS State Univ., MS State. MS.

Section 11 B. Poster.

1st place: Yield and physiological response of peanut to glyphosate drift. B. Robinson, W. T. Thomas, W. A. Pline, L. C. Burke and J. W. Wilcut. Dept of Crop Science, NC State Univ., Raleigh, NC.

2nd Place: Effectiveness of buffalograss filter strips in removing dissolved atrazine and metabolites from surface runoff. L. J. Krutz and S. A. Senseman. TX Agricultural Experiment Station, College Station, TX.

Students were presented an award of $100 for first place and $50 for second place at the conclusion of the banquet. A certificate mounted on wood compliments of Griffin LLC will be sent to each student. Photos were taken for the newsletter and historical records.

Committee meeting minutes:

The student program committee held a meeting on Tuesday morning immediately following the judge's breakfast. Several suggestions for the board and next year's contest were proposed.

Committee appointees for 2002 suggestions: Robert Etheridge, Joe Massey or Cade Smith, Roger Batts, and Katie Jennings.

Vice chairman for 2002-2003: Tracy Scott

Committee meeting: move to Monday at 5 PM (versus concurrent with the judges breakfast on Tuesday AM) so that any concerns from the previous years contest may be discussed prior to the judges breakfast and so that committee members may be involved in the make-up of judges packets and other committee duties.

Timing of the contest: move all presentations to Tuesday afternoon. There does not need to be a talk place between contestant papers. This is the preference of the judges so as not to conflict with other duties and personal presentations. This will serve to limit the time between presentations so that all impressions are fresh in the judges mind. This will also allow the awards to be given out at an earlier time at the meeting if the board so decides.

Written abstracts: After much discussion it was the decision of the committee to recommend the requirement for the written abstracts submitted for the judges use be dropped. Due to the electronic submission of abstracts it is confusing for the students to bring paper copies, time consuming for the committee chair to track them down, it is not on the judges working sheets in the current MOP, etc. Many judges do not utilize the abstract and/or rate them due to the time constraint between receiving them on Tuesday morning and the judging, attending the general session and attending to other duties/business. The committee felt that the student has other opportunities for their written work to be evaluated during their graduate career. **IF** the board does not agree with this recommendation, then the MOP **must** be changed to reflect the requirement that written abstracts be submitted.

Updating the MOP:

There are several changes that should be made in the MOP to update it. They may or may not include the following suggestions:

1. (section2a and 3)The chairperson of the committee has not been involved in submitting the eligibility for student participation in the summer newsletter nor have they been involved in appointing a faculty contact person at each university. We suggest that these be moved to the responsibility to those who are actually currently doing this. Web site can also be utilized as a source for this information.
2. (section d.)Specific times are listed as to when the Program Chairperson will contact the Student program chairperson – suggest dropping the times. Also states that the Student program chairperson will work with the individual section chairpersons to set up schedule – this is usually done directly with Program Chairperson and the MOP should reflect this. Suggest dropping the “alternately scheduled” with non-contestant paper requirement.
3. (section c) judges may also want to reflect different years of experience
4. (section e) scoring sheets and instructions for the judges are available on the web site – judges should be directed to view both on the web sites before coming to the meeting vs. sending hard copies.
5. judging sheets – need to updated to reflect whether or not the abstract is required. A review of the weighting of some areas may need to be address.
6. Judges of each section meeting together after the individual judging to determine the overall ranking of the section which will in turn be turned into the student program chairperson.
7. divide out the responsibilities of the vice chair vs. the chairperson in the MOP to more easily define the roles.

Respectfully submitted,

Susan K. Rick

Chairperson, Student Program Committee

Committee Number: 124 **Committee Name**: Weed Identification Committee (Standing)

Committee Chair: C. T. Bryson

Chair Phone: 662-686-5259

Chair e-mail: cbryson@ars.usda.gov

Committee Members and Terms of Service:

J. W. Boyd 2002	M. L. Ketchersid 2003	M. DeFelice 2004
C. T. Bryson* 2002		J. D. Green 2004
T. M. Webster 2002		

Recommendations for Board Action: Monies were approved for transferring Arlyn Evan's slides for set # 8 onto photo CD during 2001. This task has not been completed. The committee requests that the budgeted monies for photo transfer in 2001 be rolled over into the 2002 budget.

Finances Requested: See above.

Summary of Progress:

After Mike DeFelice discovered that the CD-ROM version 2.0 was not compatible with Windows 2000, revisions were completed and Weed ID CD-ROM version 2.1 is now available. This revision fixed the bug, made a few corrections, added eight new World of Weed Articles, and tested the program prior to its release. Weed write-ups and maps for SWSS Weed ID Guide set # 8 were completed and edited. Data-base descriptions are almost completed by John R. MacDonald at Mississippi State University and Brett R. Serviss at Henderson State University, Arkansas for about 95% of the weeds currently in the SWSS Weeds of the United States and Canada CD-ROM and those proposed for Weed ID Guide set # 8. These descriptions are being edited and formatted for the development of an interactive key for mature and immature weeds in version 3.0 of the Weed ID CD-ROM by Mike DeFelice. Based on requests form users of the Weed ID CD, J. D. Green developed a weed by crop index for version 3.0 of the Weed ID CD-ROM and revised the index to include the weeds that are proposed for set #8.

Weed Alerts for yellow unicorn-plant [*Ibicella lutea* (Lindl.) Van Eselt. (=*Proboscidea lutea* (Lindl.) Stapf)] were published in the SWSS and the Mississippi Weed Science Society newsletters because this non-native was detected in two Mississippi counties.

Action Plan for 2001:

Completed weed write-ups descriptions, distributions, and maps for SWSS Weed ID Guide set # 8 will be marched with photos from the Photo CDs of Arlyn Evans' slides. Work will continue on CD version 3.0 with a target release date of sometime in 2003. As of November 1, 2001 the balance of Weed ID Guides available (except the newly released set #7) is as follows: Set #1 – 3978; Set #2 – 450; Set #3 – 1600; Set #4 – 3168; Set #5 – 5076; and Set #6 – 5364. Based on these numbers the committee is obtaining quotes for reprinting set # 2 and printing set # 8.

Committee Number: 124b **Committee Name**: Herbicide Resistant Weeds Subcommittee

Summary for 2001 and Action Plan for 2002

Committee Chair: Nilda R. Burgos
phone: (479) 575-3984
e-mail: nburgos@uark.edu

Committee members and terms of service:

W.L. Barrentine	S.O. Duke	D. L. Jordan	T.T. Peeper	J.W. Wilcut
M. Barrett	M.L. Fischer	J.A. Kendig	R. Smeda	
T.A. Bewick	J.L. Griffin	C.C. Kupatt	J.D. Smith	
N.R. Burgos	K.K. Hatzios	J.J. LeClair	R.E. Talbert	
J.D. Burton	R.M Hayes	E.C. Murdock	W.K. Vencill	
J.M. Chandler	D. Johnson	R.L. Nichols	G.R. Wehtje	

Recommendations for Board of Action:

This subcommittee falls under the Weed Identification Committee and is charged with providing updates of herbicide-resistant weeds within the SWSS geographical area and with addressing issues related to the development of herbicide-resistant weeds. Committee recommendation to the Board are as follows:

1. Yearly update of information on the website regarding chair, secretary, and membership of this committee. Announce a deadline for submission of preliminary minutes of committee meetings soon after the culmination of yearly conference in January. This should contain information on who is assuming what position.
2. Include a specific statement in the by-laws as to the function and duties of this committee, rotation of chairmanship, and terms of membership.
3. Designated contact persons by state for reporting herbicide-resistant weeds should also be members of this committee. Herbicide-resistant weeds should be reported directly to the WSSA website; information thereof can also be accessed via the SWSS website.
4. Set aside resource for development of educational materials re herbicide-resistant weeds and protocols for testing of resistance. Coordinate with WSSA on this project.

Finances requested: $ none

Summary of progress:

Representatives from Southern states participated in the evaluation of improved features of the herbicide-resistant weeds survey website for WSSA. This was done to facilitate submission of new information or updating existing information. Status of herbicide-resistant weeds were reviewed for the states of Arkansas, Florida, Missouri, South Carolina, Tennessee, and Texas. Some new information that are not yet reported in the website include 1) differential response of hydrilla to Fluoridone (FL) - not sure whether resistance exists; 2) waterhemp escaping glyphosate treatments in MO - need to resolve tolerance vs. resistance issue; 3) shattercane resisatnt to Pursuit, Accent, and Beacon (MO) - not yet reported in the WSSA website; and 4) Palmer amaranth resistant to Staple (SC) - not yet reported in the WSSA website. Arkansas, Florida, Tennessee, and Texas have current information in the Website. Currently, reported cases of weed resistance in the Southern states are: AL - 3, AR - 3, FL - 2, GA - 4, KY - 3, LA - 5, MS - 8, NC - 8, Ok - 2, SC - 5, TN - 5, TX - 6, VA - 6.

The resolution about indicating herbicide grouping and resistance management guidelines on herbicide labels was discussed.

The committee feels strongly about disseminating information on the definition of resistance vs. tolerance not only to researchers in academia, but also to those in extension service. With this should also come some general guidelines for sampling and testing plants for resistance to a particular herbicide. There is a need to develop a resistant weed diagnostic tool. It was also suggested that this topic be presented in the educational session in the

2002 SWSS meeting. In effect, a paper on "How do we test for herbicide resistance?" by Burgos and Talbert will be presented in the 2002 conference.

A motion has been put forth that researchers dealing with herbicide-resistant weeds need to study the fitness of resistant biotypes and their offsprings. In some cases this is done, but not usually.

Some members of the committee are involved in studies of gene flow between crops and weeds, especially rice and red rice. Outcrossing studies have been conducted on Liberty Link rice and red rice. Studies are also on-going regarding outcrossing of Clearfield rice and red rice. Genetic studies of red rice has been done in Texas and similar studies are on-going in Arkansas. This should expand our knowledge on the nature of red rice and the effects of movement of herbicide-resistant genes into red rice.

The committee also discussed the possibility of conducting collaborative projects for graduate students, which could possibly attract federal research funding.

Action plan for 2002:

There is a lot of ambiguity about the purpose of this committee, and this deters cohesive and proactive efforts. Therefore, the mission and goals of this committee will be reviewed and redefined, if necessary, to meet the future needs of the society. We will also need to define the relationship of this committee and the Herbicide Resistant Plants Committee of the WSSA. Membership issue and terms of chairmanship will be clarified. At the moment, the committee changes chairs every year, which keeps it from laying down significant groundwork for any long-term project. Nothing takes root. The committee will decide on extending the term of chairmanship to more than one year so as to gain some continuity and stability.

Plans on producing educational tools for understanding and diagnosing herbicide-resistant weeds will be pursued.

Identify of state representatives/contact persons for reporting herbicide-resistant weeds will be reviewed and updated. Quality control for reporting data to the WSSA website will be specified. Current list of reported herbicide-resistant weeds and related information will be reviewed and updated.

Studies on gene flow will be reviewed.

Plans for conducting a collaborative project will be pursued. Limited time of faculty/researchers is the biggest hindrance to this endeavor, but hopefully something will happen.

Committee Number: 126 **Committee Name:** Membership Committee (Special)

Summary of Progress:

Membership Committee members were polled as to comments, recommendations, or suggestions that they may have concerning SWSS membership and how to address the decline in membership. The Committee indicated that several major challenges face SWSS, and these challenges need to be surmounted if SWSS is to survive as an organization.

1. One observation was that major companies are ignoring the SWSS when it comes to scheduling their internal planning meetings. For example, two companies have scheduled a meeting the week of the SWSS and thus, few, if any representatives from those companies will be in attendance this year. One challenge, therefore, is to determine how to reestablish the SWSS as a primary conference for industry.
2. A second challenge is to critically evaluate our meeting format. Are we too inbred and stuck on an old formula? We need to change our format to include more indepth discussions of important issues, encourage more group interchange of ideas, invite speakers who may not always fit the mold, and provide more support for symposia and workshops.
3. Almost from its inception, the SWSS was basically an Industry-University weed scientist partnership, with an annual tradeoff in the position of President between the two groups. This may severely limit the desire or ability of other groups to become meaningful participants in SWSS. A third challenge, therefore, is to determine how to make SWSS more attractive and meaningful to other groups.
4. Another challenge related to the previous one is that we may be so focused on a narrow issue that, if one is trying to determine whether to attend SWSS or a competing meeting, they choose the latter. The SWSS leadership may need to begin serious discussions along the line of merging with another regional society. Other groups must be identified and approached to see if they are interested in joint meetings.
5. One more challenge is that the SWSS Board or membership must evaluate the objectives of the organization. Will SWSS continue to be a professional, scientific organization or refocus the organization to attract more lay members involved with hands on weed control activities? Currently, the primary function of the SWSS is to conduct an annual meeting of members. Could some function(s) beyond that serve a broader need and create greater interest?

Objectives for Next Year:

Follow up on Board decisions to the recommendations made below.

Recommendation or Request for Board Action:

The Membership Committee submits the following recommendations to the Board. Some of these recommendations, in one form or another, have been made previously and either were not adopted or were not put into active practice.

1. A separate mailout to past or prospective members who did not attend the annual meeting
2. Hold joint meetings with other groups
3. Develop ways to attract those involved in non-traditional groups
4. Seriously reevaluate the program format for the annual meeting to make it more attractive and interesting to a broader audience

Finances (if any) Requested:

None

Respectively Submitted:

J.D. Byrd	R.B. Cooper
S.O. Duke	W.N. Kline
J.H. Miller	T.R. Murphy
T.F. Peeper	B.D. Sims
G. Stapleton	J.W. Wilcut
M.A. Locke, Chairman	

Committee Number: 127 **Committee Name**: External Funding (Special)

Summary of Progress:

In our contacts with organizations we found ourselves in competition with more traditional recipients such as 4-H, FFA and educational institution alumni associations. While reasons for denying contribution to SWSS Endowment were varied, basically grantors view SWSS Endowment support of student activities as a professional development activity and the responsibility of the association (SWSS). Support for participation in our annual meeting and even related activities such as the SWSS Weed Contest were viewed less than deserving than basis programs in traditional high profile areas, e.g. 4-H.

The concept of a silent auction was borrowed from other organizations and will be tried at this meeting.

There was a great deal of enthusiasm in regard to a sporting activity raffle. A number of members and former members volunteered hunts, fishing trips, etc.; however, agreement was not reached as to how to best implement. Concerns in regard to liability surfaced, but are believed manageable through "wavier". There was some concern over events being run by "non-professionals" as guides, but it is believed such can be overcome by complete disclosure of the nature of the event in the offering.

Objective(s) for Next Year:

1) Follow-up on the Silent Auction as appropriate.
2) At least a trial run at sporting events with sales culminating at 2003 meeting of SWSS with drawing of winners.

Recommendation or Request for Board Action:

How much concern if any does the Board have in handling liability through use of a "waiver"?

Finances (if any) Required:

None, all expenses should be carried by activity from the event.

Respectively submitted:

J. R. Bone, Chairperson
(This report reflects what is known by the Chair who did a poor job of keeping members informed.)

Members: J. L. Griffin, J. H. Miller, L. R. Oliver, T. F. Peeper, D. G. Schilling, W.W. Witt and A. D. Worsham

Committee: 128 **Committee Name:** Computer Applications Committee (Standing)

Summary of Progress: The newer simplified domain name www.SWSS.WS was purchased and installed on the Mississippi State University server. This year all paper title submissions were via the web. Additionally, an interface was added to the web enabling online submission of papers and abstracts. Approximately 80% of all abstracts were submitted via the web.

Objectives (s) for Next Year: We should have an improved title submission interface that will allow the use of special characters, bolding, italics, and subscripting. The group will determine if the existing abstract submission process is sufficient or if a system that "bounces" back a HTML copy for viewing via the web is more desirable. Activate the committee reporting system so that committee reports can be submitted via the web. Revise typing instructions for the MOP to reflect new web requirements. Will evaluate the use of LCD projection units at the WSSA and make a recommendation regarding their use at SWSS by the summer board meeting.

Recommendation or Request for Board Action: Approve continued budget request. Approve MOP submission for the Computer Application Committee. Require all title, abstract, paper, and committee reports to be submitted via the web. Request that the ability to use our own LCD projectors be negotiated in the contract for upcoming meetings. To determine if the properties under contract will allow the use of LCD projectors.

Finances (in any) Requested: Continue the $1,000 budgeted amount for programming charges and for Domain name subscription.

Respectfully Submitted:

S. Askew, A.C. Bennett, T.C. Mueller, S. Senseman, W.K. Vencill, T. Whitwell, and D.B. Reynolds, Chairperson

Abstracts & Papers Index

Section I : Weed Management in Agronomic Crops

Section VII : Education and Regulatory Aspects of Weed Management

Section VIII : Developments From Industry

Section IX : Application Technology

Section X : Soil & Environmental Aspects of Weed Science

GENERAL SESSION

SEEDS OF CHANGE. Joe E. Street, President, SWSS, Research Professor, Delta Research & Extension Center, Mississippi State University, Stoneville, MS 38776

Good Morning ladies and gentlemen. I would like to add my words of welcome to the 55th annual meeting of the Southern Weed Science Society. It has been the highest honor to serve as your president during the past year. Those of you who have been through the program chair position as president elect, know that being president is much easier. I would like to say a special thanks to Jerry Wells as Program Chair and to Virginia Hawf as Local Arrangements Chair. Virginia was drafted after the meeting last year. For some reason, the local arrangements chairperson was not selected when the site was chosen some three years ago. Virginia has stepped in and done an outstanding job as local arrangements chair. Thanks again Virginia.

It is ironic that the theme of this meeting is feeding the world in the 21st century. When I started my career way back in the 20th century, the word was that by 1995, anyone involved in agriculture would be in high demand because we would not be able to feed the world. I am confident that we will be able to feed the world for some time to come because of the brain power available today. Of all the scientists who ever lived, ninety percent are alive today.

Even if you get nothing else out of this talk, somewhere in this talk, I will tell you how doing one thing three times a week has been shown to add nine years to your life. No, it is not exercise.

Two years ago when Don Murray was President, I suggested to him that he give a state of the society presentation and he did an outstanding job of bringing us up to date on our society and its functions. The more you know about what our Society is doing, the better advocate you are. Today I want to provide a brief update to Don's address to the society and then plant a few seeds, which may bring about change in our society. The title of my talk was submitted well before it was written and thus I take editorial liberty to expand the seeds of change.

Financially, the society is in good condition. We have more than the two years operating capital required by the Manual of Operating Procedures. Much of the financial stability has been the result of SWSS publications. The Weed ID Guide has been a tremendous asset to the Society thanks to the efforts of Arlyn Evans, Dennis Elmore, Charles Bryson and to the foresight of the Board of Directors. We have invested about $444,000 so far and have recovered about $760,000. Set seven of the Weed ID Guide is published and selling now. Set eight is almost complete but we are holding production of it. I urge each of you to buy a copy of set seven so we can proceed with set eight. Set eight is the last set planned at this time.

The Weed ID CD-ROM continues to be a high profit item. Mike and Karen Defelice continue to provide invaluable service to this Society. We have spent about $29,000 and have recovered almost $150,000.

Forest Plants of the Southeast and Their Wildlife Uses has surpassed the breakeven point and we are well on the way to a successful venture. We have invested about $104,000 on this project. Jim Miller and Karl Miller are to be congratulated not only for their efforts to produce the book but also for their persistence with the SWSS Board of Directors. I was on the Board when this book was first proposed as a Forest Weed ID Guide and a little money was allocated each year until we were finally committed to proceed. Thanks Jim and Karl for persisting and completing this excellent book plus the CD version. Based on the interest in this book from distributors and other organizations, this book has the potential to be an excellent profit center for SWSS. It is used as a textbook at several universities. I was contacted by several people looking for a copy as a Christmas present so there is widespread interest.

The Endowment Foundation continues to gain resources and is a critical asset to this Society. I consider the Endowment Foundation as one of the primary keys to our success. With the foresight of individuals like Bob Frans and Doug Worsham in 1986, the Endowment Foundation continues to increase its support of the Society and now with the imagination of individuals like David Prochaska, Ray Smith, and Jim Bone, and the Endowment Board, the Foundation will continue to do even bigger and better things for the Society. The Foundation currently has about $244,000 with a long-term goal of supporting the entire student program. I am confident that will happen. I trust that you will support the silent auction of paintings provided by two of our own, Charles Bryson and Doug Worsham. My office is in the building where the SWSS first met in 1948 and I would like to be able to buy the original painting and donate it to the Delta Research & Extension Center but I also hope that I am out bid so that the Foundation will have more money. I am sure many of you have the same feeling for the Tobacco print provided by Doug Worsham. If each of us would give only $25 per year for the next 10 years, the Foundation would easily meet its goal of supporting the student program and beyond.

Most of you remember the time and controversy of funding the Congressional Science Fellow. There was considerable discussion about that each time it came before the Board. Now, in conjunction with WSSA and the other regional societies, we have a presence in Washington as the Director of Science Policy. Rob Hedberg, who attended the Board meeting and will present a paper today, works on your behalf in Washington. Having someone in Washington of the caliber of Rob Hedberg is an outstanding asset to SWSS and weed science in general. Many of you have read in the newsletter of Rob's accomplishments but I would like to review a few of the more pertinent issues. I frequently hear concern about what SWSS doing for individuals. The Director of Science Policy is an important part of what we do for our members.

Invasive Species. The sponsoring societies recognized the need to participate and have our voices heard in government and non-government organizations working on Invasive Species. The Director of Science Policy has participated and represented our views, and promoted our societies to provide important interactions in several key areas including: 1) National Invasive Species Council; 2) Invasive Species Advisory Committee; 3)Federal interagency Committee for management of Noxious and Exotic Weeds; 4) Invasive Weed Awareness Committee and; 5) National Park Service- Exotic Plant Management Teams.

These teams will provide additional jobs for graduate students and will allow Weed Scientists to fill a critical role that has not been traditionally held by scientists who understand weed management. In addition to the above, the DSP is working with WSSA to coordinate and Inter-Organization Invasive Plant Conference in November 2003 to bring together many societies concerned about the Invasive Species issue. This is an excellent area to increase visibility and an area that SWSS should expand to attract new members. Bill Witt is already planning an invasive plant symposium for next year's program.

Worker Protection Standards. Much work has been done to clarify how the Office of Pesticide Programs intended to interpret several specific provisions of the Worker Protection Standards relative to research settings. The EPA has written a letter of clarification, which offers a reasonable compromise that lets the regulations stand while providing researchers the flexibility to work efficiently without being cited for non-compliance with certain provisions of the Worker Protection Standards. The DSP will continue to monitor this issue, and be ready to participate in future changes to the Worker Protection Standards.

Research Funding. In an effort to be involved in the processes necessary to secure funding sources for weed science, the DSP is building relationships and networking to move toward this goal. The DSP has participated in the Coalition of Funding Agricultural Research Mission-made up of 22 agriculture-related societies. Rob became chair of the research committee of National Coalition for Food and Agriculture (CFAR). The coalition has 110 member societies and this is a key committee to help grow the dollars available for agricultural research. In Gale Buchanan's address to the society in 1999, he indicated that the commitment for support of agricultural research and extension programs by both state and federal governments is static or even in a period of decline. Having the Director of Science Policy involved in this very important area will be a great benefit to weed science and to agricultural research funding. To quote Buchanan again, "we must continue to form alliances and develop collaborative relationships wherever possible to capitalize on strengths of other disciplines and finally, we need a few good administrators and of course a little luck." The DSP is certainly involved in building relationships.

One thing the tragedy of September 11 has done is put food production and safety in the spotlight. We must move food production into the national security arena. To quote Bob Odom, Louisiana Commissioner of Agriculture, " In ranking our nation's priorities, food and fiber production should be at the same level as national defense". The US government must consider food as a national security issue to ensure a safe and abundant supply and if weed science is positioned correctly, we should be able to capitalize on funding in this arena. Food production should become a key issue in the war against terrorism.

Pesticide Regulation. The DSP has continued to represent the Society on several important committees and panels to provide guidance and recommendations. Rob has a seat on the Committee to Advise on Reassessment and Transition (CARAT). Rob has attended numerous other committee and panel meetings, which gives us a voice and the ability to review various position documents. It is important for us to comment on these cases because the comments are entered into the public docket and must be considered.

In Randy Ratliff's presidential address, he gave us some reasons that could cause the society to fail including, lack of membership, member apathy, lack of recognition/visibility, decline in agriculture, lack of focus and lack of vision. Having Rob Hedberg in Washington has increased our visibility and is a definite asset to our society. Rob is working on your behalf to ensure our visibility and if you have a burning issue, please let Jerry Wells know so that he can get it onto the priority list of Rob. The legislative committee is being revitalized for greater interaction with Washington to increase visibility.

We have looked at where we are on a few issues; I would now like to plant a few seeds as we now look at where we are going.

In general, meeting attendance has been decreasing over the past 10 years and we have had less than 500 for the past two years. Paper submissions have not declined but attendance has. One thing is certain: If we continue to do what we have been doing, we will continue to get what we have been getting. Many of you have read "Who Moved My

Cheese" by Spencer Johnson with cheese being a metaphor for a job, source of income or in our case, source of members. It is a book about being willing to change and I encourage you to read it. In an effort to find out if our cheese has moved and to find new cheese, the Board of Directors commissioned the long range planning committee to conduct a survey of the members and former members to determine if something could be done about meeting times and format to enhance membership. The Board will be considering the committee recommendations and I am sure would welcome your suggestions. We have to face facts that our industry is smaller but that does not mean that we cannot attract new membership. Each of us probably knows someone who has not attended a recent meeting. A phone call may be all it takes to get them back as a vital member. A few years ago, Bob Hayes came to me and commented that he had not seen a fellow weed scientist from Mississippi at the meetings for several years and asked me to contact him. I did and he has renewed his membership, given papers and called me as President to volunteer for committee assignment.

We cannot be all things to all people but we must focus on the needs of our clientele. To quote Randy Ratliff, "If we continue to be focused on needs of our clients, we can't help but be successful." The survey was designed to focus on client needs. The survey of members and former members revealed a truly mixed bag of suggestions and I would like to share a few items to generate discussion. January may not be the month of choice for meeting. Many suggested moving the meeting date to late September or early October. Meeting date changes will not be rapid because hotel contracts have been signed for 2004. Should we have joint meetings with other regional societies or with WSSA when they meet in the southern region? There were several suggestions to move the meeting to Tuesday-Wednesday-Thursday following the Martin Luther King Holiday. Should we have more symposia, more posters and less talks? Some suggested that we should be happy with 500 attending the meetings. In the business world, a company that is not growing may be seeing the first signs of death. Could this be true for SWSS? Obviously there are no magic fixes but the Board of Directors is open to suggestions and will give careful consideration to any input received. We are reorganizing the Long-Range Planning Committee to provide more continuity to study these issues. I am intentionally not selecting a path at this time. This is a Board function and should receive full discussion.

One reason for discussing this now is to give you time to think about some of these suggestions and let you provide input to the Board before the end of this meeting. I trust that you are concerned and I ask for your involvement.

For the first 1600 years of recorded history, no one could run a mile in less than four minutes. Then Roger Banister broke the four-minute barrier and within a few months, his record was broken. Today it is common to run a mile in less than four minutes. We didn't break the four-minute barrier for 1600 years because we didn't think we could. It is up to us. I like Henry Ford's quote and I paraphrase "whether you believe you can or can't accomplish something, you are correct." That is true of our society. It is up to us and I think we can survive the hard times and we will be a much better society if we think we can. What do you think we can do as a society? If we change our thinking and make the correct choices, we will see good results. Trying to determine the correct choices is like going through a maze. You know there is a way to do it but it is much easier if we can come to a consensus on the solution. We will succeed.

What is the one thing that you can do three times a week that has been proven to add nine years to your life? Go to church.

In closing, let me again say thank you to Jerry Wells, Virginia Hawf and the local arrangements committee. Thanks to the Board of Directors and committee members for outstanding support. This society is made of volunteers and I appreciate your efforts.

U.S. Farming in the 21st Century—Opportunity and Opposition. By Alex A. Avery, Center for Global Food Issues, Hudson Institute, USA

The short and the sweet of it is that the world is smack in the middle of the largest increase in global food demand in human history. A likely three-fold increase in food demand will unfold in the next 30-40 years, primarily as a result of economic development in Asia. That economic growth is driving a greater demand for protein and improved diets throughout the developing world that is outpacing their agricultural capacity.

In the next 30-40 years, Asia will grow to fully half of the world's food and fiber consumers, but will have less than one third of the world's arable land and less than one fourth of the world's pasture and grazing lands. In short, Asia will be unable to feed and clothe itself. This means export market opportunities will grow substantially for several decades to come.

The question is who will gain from these export opportunities and how big will they get, and the answer depends on many factors. Most importantly will be the future structure of our domestic farm policies, especially how those policies affect international farm trade liberalization negotiations. Both of those issues are way up in the air at the moment and only time will tell. But American agriculture has more power than it realizes to shape its future and lay the groundwork for prosperity in the 21st century, but it will be a politically difficult road strewn with potential pitfalls.

Let us look today at the trends affecting farm product demand, where they are heading and what the future holds for American farmers.

World Food Needs—Population and Affluence

The two factors affecting world food needs and farm product demand are population growth and individual income growth.

As the World Bank's website puts it: "No social phenomenon has attracted more attention in the past half century than the 'population explosion'—that surge from about 2.5 billion people in 1950 to more than 6 billion in 1999, making the 20th century one of unprecedented population growth. As the number of people grew, the interval for adding another billion people became shorter and shorter, with the increase from 5 billion to 6 billion occurring in only 12 years."

The world passed the six billion mark in 1999. The world's overall population growth rate is currently about 1.5 percent per year—adding an additional 80-85 million consumers each year to the global population. That's another Mexico added to the world's consumer pool every year or an additional New York City added every month. According to many environmental activists, these currently fast-growing numbers mean we're headed for a population train wreck. Sooner or later (with a heavy emphasis on sooner) they claim we'll run out of resources, humanity will starve, and the environment will be destroyed. Their mantra is that we must stop population growth! (It's a little known fact, but when the UN held its population summit in Cairo, Egypt in 1994, UN member nations agreed to spend $17 billion U.S. dollars on population control measures—per year!)

While an additional 85 million people per year may seem daunting, we are far from heading toward a population disaster.

In fact, recent analysis suggest that the world's peak population will likely be less than nine billion, perhaps as low as eight billion or less. If these projections are correct (and they come from the widely respected Winrock Foundation with a better track record than UN or World Bank geniuses), we're looking at roughly a 50 percent increase over today's global population during the next 45 years or so. Even the United Nations and the World Bank now project a peak population of between nine and ten billion.

The Slowing Population Train

The World Bank projects that the 7 billion mark will be reached around the year 2014. The Bank and the UN have historically overestimated population growth, so the 7 billion mark may actually reached later. Whatever the exact date, the current period marks the first time since 1800—when the global population reached one billion—that adding the next billion people took longer than the previous billion.

What this means is that the global population train has its brakes on hard, but it has taken a while for the train to scrub off momentum. In fact, 1997 marked the year of fastest population growth (90 million additional people) and the point at which the population train started noticeably slowing down (85 million for 1999, 80 million for 2000). From here on out, world population growth will be slower every year until the human population peaks—expected sometime around the year 2050. Then the global population is expected to begin shrinking.

This is a massive change in population projections compared to the wild-eyed predictions of the 1970s and early 1980s. Back then, the UN and World Bank predicted peak global populations of 15-20 billion people—some analysts warned of potential 25 to 30 billion people. In 1968, Dr. Paul Erhlich wrote *The Population Bomb*, one of the most successful environmental books of all time. Erhlich predicted massive global famines by 1975 as a result of the dawning population explosion. Lester Brown followed closely behind Erlich with his first book, *By Bread Alone*, in 1974.

So what happened during the intervening period to make Dr. Erhlich and Brown so radically wrong in their population growth predictions? The answer is unprecedented global economic growth that radically reduced the desired family size. It is somewhat counterintuitive, but rich people have smaller families.

Fertility rates are always low in affluent countries. This is because in a developed economy children are just plain expensive. Disposable diapers, Nike sneakers, car insurance, college tuition—I'm sure many of you can attest to exactly how expensive it all is. Women in the workplace mean that things that were previously free, like childcare, become a major household expense.

As a result, women in developed countries now average only 1.7 children apiece—well below the direct replacement level of 2.1 children per couple (one to replace mom, one to replace dad, and 0.1 to make up for those that die young). Consider Italy and Germany: with a current average of only 1.2 children per couple, they stand to lose virtually half their population over the next 40 years, not withstanding any foreign immigration. Europe as a whole averages only 1.4 kids per couple, which puts them in the same bind as the U.S. faces with Social Security and an impending increase in the ratio of retirees to workers. Italy was recently and may still be paying couples $1,000 to have second children—the exact opposite of China's one-child policy.

In contrast, larger families make economic sense in poor and relatively undeveloped countries. If you are a poor, subsistence farmer, more children mean more cheap helping hands to harvest the crop, gather firewood, haul water, and do the myriad other chores. In the developing world, children are still the equivalent of Social Security, expected to support their parents in their old age. Thus the incentives are toward large families. Another factor: when infant and child death rates are high, as they still unfortunately are in too many areas, the parents must have more children to ensure that one or two of their children will live to provide that social security. Because of all these factors, the average Third World fertility rate in 1960 was 6.5 children per couple.

Today, because of rapid economic growth and rising affluence, fertility rates have plummeted across the globe—most dramatically in formerly poor countries. Compared to an average 1.7 kids per couple in high-income countries, the middle and lower income countries together averaged only 2.9 births per woman in 1998, 3.1 for the poorest countries, and 2.5 for the middle-income. The global average is now only 2.7 and falling, meaning that humanity has moved more than 75 percent of the way to a stabilizing fertility rate in only one generation. Moreover, fertility rates are still falling rapidly in all developing countries.

That fundamental change in the fertility rates in the Third World—going from 6.5 children per woman in 1960 to only 2.9 in 1998 is what dramatically changed the population outlook for humanity.

Today, the projections for the peak global population are around 9 billion people, reached somewhere about the middle of the century. This is roughly a 50 percent increase above today's global population. From that point forward, the global population is expected to begin slowly shrinking. Meeting the needs of that peak global population is our challenge, and once that is accomplished, the population monkey will be off our back. The light at the end of the tunnel is shining and we have the capability to reach it, if we allow ourselves the opportunity.

World Food Needs—Affluence

Yet while the population train clearly has its brakes on, the global food demand train is still gaining speed. The reason is, ironically, the same as for the drastic fertility rate decline: economic growth in formerly poor countries. Increased wealth translates into improved dietary quality and higher overall farm product demand.

The GATT, now the World Trade Organization (WTO), has clearly shown itself to be the most successful international institution in human experience. It replaced tariff wars with economic growth. World non-farm trade has increased more than sixteen-fold since 1950, and is still rising.

As a result of the explosion in world trade, nearly 3 billion people in Asia are now living in market-oriented economies that have been increasing their national economic output by nearly 10 percent per year, compounded, since 1980. This economic growth is headlined by Japan, but also includes Taiwan, South Korea, Thailand, Malaysia, Mauritius, and China. India, Pakistan, and Indonesia have come a long way as well; although political unrest and regional conflict obviously threaten to stall their economic progress.

As an example of the impacts of economic growth, consider the evolution of the desired consumer goods of the average Chinese citizen. The so-called "precious three" most-coveted and desired household consumer goods in the 1960s and 70s were the bicycle, wristwatch and transistor radio. In the 1980s they became the telephone, television and refrigerator. By the 1990s the "precious three" were a cell phone, computer and a car. China has now entered as a member of the World Trade Organization and the prospects for increased economic growth in Asia are there.

Surging Demand for Better Diets

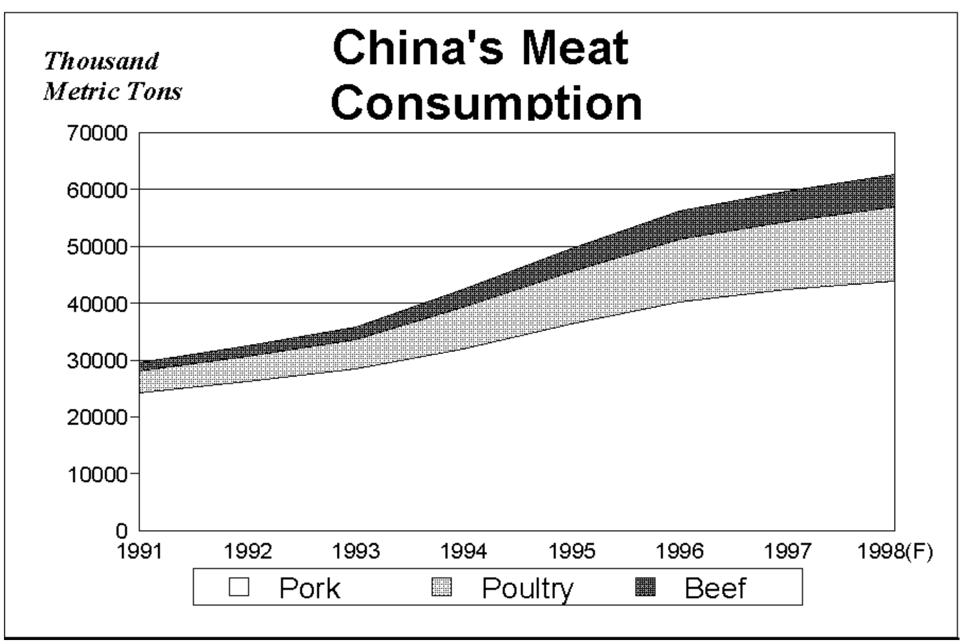
The first thing that poor people do when they get more income is to bid for better diets. The typical progression is first to buy more rice and wheat—modestly increasing total caloric intake and diversify cereals. Then, they buy more cooking oil—that is, more fried foods. Then, they buy more eggs and diary products. Finally, they purchase more meat, and fresh fruits, and vegetables. These farm products take three to five times as many farming resources to produce as a calorie of cereals – but there is an innate human hunger for them.

The biggest lie from environmental activists is that people in China and other developing countries are only eating more meat because of the advertising of McDonald's and Kentucky Fried Chicken (the largest Western fast food chain in China). That's silly. It was poverty that kept meat consumption low and meat demand in Asia has been skyrocketing in lockstep with the rise in personal incomes:

Japan was the first of the Asian tigers, and it has become the first of the Asian meat consumers as well. A country that once consumed less than 15 grams per day of animal protein and felt urgent concern about having fish on the plate, is now nearing 60 grams per day of meat and dairy products. If Japan did not still have such high tariffs on beef imports, the average Japanese might already eat more than 70 grams of animal protein. The Japanese meat consumption pattern is being emulated in *Taiwan.*

Thailand, which used to grow its poultry for export, was recently expanding its poultry flocks for domestic consumption, and Thai hog production was also starting to trend upward before the currency problems emerged.

China, of course, is the huge Asian food challenge, with 1.25 billion people raising their incomes at a speed never before seen in a large, low-income country. China has been raising its meat consumption at 10 percent annually for the past decade, more than doubling its national meat consumption in the 1990s. Most of the expansion to date has been pork, but the demand for both beef and poultry have more than doubled and are still growing.



Moslem countries, also, are joining in the meat demand, even though they forego pork, one of the favorite, lower-cost meats for many world cultures.

Indonesia, which is both Moslem and Asian, has increased its poultry consumption dramatically. The broiler flock rose 25 percent in 1995 alone, to 600 million birds. The demand for corn in poultry feeds has been rising by 4 million tons per year as the feed industry expanded by 13 percent recently. Indonesia had even deregulated soybean imports so that a lack of protein meal wouldn't constrain meat and egg production.

Moslems in *Pakistan*, too, have been increasing their meat and egg consumption as cotton and textile exports generate recent levels of economic growth of 5-6 percent annually. Poultry consumption is now more than 300,000 tons, soybean meal consumption has jumped 3 million tons since 1994, and poultry meat consumption will rise in the future as rapidly as income gains permit. Milk consumption has also been rising strongly. To the east, *Bangladesh* is setting its sights on economic growth through export manufacturing. The Bangladeshis already eat many of India's worn-out cows, and will raise the quality and quantity of meat and dairy products in their diets when they can afford it.

And in addition to meat and high-quality animal protein, these Asian consumers are increasing their consumption of fresh fruits and vegetables, further increasing domestic farm resource use and creating greater pressures for farm imports.

New Clothes, Beer and Dogs

The other reason why I believe the world must triple farm output is that once we have fed 8.5 to 9 billion people the way they prefer, we'll have to satisfy their growing appetites for other farm products.

Not only will consumers in these developing countries eat better, but these consumers will drink and dress better, too. China's beer consumption has more than tripled in the last decade. Imagine how much additional grain would be required if every one of the 730 million Chinese men drank just one extra beer per month. That's 8 billion bottles of beer in a year! One extra beer per week would mean an extra 3.5 billion gallons of beer consumed!

Huge populations of people are moving from societies where everyone owned only two cotton outfits apiece, to a dozen and more—just like any other modern society.

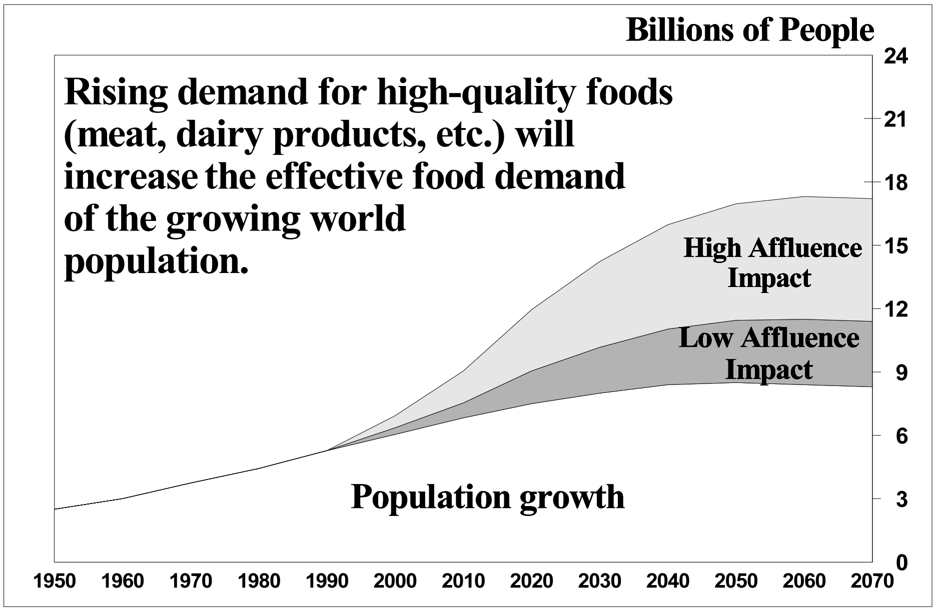
People all over the world are increasingly living in bigger houses, made with additional timber and wood products. Parts of Asia look just like suburban America already, with strip malls and housing subdivisions. The demand for wood products is projected to increase faster than food.

There will even be a pet food challenge. The U.S. has 113 million pet cats and dogs for 270 million people. All over the world, ownership of companion animals and pet food sales rise with incomes. Already, China's one-child policy is stimulating pet ownership. It is reasonable to project that China in 2050 will have more than 500 million cats and dogs, translating into significantly increased demand for pet food, which includes meat, grain, and protein meal.

And finally, Asians are smoking more as they become more affluent, taking even more land to satisfy them.

Combining the expected 50% increase in global population with the fact that most of these additional people will live in countries that are radically increasing individual incomes and adopting wealthier farm product consumption patterns, it is easy to see how overall farm resource demand will at least double, and will more likely triple over the next 45 years.

All in all, the next 30-40 years will see the largest and last surge in global food demand in human history. No one is better situated to take advantage of the global farm market opportunities that lie ahead than North American farmers. We have the best land, the best research network, the best technologies, the best infrastructure, and the best transport network. We have 4 coasts from which to choose for shipping, the best rails, the best roads. And, of course, I think we have the world's best farmers.



What About Farmland?

One reason there will be a large export opportunity in Asia is the lack of additional farmland there. Already, the world's farmers utilize an estimated 37 percent of the planet's total land area (including Antarctica and Greenland!) The UN estimates that humanity crops 11 percent of the land area, and uses another 26 percent for pasture and rangeland. Farming takes nearly half the planet's total land area not permanently covered in ice (excluding Antarctica and Greenland). What this means is that virtually all of the good, productive farmland is already in production, around the world and including Asia. There are still areas that could be farmed that aren't, but there are far fewer of them and society is demanding other uses for those lands, especially wildlife habitat and biodiversity conservation. In fact, the environmental collision is that much of the non-farmed land that it is possible to farm is also some of the more biodiverse areas on the planet.

Asia is one of the most densely populated areas on the globe, and in terms of arable farmland, it is by far the most densely populated region. China has 20 percent of the global population, but only 7 percent of global arable land. Much of China's farmland is steep and terraced, although reasonably productive. Asia in 2050 will likely have more than half of the global population but less than a third of global farmland. As far as cropland, Asia will be eight times more densely populated per acre of cropland as North America.

There will be some competition for this export market. I speak especially of South America, primarily Brazil, as well as eventually Eastern Europe. But looking at Brazil's soybean area of 107 million acres is currently less than half our planted acres of 226 million acres. But the undeveloped Cerrados area which could potentiall grow soybeans is staggering, at an estimated 350 million acres, or almost double our current soybean acreage. However, it must be remembered that to develop the Cerrados will take some time—and some new roads and railroads. Whereas the US has 2.3 million miles of roads and 150,000 miles of railways, Brazil has only 114,000 miles of roads and 17,000 miles of rail, both less than a tenth of the US.

Obstacles to Trade and Technology: Activist and Ignorance

There is one main obstacle to export opportunities that should materialize over the next 20-30 years—some don't want you to have it and lots more don't know enough to arrive at sound opinions. There is an enormous, well-funded army of anti-modern farm technology, anti-globalization activists that is bent on limiting technology, limiting trade, and limiting inputs. They believe that modern farming and weed control methods are the biggest environmental problem on the planet and they want a lot more control over how and what you do. And they've been winning!

The world's most advanced societies are attempting to legislate low-yield agriculture. All over the Developed World, government funding for agricultural research is being cut back or shifted to low-yield "sustainable" farming. Governments in affluent countries, especially Europe, are subsidizing organic farming (in several European countries the legislated goal is now 20 percent organic by 2010, when most are still below 3 percent), while regulators respond to public opinion by depriving the world's high-yield farmers of time-tested pesticides and raising the safety hurdles to unjustifiably high levels. The European response to biotech crops has been political paralysis.

In Africa, which has not yet had a full Green Revolution, foreign aid donors are now demanding that farmers increase food production *without* modern pest protection or plant nutrients on the grounds that these inputs will irreparably harm the environment. Never mind that the poor Africans are expanding low-yield cropland at the expense of wildlife habitat because of a lack of farm inputs.

Large numbers of well-fed, affluent, influential people are opposing agricultural biotechnology, the most important unexploited advance in humanity's knowledge of how to increase food production rapidly and sustainably. There is serious question still about whether the power of biotechnology will be marshaled in agriculture soon enough to make its undoubtedly huge contribution to simultaneously saving people and wildlife.

Are modern societies attempting to surrender the planet back to hunger, malnutrition and massive losses in wildlife habitat? And if so, why?

The Environmentalist Campaign Against Modern Farming

The opponents of modern, high-yield agriculture and ag biotechnology are, ironically, gathered under the banner of environmentalism.

- With the help of Rachel Carson's brilliantly-flawed book, *Silent Spring*, eco-activists have long maintained that modern farmers are poisoning children with cancer-causing chemicals. After 50 years of widespread pesticide use and billions of research dollars, science is still looking for the first case of cancer caused by pesticide residues. The U.S. National Research Council, the Canadian Cancer Institute and other medical authorities are trying to tell the public that the cancer fears are unfounded.

- For fifty years, wildlife groups have universally claimed that modern farm chemicals were poisoning wildlife on a massive scale. However, the wildlife losses to today's narrowly-targeted and rapidly-degrading chemicals are trivial—especially when compared with the millions of square miles of wildlife habitat saved by modern farmers' high yields. One of the newest insecticides used in farming and termite control is only 1/10th as acutely toxic as nicotine and is so safe many of us apply the same chemical directly on our dogs and cats once a month to keep fleas and ticks away.

- Eco-activists claim that more food means more people. But we are clearly in the first era of human history when more food has *not* meant more people. Births per woman in the Third World are down from 6.5 in 1960 to 2.9 today, and the birth rates have fallen fastest in the countries where the crop yields have risen most rapidly.
- Environmentalists claim that modern farming is unsustainable due to rampant soil erosion. But farmers have used herbicides and tractors to invent conservation tillage, which cuts soil erosion per acre by 65 to 95 percent. A recent soil erosion study in Wisconsin finds that the farmers there are suffering only 5 percent as much erosion as they did during the "Dust Bowl" days of the 1930s.

- Environmentalists oppose liberalized farm trade, though this is the only hope for much of Asia's wildlife.

We must now realize that modern agriculture is being targeted, not because it is bad for the environment, but because modern farming 1) represents the greatest success of technological abundance; and 2) because farming controls much of the world's land and water. The environmental movement seems to want managed scarcity for a few people. It seems to want environmental purity on some land even if that ultimately sacrifices more wildlands and biodiversity elsewhere.

The New Global Campaign Against Plant Nutrients

The latest eco-campaign is against plant nutrients. The U.S. supposedly has a crisis in water quality. The public is being told that vital plant nutrients such as nitrogen and phosphorus are environmental threats. In a November 2001 issue of the Journal Science, no doubt the most prestigious and well-respected science journal in the world, an Environmental Policy article called man-made agricultural nitrogen pollution a problem on par with global warming from CO2. Think about that! It says that nitrogen is harming ecosystems and public health.

Blue Baby Syndrome. Some environmental groups are demanding that the nitrogen limit in drinking water be lowered from 10 parts per million to 5 ppm, apparently just to make it more difficult for modern agriculture to function. Never mind that the incidence of blue baby syndrome fell drastically during the very period when the use of chemical fertilizers and confinement feeding of livestock and poultry flourished. Never mind that the latest research indicates it is gastrointestinal inflammation and irritation that causes blue baby syndrome—not nitrates.

Hypoxia. A White House task force has announced its solution to the hypoxia problem in the Gulf of Mexico. The hypoxic, or low-oxygen, zone in the Gulf doubled after 1990, from 3,500 square miles to 7,000 square miles. Agriculture, again, is being blamed. The presumed solution is to make Midwest farmers cut their use of fertilizer (the goal is a 20% loading reduction), and to "crack down" on big livestock and poultry farms. Never mind that hypoxic zones are characteristic of rivers that drain fertile lands all over the world. Never mind that the Mississippi River has always carried an enormous nutrient load—even before Europeans settled North America's Great Plains, and has likely always had a hypoxic zone at its mouth during the stagnant summer months. Never mind that the nutrients support rich fisheries in the Gulf of Mexico to the point that endangered sperm whales now live year-round at the mouth of the Mississippi and the surrounding Gulf—all because of the nutrients from the Mississippi that support the food chain. Never mind that cutting fertilizer use on the world's good farmland would mean significantly lowering yields—and clearing forest for low-yield crops somewhere else in the world.

- *Manure as Toxic Waste*. For 50 years, the critics of modern farming have held up organic crops fertilized with animal manure as the global ideal. Now the same critics are saying that "organic fertilizer" is "toxic waste"—if the animals or birds are being raised in a big confinement facility. Never mind that the big confinement feedlots and poultry houses protect the environment by collecting their wastes, and using them constructively to more sustainably raise the yields of feed crops.

The Future with Biotechnology

The world is in the early phases of exploring biotechnology's potential—the "biplane stage," to draw the analogy with airplanes. But already we see enough to know that biotechnology will be enormously important to conservation.

Saving Wild Species with Aluminum-tolerant Crops

Two researchers from Mexico discovered a way to overcome the aluminum toxicity that cuts crops yields by up to 80 percent on the acid soils characteristic of the tropics. Noting that some of the few plants that succeed on the world's acid savannas secrete citric acid from their roots, they took a gene for citric acid secretion from a bacterium and put it into tobacco and papaya plants. Presto, they had acid-tolerant plants. The acid ties up the aluminum ions, and allows the plants to grow virtually unhindered. The Mexican researchers have since gotten the citric acid gene to work in rice and hope that it can be used widely in a variety of crop species for the tropics, including wheat which would particularly help in areas such as South Africa.

Acid-soil crops have enormous potential for wildlife conservation. Acid soils make up 30 to 40 percent of the world's arable land, and about 43 percent of the arable land in the tropics. Thus far, they have been one of the major barriers to providing adequate food in the very regions that are critical to wildlands conservation, the Third World tropics. These are the very areas where the populations are growing most rapidly, where incomes are rising most rapidly, where the food gaps are expanding most rapidly—and where most of the world's biodiversity is located.

Sustainability Through Biotech

A research professor with the University of California, Davis decided to take a new approach to breeding salt-tolerance. Working with tomato, Dr. Eduardo Blumwald noted that all crop species have a natural protein that pumps sodium into the storage chamber of the plant cell. Dr. Blumwald wondered what would happen if he engineered the tomato plants to express more of this natural tomato gene/protein. Using biotechnology, he increased the genetic expression of the protein and his team has succeeded in creating a tomato plant that thrives in water that is nearly half as salty as sea water. Not only that, but the plants store the salt only in the leaves and stalks of the plant, not the fruit. This means the fruit will still taste great, but it also means that such plants could be used to reclaim previously salt-contaminated fields. By harvesting the plant residues after fruit harvest, the salts can be removed from the field and returned to non-salt-tolerant crops.

Improved Animals with Biotech

Heretofore, methods for introducing new genes into livestock had a low efficiency—less than 10 percent. However, in the 24 November 1999 issue of *The Proceeding of the National Academy of Sciences,* researchers report a new method for producing transgenic animals that approaches 100 percent efficiency. Researchers put the foreign gene into the animal's egg before it was fertilizer rather than shortly after. Obviously, this is another important step in creating animals with greater tolerance for pests and diseases, better feed conversion ratios and other practical advantages—with the end effect being more efficient farm resource utilization. Think of it as increasing the metaphorical gas mileage of humanity's agricultural car.

Saving Forests with Biotech Trees

The world could increase its forest harvest ten-fold if we planted just 5 percent of today's wild forests in high-yield tree plantations. Such plantations are good-but-not-great wildlife habitat because they are not “fully natural,” but they could apparently take all of the logging pressures off 95 percent of the natural forests.

Trees have always been difficult to improve through crossbreeding because the time frames are so long. Biotechnology is already helping to provide the higher-yielding trees through cloning and tissue culture -- which permit us to rapidly copy the fastest-growing, most pest-resistant trees in a species. When we master the tools of biotechnology more fully, we should be able to increase forest growth rates, drought tolerance, pest resistance and other important traits more directly, and even more effectively.

Already, biotech crops cover over 50 million hectares or 125 million acres around the globe. This figure is up by almost 20% over the year 2000. And this massive increase hasn't just been generated in North America. China, for example, is tripling its farm area under Bt cotton and Indonesia is planting Bt cotton for the first time. India will almost surely allow its farmers to grow Bt cotton in the next growing season. Last year, they had a huge outbreak of cotton boll worm that destroyed nearly all the cotton—save 10,000 acres of illegally planted Bt cotton. Now that the farmers see that Bt cotton does what it says (and Indian farmers are very wary considering the rampant adulteration and fraud in the chaotic Indian Ag chemical industry.) The farmers rioted in the streets when the government mentioned burning the already harvested unauthorized cotton.

In Latin America, Argentina is now second in the world in terms of agricultural land growing biotech crops, with 11.8 million hectares of its farm area under biotech products. Moreover, three quarters of the 5.5 million farmers involved were resource-poor rural folks. Between 1996 and 2002, the cumulative world total of biotech crops covers a massive 175 million hectares, or nearly 450 million acres.

And given the amount of potential illegal GM plantings in Brazil and elsewhere—remember the Indian cotton experience last year—GM plantings are likely near half a billion acres worldwide and growing!

A Global Trend Toward More Activists

It is the nature of activists to push for something different. In Peru, activists demanded an end to the chlorination of drinking water because the U.S. Environmental Protection Agency found chlorine, at high levels, could cause cancer in laboratory rats. Peruvian officials took the chlorine out of the water, and the cities promptly suffered a cholera epidemic that killed more than 7,000 people.

I don't blame the activists. I blame the people who trusted the activists. I also blame the press, which should have sought out the broader reality.

Like it or not, the world is on a trend to have more activists, in more countries. Democracy and affluence encourage activists and the free, open debate of public questions. The internet and instant global communication are spurring the creation of more activists. If modern agriculture is to succeed, it must learn to succeed in an activist-rich environment.

It is true that the Green Movement has rarely won an election, anywhere in the world. But the desire to preserve Nature is so urgent in First World cities that the Greens haven't needed to win elections. Environmental concern is so widespread that politicians race each other to embrace key points of environmental strategy. In America, Wirthlin polling a few years ago indicated that 75 percent of the public agrees with the statement, “We cannot set our environmental standards too high—regardless of cost.”

Bureaucrats who work for government environmental protection ministries know that public opinion has been pushed quite far on the side of environmental protection—they read newspapers and polling results. They now assume that they can regulate “environmentally offending” industries, such as agriculture, in virtually any way they choose.

Modern farming's reputation with the urban public is now so bad that it can no longer garner the support of many farm state legislatures.

Betrayed by Modern Journalism?

Unfortunately, today's mainstream media are not living up to their professional obligations for objectivity and research. Somewhere during the Vietnam era, journalists got the idea that refereeing the game of life was not as satisfying as playing on the winning team. Among the causes they have adopted as their own in recent decades is the environment.

Recently, our Center put out a press release noting that the water quality in North Carolina's Black River has improved over the last 15 years, even though the hog population in its watershed had quintupled to the highest hog densities in the U.S. Of the 300+ media outlets we sent the press release to, one lone skeptical reporter called to inquire further. She asked whether the hog industry had sponsored the study. No, we told her, the data was from the State environmental agency. "But that's not what my readers want to hear," she lamented, then hung up.

That's how far behind the public affairs curve modern agriculture currently finds itself. This is not a problem that can be dealt with by writing press releases, or by hosting community tours of farms and milk processing plants.

Can We Educate the Public on High-Yield Conservation in Time?

Someone must tell the urban public about the environmental benefits of high-yield modern farming. I submit that it will have to be agriculture. Someone must also confront the false ideal that is being peddled to the public in the form of organic farming.

We at the Center for Global Food Issues have decided about two years ago to go on the organic offensive and confront the myths being marketed to the public about organic food and farming. Already, we've had some noticeable victories. For example, when the latest pesticide use statistics for the U.S. were released by the National Center for Food and Agricultural Policy, the group that kept the database on contract for the EPA, we were the ones noting that the two most heavily used farm pesticides were both 'organic-approved' pesticides: oil and sulfur. Organic sulfur received the worst environmental rating of any farm pesticide in Cornell University's environmental impact quotient rating system.

Then, early last year, I received a call from a reporter with the Bureau of National Affairs in Washington, DC wanting to get my thoughts on the organic pesticide pyrethrum flunking the cancer rat tests by the EPA. I hadn't even known that the EPA was reviewing pyrethrum. It turns out that the EPA's Cancer Assessment Review Committee concluded way back in 1999 that the natural insecticide pyrethrum caused tumors in two different kinds of rats when administered in large doses—thus the EPA has reclassified natural pyrethrum as a "likely human carcinogen," a label that the very same activists have claimed was enough risk to permanently ban scores of synthetic pesticides. But rather than warn their chemo-phobic customers and the public about the EPA's conclusions, both the agency and organic activists kept a lid on the scientific findings for two full years. Now the cat is out of the bag: organic farmers are allowed, not only to use toxic pesticides, but they're allowed to use carcinogenic pesticides! The notion that organic or natural is harmless has become entrenched in the public's mind by the constant misrepresentation and marketing of organic proponents. We must educate and re-educate the public about the realities of farming and the limitations of so-called "natural" and "organic" solutions.

Agriculture and agricultural researchers must talk about saving wildlands and wild species with better seeds. We must talk about the land conserved by using synthetic nitrogen fertilizers, rather than land-extensive organic nitrogen. We must talk about conquering soil erosion with high yields (so there's less farmland to erode) and conservation tillage (which radically reduces erosion per acre of farmland). We must talk about preventing forest losses to slash-and-burn farming (the cause of destruction for two-thirds of the tropical forest lost to date). We must point out that where high-yield farming is practiced, the amount of forest is expanding. We must point out that the losses in wildlife habitat overwhelmingly occur where the farmers get low yields.

We must analyze every eco-activist proposal in terms of its land requirements:

- Organic farming for the world would mean clearing at least 5 million square miles of wildlife for clover and other green manure crops for the organic nitrogen. As Vaclav Smil of the University of Manitoba puts it, "We'd need the manure from an additional 6-8 billion cattle to replace the world's current synthetic fertilizer use, compared to only 1.2 billion cattle in the world today. Where are you going to park that many extra cows?"

- Reducing fertilizer usage in the U.S. Corn Belt would mean clearing many additional acres of poorer-quality land in some distant country to make up for the lost yield.

- Blocking free trade in farm products and farm inputs will probably mean clearing tropical forest for the dubious goal of food self-sufficiency in Asia.

It should not be solely up to agriculture to prevent such a needless disaster. Agriculture has no history of public affairs campaigns or any real experience in conducting them. However, I see no other entity with the knowledge, the financial requirements and the direct interest to do it.

How can we present the environmental case for high-yield agriculture if the journalists will not write it and politicians fail to support it?

Modern agriculture must take its case directly to the people, through *advertising*.

So far, agriculture has failed to accept the challenge, and the momentum for high-yield conservation is waning. We are not increasing public investments in high-yield research. We are not creating support for the farm community. The regulators are continuing to strangle farm productivity at an increasing rate all over the world.

In the long run, of course, farmers and farm researchers will be vindicated even without a public affairs campaign. But that vindication could come too late for the wildlands and the wild species—and too late for most of today's high-tech farmers and agribusinesses.

At this point, it looks as though we will fail to meet the food challenge of the 21st century—not for lack of time, but for lack of realism in our public life.

EVALUATION OF GLYPHOSATE FORMULATIONS FOR EFFICACY AND CROP TOLERANCE IN ROUNDUP READY CORN AND COTTON. K.M. Bloodworth, D.B. Reynolds, and L.T. Barber, Department of Plant & Soil Sciences, Mississippi State University, Mississippi State, MS.

ABSTRACT

The introduction of transgenic crops, to which Roundup (glyphosate) could be applied, has resulted in increased market share for glyphosate, while decreasing usage and profitability of other commonly used active ingredients. These factors, coupled with the expiration of the patent on glyphosate, has resulted in interest by others to manufacture and market glyphosate for use in transgenic crop production. Numerous manufacturers are now producing glyphosate for use in Roundup Ready cotton and corn. With the availability of glyphosate from these new sources, questions have arisen regarding the efficacy and safety on transgenic crops. Although all of these products are manufactured using the same parent acid, some are formulated as different salts. Roundup is formulated as an isopropylamine salt. Most other "generic" formulations also use the same salt; however, some like Touchdown IQ use a diammonium salt. Additionally, each formulation contains proprietary surfactants which may affect absorption, rainfastness, efficacy or crop safety. With the introduction of "new" glyphosate products, questions are being asked about efficacy and crop tolerance. With this in mind, experiments were conducted in 2000 and 2001 to evaluate various formulations of glyphosate for weed control and crop tolerance in cotton and an experiment was conducted in 2001 to evaluate crop tolerance in Roundup Ready corn. These experiments were conducted at the Black Belt Branch Experiment Station, Brooksville, MS. The experiments were conducted as a randomized complete block with four replications. Cotton treatments were applied over-the top at the 2-leaf stage followed by the 4-leaf stage. Included in these experiments were: Glyfos, Glyfos Xtra, Glyphomax Plus, Glyphosate Original, Roundup Original, Roundup UltraMax, and Touchdown IQ. These products were evaluated for control of large crabgrass [*Digitaria sanquinalis* (L.) Scop.], sicklepod [*Senna obtusifolia* (L.) Irwin and Barneby], and pitted morningglory (*Ipomoea lacunosa* L.), along with injury and yield. Corn treatments were applied over-the-top at the 2-, 4-, 6-, and 8-leaf stages of growth and a treatment was applied at the 2-leaf followed by a 6-leaf application. Corn plots were maintained weed free throughout the growing season. In this experiment,Glyphomax Plus, Roundup UltraMax, and Touchdown IQ were evaluated for injury and yield. All treatments for all experiments were applied at a rate of 0.75 lb ae/A in a carrier volume of 15 GPA. Latron AG-98 was used at 0.25% v/v when a surfactant was needed. Plots were 13' by 40' and planted in 'Stoneville 4892 BR' for cotton experiments and 'Dekalb 826RR' in the corn experiment. All weed control and injury ratings were taken visually on a 0 to 100 scale. Yield was determined by harvesting the center two rows of each four row plot.

Visual weed control and injury ratings in cotton did not differ among formulations. Weed control fourteen days after the 4-leaf application was 96 to 97, 85 to 91, and 90 to 93% for large crabgrass, sicklepod, and pitted morningglory, respectively. No injury was observed with any formulation and yield did not differ, with a range of 2101 to 2344 lb seed cotton per acre.

No visual corn injury was observed at any rating date. Observations were made 7, 14, 21, and 28 days after the 4 leaf treatments were applied. Yield did not differ among treatments, with a range of 121 to 154 bu/A.

These data indicate that there is no significant difference among these glyphosate-containing products with respect to weed control or injury when used according to label instructions. These data also indicate that these products are safe for application in Roundup Ready cotton and corn, since there were no adverse effects on yield. No inferences should be made regarding other formulations not evaluated in this research.

CONTROL OF VOLUNTEER PEANUT IN COTTON AND CORN. T. A. Baughman, J. W. Wilcut, W. J. Grichar, D. L. Jordan, J. C. Reed, and C. A. Gerngross, Texas A&M University, Vernon and Yoakum; and North Carolina State University, Raleigh, NC.

ABSTRACT

Rotation to other crops is a key in maintaining high yields in a peanut management system. Rotational crops assist in reducing disease severity in peanut. Therefore, control of volunteer peanut in these rotational crops must be accomplished to aid in breaking the disease cycle. Trials were established at two locations in Texas and two locations in North Carolina to evaluate traditional non-selective herbicides developed for use with transgenic cotton and corn alone and in combination with conventional or selective herbicides. Local peanut varieties were planted in all trials to simulate volunteer peanut. The first study (Cotton POST) was conducted at all four locations and included the evaluation of Buctril (bromoxynil), Liberty (glufosinate), and Roundup UltraMax (glyphosate) applied alone early postemergence (EPOST) or in combination with CGA 362622, MSMA, and Staple (pyrithiobac). The second trial (Cotton PDS) was conducted at three locations and evaluated EPOST applications of Liberty and Roundup UltraMax applied alone or followed by Caparol (prometryn), Direx (diuron), Harvade (dimethipin), Linex (linuron), MSMA, and Valor (flumioxazin). At two of the locations Caparol, Direx, Harvade Linex, and Valor were tank mixed with MSMA. The final trial (Corn Post) was conducted at two locations and evaluated EPOST applications applied alone or in combination with Aim (carfentrazone), atrazine, Basis Gold (nicosulfuron + rimsulfuron + atrazine), Clarity (dicamba), Exceed (prosulfuron + primisulfuron), and ZA 1296. In all studies the conventional herbicides were also applied alone. All herbicides were applied at labeled rates and included spray additives as indicated by label requirements. EPOST treatments were applied 22-40 days after planting when the peanut were 2 to 6 inches in diameter. The post-directed cotton herbicides were applied 10-14 days after the EPOST treatments when the peanut were 2 to 8 inches in diameter. Volunteer peanut control was evaluated 21 to 34 days after the last application.

In the Cotton POST study, the addition of Liberty or Roundup UltraMax increased the control of volunteer peanut over the application of the selective herbicides applied alone. All treatments that included Buctril resulted in less than 70% control except at one location in North Carolina when it was applied in combination with CGA 362622. The addition of MSMA and Staple increased volunteer peanut control when compared to Liberty applied alone at two locations. At one North Carolina location Liberty alone and in combination controlled volunteer peanut at least 98%, while at one Texas location all Liberty treatments resulted in less than 70% control. Volunteer peanut control was not increased at three locations with the addition of a selective herbicide compared to Roundup UltraMax applied alone, and was at least 85%.

In the Cotton PDS study, control was less than 70% when post-directed herbicides were applied alone except for Caparol, Direx, and Linex at one Texas location, and Valor at the North Carolina location. Volunteer peanut control was greater than 95% with all Liberty treatments at two locations. At the other location control was less than 50%. Roundup UltraMax treatments controlled volunteer peanut at least 95% except when applied alone at one of the Texas locations.

All selective herbicides controlled volunteer peanut less than 90% except atrazine and Basis Gold at the Texas location. Volunteer peanut control was greater than 90% with all Liberty and Roundup UltraMax treatments at both locations.

In many cases volunteer peanut control was higher than what might be expected with one application of Liberty or Roundup UltraMax, and control of less then 90% did occur in some instances with a single application of these herbicides applied alone. Both herbicides do appear to be a foundation to build on for adequate volunteer peanut control, and performed better than the conventional herbicides. However, depending on location and year repeat applications of these herbicides may be needed.

ROUNDUP READYâ SOYBEAN (GLYCINE MAX) AND COTTON (GOSSYPIUM HIRSUTUM L.) CONTROL IN ROUNDUP READYâ COTTON (GOSSYPIUM HIRSUTUM L.) J.L. Alford, R.M. Hayes, T.C. Mueller, and G.N. Rhodes, Jr., University of Tennessee, Knoxville, TN.

ABSTRACT

Glyphosate resistant crops have become more common and so has the problem of controlling volunteer glyphosate resistant crops. The emergence of these volunteer resistant "weeds" creates a need for control, especially the control of soybeans (*Glycine max*) and cotton (*Gossypium hirsutum L.*) in Roundup Readyâ cotton. Field experiments were conducted at Jackson, Tellico Plains, and Knoxville, TN to evaluate control of glyphosate resistant soybeans and cotton in Roundup Readyâ cotton using preemergence (PRE), postemergence (POST), hooded (HOOD), and cultivation treatments.

'PM 1218 B/R' cotton was planted April 27, 2001 at Jackson, TN, 'PM 1220 B/R' was planted May 1, 2001 at Knoxville, and 'SG 125 B/R' was planted May 21, 2001 at Tellico Plains. Glyphosate resistant soybeans and cotton (two rows of each) were planted perpendicular to the cotton rows. PRE and POST treatments at all three locations were applied using a tractor-mounted boom sprayer and HOOD treatments in Jackson and Knoxville also used a hooded sprayer. Treatments were arranged in a randomized complete block design with four replications.

Treatments at Jackson and Knoxville included POST applications of Staple 0.6 oz/A + Roundup Original 24 oz/A at 1 to 2-leaf and 4-leaf stages. HOOD treatments of Gramoxone Extra 12 oz/A + 0.25% NIS, Gramoxone Extra 3, 6, 12 oz/A + 0.25% NIS and 32% N, Roundup UltraMax 26 oz/A + 0.25% NIS + 32% N tank-mixed with Direx or Cotoran at 16 oz/A, Roundup UltraMax tank-mixed with Direx 16oz/A, Aim 0.144 oz/A, Caparol 26 oz/A, or Cobra 16 oz/A. Additional applications at Jackson included PRE applications of Cobra 16 oz/A and Valor 3.2 oz/A and HOOD treatments of Liberty 20 oz/A or Buctril 8 oz/A both applied with 32% N, and Direx 16 oz/A and Linex 16 oz/A, and Gramoxone 24 oz/A + Direx 16 oz/A all three applied with 0.25% NIS + 32% N. Treatments at Tellico Plains included POST applications of Gramoxone Max 13 oz/A + 0.25% NIS, Roundup UltraMax 26 oz/A + 32% N, and Roundup UltraMax 26 oz/A tank-mixed with Gramoxone Max 3, 5, 10 oz/ A, Valor 2.5 oz/A, Aim 0.144 oz/A, Direx 16 oz/A, Caparol 26 oz/A, and Clarity 8 oz/A.

Data collected included glyphosate resistant soybean and cotton control 34 days after HOOD applications (DAHA). Cotton crop injury was also evaluated in Jackson and Knoxville, and cotton yields were recorded in Jackson. Visual evaluations were based on a scale of 0 to 100% with 0 being no injury or control and 100 being complete control or death of cotton. Cotton lint yields (lbs of lint/A) were recorded 123 days after planting (DAP) in Jackson.

All HOOD treatments at Jackson controlled soybeans > 75%, except for Roundup UltraMax + Aim or Cobra having <5% control at 34 DAHA. POST treatments of Roundup Original + Staple controlled soybeans 62% at 1 to 2-leaves and 56% at 4-leaf applications. At Knoxville, Gramoxone Extra 12 oz/A, Gramoxone Extra >3 oz/A + 32% N, and Direx + Roundup UltraMax HOOD treatments controlled soybeans >60%. POST treatments of Staple + Roundup Original controlled soybeans >95% at 30 DAHA. At Tellico Plains, Gramoxone Max >5 oz/A, Direx + Roundup UltraMax, and Clarity + Roundup UltraMax all controlled soybeans > 90% at 35 days after POST (DAPO).

At Jackson, Gramoxone Extra >6 oz/A + 32% N, Gramoxone Extra 12 oz/A, Roundup UltraMax + Direx, Liberty, Gramoxone Extra + Direx HOOD treatments all controlled glyphosate resistant cotton > 95% 34 DAHA. In Knoxville, Gramoxone Extra > 3 oz/A + 32% N, Gramoxone 12 oz/A, Roundup UltraMax + Direx + 32%, and Roundup UltraMax + Direx controlled cotton > 52% at 30 DAHA. At Tellico Plains, Gramoxone Max >5 oz/A, Roundup Ultra Max + Valor, Aim, or Clarity POST treatments all controlled cotton >70% at 35 DAPO.

In addition, all cultivation treatments showed > 95% control for both soybeans and cotton at Jackson and Knoxville. However, cultivation does create problems of erosion and moisture loss. Results also showed no advantage to using 32% N as an additive for better control. At both Knoxville and Jackson, there was no significant crop response observed in treatments tested. Also cotton lint yield recorded at Jackson showed no significant yield differences observed between treatments tested, possibly due to low density of volunteer soybeans and adequate rainfall/irrigation.

SUSCEPTIBILITY OF PALMER AMARANTH ACCESSIONS TO GLYPHOSATE, PYRITHIOBAC, AND FOMESAFEN. J.A. Bond, L.R. Oliver, J.W. Barnes, D.O. Stephenson, IV, and E.R. Walker; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72701.

ABSTRACT

Palmer amaranth [Amaranthus palmeri (S.) Wats.] is a tremendous hindrance to crop production in the southern United States, and reports of herbicide efficacy on the species are sometimes contradictory. An experiment was conducted at the Arkansas Agricultural Research and Extension Center in Fayetteville to determine whether differences in herbicide efficacy on Palmer amaranth exist, and whether these differences are due to variation in susceptibility of ecotypes or biotypes.

The seed source in the experiment was Palmer amaranth seeds collected from ten states across the geographic range of the species in the United States. These seed sources included seeds collected from various locations in New Mexico, Texas, Kansas, Missouri, Arkansas, Tennessee, Louisiana, Mississippi, Alabama, and South Carolina. Seeds representing each location were planted in plots consisting of 4 1-m rows that were 1 m in length on June 26, 2001. The experimental design was a strip-plot with four replications. Vertical treatments included glyphosate (0.84 kg ae ha^{-1}), pyrithiobac (0.071 kg ai ha^{-1}), fomesafen (0.42 kg ai ha^{-1}), and a nontreated check. Horizontal treatments consisted of Palmer amaranth accesssions from the various locations randomized within vertical treatments. Herbicide treatments were applied with a CO_2 backpack sprayer delivering 94 L ha^{-1} for glyphosate or 187 L ha^{-1} for pyrithiobac and fomesafen when weeds reached 60 cm. Data collected included herbicide injury at 7, 14, and 21 days after treatment (DAT) and plant biomass. Data were subjected to analysis of variance (ANOVA) with means separated by Fisher's Protected Least Significant Difference (LSD) test at the 0.05 probability level.

Glyphosate injury at 21 DAT was equivalent and at least 97% for all accessions. Biomass was similar following treatment with glyphosate, regardless of the accession's origin. Differences in injury from pyrithiobac were observed among accessions within Arkansas, Louisiana, and Texas. Pyrithiobac injured Palmer amaranth accessions from southwest Arkansas more than those from other regions of the state, but when pyrithiobac was applied to 60-cm weeds, injury was no more than 30% 21 DAT. Fomesafen injured all accessions equally regardless of geographic origin, but this injury was no more than 13% 21 DAT. The low levels of injury for pyrithiobac and fomesafen were a product of the weed size at application. Variation in susceptibility of Palmer amaranth accessions was observed for pyrithiobac, but not glyphosate or fomesafen. Palmer amaranth accessions responded differently to pyrithiobac, but differences were not credited to an individual accession's specific origin. Weed size at application influenced injury by pyrithiobac and fomesafen, but not glyphosate.

BROADLEAF WEED CONTROL WITH LIBERTY, STAPLE, ROUNDUP ULTRA, AND BUCTRIL. B. L. Robinson, S.B. Clewis, J.W. Wilcut, J.L. Corbett and M. Paulsgrove, Department of Crop Science, North Carolina State University, Raleigh, NC

ABSTRACT

Thirteen field trials were conducted in 1999 and 2000 to evaluate weed control at the Central Crops Research Station near Clayton, NC; the Cherry Hospital Research Farm near Goldsboro, NC: the Peanut Belt Research Station located near Lewiston-Woodville, NC; and the Upper Coastal Plain Research Station located near Rocky Mount, NC. Treatments evaluated included Buctril (bromoxynil) at 0.5 lb ai/ac, Liberty (glufosinate) at 0.26 and 0.36 lb ai/ac, Roundup Ultra (glyphosate) at 1.00 lb ai/ac and Staple (pyrithiobac) at 0.032 and 0.064 lb ai/ac. Additional treatments evaluated included sequential applications of Liberty EPOST + POST at 0.36 lb ai/ac and Roundup Ultra EPOST + POST 1.0 lb ai/ac. Fallow areas were selected for heavy infestations of weeds of importance, or areas were seeded with weed species planted in rows running perpendicular to the plots. Broadleaf weeds were 1-2 inches or 3-4 inches tall at the time of EPOST application. Plots were arranged in a randomized complete block design with three replications of treatments. All species at both sizes occurred in at least two experiments, with some species found in five experiments. Weed control of emerged vegetation at the time of treatment was evaluated 14 to 20 days after treatment.

All herbicide treatments controlled 1-2 inch common cocklebur (*Xanthium stumarium*), Florida beggarweed (*Desmodium tortuosum*), jimsonweed (*Datura stramonium),* ladysthumb smartweed (*Polygonum persicaria)*, Pennsylvania smartweed (*Polygonum pensylvanicum),* pitted morningglory *(Ipomoea lacunosa*), prickly sida *(Sida spinosa),* redroot pigweed (*Amaranthus retroflexus),* smooth pigweed (*Amaranthus albidus*), and velvetleaf (*Abutilon theophrasti)* at least 90%. All treatments except for Staple at either rate controlled common lambsquarters (*Chenopodium album)*, common ragweed (*Ambrosia artemesifolia),* tall morningglory (*Ipomoea purpurea)* at least 90%. EPOST + POST treatments of Liberty and Roundup provided 100% control of common cocklebur, common lambsquarters, common ragweed, Florida beggarweed, jimsonweed, Palmer amaranth, redroot pigweed, smooth pigweed, and velvetleaf at both sizes. The development of Liberty Link cotton and the registration of Liberty would provide cotton growers another broad spectrum option for annual broadleaf weed control.

WEED AND HELIOTHINE-COMPLEX MANAGEMENT IN TRANSGENIC COTTON. O.C. Sparks, J.L. Barrentine and M.R. McClelland; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72704.

ABSTRACT

Studies were conducted at Marianna and Rohwer, AR, in 2000 and 2001 to determine the advantages of using transgenic cotton technologies with respect to weed control and management of the heliothine-complex and to identify possible shifts in weed species over time from using a specific technology.

Herbicide treatments consisted of four herbicide systems: 1) A conventional system (CONV) consisting of preemergence (PRE) applications of Pendimax® 3.3 (pendimethalin) @ 1 lb ai acre^{-1} + Meturon® (fluometuron) @ 1 lb ai acre^{-1} followed by (fb) fluometuron @ 1 lb ai acre^{-1}+ Ansar® 6.6 (MSMA) @ 2 lb ai acre^{-1} PDIR fb Direx® (diuron) @ 0.8 lb ai acre^{-1}+ AgriDex® crop oil concentrate (COC) @ 1% LAYBY; 2) A PRE+RR system of pendimethalin 1 lb ai acre^{-1} PRE fb Roundup Ultra® (2000) or Roundup Ultramax® (2001) (glyphosate) @ 0.75 lb ai acre^{-1} POST fb glyphosate @ 0.75 lb ai acre^{-1} PDIR fb glyphosate @ 0.75 lb ai acre^{-1} + diuron @ 0.8 lb ai acre^{-1} LAYBY; 3) A total POST RR system of glyphosate @ 0.75 lb ai acre^{-1} POST fb glyphosate @ 0.75 lb ai acre^{-1} PDIR fb glyphosate @ 0.75 lb ai acre^{-1} + diuron @ 0.8 lb ai acre^{-1} LAYBY; and 4) a BXN system consisting of pendimethalin + fluometuron PRE fb Buctril® 4EC (bromoxynil) @ 0.5 lb ai acre^{-1} + Staple® 85SP (pyrithiobac) @ 0.042 lb ai acre^{-1} EPOST fb bromoxynil @ 0.5 lb ai acre^{-1} + pyrithiobac @ 0.042 lb ai acre^{-1} MPOST fb diuron @ 0.8 lb ai acre^{-1} + COC @ 1.0% v/v at LAYBY. Heliothine control regimes of no control and standard control were applied to each herbicide system by variety combination. Varieties expressing the endotoxin for *Bacillus thuringiensis* (B.t.), in addition to no control and standard heliothine control systems, had heliothine control based on B.t. cotton threshold of 9 to 10 larvae per 100 plants with at least a ¼ in. length. Heliothine control measures were based on the University of Arkansas publication MP 144, Recommended Insecticides for Arkansas.

Data collected consisted of weed control and crop injury ratings on a scale of “0” to “100” with “0” being no weed control or crop injury and “100” being complete weed control or total crop destruction. Late-season weeds in the reproductive stage were counted in each plot. Plots were scouted for heliothine species, damaged squares (chewing mouthparts), damaged bolls (chewing mouthparts), plant bugs, boll weevils, and beneficial insects based on counts from 25 terminals, squares, and small bolls per plot. Other data included final season plant mapping, yield, and fiber quality analysis , but are not included in this paper. All data except weed control, yield, and crop injury from the untreated control were tested for homogeneity of treatment variances, subjected to analysis of variance, and pooled when appropriate. Treatment means for yield were separated by Fisher’s Least Significant Difference (LSD) at the 0.05 level of significance. Means for weed control and weed counts were grouped by herbicide treatments, and means for initial square damage and heliothine numbers were grouped by variety. These means were compared by orthogonal contrasts and separated by p-values at the 0.05 level of significance.

Systems that used glyphosate with or without PRE applications of pendimethalin had better control of Palmer amaranth than BXN or conventional herbicide systems. Conventional systems controlled pitted morningglory better than glyphosate-based systems early-season. In 2001, systems that used glyphosate had significantly lower numbers of reproductive Palmer amaranth than conventional or BXN systems. Glyphosate-based systems also had lower numbers of reproductive prickly sida than conventional systems, but was equal to BXN systems. There were no differences in final season numbers of pitted morningglory when comparing glyphosate-based systems to conventional herbicide systems. In 2001, under higher weed pressure, systems using glyphosate showed trends of increased yield compared to the same variety under conventional herbicide systems. There were no significant differences in heliothine management systems with respect to cotton yield. This was due to low numbers and late occurrence of heliothine in 2000 and 2001; however B.t. varieties did have lower numbers of heliothine at initial insecticide applications as compared to conventional and BXN varieties. There was a trend for a cultivar response in which DP 451BR, under conventional or glyphosate-based herbicide systems was one of the higher yielding cultivars in both years and locations. This may account for some of the dramatic increases in Arkansas cotton acreage planted to BG/RR cotton.

COTTON TOLERANCE AS INFLUENCED BY OVER-THE TOP APPLICATIONS OF GLYPHOSATE WITH VARIOUS ADJUVANT COMBINATIONS IN GLYPHOSATE-TOLERANT COTTON. J. Breen, R.B. Lassiter, V. Langston, B. Braxton, J.L. Barrentine, A.S. Culpepper, C. Guy, R.M. Hayes, W. Keeling, J.A. Kendig, D.K. Miller and D.B. Reynolds. Dow AgroSciences LLC, Indianapolis, IN; University of Arkansas, Fayetteville, AR; University of Georgia, Tifton, GA; G&H Associates, Tillar, AR; University of Tennessee, Jackson, TN; Texas Agricultural Experiment Station, Lubbock, TX; University of Missouri, Portageville, MO; Louisiana State University, St. Joseph, LA; and Mississippi State University, Mississippi State, MS.

ABSTRACT

To determine the safety to cotton of various adjuvants tank mixed with Glyphomax herbicide, which requires such adjuvants, field trials were conducted at eight locations across the Cotton Belt. Varieties used included PM1218BR, ST4892BR, SG501BR and PM2280BR, all glyphosate tolerant varieties. Best production and pest management practices were employed. Treatments focused on the type and amount of recommended adjuvants used in tank mixture with Glyphomax herbicide (4 lbs. isopropylamine salt of glyphosate / gallon). Each treatment included two applications of a glyphosate/adjuvant mixture over-the-top (OTT) before the cotton 5th leaf stage and 1-2 post-directed applications between the 5th and 9th leaf stages. Glyphomax was applied at 1 quart / acre in tank mix combinations of nonionic surfactants and water conditioners. Adjuvants used included LI-700, Choice, Optima, AG-98, R-11, Surf Aid, Induce, X-77, Activator 90, ammonium sulfate and Quest. The adjuvants were tested at their recommended label rate, and at 2X this rate. One treatment included an off-label, over-the-top late application at the 8-9 LF stage of cotton. Cotton safety from the comparison treatments Glyphomax Plus and Roundup Ultra was excellent, and mean peak injury across locations was 2% and 4% for the two treatments, respectively. Glyphomax herbicide tank mixed with LI-700 and Choice showed excellent visual crop safety. The adjuvants Optima and AG-98 caused transient injury greater than the comparison treatments at 1-3 locations. However, no adjuvant at its label rate in tank mixture with Glyphomax reduced seed cotton yield compared to Glyphomax Plus or Roundup Ultra at any location. Glyphomax Plus and Roundup Ultra were not significantly different from each other in yield at any location, with mean percent of maximum cotton yield across locations of 91% and 96%, respectively. In contrast, a late, off-label glyphosate application at the 8-9 cotton LF stage showed significantly reduced yield at 6 of 10 locations, and just 74% of maximum yield across locations. There was no evidence to suggest that the adjuvants tested can not be used safely in RR cotton at their label rates. Moreover, late application of glyphosate was clearly much more risky to RR cotton yield than misapplication of nonionic surfactants or water conditioners.

INTRODUCTION

Roundup Ready™ (RR) cotton is used on a large and expanding percentage of the cotton acreage in the U.S. Previous research has suggested that there is no difference in RR cotton yield between conventional weed control and control with glyphosate, so long as the herbicides are properly applied. Various formulations of glyphosate are labeled for use over the top of RR cotton. Some require the addition of adjuvants (surfactants and other water conditioners), while others do not. Some glyphosate formulations requiring such adjuvants have been used widely on a commercial basis, and are recommended by local state extension agencies. While commercial experience has suggested that certain glyphosate formulations can be used safely in RR cotton, little research has been published examining RR cotton safety of nonionic surfactants and water conditioners applied in tank mixture with them. This research was conducted to determine the safety to RR cotton of one such glyphosate formulation, Glyphomax* herbicide, when used with various recommended adjuvants.

METHODS AND MATERIALS

Eight field trials were conducted in 2001 across the cotton belt at locations in TX, LA, AR (2), MO, TN, MS and GA. Cotton varieties used contained the RR and Bollgard™ genes, and included PM1218BR, ST4892BR, SG501BR and PM2280BR, chosen for their suitability to the local region. Planting was between April 22 and May 29, 2001. Best production and pest management practices were employed. Irrigation was available at all but one location. Plot size was 180 to 640 ft.^{2} with 3-4 replications.

Treatments focused on the type and amount of recommended adjuvants used in tank mixture with Glyphomax herbicide (4 lbs. isopropylamine salt of glyphosate / gallon). Each treatment included two applications of a glyphosate/adjuvant mixture over-the-top (OTT) before the cotton 5th leaf stage and 1-2 post-directed applications between the 5th and 9th leaf stages (Figure 1). Glyphomax was applied at 1 quart / acre per application.

Chemicals used are shown in Table 1. Glyphomax was applied in tank mix combinations of nonionic surfactants and water conditioners in 10-20 gallons/acre spray volume. The adjuvants were tested at their recommended label rate, and at 2X this rate, to determine the margin of error for these adjuvant tank mixtures. For comparison, Glyphomax Plus and Roundup Ultra, neither of which requires additional surfactant, were used. One treatment included an off-label, over-the-top late application at the 8-9 LF stage of cotton (Table 2), to compare the effect of late application to the effect of misapplication of adjuvants. Not all treatments were included at all locations.

Weekly percent visual crop injury ratings were made after each application, and/or where visual change in cotton appearance from previous observations was noted. Plant mapping was conducted at the Tennessee and Tillar, AR locations. After defoliation, cotton was harvested at maturity and seed cotton yield was measured, and lint quality was measured at the Texas and St. Joseph, LA locations. Lint yield can be roughly estimated from seed cotton yield by multiplying the latter by 1/3. For each trial, maximum seed cotton yield was recorded, and all treatments were expressed as a percentage of the maximum yield. Mean (across locations) percent of maximum yield was calculated for each treatment.

Visual crop injury and yield data was analyzed by ANOVA for each trial. Where significant differences were detected ($p < 0.05$), means were compared by the LSD test at the 5% level. Significant differences from the comparison standards (Glyphomax Plus and Roundup Ultra) were noted.

RESULTS AND DISCUSSION

Weed control was excellent in all treatments, and was not a factor in cotton growth or yield in these trials. Moreover, other pests and cotton stresses were generally minimal, and cotton growth and yield was very good overall, except in one trial where irrigation was unavailable.

Cotton safety from the comparison treatments Glyphomax Plus and Roundup Ultra (Trts. 8 & 9) was excellent, and did not exceed 5% visual injury in most trials. Mean peak injury across locations was 2% and 4% for the two treatments, respectively (Figure 2). Similarly, Glyphomax tank mixed with LI-700 + Choice or Glyphomax mixed with various other nonionic surfactants shown in Table 1 had peak injury of no more than 5-10% in most cases. Injury symptoms included leaf discoloration and spotting, and were transient, usually lasting less than one week. Treatment 7, Glyphomax Plus in an off-label nonionic surfactant tank mix, also showed no significant visual injury.

A few treatments showed somewhat higher transient visual injury. The mixture of Glyphomax with Optima at the X rate showed injury significantly greater than the comparison treatments in MO, Marianna, AR and GA at one observation timing. However, in each case, this visual injury was greatly reduced within a few days time. AG-98 and Induce also showed such transient injury at one location. Other adjuvants used did not show significant cotton safety differences from the comparison treatments (data not shown).

Cotton yield results are presented in Figure 3. Mean seed cotton yield across trials was between about 2600 and 2800 lbs. seed cotton / acre, except for the treatment including late OTT glyphosate application. The comparison treatments Glyphomax Plus and Roundup Ultra were not significantly different from each other in yield at any location. These two treatments had mean percent of maximum yield of 91% and 96%, respectively. Only one adjuvant treatment, Treatment 5, showed significantly reduced yield compared to the comparison treatments, which occurred at the MS and MO locations only. This was an off-label application of the 2X rate of Optima with combined with Glyphomax (Treatment 5). In contrast, the label rate of Optima did not yield differently from the comparison treatments at any location, and yielded 94% of maximum trial yield across the eight locations. No other combination of Glyphomax with any adjuvant mixture, including 2X applications, showed reduced yield compared to Glyphomax Plus and Roundup Ultra. No differences in fruit position among the adjuvant treatments were detected by plant mapping. Moreover, no lint quality differences were detected among any treatments at either location where it was evaluated. From this, we concluded that the products tested here could be safely used across environments in tank mix with Glyphomax herbicide by following label directions.

The off label application of Glyphomax Plus tank mixed with a nonionic surfactant did not show a yield difference from the either Glyphomax Plus alone or Roundup Ultra at any location (not shown in Figure 3). Mean percent of maximum yield was 91%.

In contrast, Treatment 10, which included a late, off-label application at the 8-9 cotton LF stage in addition to the other applications received by all other treatments, showed significantly reduced yield at 6 of 10 locations. This has been reported previously in RR cotton by many researchers. Across trials, mean yield for this treatment was just 2108 lbs. / acre compared to more than 2600 lbs. / acre for all other treatments (Figure 3). On a percentage basis, yield was just 74% of maximum yield across locations. Such losses have been reported frequently with late applications of glyphosate to RR cotton. Therefore, late application of glyphosate was clearly much more risky to RR cotton yield than misapplication of nonionic surfactants or water conditioners. This was a favorable result for cotton growers who choose to add their own adjuvant combinations in RR cotton for optimal weed control with Glyphomax herbicide.

Note: Always follow label instructions for all agrochemical products. Neither the authors nor Dow AgroSciences LLC recommends the use of off-label applications. The off-label applications described here were conducted in controlled conditions in order to demonstrate the potential for cotton injury under such conditions.

Glyphomax is a registered trademark of Dow AgroSciences LLC.
Roundup Ready, Bollgard and Roundup Ultra are registered trademarks of Monsanto.

LITERATURE CITATIONS

1. Culpepper, A.S. and A.C York. 2001. Comparing Roundup Ultra and Touchdown IQ in glyphosate resistant-cotton. Proceedings of the Beltwide Cotton Conferences. 2001(2): 1232.

2. McCarty, W.H., A. Mills, R. Smith, T. Pepper, W. Maily, C. Stokes, B. Atkins, J. Singleton and A. Ruscoe. 2000. Evaluation of Roundup Ready cotton tolerance to Roundup Ultra herbicide in commercial size plots in Mississippi. Proceedings of the Beltwide Cotton Conferences. 2000(1): 661.

3. Swann, C.W. and J.C. Maitland. 2001. Response of Roundup Ready cottons to selected weed management systems. Proceedings of the Beltwide Cotton Conferences. 2001(2): 1233.

4. Viator, R.P., J.T. Cothren and S.A. Senseman. 2001. Response of Roundup Ready cotton to Roundup Ultra. Proceedings of the Beltwide Cotton Conferences. 2001(1): 447.

Table 1. Chemicals used.

Product type	Product Name		
	Included in all trials	Included in one or more trials	X Rate[4]
Glyphosate formulations[1]	Glyphomax[2]		1 quart / acre
	Glyphomax Plus[3]		1 quart / acre
	Roundup Ultra[3]		1 quart / acre
Nonionic surfactants	LI-700		1 quart / 100 gallons
	Optima		2 quarts / 100 gallons
		R-11	
		Ag-98	1 quart / 100 gallons
		Surf Aid	1 quart / 100 gallons
		Induce	1 quart / 100 gallons
		X-77	1-2 quarts / 100 gallons
		Activator 90	1 quart / 100 gallons
Water conditioners	Choice		1.5 quarts / 100 gallons
		Ammonium sulfate	8.5 to 17 lbs. / 100 gallons
		Quest	1.5 quarts / 100 gallons

[1] All three are liquid formulations containing 4 lbs. isopropylamine salt of glyphosate / gallon
[2] Requires ionic surfactant
[3] Does not require or allow nonionic surfactant
[4] Rates were based on manufacturers' recommendations. Treatments receiving 2X rates (see Table 2) received double the rate shown at each application timing.

Table 2. Treatments used.

	Treatment Name	Adjuvants at X Rate	Adjuvants at 2X Rate (off-label treatment)[4]
1-2	Glyphomax LI-700 Choice	√	√
3-4	Glyphomax Optima	√	√
5-6	Glyphomax Other nonionic surfactant[1] Other water conditioner[1]	√	√
7	Glyphomax Plus Other nonionic surfactant[1,2]	√	
8	Glyphomax Plus		
9	Roundup Ultra		
10	Glyphomax Plus[3]		

[1] Chosen from the list of products in Table 1 based on local use patterns for the trial location
[2] Off-label (nonionic surfactant not required or allowed with Glyphomax Plus)
[3] Same application timings as all other treatments, but received an additional, off label application, over-the top of 8-9 LF RR cotton. The label allows application only until the 5th leaf is emerging.
[4] Glyphosate was always applied at the X rate, even when adjuvant rates were doubled.

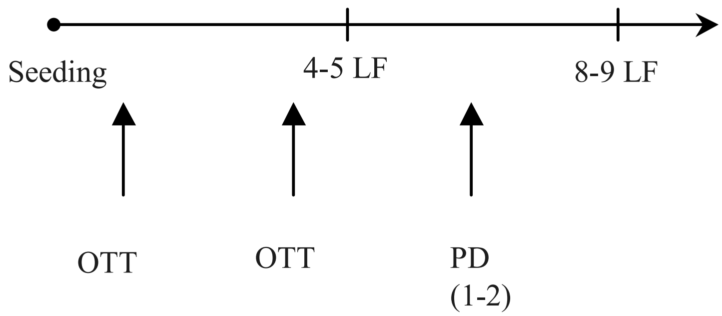


Figure 1. Arrows indicate application timings used for each treatment in the ten trials. Each treatment received 3-4 applications of glyphosate with or without specified adjuvants. Two treatments were over-the-top (OTT) of RR cotton and 1-2 treatments (as needed for weed control) were post-directed (PD) between the 5 and 9 LF stages. However, one treatment (Trt. 10) included an off-label, late over-the-top application (not shown) as a comparison.

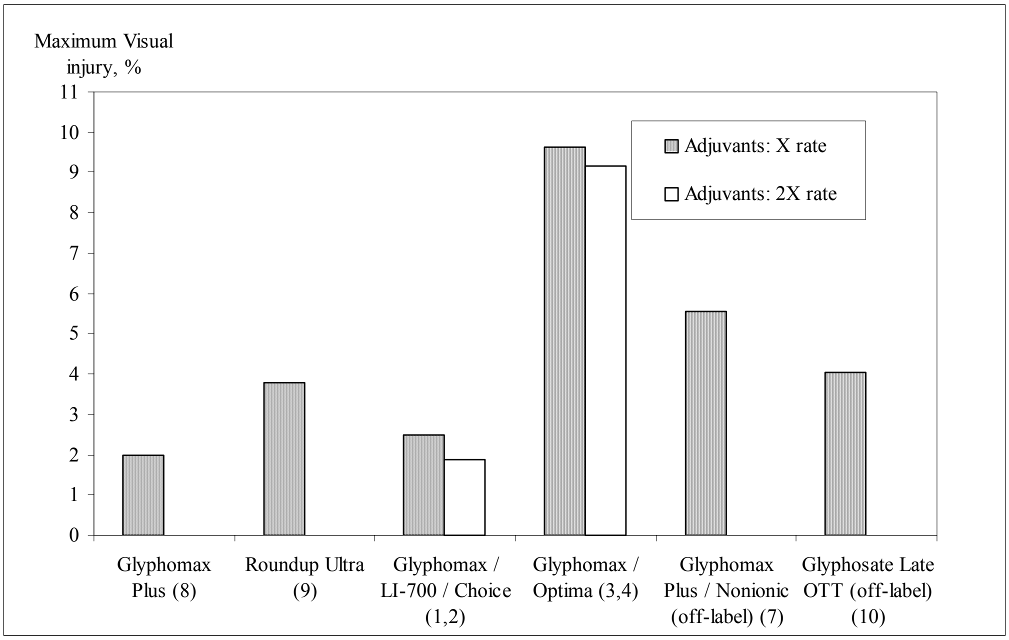


Figure 2. Maximum visual percent cotton injury across trials. Columns show means of 7-8 locations. Numbers in parentheses are treatment numbers explained in Table 2.

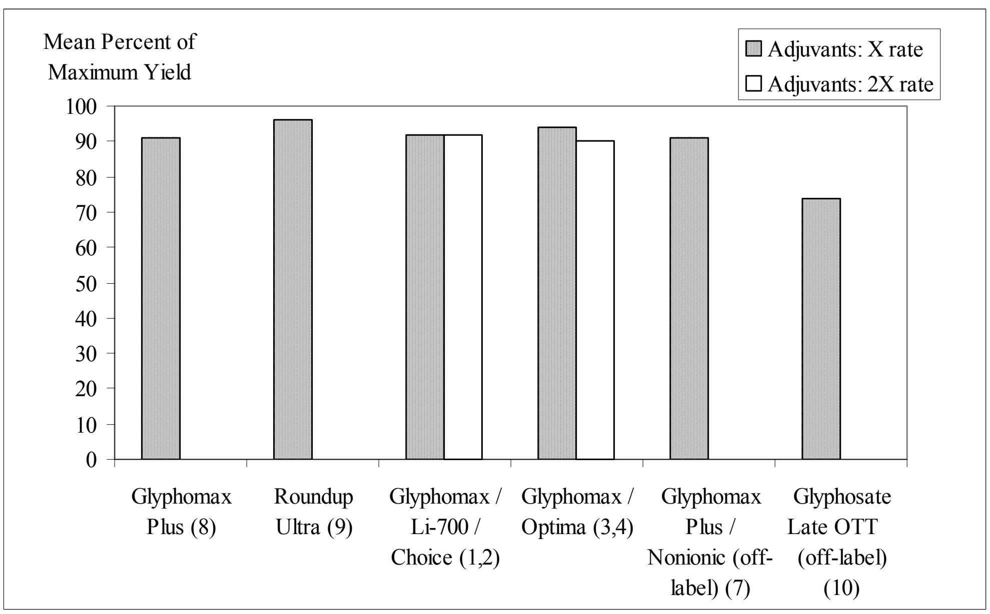


Figure 3. Mean percent of maximum seed cotton yield across trials. Columns show means of 7-8 locations. Numbers in parentheses are treatment numbers explained in Table 2.

EFFECT OF POSTEMERGENCE APPLICATION OF TOUCHDOWN IQ ON GROWTH AND YIELD OF GLYPHOSATE TOLERANT COTTON. D.K. Miller, P.R. Vidrine, S.T. Kelly, and D.R. Lee; Louisiana State University AgCenter, Baton Rouge, LA 70803.

ABSTRACT

Research was conducted in 2001 at the Northeast Research Station in St. Joseph, La, to evaluate effects of Touchdown IQ (glyphosate) on glyphosate tolerant cotton. EPOST, MPOST, and PD timings were over-the-top to two-leaf cotton, over-the-top to four-leaf cotton, and directed underneath cotton 18 d after MPOST timing, respectively. Touchdown IQ at 0.75 lb ae/A was applied in the following programs: EPOST; MPOST; EPOST followed by MPOST; EPOST followed by MPOST followed by PD; MPOST followed by PD; in combination with Dual Magnum (metolachlor) at 0.95 lb ai/A EPOST; in combination with CGA 362,622 at 0.0047 lb ai/A MPOST; EPOST followed by CGA 362,622 at 0.012 lb ai/A PD; and MPOST followed by combination with CGA 362,622 at 0.012 lb ai/A PD. A nontreated check was included for comparison. In addition to location in a relatively weed-free area, a combination of Prowl (pendimethalin) at 0.75 lb ai/A plus Cotoran (fluometuron) at 1.2 lb ai/A and Bladex (cyanazine) at 1.0 lb ai/A were applied PRE and at layby, respectively, to all plots to eliminate weed competition. Experimental design was a randomized complete block replicated four times. EPOST, MPOST, and PD treatments were applied at 15 GPA to DP 458BR cotton on May 14, May 24, and June 11, respectively. Treatments were applied to all rows of each 4 x 12 m, four-row plot. To assess possible negative effects from herbicide treatment, plants were visually rated for injury 17 and 34 d after EPOST application. In addition, the following were determined after machine harvest of center two rows of each plot: lint fraction; lint yield; and fiber micronaire, strength, and length. Final plant height; total sympodial branches; and percent boll retention from first and second sympodial branch positions were also determined from 10 randomly selected plants per plot.

At 17 d after EPOST application (DAT), Touchdown IQ in combination with CGA 362,622 at 0.0047 lb ai/A MPOST resulted in 6% visual injury in the form of chlorosis, which was greater than all other EPOST and MPOST applications (< 2%). By 34 DAT, injury was not evident for any of the treatments evaluated. Lint fraction, lint yield, fiber micronaire, fiber strength, fiber length, final plant height, total sympodial branches, and percent boll retention from first and second sympodial branch positions for nontreated plots averaged 0.40, 1043 lb/A, 4.8, 28.6, 1.1, 133 cm, 13.4, and 38%, respectively. Touchdown IQ programs resulted in no negative effects on any parameter measured when compared to the nontreated check.

COTTON AND SORGHUM RESPONSE TO LOW RATES OF GLYPHOSATE. L.L. Lyon, J.W. Keeling, Texas Agricultural Experiment Station, Lubbock, TX 79403; P.A. Dotray, Department of Plant and Soil Sciences, Texas Tech University, Lubbock, TX 79409; T.A. Baughman, Texas Cooperative Extension, Vernon, TX, 76384, and T.S. Osborne, Oklahoma State University, Altus, OK 73521.

ABSTRACT

Since their commercial introduction in 1997, Roundup Ready cotton varieties have increased in acreage. In 2000, 54% of the 15.3 million acres of upland cotton in the United States was planted to Roundup Ready varieties. Non-Roundup Ready cotton is often planted adjacent to Roundup Ready cotton, so the potential for herbicide drift or misapplication exists. However, non-Roundup Ready cotton is not the only problem, because that drift or misapplication potential also exists on the millions of acres of sorghum planted in the United States. The objective of these studies was to determine the effects of low rates of glyphosate (similar to drift) on non-Roundup Ready cotton and sorghum.

Cotton experiments were established at three locations: Lubbock, TX, Munday, TX, and Altus, OK. These locations represent upland cotton producing regions of the Texas Southern High Plains, Texas Rolling Plains, and Southwest Oklahoma. At the Lubbock location, Paymaster HS26 was planted and at Munday and Altus, DPL 237B was planted. Sorghum (DK 44) was planted at Halfway, TX. Glyphosate was applied at 0.38 lb ae/A (1/2X based on 0.75 lb ae/A), 0.19 lb ae/A (1/4X), 0.094 lb ae/A (1/8X), 0.047 lb ae/A (1/16X), and 0.023 lb ae/A (1/32X) postemergence-topical (POST) to cotton at the cotyledon to 2-leaf (COT to 2-lf), 4- to 5-leaf, pinhead square (PHSQ), and first bloom (FBLM) growth stages. These rates were also applied to sorghum at the 4-inch, 12-inch, boot, and bloom growth stages. Cotton and sorghum injury ratings and plant heights were recorded at 14 days after treatment (DAT) and at the end of the season. Cotton lint yields, quality and sorghum grain yield (adjusted to 12% moisture) were determined.

At Lubbock, cotton injury 14 DAT ranged from 0 to 50% for all growth stages. Glyphosate at 0.19 lb ae/A did not injure cotton when applied at the FBLM stage, while the 0.094 lb ae/A rate only injured cotton at the PHSQ stage. Applications made at the PHSQ growth stage caused more initial visual injury than applications made at FBLM. Cotton injury declined as the season progressed, and only the highest rate applied at the COT to 2-lf and PHSQ showed injury at the end of the season (3 and 6%, respectively). No differences in end of season plant height were observed for any rate at any growth stage. Only glyphosate at 0.38 lb ae/A applied at the PHSQ and FBLM cotton growth stages decreased yield compared to the untreated. All rates applied to cotton at the PHSQ growth stage and 0.047 and 0.19 lb ae/A applied at the 4- to 5-lf stage significantly increased micronaire compared to the untreated, but no other quality measurements were affected.

At 14 DAT, all rates at all growth stages injured cotton 10 to 90%, with increasing injury from increasing rate at the Munday location, and at Altus, injury ranged from 0 to 85%. Applications of gylphosate at 0.38 lb ae/A at the Altus location caused injury to COT to 2-lf, 4- to 5-lf, and PHSQ cotton, while 0.19 and 0.094 lb ae/A only injured cotton at the COT to 2-lf and 4- to 5-lf stages. No injury was observed 14 DAT from any treatment at the FBLM growth stage at Altus. At Munday eight weeks after treatment (8 WAT), all but the lowest rate of glyphosate applied at the COT to 2-lf stage showed injury and all rates applied at the 4- to 5-lf stage injured cotton. Rates of glyphosate greater than 0.094 lb ae/A applied to cotton at the PHSQ stage also caused injury; however, no injury was observed from applications made at FBLM. At the end of the season at Altus, the only injury observed was from glyphosate at 0.38 lb ae/A applied at the PHSQ stage (6%). Glyphosate applied at higher rates, especially at the FBLM stage, increased plant height at Altus. Cotton lint yield at Munday was reduced from glyphosate applications at 0.38 lb ae/A applied to COT to 2-lf cotton, all rates applied to 4- to 5-lf cotton, greater than 0.094 lb ae/A applied to cotton at PHSQ, and greater than 0.19 lb ae/A applied to cotton during FBLM. At Altus glyphosate at 0.38 lb ae/A, decreased lint yield was observed when glyphosate was applied at the COT to 2-lf and PHSQ growth stages and rates greater than 0.19 lb ae/A applied to cotton in FBLM decreased yields.

At 14 DAT, sorghum injury from glyphosate at 0.09 lb ae/A and greater was 90 to 100% when applied at the 4-inch stage; whereas, 8 to 70% injury was observed at those rates from applications made to 12-inch sorghum. Boot applications at 0.09 lb ae/A and higher caused 8 to 51% injury and all rates applied at the bloom growth stage injured sorghum at 14 DAT. At season’s end, injury up to 100% was still observed from applications of glyphosate at 0.05 lb ae/A and greater on 4-inch sorghum and the two highest glyphosate rates at the 12-inch and boot stages

caused 80 to 90% injury. Applications of 0.09 lb ae/A and higher applied at bloom caused 50 to 90% injury. Glyphosate applications at 0.05 and 0.09 lb ae/A at the 4-inch stage reduced end of season plant height and plants never recovered from the two high rates applied at that stage. Heights were reduced from rates of glyphosate at 0.38 lb ae/A applied at the boot and bloom stages. No yield was produced from 0.19 and 0.38 lb ae/A applied to 4-inch sorghum because of complete stand loss. All rates applied to sorghum at the 12-inch stage reduced grain yield, although end of season plant height was not reduced. Less yield was produced from sorghum receiving the two highest glyphosate rates at boot and bloom because of blasted heads and no grain fill.

Cotton injury was affected by glyphosate application timing and rate, but varied between locations. Visual injury did not always result in a yield reduction, especially at the COT-2 lf growth stage. Sorghum yield was reduced by glyphosate rates as low as 1/32X (0.02 lb ae/A) when applied at the 12-inch stage and 1/4X (0.19 lb ae/A) at all other stages. These studies suggest that non-Roundup Ready cotton can tolerate some glyphosate injury, especially early in the season, with little effect on yield; however, sorghum has little tolerance to glyphosate, especially at the 12-inch stage.

WEED MANAGEMENT IN LIBERTY LINK COTTON - SOUTHEASTERN RESULTS. A.C. York, Department of Crop Science, North Carolina State University, Raleigh, NC 27695; A.S. Culpepper, Department of Crop and Soil Sciences, University of Georgia, Tifton, GA 31793; E.C. Murdock, Department of Crop, Soil, and Environmental Sciences, Clemson University, Florence, SC 29506; J.W. Wilcut, Department of Crop Science, North Carolina State University, Raleigh, NC 27695; and J.W. Sanderson, Aventis Crop Science, Willow Springs, NC 27592.

ABSTRACT

Liberty Link cotton, resistant to Liberty (glufosinate) applied topically, is nearing commercialization. This technology offers growers a wider window for topical and sloppy directed applications of the non-selective herbicide Liberty as compared to Roundup Ready programs. Experiments were conducted throughout the Southeast to evaluate Liberty Link cotton tolerance to Liberty and the effectiveness of Liberty-based herbicide systems on numerous weed species.

Experiments were conducted at two locations near Goldsboro, NC; in Barnwell and Horry counties, SC; and in Tifton, GA. Herbicides systems at all locations included the following: 1) Liberty topical to 4- and 10-leaf cotton, 2) Prowl (pendimethalin) or Treflan (trifluralin) applied at planting followed by Liberty topical to 4- and 10-leaf cotton, 3) Prowl or Treflan plus Cotoran (fluometuron) preemergence followed by Liberty topical to 4- and 10-leaf cotton, 4) Prowl or Treflan at planting followed by Liberty topical to 4-leaf cotton and Liberty plus Dual Magnum (*S*-metolachlor) topical to 10-leaf cotton, 5) Prowl or Treflan at planting followed by Liberty topical to 4- and 10-leaf cotton followed by Liberty directed to 15-leaf cotton, and 6) a non-treated control. Additional treatments included Cotoran PRE followed by Liberty topical to 4- and 10-leaf cotton at four of five locations, Prowl PRE followed by Liberty topical to 4- and 10-leaf cotton followed by Caparol (prometryn) plus MSMA directed to 15-leaf cotton at three of five locations, and Prowl or Treflan at planting followed by Liberty topical to 4-leaf cotton and Liberty plus Staple (pyrithiobac) topical to 10-leaf cotton at two of five locations. Soil-applied herbicide rates were based on soil types. Liberty was applied at 27 fl oz/A except when in combination with 1 pt of Dual Magnum or 0.6 oz of Staple, where the Liberty rate was reduced to 24 oz/A. Caparol and MSMA were applied at 2 pt/A each. Testing agreements required the cotton to be destroyed without harvesting.

Liberty applied alone did not visibly injure Liberty Link cotton. Dual mixed with Liberty injured cotton 7 to 9% 1 week after application while Staple mixed with Liberty injured cotton 15 to 31% at two locations. No injury was observed with either treatment 3 weeks after application.

Late-season control of carpetweed (*Mollugo verticillata*), cutleaf groundcherry (*Physalis angulata*), Florida beggarweed (*Desmodium tortuosum*), mixtures of ivyleaf (*Ipomoea hederacea*) and entireleaf morningglory (*Ipomoea hederacea* var. *integriuscula*), pitted morningglory *(Ipomoea lacunosa*), seedling johnsongrass (*Sorghum halepense*), sicklepod (*Senna obtusifolia*), smallflower morningglory (*Jacquemontia tamnifolia*), smooth pigweed (*Amaranthus hybridus*), and Texas panicum (*Panicum texanum*) was at least 91% and was similar by all herbicide systems. Goosegrass (*Eleusine indica*) control by all herbicide systems also was similar and was at least 87%. Differences in herbicide systems were noted for common cocklebur (*Xanthium strumarium*), Florida pusley (*Richaradia scabra*), Palmer amaranth (*Amaranthus palmeri*), southern crabgrass (*Digitaria ciliaris*), and yellow nutsedge (*Cyperus esculentus*).

The total POST Liberty system (two over-the-top applications) controlled Palmer amaranth, southern crabgrass, and Florida pusley 90, 58, and 12%, respectively, at late-season. Use of a soil-applied herbicide(s) improved control of these weeds at least 9, 22, and 82%, respectively. Yellow nutsedge was controlled 67 to 68% by the total POST Liberty system or Liberty following Prowl or Treflan at planting. A third application of Liberty, applied as a directed spray, did not statistically improve control (78%). However, greater than 96% yellow nutsedge control was noted in systems containing Cotoran PRE or Dual Magnum plus Liberty applied topical to 10-leaf cotton. Common cocklebur emerged throughout the season, and programs including Cotoran PRE or layby applications controlled cocklebur at least 90% late in the season. Systems without Cotoran or a layby application controlled common cocklebur 80 to 83%.

TANK MIXTURES OF NARROW-SPECTRUM HERBICIDES WITH ROUNDUP. J. A. Kendig, G. A. Ohmes, B. A. Hinklin and P. M. Ezell; Plant Science Unit;, University of Missouri Delta Center, Portageville, MO 63873.

ABSTRACT

Roundup or glyphosate is slightly weaker on morningglory (*Ipomoea*) species than it is on weeds such as crabgrass and cocklebur. However, morningglory control has not been a significant problem in Roundup Ready weed control programs in soybeans or cotton. Nevertheless, producers have noticed that Roundup-treated morningglories will sometimes remain yellowed, without completely dying. Because of the slight weakness on morningglory and because Roundup lacks residual activity, a number of herbicides have been promoted as tank-mix partners. In the first few years that Roundup Ready was available, the suggested tank-mix partners tended to be ALS-inhibitor herbicides that often offered residual activity. The tank mix partners ranged in price, but were at least moderately expensive. However, more recently, narrower-spectrum herbicides, which often tend to be PPO inhibitors (or have a burning-type mode of action) have been suggested. A notable difference is that these newer suggestions have exceptionally low costs. These herbicides do not have residual activity; however, morningglory is still a key target, although some other weeds are also targets of the tank-mix partners.

To evaluate the morningglory efficacy, a non-crop study was conducted in 2001. Sencor (metribuzin) at 0.375 lb ai/A was applied to a morningglory infested area to control other broadleaf weeds, and to release ivyleaf (*Ipomoea hederacea*) and entireleaf (*Ipmomoea hederacea*, var. *integriuscula*) morningglory. Treatments included tank mix partners that have recently been suggested for corn, cotton and soybean weed control. Treatments were a factorial arrangement of Roundup Ultra at 13, 20 and 26 fl oz/A (glyphosate at 0.375, 0.56 and 0.75 lb ae/A) with Aim at 1/3 and 1/6 oz product/acre (carfentrazone at 0.008 and 0.004 lb ai/A), Harvade at 8 fl oz/A (dimethipin at 0.3 lb/A) , Resource at 2 fl oz/A (flumiclorac at 0.013 lb/A) and S-3153 at 0.018 lb/A.

Roundup at 0.375 lb ae/A provided 65% morningglory control. Aim increased the control to 90 and 80% at 0.008 and 0.004 lb ai/A, respectively. Morningglory control from the other tank mixtures was 69 to 71%. Roundup at 0.56 lb ae/A provided 71% morningglroy control. Aim increased the control to 92 and 83% at 0.008 and 0.004 lb ai/A, respectively. Morningglory control from the other tank mixtures was 69 to 80%. Roundup at 0,75 lb ai/A provided 86% morningglory control. Aim at 0.008 lb ai/A increased the control to 100%. Morningglory control from other mixtures was 79 to 88%. The higher rate of Aim was the only treatment that consistently improved morningglory control, although the lower rates of Roundup also benefitted from lower Aim rates. When the full, 0.75 lb/A rate of Roundup Ultra was used, only the high rate of Aim improved morningglory control. This study did not evaluate repeated Roundup applications; which may have lessened the benefit of the tank mixtures.

CONTROL OF VOLUNTEER GLYPHOSATE (ROUNDUP) - TOLERANT COTTON AND SOYBEAN IN ROUNDUP READY COTTON. E.C. Murdock, M.A. Jones, and R.F. Graham, Clemson University, Florence, SC 29506

ABSTRACT

Two field experiments were established at an on-farm site in Horry County, SC, to evaluate preplant and in-crop control of volunteer Roundup Ready cotton and soybean in Roundup Ready cotton.

In the preplant trial, four rows of Roundup Ready cotton and four rows of Roundup Ready soybean were planted perpendicular to the crop rows May 26, 2001. Preplant treatments were applied 2 weeks later when volunteer cotton and soybean seedlings were 3 and 4 inches tall, respectively. Roundup Ready cotton was planted 2 weeks after application of the preplant treatments.

Urea ammonia nitrate @ 40 qt/ac applied preplant provided ≤ 10% control of the volunteer Roundup Ready cotton and soybean. Preplant tillage controlled 100% of the volunteer crops but depleted the soil moisture, resulting in a poor stand of Roundup Ready cotton. Gramoxone Max (paraquat) @ 5,10,and 13.4 oz/ac controlled volunteer Roundup Ready cotton 92 to 99%; control of volunteer Roundup Ready soybean with these respective treatments was 77, 98, and 99%. Preplant applications of Valor (flumioxazin- 2.6 oz/ac), Weedone LV4 (2,4-D-0.8 qt/ac), Clarity (dicamba-8 oz/ac), and Cobra (lactofen- 12.8 oz/ac) controlled Volunteer Roundup Ready cotton 96 to 100%. Aim (carfentrazone-0.144 oz/ac), Direx (diuron-1 pt/ac), and Caparol (prometryn- 0.8 qt/ac) provided poor (0 to 7%) control. Preplant application of Valor (2.6 oz/ac), Aim (0.144 oz/ac), Direx (1 pt/ac), Caparol (0.8 qt/ac) and Cobra (12.8 oz/ac) provided poor (0 to 57%) control of volunteer Roundup Ready soybean. Weedone LV4 (0.8 qt/ac) and Clarity (8 oz/ac) controlled volunteer Roundup Ready soybean 100%.

In the in-crop experiment, four rows of Roundup Ready cotton and soybean were planted perpendicular to the crop rows immediately prior to planting the Roundup Ready cotton. Staple (pyrithiobac) @ 0.6 oz/ac applied POST to 2-and 4-leaf cotton provided 92 and 78% control of Roundup Ready soybean, but provided no control of the cotton.

When applied with a hooded/directed sprayer at the 8- to 9- node cotton stage, Gramoxone Extra (paraquat) @ 2.6 to 10 oz/ac controlled volunteer Roundup Ready cotton 20 to 85% and Roundup Ready soybean 52 to 72%, respectively. Cotoran (fluometuron) (1 pt/ac), Aim (0.144 oz/ac), Caparol (0.8 qt/ac), and Cobra (12.8 oz/ac) controlled volunteer Roundup Ready cotton and soybean 4 to 13% and 10 to 43%, respectively.

TOLERANCE AND WEED CONTROL IN GLUFOSINATE-TOLERANT COTTON ON THE TEXAS SOUTHERN HIGH PLAINS. B.C. Burns, P.A. Dotray, Texas Tech University Lubbock, TX 79409; and J.W. Keeling, Texas Agricultural Experiment Station, Lubbock, TX 79403.

ABSTRACT

Recent advances in biotechnology have paved the way for the development of glufosinate-tolerant cotton. In 1995, the bar gene was introduced into Coker 312 cotton for tolerance to glufosinate. Field studies from 1996 to 2000 confirmed this tolerance, and current studies are being conducted to test the glufosinate-tolerant gene in lines derived from the genetic backgrounds of commercially available cultivars (designated as 8000515 and 8000535). Cotton tolerance to glufosinate was evaluated in both glufosinate-tolerant stripper cotton lines when applied at selected growth stages, rates, and sequential timings. An additional field study was conducted in 2001 to evaluate weed control in glufosinate-tolerant Coker 312 using glufosinate alone and in combination with residual herbicides.

In the growth stage test, glufosinate was applied postemergence-topical (POST) at 0.54 lb ai/A to both glufosinate-tolerant lines at the cotyledon, 2- to 3-leaf, 7- to 8-leaf, first square, first bloom, peak bloom, and cut-out growth stages. In the rate test, glufosinate was applied POST to both glufosinate-tolerant lines at the 2- to 3-leaf stage at 0.36, 0.72, 1.44, and 2.88 1b ai/A. In the sequential tolerance test, glufosinate was applied POST at 0.36 lb ai/A to cotton at the cotyledon, 2- to 3-leaf, 4- to 5-leaf stages, and postemergence-directed (PDIR). Visual injury was evaluated 7, 14, and 21 days after treatment (DAT). Plant heights were recorded 14 and 21 DAT. Cotton plants were mapped at harvest and yield and fiber quality was determined.

No visual injury was observed in either glufosinate-tolerant line (8000515 and 8000535) from applications made at any growth stage, from cotyledon to cutout. No cotton injury was observed from glufosinate rates up to 2.88 lb ai/A or from up to three sequential applications. Treatments had no effect on plant height, first position bolls, or nodes per plant. Glufosinate applications did not adversely affect yield or fiber quality in either glufosinate-tolerant line.

Additional field studies were conducted in 2001 to evaluate weed control in glufosinate-tolerant cotton (Coker 312) using glufosinate alone and in combination with residual herbicides. Trifluralin at 0.75 lb ai/A was applied preplant incorporated (PPI) to all plots. Treatments included: 1) prometryn at 1.2 lb ai/A preemergence (PRE) followed by (fb) glufosinate at 0.36 lb ai/A POST; 2) glufosinate POST alone; 3) prometryn PRE fb glufosinate POST fb glufosinate POST; 4) glufosinate POST fb glufosinate POST; 5) prometryn PRE fb glufosinate POST fb glufosinate POST fb glufosinate PDIR; 6) glufosinate POST fb glufosinate POST fb glufosinate PDIR. After each glufosinate application, Palmer amaranth (*Amaranthus palmeri*), devil's-claw (*Proboscidea louisianica*) and silverleaf nightshade (*Solanum elaeagnifolium*) control was evaluated. Glufosinate controlled annual weeds such as devil's-claw that were not controlled by residual herbicides. Trifluralin fb glufosinate POST controlled devil's-claw 95% and silverleaf nightshade 35% compared to no control when trifluralin was used alone. Late-season Palmer amaranth control improved with two glufosinate applications. Two glufosinate POST applications improved silverleaf nightshade control (65%) over one application.

These studies indicate that both glufosinate-tolerant lines have excellent season-long tolerance to POST and PDIR glufosinate applications. In addition, glufosinate controlled devil's-claw and silverleaf nightshade that were not controlled by residual herbicides alone.

EVALUATION OF CARFENTRAZONE FOR WEED CONTROL IN COTTON. S.T. Kelly, T.B. McKnight, D.K. Miller, A.L. Perrit and D.R. Lee. LSU Agricultrural Center, Scott Research, Extension and Education Center, Winnsboro, LA, 71295 and Northeast Research Station, St. Joseph, LA 71366.

ABSTRACT

Experiments were conducted in 2001 to evaluate carfentrazone for weed control in cotton. These experiments evaluated the utility of carfentrazone applied post-directed or at layby. Experiments one and two were conducted at the Northeast Research Station near St. Joseph, LA on a silt loam soil, while Experiment three was conducted on a producer field near Waterproof, LA. All treatments were applied using a CO_2-powered layby rig delivering 15 gallons per acre (gpa). Experimental design was a randomized complete block with four replicates.

Experiment one was conducted to evaluate carfentrazone tank-mixes applied at layby. Treatments included carfentrazone + clomazone (0.016 + 0.75 lb ai/A, respectively), clomazone + glyphosate (0.75 + 0.75 lb ai/A, respectively), clomazone + glyphosate + carfentrazone (0.75 + 0.75 + 0.016 lb ai/A, respectively), or clomazone + glyphosate (0.75 + 1.0, 1.0 + 0.75, or 1.0 + 1.0 lb ai/A, respectively). Treatments were applied to 20 inch cotton on July 19, 2001. Weeds present included hemp sesbania (*Sesbania exaltata*), sicklepod, (*Senna obtusifolia*), pitted morningglory (*Ipomoea lacunosa*), entireleaf morningglory (*I. hederacea*), and smooth pigweed (*Amaranthus hybridus*). No differences in control of sicklepod , pitted or entireleaf morningglory were observed between any of the treatments. Any treatment containing glyphosate controlled smooth pigweed at least 88% at 22 days after treatment (DAT), while carfentrazone + clomazone provided 80% control. Similar results were observed with hemp sesbania control, with any treatment containing glyphosate providing at least 91% control and carfentrazone + clomazone providing 84% control.

Experiment two was conducted to evaluate carfentrazone tank-mixes applied post-directed to 25 inch cotton on July 9, 2001. Treatments included carfentrazone alone (0.015 or 0.024 lb/A), and tank-mixes of 0.015 lb/A carfentrazone in combination with fluometuron (0.75 lb ai/A), bromoxynil (0.375 lb ai/A), glyphosate (0.56 lb/A), pyrithiobac (0.0625 lb ai/A), MSMA (2.0 lb ai/A), diuron (1.0 lb ai/A), or prometryne (0.375 lb ai/A). A combination of 0.008 lb/A carfentrazone + 0.56 lb/A glyphosate was also included. Weed control evaluations were made at 7 or 14 DAT. Weeds present included: pitted morningglory, hemp sesbania, sicklepod, and purple nutsedge (*Cyperus rotundus*). No differences in pitted morningglory control were observed, with any treatment providing at least 93% control at 7 DAT, and 95% control at 14 DAT. Hemp sesbania control was at least 80% with carfentrazone alone at 7 DAT. However, the addition of any herbicide evaluated increased control from 85 to 95%. By 14 DAT, hemp sesbania control ranged from 80 to 93%. Carfentrazone alone, or tank-mixed with pyrithiobac provided less control versus tank-mixes with other herbicides. Sicklepod control was not different between any treatments by 14 DAT (82 to 95%). Purple nutsedge control was less than 20% at 14 DAT unless glyphosate or MSMA was included in the tank-mix.

Experiment three was a duplicate of Experiment two, but conducted on a producer field. Weeds present included pitted and entireleaf morningglory, hemp sesbania, sicklepod, and smooth pigweed. Weed control was evaluated at 22 DAT. At this date, any treatment controlled pitted or entireleaf morningglory at least 94% with exception of carfentrazone + pyrithiobac (85%). This combination also provided less control of hemp sesbania, sicklepod, or smooth pigweed compared to the other combinations.

These data suggest that carfentrazone can be successfully used for weed control in cotton provided that proper tank-mix partners are used to control those species that carfentrazone may not control.

CUTLEAF EVENINGPRIMROSE (*OENOTHERA LACINIATA*) AND WILD RADISH (*RAPHANUS RAPHANISTRUM*) CONTROL WITH BURNDOWN HERBICIDES FOR CONSERVATION TILLAGE COTTON (*GOSSYPIUM HIRSUTUM*). A.S. Culpepper, Department of Crop and Soil Sciences, University of Georgia, Tifton, GA 31793; A.C. York, Crop Science Department, North Carolina State University, Raleigh, NC 27695-7620; S. Carlson, Tift County Extension, University of Georgia, Tifton, GA 31793.

ABSTRACT

Conservation tillage practices in Georgia and North Carolina have increased approximately 10 to 15% since 1998. This trend will likely continue as economic and labor issues continue to strain producers. The most troublesome weeds in reduced tillage practices are cutleaf eveningprimrose and wild radish. A series of field experiments were conducted at two Georgia locations during 2001 and at ten North Carolina locations from 1999 through 2001 to examine the most effective cotton burndown program for control of cutleaf eveningprimrose and wild radish.

Treatments included glyphosate (0.75 lb ae/A) or paraquat (0.63 lb ai/A) applied alone or in combination with Aim (carfentrazone, 0.016 lb ai/A), 2,4-D (0.5 lb ae/A), Direx (diuron, 0.5 lb ai/A), Harmony Extra (thifensulfuron-methyl + tribenuron-methyl, 0.0156 + 0.0078 lb ai/A), Resource (flumiclorac pentyl ester, 0.013 to 0.02 lb ai/A), and Valor (flumioxazin, 0.032 to 0.064 lb ai/A). Additional treatments for cutleaf eveningprimrose included glyphosate mixed with Clarity (dicamba, 0.25 lb ai/A) or Goal (oxyfluorfen, 0.25 lb ai/A). A non-treated control was included for comparison. Non-ionic surfactant was included with all paraquat applications. Treatments were applied at 14.8 GPA.

Cutleaf eveningprimrose control by glyphosate at all locations was less than 66% at 30 days after application. Harmony Extra mixed with glyphosate did not improve control of cutleaf eveningprimrose compared to glyphosate applied alone. Aim, Direx, Goal, or Resource mixed with glyphosate improved control 9 to 18%; however, eveningprimrose control was still less than 75%. Greater control (83 to 87%) was noted when Valor or Clarity were mixed with glyphosate. The most effective glyphosate tank-mix partner was 2,4-D, which increased control to at least 97%. Wild radish control by glyphosate alone was 70% at 30 days after application. Aim or Resource mixed with glyphosate did not improve wild radish control. Valor or Direx mixed with glyphosate improved control 13 to 14%. Harmony Extra or 2,4-D were the most effective tank-mix partners, and increased control 23 to 24%.

Paraquat alone controlled cutleaf eveningprimrose only 55% at 30 days after application. Aim, Resource, and Direx did not improve control compared to paraquat applied alone. Harmony Extra and Valor improved control 13 to 16% but control was still less than 72%. Paraquat plus 2,4-D controlled cutleaf eveningprimrose 96%. Wild radish was controlled 67% by paraquat applied alone. Harmony Extra or 2,4-D mixed with paraquat increased control to at least 94%. Direx mixed with paraquat was the only other mixture more effective (87% control) than paraquat applied alone on wild radish.

Cutleaf eveningprimrose control greater than 80% at 30 days after treatment was achieved only by 2,4-D plus glyphosate or paraquat, glyphosate plus Valor, and glyphosate plus Clarity. Similar control of wild radish was achieved by 2,4-D plus glyphosate or paraquat, Harmony Extra plus glyphosate or paraquat, Direx plus glyphosate or paraquat, and glyphosate plus Valor.

LIBERTY TANK-MIXTURES FOR RICE WEED CONTROL. C.T. Leon, E.P. Webster, K.J. Pellerin, and W. Zhang. Louisiana State University AgCenter, Baton Rouge, LA 70803.

ABSTRACT

Research was conducted at the Rice Research Station near Crowley, LA, to evaluate Liberty tank-mix combinations. Rice (*Oryza sativa* L.) was drill-seeded in April and May 2000 and 2001 using conventional rice production practices. Treatments consisted of early postemergence (EPOST) applications followed by (fb) late postemergence (LPOST) applications of 0.188 or 0.375 lb ai/A Liberty alone or tank-mixed with 1 or 2 lb ai/A Stam, or 1.5 or 3 lb ai/A Arrosolo. Two applications of Stam or Arrosolo at each respective rate were made for comparison. Weeds evaluated include barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.], red rice (*Oryza sativa* L.), rice flatsedge (*Cyperus iria* L.), yellow nutsedge (*Cyperus esculentus* L.), and hemp sesbania [*Sesbania exaltata* (Raf.) Rydb. ex A.W. Hill].

At 18 days after LPOST (DALPOST), barnyardgrass, rice flatsedge, and yellow nutsedge control was 94 to 97% for all sequential treatments with Liberty alone or tank-mixed with Stam or Arrosolo. Two applications of 3.0 lb/A Arrosolo controlled barnyardgrass 75%, and rice flatsedge and yellow nutsedge 90 and 95%, respectively. Red rice control was 97% with two applications of 0.375 lb/A Liberty. All treatments controlled hemp sesbania at least 96%.

Barnyardgrass control 45 DALPOST was at least 95% with two applications of Liberty + Arrosolo regardless of rate, which was comparable to two applications of 3 lb/A Arrosolo. Rice flatsedge and yellow nutsedge control was improved when any rate of Stam or Arrosolo was tank-mixed with 0.188 lb ai/A Liberty. Sequential applications of 0.375 lb/A Liberty controlled red rice 97%. Red rice control was 94% with 0.188 lb ai/A Liberty + 3.0 lb/A Arrosolo. All treatments evaluated controlled hemp sesbania at least 96%.

This research indicates that 0.188 lb/A Liberty + 1 lb/A Stam or 1.5 lb/A Arrosolo consistently controlled barnyardgrass, rice flatsedge, yellow nutsedge, and hemp sesbania at least 90%. At each rating interval, rice flatsedge and yellow nutsedge control was improved by adding Stam or Arrosolo to Liberty compared with sequential applications of Liberty alone. When red rice occurred, 0.375 lb/A Liberty was needed for control greater than 95%. Future research will evaluate the relationship between application interval, permanent flood establishment, and weed control.

IMAZETHAPYR PROGRAMS IN WATER-SEEDED RICE. K.J. Pellerin, E.P. Webster, W. Zhang, and C.T. Leon; LSU AgCenter, Louisiana State University, Baton Rouge, LA 70803.

ABSTRACT

A study was conducted in 2000 and 2001 at the Rice Research Station near Crowley, LA utilizing a water-seeded rice production system. The experimental design was a randomized complete block with four replications. Treatments included imazethapyr preemergence (PRE) at 0, 35, 53, 70, 87, 105, and 140 g ai/ha followed by (fb) an early postemergence (EPOST) or late postemergence (LPOST) application of imazethapyr applied at 140, 105, 87, 70, 53, 35, and 0 g/ha. The total amount of imazethapyr applied per treatment equaled the recommended rate of 140 g/ha per growing season. Barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.] control, crop injury, rice height and crop yield were evaluated. Data were averaged over years and means were separated using Fisher's Protected LSD at the 5% probability level.

At 49 days after LPOST (DALPOST), control of barnyardgrass was 90% or better with single or split applications of imazethapyr. Crop height was 66 to 80 cm for all treatments. Rice yields for all treatments containing a PRE application fb an EPOST were 4,420 to 4,890 kg/ha compared with 3,260 to 4,230 kg/ha with PRE fb a LPOST treatment. Little to no crop injury was observed.

Another study was established in water-seeded rice in 2000 and 2001 at two locations: the Rice Research Station near Crowley, LA and a producer location near Rayne, LA. The study consisted of a factorial arrangement of treatments in a randomized complete block design with four replications. Factor A consisted of imazethapyr at 87 g/ha PRE, or no PRE, and Factor B was a mid-postemergence (MPOST) application of imazethapyr at 53 g/ha in combination with one of the following herbicides: 42 g/ha bensulfuron, 280 g/ha triclopyr, 3.37 kg/ha propanil plus molinate, 28 g/ha carfentrazone, 842 g/ha bentazon plus aciflurofen, 53 g/ha halosulfuron, 22 g/ha bispyribac-sodium, or no MPOST. Hemp sesbania [*Sesbania exaltata* (Raf.) Rydb. ex A. W. Hill] control, and crop injury were evaluated at the Rice Research Station in 2000 and 2001. In 2001, red rice (*Oryza sativa* L.) control, crop injury, and rice yield were evaluated at both locations. Data were separated using Fisher's Protected LSD at the 5% probability level.

Hemp sesbania data was averaged over years. At 14 DAMPOST, hemp sesbania control was 88 to 96% with all treatments receiving a MPOST mixture with the exception of Londax treatments. At 35 DAMPOST, hemp sesbania control was 91 to 96% with imazethapyr PRE fb a MPOST application containing bentazon plus aciflurofen or propanil plus molinate. Hemp sesbania control was less than 40% with imazethapyr applied PRE, or no PRE, fb imazethapyr MPOST.

Red rice data was averaged over locations. At 21 DAMPOST, red rice control was 90% or greater with imazethapyr PRE fb a MPOST application; however, red rice control was less than 80% with a single MPOST application. At 35 DAMPOST, treatments containing imazethapyr PRE increased red rice control more than 5 percentage points compared with treatments without imazethapyr PRE. Red rice control was greater than 89% with imazethapyr PRE fb a MPOST application containing imazethapyr mixed with propanil plus molinate, carfentrazone, halosulfuron, or a single application of imazethapyr. Rice yields with imazethapyr PRE fb bensulfuron, propanil plus molinate, carfentrazone, bentazon plus aciflurofen, and halosulfuron were 2,900 to 3080 kg/ha; however, yields were less than 1400 kg/ha with imazethapyr applied alone.

In conclusion, two applications of imazethapyr will not be a stand-alone weed control program. Two applications of imazethapyr controls barnyardgrass; however, an additional herbicide with broadleaf activity will be required to control many broadleaf weeds, specifically those belonging to the Fabaceae family such as hemp sesbania. Imazethapyr PRE fb an imazethapyr postemergence is required for sufficient control of red rice which is reflected in higher yields compared with treatments without a PRE application of imazethapyr.

SEQUENTIAL POSTEMERGENCE APPLICATIONS OF IMAZETHAPYR FOR WEED CONTROL IN CLEARFIELD* RICE. J.H. O'Barr, B.V. Ottis, G.N. McCauley, and J.M. Chandler; Department of Soil and Crop Sciences, Texas A&M University, College Station, TX 77843-2474.

ABSTRACT

Field studies were conducted in 2000 and 2001 to evaluate CLEARFIELD* rice (*Oryza sativa* L.) tolerance and red rice (*Oryza sativa* L.) control with sequential postemergence (POST) applications of NewPath (imazethapyr 2lbs ai/gallon). Experiments were conducted at the Texas Agricultural Experiment Station near Beaumont, Texas. NewPath was applied alone early postemergence (EPOST) at 3 oz/acre, late postemergence (LPOST) alone at 3 oz/acre, and EPOST followed by (fb) LPOST at 1 fb 2, 1.5 fb 2, 2 fb 3 and 3 fb 3 oz/acre. EPOST treatments were applied to rice at the 2 to 3-leaf stage and LPOST at the 4 to 6-leaf stage. An untreated check was also included. Single applications of NewPath were inadequate, providing less than 86% control. Sequential treatments of 1 fb 2 and 1.5 fb 2 oz/acre provided 85 to 95% red rice control. Sequential treatments of 2 fb 3 and 3 fb 3 oz/acre provided greater than 97% red rice control. Early season crop injury ranging from 0 to 29% did not result in any significant differences in yield.

IMPACT OF CULTURAL PRACTICES ON IMAZETHAPYR IN LA RICE PRODUCTION. R.J. Levy, Jr., E.P. Webster, and S.D. Linscombe; LSU AgCenter, Louisiana State University, Baton Rouge, LA 70803.

ABSTRACT

A study was established in 1999, 2000, and 2001 at the Rice Research Station near Crowley, Louisiana to evaluate weed control, crop response, and yield of Clearfield Rice (*Oryza sativa* L.) to imazethapyr applications under different cultural practices. The imidazolinone-tolerant '93 AS-3510' rice was planted in 1999 and CF121 was planted in 2000 and 2001 over 5 environments from mid-April to mid-June. The experiment had a split-split plot design. The whole plot was drill- or water-seeded rice, the sub-plot was conventional- or minimum-tillage, and the sub-sub-plot was herbicide treatment. Herbicide treatments were imazethapyr at 70 g ai/ha applied to the soil surface (SURF) prior to planting followed by 70 g/ha imazethapyr postemergence (POST) on 4 to 5 leaf rice or 105 g/ha imazethapyr SURF followed by 70 g ai/ha imazethapyr POST. Barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.] and Amazon sprangletop [*Leptochola panicoides* (Presl) Hitchc.] control, rice injury, plant height at harvest, rice plant lodging at harvest, and rough rice yield were evaluated. All data were subjected to PROC GLM for testing all possible interactions of environment, planting method, tillage method, and herbicide treatment. Means were separated using Fisher's protected LSD test at the 5% probability level. An environment by planting method by herbicide treatment interaction occurred for all evaluations; therefore, data were averaged over tillage method.

At 35 DAT, barnyardgrass control was 97 to 99% for all treatments and environments. Imazethapyr has excellent activity on barnyardgrass in a rice production system when applied in a split application. However, imazethapyr is inconsistent for control of Amazon sprangletop. Environments 1 through 3 indicate increased control with the water-seed planting method compared with the drill-seeded method. Control of Amazon sprangletop was 86 and 89% for drill-seeded rice compared with 94 and 95% control in water-seeded rice for the herbicide treatments in environment 1. Similar control and results were observed in environment 3. Control dropped to less than 75% in environment 2 for all treatments; however, the water-seed rice system resulted in 61 and 73% control of Amazon sprangletop compared with 27 and 30% control in the drill-seeded system. This was due to establishing the test in mid-April in a heavily infested Amazon sprangletop area, and the weed germinated continuously throughout the growing season. Later germination of this weed indicates that the residual activity of imazethapyr in a rice production system may be reduced and Amazon sprangletop could be a problem in an imidazolinone-tolerant rice production system. Amazon sprangletop control in environments 4 and 5 was 96 to 99% and 94 to 96%, respectively, with no differences observed within environments.

At harvest maturity, overall rice plant height was measured from the soil surface to the tip of the extended mature rice panicle. No differences were observed within environments for plant height. Differences occurred across environments mainly due to planting time and the length of the growing season. Planting the individual trials early resulted in increased plant height compared with later planted trials. This is also reflective in plant lodging at harvest. The taller rice in the earlier planted trials was more susceptible to lodging than the later planted trials.

Rough rice grain yields were adjusted to 12% moisture. Little to no differences in yield occurred within environments 1, 4, and 5 regardless of herbicide treatment and planting method, however, differences did occur when compared with the nontreated. Environment 2 did have an increased yield in the water-seeded rice compared with the drill-seeded. This was probably due to the difference in Amazon sprangletop control observed across the planting methods. The water-seeded rice in Environment 3 resulted in an increased yield compared with the drill-seeded system. In south Louisiana when planting date, growing conditions, weed control, and water management are consistent, water-seeded rice will result in increased yield compared with drill-seeded rice.

In conclusion, imidazolinone-tolerant rice has excellent potential as a tool in Louisiana rice production. This research indicates that imidazolinone-tolerant rice has the flexibility to be grown using different tillage systems and planting methods commonly used in south Louisiana and across the United States rice belt. This research will allow producers to choose which system best fits their individual farming operation and how to best utilize the technology to increase yields and profits.

REDUCED RATES OF CYHALOFOP-BUTYL WITH VARIOUS PROPANIL FORMULATIONS FOR BARNYARDGRASS CONTROL. E. F. Scherder, R. E. Talbert, M. L. Lovelace, F. L. Baldwin, J. A. Kendig, and M. E. Kurtz. University of Arkansas, Fayetteville, AR; University of Arkansas Cooperative Extension Service, Little Rock, AR; University of Missouri Delta Center, Portageville, MO; and Delta Branch Experiment Station, Stoneville, MS.

ABSTRACT

Experiments were conducted across the Mid-south in 2001 to evaluate reduced rates of cyhalofop-butyl tank-mixed with various propanil formulations for barnyardgrass (*Echinochloa crus-galli*) control. Experiments were established at the Rice Research and Extension Center at Stuttgart, Arkansas, the University of Arkansas at Pine Bluff experimental farm, Lonoke, Arkansas, The Missouri Delta Center, Portageville, MO, and the Delta Branch Experiment Station, Stoneville, MS.

Herbicide treatments evaluated at Stuttgart, Lonoke, and Portageville included: cyhalofop applied alone at 0.25 lb ai/A; propanil (Super WHAM), propanil + bensulfuron (DUET), and propanil + molinate (Arrosolo) applied alone at 4.0 lb ai/A; and in tank-mix combinations with cyhalofop at 0.25, 0.125, 0.063, and 0.031 lb/A. Treatments at the Stoneville location were cyhalofop applied alone at 0.188 lb/A, propanil (Super WHAM), propanil + bensulfuron (DUET), and propanil + molinate (Arrosolo) applied alone at 4.0 lb/A and in tank-mix combinations with cyhalofop rates of 0.046 and 0.023 lb/A. The propanil formulations of Stam M-4 and Stam 80 EDF were also evaluated at Stuttgart alone and with cyhalofop in the same treatment arrangement as stated above. All herbicide treatments were applied to a 3- to 4-leaf barnyardgrass stage.

Barnyardgrass control ranged from 63 to 81% when propanil (Super Wham) was applied alone. When cyhalofop was applied alone, barnyardgrass control ranged from 56 to 99% with 0.25 lb/A 28 DAT. When cyhalofop was tank-mixed with propanil (Super Wham), control was increased at the Stoneville location only (84%) when compared to this propanil formulation applied alone (68%). Control, however, was not increased when cyhalofop was tank-mixed with (Super Wham) at the other locations with control ranging from 63 to 93%.

When propanil + bensulfuron was applied alone barnyardgrass control ranged from 65 to 90% over the locations. When cyhalofop was applied alone at 0.25 lb/A barnyardgrass control ranged from 56 to 99% 28 DAT. When cyhalofop was tank-mixed with propanil + bensulfuron control was increased at the Stoneville location only (96%) when compared to this propanil formulation applied alone (73%). Control ranged from 60 to 90% at other locations, which was not significantly different from that of propanil + bensulfuron applied alone (65 to 90%).

Barnyardgrass control ranged from 69 to 100% when propanil + molinate were applied alone at the various locations. When cyhalofop was applied alone, barnyardgrass control ranged from 56 to 86%. No differences in control were observed when cyhalofop was tank-mixed with propanil + molinate, with control ranging from 81 to 100%.

The propanil formulation of Stam M-4, evaluated at the Stuttgart location only, gave 60% control of barnyardgrass when applied alone 28 DAT. When tank-mixed with cyhalofop at 0.031 to 0.125 lb/A, barnyardgrass control ranged from 39 to 56%. When cyhalofop at 0.25 lb/A was tank-mixed with this propanil formulation, an increase in control was observed (81%); however, propanil antagonized cyhalofop activity, with cyhalofop applied alone giving 99% control.

Barnyardgrass control was 40% when propanil (Stam 80 EDF) which was evaluated at the Stuttgart location only. All tank-mixes of cyhalofop with this formulation were shown to be significantly greater than propanil applied alone, with control ranging from 75 to 93% with the various tank-mix combinations of cyhalofop 28 DAT.

Reduced rates of cyhalofop when added to the various propanil formulations gave inconsistent improvements in barnyardgrass control. Generally, adding cyhalofop to any propanil formulation did not increase control, or had little effect on control.

CLEARFIELD* RICE TOLERANCE AND RED RICE CONTROL WITH IMAZETHAPYR ON COARSE SOILS IN TEXAS. B.V. Ottis, J.H. O'Barr, G.N. McCauley and J.M. Chandler, Texas Agricultural Experiment Station, College Station, TX 77843-2474.

ABSTRACT

In 2001, Newpath (2 lb imazethapyr/gal) herbicide was not labeled for use on soils in Texas having greater than 50% sand. To address this issue, four experiments were conducted in 2001 to evaluate red rice (*Oryza sativa* L.) control and CLEARFIELD* Rice (*Oryza sativa* L.) tolerance with Newpath herbicide on coarse-textured soils in Texas. Studies were located in production fields near Katy, Garwood and Lissie and at the Texas Agricultural Experiment Station near Eagle Lake. Newpath was applied preemergence (PRE) followed by (fb) a postemergence (POST) application at the 4 to 6-leaf rice stage. Rates evaluated were 3, 4 and 5 oz/A PRE fb 2 and 3 oz/A POST. A 4 oz/A POST application was also included with the 4 oz/A PRE rate. Red rice control was 98% with all sequential treatments at Lissie. Broadleaf signalgrass [*Brachiaria platyphylla* (Griseb.) Nash] control was at least 98% with all treatments at Eagle Lake. Crop injury following PRE applications at Katy was less than 30% with all treatments. Crop injury, in the form of height reduction, following POST applications was less than 25% with all treatments at Katy, Garwood and Eagle Lake. Rice yields at Garwood and Katy were greater than 7700 lb/A with all treatments of Newpath. Yields were not significantly reduced due to early season injury from Newpath applications.

RICE YIELD AND HERBICIDE SYMPTOMOLOGY AS INFLUENCED BY OFF-TARGET HERBICIDE RATE AND TIMING. R.C. Namenek, K.L. Smith, and J.W. Branson, University of Arkansas, Southeast Research and Extension Center, Monticello, AR 71656

ABSTRACT

Field studies were established at Rohwer, AR during the 2001 growing season to determine the effects of various herbicides applied to conventional rice at rates and timings to simulate off-target movement. Cocodrie rice variety was planted on May 10, 2001 on a Sharky clay soil in 15-cm row spacing. The experimental design used was a split block design with application timing as main blocks and rate as subblocks with 3 replications. Individual plot size was 1.9m wide by 7.62m long. Rice (*Oryza sativa*) was grown under normal cultural practices and flood irrigated as needed. Herbicides evaluated included, glyphosate at 112, 11.2, 1.12 g ai/ha, glufosinate at 46.7, 4.67, 0.4674 g ai/ha, imazethapyr at 70, 7, 0.7 g ai/ha, paraquat at 63, 6.14, 0.63 g ai/ha and trifloxysulfuron at 1.729 and 0.1729 g ai/ha. All treatments were applied with a CO_2 backpack sprayer equipped with 8002 VS flat fan nozzles calibrated to deliver 93.4 l/ha at 3-4 leaf rice growth stage, 7 days prior to flood and 14 days after flood. Evaluations taken throughout the course of the trial included heading percentage, visual symptomology ratings, height measurements, and yield. All data was subject to analysis of variance (ANOVA) and means separated by LSD= 0.05.

Visual injury was evaluated using a rating scale of 0-100 with 0 being no visual injury and 100 being death of the plants. Visual injury of rice was significantly higher at the 3-4 leaf growth stage after application of imazethapyr at 70 g ai/ha and glyphosate at 11.2 g ai/ha compared to the untreated check 21 DAT. Applications of glyphosate at 112 g ai/ha, imazethapyr at 70 g ai/ha, and paraquat at 63 g ai/ha, applied at 7 days prior to flood -also produced significant visual injury 15 DAT compared to the untreated check.

Imazethapyr applied at 70 g ai/ha during 3-4 leaf rice growth stage produced visual injury symptomology, decreased heading, reduced plant height, and reduced yield compared to the untreated check. Applications of glyphosate at 112 g ai/ha and imazethapyr at 70 g ai/ha applied preflood produced visual injury, decreased heading, reduced plant height and reduced yield. Paraquat at 63 g ai/ha applied preflood produced visual injury as well as decreased heading and yield however, plant height was not reduced. Postflood applications of glyphosate at 112 g ai/ha, imazethapyr at 70 and 7 g ai/ha as well as paraquat at 63 g ai/ha and 6.14 g ai/ha produced decreased heading, plant height and yield, however, did not produce visual injury.

Glyphosate at 112 g ai/ha at 3-4 lf, glyphosate at 11.2 and 1.12 g ai/ha applied at all timings, imazethapyr at 7 g ai/ha applied at 3-4 lf and preflood, imazethapyr at 0.7 g ai/ha applied at all timings, paraquat at 6.14 g ai/ha at 3-4 lf and preflood, paraquat at 0.63 g ai/ha applied at all timings and glufosinate and trifloxysulfuron applied at all rates and timings provided no reduction in plant height, heading or yield when compared to the untreated check.

ALTERNATIVES FOR JOHNSONGRASS CONTROL IN SUGARCANE. C.A. Jones, J.L. Griffin, and J.D. Siebert. Louisiana State University Agricultural Center, Baton Rouge, LA 70803.

ABSTRACT

In 2001, field experiments were conducted to evaluate CGA 362622 and Regiment as alternatives to Asulox for postemergence (POST) johnsongrass control in sugarcane. Additionally, CGA 362622 and Prowl were each applied with Asulox to evaluate their utility. In St. James Parish, LA, herbicide treatments were applied to johnsongrass as tall as 24 inches with some plants in the boot stage. By 33 days after treatment (DAT), johnsongrass was controlled 69 to 78% with Asulox applied alone at the high rate (3.34 lb ai/A) or with Prowl at 0.83 or 3.3 lb ia/A, and with Asulox at 2.5 lb/A with Prowl at 3.3 lb/A. The high rate of CGA 362622 (0.028 lb ai/A) controlled johnsongrass 75%, but Regiment (0.02 lb ai/A) provided only 46% control. Both CGA 362622 and Regiment caused reddening/purpling of the johnsongrass foliage, stunting, and either no seed head emergence or abnormal seed head emergence. Where Prowl was applied with Asulox, fewer johnsongrass seed heads emerged when compared with Asulox alone. Sugarcane injury 33 DAT was not observed for any of the Asulox treatments, but was 18 and 29% for the high rates of CGA 362622 and Regiment, respectively.

Two field experiments were conducted to evaluate sugarcane response to CGA 362622 applied POST on April 12 and May 2 and Regiment applied POST once on April 12. Sugarcane was injured an average of 31% where CGA 362622 was applied sequentially at 0.014 lb/A followed by 0.028 lb/A and at 0.028 lb/A followed by 0.056 lb/A to three varieties (LCP 85-384, HoCP 85-845, LCP 82-089) in the third production year. Injury was accompanied by a reduction in sugarcane plant height compared with the Prowl plus Karmex standard. Where CGA 362622 was applied twice, sugarcane yield and sugar yield were reduced 12 to 20%. Application of Regiment at 0.02 lb/A injured LCP 85-384 sugarcane in the first production year 44% 15 DAT and 78% 47 DAT. The single application of Regiment reduced sugar yield 36% compared with Prowl plus Karmex.

Johnsongrass control for Asulox and CGA 362622 applied alone and in combination was evaluated in a noncrop area. Asulox controlled rhizome johnsongrass 71 DAT 28, 50, and 87% at 0.83, 1.65, and 3.34 lb/A, respectively. Control was no more than 46% for CGA 362622 applied at 0.007 and 0.014 lb/A. However, when CGA 362622 was applied at 0.007 lb/A with Asulox at 1.65 lb/A, johnsongrass was controlled 80%. The combination of CGA 362622 at 0.014 lb/A and Asulox at 1.65 lb/A controlled johnsongrass 92%, a level comparable to that for Asulox alone at the labeled rate of 3.34 lb/A. In another exper4iment conducted in the same area, Asulox controlled johnsongrass 71 DAT 68, 76, and 86% for the 1.65, 2.50 and 3.34 lb/A rates, respectively. Prowl applied at 0.83, 1.65, and 3.3 lb/A with Asulox at 1.65 lb/A controlled johnsongrass 69 to 75%. However, when the rate of Asulox was increased to 2.5 lb/A, control was 88 to 90% when at least 1.65 lb/A of Prowl was added, and equal to Asulox applied alone at 3.34 lb/A. Prowl in combination with Asulox could allow for a reduction in the use rate of Asulox without sacrificing johnsongrass control and for some residual weed control from the Prowl. This combination would also provide an economical benefit to the grower.

MESOSULFURON/IODOSULFURON (AE F 130060) FOR ITALIAN RYEGRASS CONTROL IN VA WHEAT. W.A. Bailey, H.P. Wilson, and T.E. Hines. Eastern Shore Agricultural Research and Extension Center, Virginia Tech, Painter, VA 23420.

ABSTRACT

Italian ryegrass (*Lolium multiflorum* L.) is a competitive winter annual weed with a life cycle similar to wheat (*Triticum aestivum* L.) that is a major problem in Virginia wheat production. Although diclofop-methyl has controlled Italian ryegrass, the repeated use of this herbicide has selected diclofop-resistant Italian ryegrass populations. Over 20 populations with various levels of diclofop resistance have been identified on the Eastern Shore of Virginia over the last 10 yr. For this reason, effective herbicides with alternative modes-of-action are required for consistent Italian ryegrass control.

AE F 130060 (proposed common name mesosulfuron-methyl) is an experimental ALS-inhibiting postemergence grass herbicide that may control diclofop-resistant Italian ryegrass. It is compatible with AE F 115008 (proposed common name iodosulfuron), an ALS-inhibiting postemergence broadleaf herbicide. This herbicide mixture can be used on wheat when applied with the safener mefenpyr-diethyl.

Field experiments were conducted on diclofop-sensitive (S) and diclofop-resistant (R) Italian ryegrass populations on the Eastern Shore of Virginia in 2000 to evaluate wheat response and Italian ryegrass control from AE F 130060. S ryegrass was sown at 39 kg/ha prior to planting wheat at Painter, VA. A natural population in Capeville, VA with greater than 2-fold resistance to diclofop was used for an R location. Two experiments were conducted at both locations. In one experiment, AE F 130060 was applied at 15 or 18 g ai/ha with or without the addition of methylated seed oil (MSO) at 0.5% v/v. Standard comparisons included chlorsulfuron plus metsulfuron (Finesse®) at 26 g ai/ha, chlorsulfuron (26 g ai/ha) plus metribuzin (110 g ai/ha), sulfosulfuron at 35 g ai/ha, tralkoxydim at 280 g ai/ha, CGA 184927 (proposed common name clodinafop-propargyl) at 71 g ai/ha, and diclofop at 0.84 kg ai/ha. All applications were made to 1-tiller Italian ryegrass. Wheat injury from AE F 130060 1 wk after treatment (WAT) ranged from 18 to 28% but decreased to no more than 8% at 14 WAT. Injury 1 WAT from AE F 130060 at 15 g/ha without MSO was similar to chlorsulfuron plus metsulfuron or chlorsulfuron plus metribuzin. AE F 130060 controlled both S and R ryegrass at least 96% and was more effective than all ACCase-inhibitor comparisons (tralkoxydim, CGA 184927, and diclofop) on both ryegrass populations.

In a second experiment, AE F 130060 was applied at 15 or 18 g/ha with or without MSO at ryegrass growth stages of 2-leaf, 2-3 tiller, or 4-6 tiller. Diclofop at 0.84 kg/ha was included for comparison at each timing. Wheat injury 4 WAT increased with later applications made to 4-6 tiller ryegrass (28%), but dissipated slowly to no more than 11% injury by late season. Ryegrass control was not influenced by rate or MSO but later application timings resulted in increased late-season control. AE F 130060 was more effective than diclofop in controlling S ryegrass at later timings and R ryegrass at any timing. Numbers of ryegrass seedheads/m^2 were counted in the S ryegrass study. AE F 130060 reduced ryegrass seedhead emergence more than diclofop at all application timings. Although early-season wheat injury from AE F 130060 was substantial, wheat yields in all experiments were similar to those from diclofop-treated wheat.

PERFORMANCE OF NEW HERBICIDES FOR WINTER ANNUAL GRASS CONTROL IN WINTER WHEAT. J.P. Kelley and T.F. Peeper; Department of Plant and Soil Sciences, Oklahoma State University, Stillwater, OK 74078.

ABSTRACT

Field experiments were conducted at two sites in north central Oklahoma during the 2000-2001 growing season to compare Italian ryegrass and cheat control with Maverick (sulfosulfuron), Olympus (MKH 6561), and AE F130060 + AE F107892 in winter wheat. Treatments included Maverick at 0.031, Olympus at 0.04, and AE F130060 + AE F107892 at 0.0134 + 0.026 and 0.016 + 0.032 lb ai/acre, all applied with 0.25% or 0.5% v/v NIS. All treatments were applied in 20 GPA of water carrier using a CO_2 backpack sprayer on December 5, 2000. Maverick controlled Italian ryegrass 48 to 59%, Olympus 30 to 54%, and AE F130060 + AE F107892 controlled it 95 to 99%. Cheat control with Maverick and Olympus was 98 to 99% versus 35 to 61% with AE F130060 + AE F107892. Henbit was controlled 100% by AE F130060 + AE F107892 at either rate at both sites, while Maverick and Olympus controlled henbit 40 to 77%. No wheat injury was seen from any treatment. All treatments increased wheat yield compared to the untreated check. However, yield increases were greater with AE F130060 + AE F107892 than with Maverick or Olympus.

A field experiment was conducted in central Oklahoma to evaluate the effect of application timing and carrier on cheat control in winter wheat. Treatments were applied in December, February, and March with water carrier or a 50/50 mix of water and 28-0-0 liquid fertilizer, both at 20 GPA. Nonionic surfactant was added at 0.5% v/v to water carrier treatments and at 0.25% v/v to water/28-0-0 mixes. Herbicide rates evaluated included Maverick at 0.031, Everest at 0.027, Olympus at 0.04, and AE F130060 + AE F107892 at 0.016 + 0.032 lb ai/acre. Cheat control ranged from 85 to 99% with Maverick, 97 to 99% with Everest, 94 to 99% with Olympus, and 75 to 97% with AE F130060 + AE F107892. Neither application timing nor carriers affected cheat control. Wheat yields tended to be higher when herbicides were applied in December.

A field experiment was conducted in the 2000-2001 wheat growing season near Perkins, Oklahoma to evaluate performance of herbicides applied after cattle had grazed cheat infested wheat from late November to early March. Treatments evaluated included Maverick at 0.031, Everest at 0.027, Olympus at 0.04, and AE F130060 + AE F107892 at 0.016 + 0.032 lb ai/acre. Treatments were applied with a CO_2 backpack sprayer in 20 GPA of water or 28-0-0 fertilizer carrier with 0.5% v/v NIS. Cattle were removed and treatments were applied three days later. All treatments controlled cheat 90 to 98%. Little wheat injury was seen when herbicides were applied with water carrier. Using 28-0-0 as a carrier increased wheat foliar burn. Visual foliar burn 10 DAT was 14, 18, 18, and 43% for Maverick, Olympus, Everest, and AE F130060 + AE F107892, respectively. All treatments increased wheat yield compared to the untreated check. Wheat yields were similar among herbicides.

ITALIAN RYEGRASS CONTROL IN WHEAT WITH MESOSULFURON-METHYL. H.L. Crooks and A.C. York; Department of Crop Science, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

Diclofop-resistant Italian ryegrass (*Lolium multiflorum*) is a serious problem for small grain producers throughout the South. There are currently no adequately effective control options for diclofop-resistant Italian ryegrass in wheat. Mesosulfuron-methyl is an acetolactate-synthase (ALS) inhibitor being developed by Aventis for the control of Italian ryegrass and other annual grasses in wheat. Research was conducted to determine the efficacy of mesosulfuron-methyl as affected by rate, time of application, and ryegrass biotype. Wheat tolerance to mesosulfuron-methyl was also investigated.

Experiments were conducted in 2000 and 2001 at three locations in North Carolina heavily infested with Italian ryegrass. NKC 9704 wheat was planted at each location. Location 1 had a mixed population of diclofop-resistant and -susceptible biotypes, while populations at locations 2 and 3 were 100% susceptible and resistant, respectively. Mesosulfuron-methyl was applied as experimental compound AE F130060, a 5:1 ratio of mesosulfuron-methyl to iodosulfuron-methyl, at 12, 15, and 18 g ai/ha to 3-leaf, 2-tiller, and 6-tiller Italian ryegrass. Iodosulfuron-methyl is primarily for broadleaf weed control and will not be included in the initially registered mesosulfuron-methyl formulation. All treatments included 30% UAN at 1.7% (v/v) plus methylated seed oil at 0.4% (v/v) as recommended by the manufacturer. Diclofop was applied at 1100 g ai/ha to Italian ryegrass at the same growth stages. The rate response of AE F130060 was similar across locations, and data were pooled. At 70 days after treatment, Italian ryegrass control by AE F130060 at all rates decreased as growth stage increased. Mixed biotypes treated at the 3-leaf stage were controlled at least 94% while 69 to 79% control of 2-tiller Italian ryegrass was noted. Control of 6-tiller Italian ryegrass was only 40% by AE F130060 at 12 and 15 g/ha and 66% with 18 g/ha. At location 2, diclofop and AE F130060 both controlled susceptible ryegrass 90 to 100%. Diclofop still provided 99% control at the 2-tiller stage compared to 82% control by AE F130060 at 18 g/ha. Control of 6-tiller Italian ryegrass by AE F130060 at all rates was at least 44% greater than control by diclofop. At location 3, no control by diclofop confirmed a resistant biotype. AE F130060 at 15 g/ha controlled 3-leaf and 2-tiller ryegrass at this location greater than 90% but 6-tiller ryegrass was controlled only 33%. Yield data trends were consistent with ratings data. Greenhouse experiments confirmed that both diclofop-susceptible and -resistant biotypes were equally sensitive to AE F130060.

A safener will be included with mesosulfuron-methyl when the herbicide is commercially available. Tests were conducted in 2001 at two locations in North Carolina to determine the importance of safener rates on wheat tolerance. AE F130060 was applied at 15 and 30 g/ha alone and with H1219 safener added at 1:1, 1:2, and 1:3 ratios of AE F130060 to H1219. All treatments included 30% UAN at 1.7% (v/v) plus methylated seed oil at 0.4% (v/v) as recommended by the manufacturer. NKC 9704 wheat was planted in weed-free fields and treated at the 3-leaf, 2-tiller, and 6-tiller growth stages. When the safener was included, injury by AE F130060 at both rates was 10% or less at all growth stages compared to as much as 61% injury without the safener. Yields were reduced when the safener was omitted.

The findings indicate mesosulfuron-methyl applied timely will control diclofop-resistant and -susceptible Italian ryegrass. Early application, preferably to 3-leaf ryegrass, will provide the best control and prevent early season competition. A safener will be necessary to prevent crop injury.

ITALIAN RYEGRASS CONTROL IN CLEARFIELD WHEAT. K.C. Clemmer and A.C. York; Department of Crop Science, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

Italian ryegrass (*Lolium multiflorum*) is the most problematic weed of soft red winter wheat (*Triticum aestivum*) in North Carolina and much of the south. Diclofop has traditionally been used to control Italian ryegrass, but resistance has evolved after many years of successful use, and few options are available to control diclofop-resistant Italian ryegrass in wheat. Clearfield wheat, a non-transgenic tolerant of imazamox and other imidazolinone herbicides, was commercialized in 2002. The objectives of our research were to evaluate control of Italian ryegrass by imazamox applied postemergence as affected by rate and time of application and to compare control by imazamox with that by other imidazolinone herbicides and diclofop.

An experiment was conducted at three locations in North Carolina during the 1999-2000 and 2000-2001 in fields heavily infested with Italian ryegrass. Location 1 had diclofop-susceptible Italian ryegrass while locations 2 and 3 had a mixture of susceptible and resistant biotypes. An experimental Clearfield variety was planted in late October to early November in 19-cm rows. Plot size was 1.5 by 15 meters with treatments replicated four times in a randomized complete block design. Imazamox was applied in the fall or spring at 35, 44, and 53 g ai/ha. A split-application of imazamox at 26 g/ha in the fall followed by 26 g/ha in the spring also was included. Imazethapyr at 70 g ai/ha, imazapic at 70 g ai/ha, and imazethapyr at 47 g ai/ha plus imazapyr at 16 g ai/ha were applied in the fall only. Diclofop was applied in the fall at 800 g ai/ha or in the spring at 1120 g/ha. Fall applications were made to 3- to 4-leaf wheat and 3- to 4-leaf Italian ryegrass; spring applications were made to 2- to 4-tiller wheat and 2- to 3-tiller Italian ryegrass. Herbicides were applied with a CO_2-pressurized backpack sprayer delivering 140 L/ha at 147 kPa. Imidazolinone herbicides were applied with a nonionic surfactant at 0.25% (v/v) plus 2.5 L/ha of 30% UAN. Diclofop was applied without adjuvants. Weed control and crop injury were estimated visually throughout the season. No yields were recorded as the testing agreement required crop destruction prior to grain maturity. Data were subjected to analysis of variance, and means were separated with Fisher's Protected LSD at the 5% level of probability.

Imazamox applied in the fall at 35, 44, 53 g/ha controlled Italian ryegrass 82, 83, and 90%, respectively, by late-season compared with 39 to 45% control by spring applications. Split application was no more effective than fall application. Imazethapyr was less effective than imazamox, controlling Italian ryegrass only 24% by late-season. Imazapic and imazethapyr plus imazapyr controlled Italian ryegrass 98 and 92%, respectively. Diclofop controlled Italian ryegrass 99 and 14% when applied in the fall and spring, respectively, at location 1. At locations 2 and 3, with the mixture of susceptible and resistant biotypes, diclofop controlled Italian ryegrass 61 and 40% applied in the fall and spring, respectively. There was no indication that diclofop-resistant Italian ryegrass was also resistant to imidazolinone herbicides. Treatments caused little to no injury to the wheat.

The results indicate that imazamox applied timely in Clearfield wheat may be a suitable option for control of diclofop-resistant Italian ryegrass.

WHEAT RESPONSE TO ROUNDUP DRIFT. C.A. Roider, J.L. Griffin, S.A. Harrison, and C.A. Jones; Louisiana State University Agricultural Center, Baton Rouge, LA 70803

ABSTRACT

A field experiment was conducted in 2001 at the Ben Hur Research Farm near Baton Rouge, LA, to evaluate wheat response to simulated drift of Roundup Ultra (glyphosate). The experimental design was a randomized complete block with a three-factor factorial treatment arrangement replicated four times. The first and second factors were wheat growth stage and herbicide drift rate. The wheat variety 'USG 3209' was treated at F6 (first node visible) and F10 (inflorescence emergence) growth stages. Drift rates represented 1/8 and 1/16 of the use rate of Roundup Ultra (1.0 lb ai/A), corresponding to 4 and 2 ounces product/A, respectively. The third factor was spray volume and included a constant spray volume of 25 gallons/A (GPA) and variable spray volumes adjusted proportionally to herbicide rate of 3.1 GPA (1/8 rate) and 1.6 GPA (1/16 rate). Treatments were applied using a tractor equipped with compressed air sprayer at a constant spray pressure of 27 psi. Turbo Drop 005 nozzle bodies with Turbo TeeJet 110015 nozzles were used and tractor speed was adjusted to obtain desired spray volume. Data were subjected to analysis of variance and means separated using Fisher's Protected LSD.

Averaged across spray volume and growth stage, wheat injury 14 days after treatment (DAT) with Roundup Ultra, was 39 and 60% for the 1/16 and 1/8 rates, respectively, and injury was still evident 28 DAT. At 14 DAT, Roundup Ultra application in proportional spray volume at F6 resulted in 17% greater injury than the constant spray volume, but this difference was not observed when applied at F10. Averaged across Roundup Ultra rate, height reductions of 60% (proportional spray volume) and 24% (constant spray volume) were observed for application at F6, but height reductions were not observed for the later application. Averaged across spray volume, height reductions occurred only for application at F6 and were 53% for the 1/8 and 31% for the 1/16 Roundup Ultra rates. Wheat yield averaged across Roundup rate was reduced 19% more when application was made in proportional compared with constant spray volume. Roundup Ultra applied at the 1/8 rate reduced yield 32% compared with the nontreated control, but yield reduction was not observed for the 1/16 rate. Of interest is that yield reductions were not growth stage dependant and were not attributed to fewer wheat spikes or fewer seed per spikelet, but rather to individual seed weight.

Results show that wheat is sensitive to Roundup Ultra at a drift rate of 4 ounces/A whether applied early at first node or late at inflorescence emergence. Precautions should be taken when preplant burndown applications of glyphosate products are made to fields adjacent to wheat.

RYEGRASS (*LOLIUM MULTIFLORUM* LAM.) MANAGEMENT IN CENTRAL TEXAS WHEAT. K.P. Tucker, T.D. Miller, P.A. Baumann, and S.A. Senseman; Dept. of Soil and Crop Sciences, Texas A&M University, College Station, Texas 77843

ABSTRACT

Italian ryegrass, is one of the top ten most troublesome weeds for the southern United States wheat (*Triticum aestivum)* growing region and one of the most damaging and difficult to control weeds in the eastern wheat producing region of Texas. Ryegrass contributes to reduced wheat photosynthesis, decreased tiller number, and lowered plant height, resulting in overall wheat yield loss. The CLEARFIELD® line of imidazolinone tolerant wheat has been introduced to aid in the arrest of this and other problematic weeds in U.S. wheat production.

Field studies were conducted at separate locations in McLennan County, Texas, in 2000-2001 and 2001-2002 to evaluate the impact of imazamox herbicide rate, application timing, and tank mix combinations on ryegrass efficacy in CLEARFIELD® wheat. CLEARFIELD® 9804 soft white winter wheat was planted in December, 2000, near Crawford, Texas. CLEARFIELD® AP 502 hard red winter wheat was planted in October, 2001, near McGregor, Texas. The soil type at both locations was a Crawford Clay with pH's of 5.7 and 8.0, respectively. The experimental design for both locations was a randomized complete block with four replications. All herbicide applications were made with a $C0_2$ backpack sprayer. Visual ratings (0-100%) were taken to quantify levels of control.

In the 2000-2001 study, 4.0 oz./A imazamox plus 38.8 oz./A of pendimethalin applied EPOST provided the highest level of season-long control for any treatment (90%). Initial ratings taken in the 2001-2002 study indicated 78% control with the same treatment. Additional EPOST treatments included in the 2001-2002 study were 4.0 oz./A imazamox plus 48.0 oz./A pendimethalin, and 4.0 oz./A imazamox plus 6.0 and 9.0 oz./A dimethenamid. These treatments yielded greater than 88% control 35 DAT. There were no significant differences between 4.0, 5.0, and 6.0 oz./A from imazamox EPOST treatments. All EPOST treatments of imazamox alone failed to achieve 85% control. Imazamox applied at 4.0, 5.0, or 6.0 oz./A EPOST provided greater levels of control than either the MPOST or LPOST applications at the same rates. Imazapic applied EPOST at 1.44 oz/A gave better season-long control than the imazapic PRE application at the same rate. The results of this study indicate the need for the inclusion of a pre-emergent grass herbicide with imazamox in order to attain satisfactory season-long levels of ryegrass control. Additionally, proper herbicide application timing is compulsory to control ryegrass infestation in wheat.

DOING THE ATRAZINE SHUFFLE. G.N. Rhodes, Jr., G.K. Breeden, R.M. Hayes and T.C. Mueller, The University of Tennessee, Knoxville; J.A. Kendig and G.A. Ohmes, The University of Missouri Delta Center, Portageville.

ABSTRACT

Atrazine remains as a primary component of most corn weed management systems in the Midsouth. In Tennessee, atrazine is used on approximately 95% of the corn acreage. Most of it is applied in the form of a premixture with a grass herbicide. This usually is a surface application immediately following planting. Label rate reductions occurred a number of years ago as apart of the overall groundwater and surface water protection measures. As a result, the maximum rate for PRE applications in most situations is 2 lb. a.i./A. This rate is insufficient for control of numerous broadleaved weeds through mid-season. Key species where early breakthrough occurs include common cocklebur, sicklepod, annual morningglories and burcucumber. This problem is further exacerbated in most cases by soils with an acid surface, resulting in faster degradation. Research was conducted in 2001 to evaluate split applications for potential for improving the length of broadleaved weed control with atrazine in corn.

The research was conducted at five locations in Tennessee (Knoxville, Greenback, Tellico Plains and Jackson) and at one location (Portageville) in Missouri on naturally-occurring populations of broadleaved weeds. Atrazine programs (all rates are expressed in terms of a.i.) included 2 lb. PRE; 2 lb. EPOST; 2 lb. PRE followed by (f.b.) 0.5 lb. POST; 1.5 lb. PRE f.b. 1 lb. POST; and 1 lb. PRE f.b. 1.5 lb. POST. All EPOST and POST applications included crop oil concentrate (1% v/v). All POST applications were made just prior to corn exceeding 12 inches tall. Atrazine programs were compared to an untreated check, a sequential application of Bicep II Magnum PRE f.b. Basis Gold POST, and a sequential application of Roundup UltraMax EPOST f.b. Roundup UltraMax LPOST.

Delaying a portion of the total amount of atrazine in sequential applications tended to increase late season weed control, but only in a few cases. This was most evident for sicklepod, annual morningglories and common cocklebur. Also, this effect was most noticeable at Greenback, where rainfall for activation of PRE atrazine did not occur until three weeks after planting. While all treatments improved corn yield compared to the untreated check, delaying a portion of the total amount of atrazine had little influence on corn yield. In years with lower rainfall than was recorded in 2001, yield differences may be more evident.

SOIL SURFACE TEMPERATURE AND WEED CONTROL IN CORN AS INFLUENCED BY PERSISTENCE OF FALL-APPLIED ATRAZINE AND SIMAZINE. A.T. Lee and W.W. Witt, University of Kentucky, Lexington, KY 40546.

ABSTRACT

Applying triazines to soybean stubble in the fall has become popular among Kentucky corn producers and herbicide applicators aiming to spread out their workload and control winter annual weeds. Controlling winter annual weeds before planting corn may provide many advantages including warmer spring soil temperatures, less crop drought stress, and less reliance on burn-down herbicides in no-till production systems. Controlling winter annual weeds also provides early spring cosmetic benefits that are of high interest to producers that cash-rent cropland. Field studies were conducted November 2000 through October 2001 to determine herbicide persistence and efficacy of fall applied atrazine and simazine. A nine-treatment study, comprised of three fall-applied herbicide options followed by three spring-applied herbicide options, was replicated across three locations (Lexington, Princeton, and Bowling Green) in Kentucky. Atrazine at 1.7 kg/ha, simazine at 1.7 kg/ha, and no herbicide application were the fall-applied herbicide options. Spring-applied herbicide options included 1.3 kg/ha metolachlor + 1.7 kg/ha atrazine, 1.3 kg/ha metolachlor + 1.7 kg/ha atrazine + 1.1 kg/ha glyphosate, and no herbicide application. Triazine concentration in the soil, visual efficacy ratings, surface soil temperature, and corn seed yield were used to compare differences among treatments at the α=0.05 level. Soil samples were collected at 30 day intervals (January through May) and analyzed for atrazine, simazine, and total triazine concentration. February, March, April, and May visual efficacy ratings were collected on a percent control basis for cool season weeds. Surface soil temperatures were taken in three hour intervals during March and April.

<u>Persistence.</u> January soil samples from plots treated with fall-applied atrazine contained statistically lower concentrations of total triazine than those treated with simazine. Statistical differences were not present in March, April and May, as the concentrations declined to ~ 0.02 ppm.

<u>Efficacy.</u> Henbit control with fall-applied atrazine was 95% and statistically greater than simazine at 83%. Both exhibited up to 95% control of henbit in March and April, but neither herbicide controlled or suppressed summer annual weed populations. Wild garlic control with atrazine was statistically greater than with simazine in February (95 DAT) and December 2001 (1 YAT). Wild garlic control ranged from 51% to 76% in March and April, but was not statistically different among treatments within each month.

<u>Surface Soil Temperature.</u> Surface soil temperatures ranged from 1°C to 29°C. Daily fluctuation of surface soil temperature was higher where simazine was applied compared to where no herbicide was applied.

<u>Seed Yield.</u> Corn seed yield was not statistically different at either location when a spring-applied herbicide was used.

In conclusion, atrazine offered better control of wild garlic 95 DAT and 1 YAT, but degraded more quickly 95 DAT than simazine under the conditions present from November 2000 to February 2001 in Kentucky. Fall-applied simazine and atrazine were both effective herbicide options for henbit control. Henbit control resulted in warmer surface soil temperature, but more variability during the diurnal cycle. When fall-applied simazine and atrazine were integrated with a traditional spring applied herbicide program, no statistical yield difference was observed. However, fall-applied simazine and atrazine may offer soil temperature and cosmetic advantages.

EVALUATION OF MESOTRIONE IN NO-TILL CORN PROGRAMS. G.R. Armel, H.P. Wilson, and T.E. Hines; Department of Plant Pathology, Physiology, and Weed Science, Virginia Polytechnic Institute and State University, Painter, VA 23420.

ABSTRACT

Field studies were conducted in 1999, 2000, and 2001 near Painter, VA to evaluate the efficacy of mesotrione in no-till corn (*Zea mays* L.). Mesotrione is a new triketone herbicide registered for broadleaf weed control in field corn. Little information is currently available on how well mesotrione controls winter annual weeds alone or in combinations with burndown and residual herbicides. Mesotrione (202 g ai/ha) was applied alone and in combinations with acetochlor (2240 g ai/ha), paraquat (700 g ai/ha), atrazine (280 g ai/ha) and glyphosate-tms (1120 g ai/ha). Mesotrione controlled yellow woodsorrel (*Oxalis stricta* L.) 93%, thus providing similar control to glyphosate-tms (99%). Control of annual bluegrass (*Poa annua* L.) with mesotrione was variable (63 to 96%). However, mesotrione plus atrazine combinations controlled annual bluegrass 99%. Three-way combinations of mesotrione plus acetochlor with paraquat or glyphosate-tms also controlled annual bluegrass 99%, as did glyphosate and paraquat alone. Mesotrione (157 to 314 g/ha) controlled horseweed [*Conyza canadensis* (L.) Cronq.] 37 to 89% by 3 WAT. However, control usually decreased over time. Mesotrione plus atrazine controlled horseweed 87 to 98%. Three-way combinations of mesotrione plus acetochlor with paraquat or glyphosate-tms controlled horseweed 97 to 99%. Glyphosate-tms alone controlled horseweed 99%, while paraquat controlled horseweed 65 to 92%. Corn yields were generally higher when mesotrione was applied with other herbicides.

A second field study investigated mesotrione PRE (78, 157, 235, and 314 g/ha) and POST (35, 71, 105, 140, and 186 g/ha) to determine rates for optimal weed control. All treatments contained a PRE application of glyphosate-tms (1120 g/ha). PRE mesotrione rates of 157 g/ha or greater controlled common lambsquarters (*Chenopodium album* L.) 88 to 96%. Smooth pigweed (*Amaranthus hybridus* L.) (83 to 99%) and common ragweed (*Ambrosia artemisiifolia* L.) (80 to 89%) were controlled by mesotrione rates of 235 g/ha and greater. POST mesotrione rates greater than or equal to 35 g/h controlled common lambsquarters 91 to 99%. Mesotrione applied POST at rates of 71 g/ha and higher controlled common ragweed 66 to 98%. Smooth pigweed (83 to 99%) was controlled by mesotrione rates of 105 g/ha or greater. Mesotrione at 314 g/ha controlled cutleaf eveningprimrose (*Oenothera laciniata* Hill) 71%. Corn treated with PRE mesotrione rates of 235 g/ha or greater and POST rates of 71 g/ha or greater were consistently among the highest yielding treatments.

POTENTIAL CONTRIBUTION OF TRIFLOXYSULFURON, METOLACHLOR AND NORFLURAZON IN YELLOW NUTSEDGE MANAGEMENT PROGRAMS IN GLYPHOSATE-TOLERANT COTTON.
F.E. Groves, K.L. Smith, J.W. Branson and R.C. Namenek; Southeast Research and Extension Center, University of Arkansas, Monticello, AR 71656.

ABSTRACT

Two field experiments were conducted at the University of Arkansas Southeast Branch Experiment Station near Rohwer, AR, in 2001 to evaluate yellow nutsedge (*Cyperus esculentus*) control in glyphosate-tolerant cotton (*Gossypium hirsutum*). Studies were conducted on a Hebert silt loam. Plots were 3 rows x 6-m long, with 1-m row spacing. One row of each plot was an untreated check. Plots were arranged in randomized complete block design with 4 replications. Cotton variety DP541B/RR was planted at a rate of 13 kg/ha. Studies were planted on June 5th and cotton was furrow irrigated as needed. MP and LP applications were post directed and herbicide efficacy was evaluated on yellow nutsedge throughout the growing season using a scale of 0 –100.

In study one all metolachlor and glyphosate treatments were applied @ 1.12 kg ai/ha. Study one treatments included metolachlor applied preplant (PP) or early-postemergence (EP); metolachlor in combination with glyphosate or trifloxysulfuron @ 0.013 or 0.019 kg ai/ha EP; metolachlor PP followed by (fb) glyphosate EP or trifloxysulfuron @ 0.013 or 0.019 kg ai/ha EP; metolachlor + trifloxysulfuron @ 0.013 kg ai/ha EP fb trifloxysulfuron @ 0.019 kg ai/ha mid-postemergence (MP) or 0.032 kg ai/ha late-postemergence (LP); trifloxysulfuron @ 0.019 kg ai/ha EP fb trifloxysulfuron @ 0.019 kg ai/ha MP or 0.032 kg ai/ha LP; glyphosate EP; MSMA @ 2.24 kg ai/ha MP.

In study one metolachlor PP provided 71% control @ 35 DAT. Increased control was achieved with EP treatments. Trifloxysulfuron applied alone, in combination with metolachlor, or following metolachlor provided > 80% control @ 21 DAT. Glyphosate alone offered 73% control while glyphosate tankmixed with or following metolachlor provided 85% control @ 21 DAT. Sequential applications of trifloxysulfuron @ 0.013 kg ai/ha EP fb 0.019 kg ai/ha MP provided > 90% control @ 35 DAT. MSMA alone and metolachlor + trifloxysulfuron @ 0.013 kg ai/ha EP fb trifloxysulfuron @ 0.019 kg ai/ha MP provided > 85% control @ 35 DAT. Sequential applications of trifloxysulfuron @ 0.013 kg ai/ha EP fb 0.032 kg ai/ha LP resulted in 94% control @ 21 DAT. The addition of metolachlor EP did not improve control over the sequential applications of trifloxysulfuron alone.

Study two treatments included sequential applications of norflurazon @ 1.12 kg ai/ha preplant incorporated (PPI) and PP. All other treatments containing norflurazon were applied @ 2.24 kg ai/ha and all glyphosate treatments were applied @ 1.12 kg ai/ha. Norflurazon PPI was evaluated alone and fb trifloxysulfuron @ 0.013 kg ai/ha EP, 0.019 kg ai/ha MP, or 0.032 kg ai/ha LP; norflurazon PPI fb trifloxysulfuron @ 0.013 kg ai/ha EP fb trifloxysulfuron @ 0.019 MP or 0.032 kg ai/ha LP; norflurazon PPI fb glyphosate @ 1.12 kg ai/ha EP alone and in combination with trifloxysulfuron @ 0.013 kg ai/ha EP and fb trifloxysulfuron @ 0.032 kg ai/ha LP; sequential applications of glyphosate @ 1.12 kg ai/ha EP fb MP; glyphosate + trifloxysulfuron @ 0.013 kg ai/ha and fb trifloxysulfuron @ 0.013 kg ai/ha LP; trifloxysulfuron @ 0.013 or 0.019 kg ai/ha EP fb trifloxysulfuron @ 0.032 kg ai/ha LP.

In study two, the PPI application of norflurazon @ 2.24 kg ai/ha provided 82% control of yellow nutsedge @ 35 DAT. The same level of control was provided with a PPI / PP split application of norflurazon @ 1.12 kg ai/ha. The EP application of glyphosate provided 70% control while trifloxysulfuron @ 0.013 kg ai/ha offered 79% control @ 21 DAT. An EP tank-mix of trifloxysulfuron @ 0.013 kg ai/ha and glyphosate gave 81% control @ 21 DAT. However, when these treatments followed a PPI application of norflurazon @ 2.24 kg ai/ha the levels of control exceeded 85% @ 21 DAT. Sequential applications of glyphosate EP and MP provided 92% control @ 35 DAT. LP evaluations were made @ 21 DAT. Norflurazon PPI fb glyphosate and trifloxysulfuron EP fb trifloxysulfuron @ 0.032 kg/ha provided 94% control. Similar control was achieved with trifloxysulfuron @ 0.032 kg ai/ha following trifloxysulfuron @ 0.013 or 0.019 kg ai/ha EP with or without norflurazon PPI. Norflurazon PPI fb trifloxysulfuron @ 0.032 kg ai/ha offered 76% control. Trifloxysulfuron in combination with glyphosate EP fb trifloxysulfuron @ 0.013 kg ai/ha resulted in 72% control.

PESTICIDE INTERACTIONS WITH CGA-362622 IN COTTON. D.G. Wilson, D.B. Reynolds, N.W. Buehring, and L.T. Barber. Department of Plant & Soil Sciences, Mississippi State University, Mississippi State, MS.

ABSTRACT

In the past, studies have shown that negative interactions exist between some pesticides. CGA-362622 (trifloxysulfuron sodium) is a new sulfonylurea herbicide formulated by Syngenta Crop Protection. The purpose of this study was to determine if CGA-362622 exhibited any antagonistic effects on various graminicides, and also to investigate whether any possible interactions between this new compound and malathion exist. Four field studies were conducted over 2000 and 2001 at the Plant Science Research Center, Starkville, MS, and the Black Belt Branch Experiment Station, Brooksville, MS, to evaluate johnsongrass [*Sorghum halepense* (L.) Pers.] control with tank mixtures and sequential applications of CGA-362622 and the graminicides clethodim, fluazifop, and quizalofop. The studies were arranged as a two-factor factorial arrangement of treatments in a randomized complete block design, using four replications of treatments. CGA-362622 at 5.3 g ai/ha was applied 7, 3, and 1 day before, mixed with, or 1, 3, and 7 days after application of 140 g ai/ha clethodim, 211 g ai/ha fluazifop, and 77 g ai/ha quizalofop. Each graminicide was also applied alone. Graminicides were all applied on the same day to minimize environmental effects on efficacy. Visual estimates of control were recorded and then converted to a percent of that achieved with each respective graminicide alone. Data were expressed in this manner to minimize differences due to environmental conditions or johnsongrass growth stages among locations. Compared to the graminicide alone, CGA-362622 reduced johnsongrass control 30 days after treatment (DAT) 24, 33 and 37% when applied in combination with fluazifop, clethodim, and quizalofop, respectively. Generally, johnsongrass control was reduced more when CGA-362622 was applied prior to graminicide applications than when applied after. The level of johnsongrass control increased when CGA-362622 was applied 3 to 7 days after graminicide applications. This may be due to the additional efficacy from the CGA-362622 on johnsongrass. It appears that it is better to apply the graminicide before CGA-362622 than after, and it is best to wait at least 3 days after the graminicide application before applying CGA-362622.

In related research, CGA-362622 at 5.3g ai/ha was applied 24, 8, 4, 2, 1, and 0.5 hour before, immediately after (0 to 5 min), or 0.5, 1, 2, 4, 8, and 24 hour after application of 0.86 kg ai/ha malathion applied ULV, per the Boll Weevil Eradication Program. The studies were arranged as a two-factor factorial arrangement of treatments in a randomized complete block design, using four replications. These data indicated that applications of CGA-362622 before or after an ULV (Ultra Low Volume) application of malathion results in no detrimental interaction to cotton. There was no visual injury noticed for any of the treatments, and the application of CGA-362622 at any of the timings did not affect yield. This should help address concerns over herbicide/insecticide interaction potentials in areas enrolled in Boll Weevil Eradication Programs.

WEED MANAGEMENT IN COTTON WITH CGA 362622 AND PYRITHIOBAC SYSTEMS. I.C. Burke, S.B. Clewis, A.J. Price, and J.W. Wilcut. Department of Crop Science, North Carolina State University, Raleigh, NC

ABSTRACT

Field experiments were conducted at five locations in North Carolina from 2000 to 2001 to evaluate the use of pyrithiobac with CGA 362622 in conventional cotton. The experimental design was a RCBD with treatments in a factorial arrangement of preemergence (PRE) by postemergence (POST) by late post-directed herbicide options (LAYBY). PRE herbicide options included pendimethalin (840 g ai/ha), pendimethalin plus pyrithiobac (36 g ai/ha), or pendimethalin plus fluometuron (1120 g ai/ha). POST treatment options included no herbicide, CGA 362622 (3.6 g ai/A) POST, CGA 362622 plus pyrithiobac (36 g ai/ha) POST, or CGA 362622 early-postemergence (EPOST) plus CGA 362622 (POST). LAYBY herbicide options included no herbicide or prometryn (730 g ai/ha) plus MSMA (2240 g ai/ha). All EPOST, POST, and LAYBY treatments were applied with a non-ionic surfactant at 0.25% (v/v).

Weed species evaluated included common ragweed (*Ambrosia artemisiifolia*), entireleaf morningglory (*Ipomoea hederacea* var. *integriuscula*), ivyleaf morningglory (*Ipomoea hederacea*), jimsonweed (*Datura stramonium*), pitted morningglory (*Ipomoea lacunosa*), prickly sida (*Sida spinosa*), and sicklepod (*Senna obtusifolia*).

At Goldsboro in 2000, all CGA 362622 treatments injured cotton 73-77% at 3 weeks after treatment (WAT). Injury consisted of discoloration and stunting, but not stand loss. By 6 WAT, crop injury was lower at 18-20%. Injury was noted at other locations in treatments containing CGA 362622, but never exceeded 18% at 3 WAT. No injury was observed by 6 WAT in all tests except Goldsboro in 2000

Early season sicklepod control from all PRE herbicide treatments alone was less than 52%. The addition of CGA 362622 EPOST increased sicklepod control to at least 87% in all systems. CGA 362622 EPOST or EPOST + POST controlled jimsonweed and prickly sida less than 10% and 34%, respectively, with pendimethalin PRE. Pendimethalin plus fluometuron PRE alone controlled jimsonweed and prickly sida 80 and 69%, respectively. Any herbicide system containing pyrithiobac, either PRE or POST, controlled jimsonweed >90% and prickly sida >85%. Pendimethalin plus fluometuron PRE fb CGA 362622 EPOST or EPOST + POST controlled jimsonweed and prickly sida >88%. All herbicide systems that included pendimethalin plus fluometuron PRE and CGA 362622 EPOST controlled common ragweed >98%. Early season control of morningglory spp. was >85% for treatments that included POST herbicide(s).

All systems but one required both POST and LAYBY systems for full season control of sicklepod. Pendimethalin plus fluometuron PRE fb CGA 362622 EPOST + POST did not require a LAYBY treatment and controlled sicklepod >90%. A system that included a LAYBY herbicide with any POST treatment controlled sicklepod, jimsonweed, prickly sida, entireleaf morningglory, ivyleaf morningglory, and pitted morningglory >98%, and was better than herbicide systems that did not include a LAYBY herbicide treatment.

Systems without POST herbicide(s) were not harvestable. Early season injury was not reflected in cotton yields. LAYBY herbicide treatments increased yields (>695 kg/ha). With the exception of pendimethalin PRE, cotton treated with POST herbicide(s) plus a LAYBY treatment yielded similarly for each PRE herbicide treatment. Pyrithiobac PRE or POST plus CGA 362622 provide complementary weed control, and together offer effective broad spectrum broadleaf weed control for cotton when used in conjunction with soil applied herbicides and properly timed LAYBY herbicides. Cotton yields with fluometuron PRE were numerically greater than with pyrithiobac PRE.

COTTON PHYTOTOXICITY WITH TRIFLOXYSULFURON AS INFLUENCED BY SOIL MOISTURE, TEMPERATURE, AND TANKMIXES. J.W. Branson, K.L. Smith, J.L. Barrentine, R.C. Namenek. University of Arkansas, Southeast Research and Extension Center, Monticello, AR, Department of Crop, Soil and Environmental Science, University of Arkansas, Fayetteville, AR.

ABSTRACT

Field, greenhouse, and growth chamber studies were conducted in the 2001 growing season to determine the influence of environmental conditions, and herbicide tank mixes on cotton phytotoxicity following postemergence applications of trifloxysulfuron. Field studies were established at the University of Arkansas Cotton Branch Experiment Station at Marianna, AR and at the Southeast Branch Experiment Station at Rohwer, AR. Greenhouse and growth chamber studies were conducted at the Southeast Research and Extension Center at Monticello, AR. In field studies Paymaster 1218 RRBG was planted on May 9, 2001 in conventional 96-cm rows. The experimental design was a randomized complete block with four replications. In greenhouse and growth chamber studies DP 436 RR was planted in 10 x 10 cm pots and grown in potting soil. The experimental design was a randomized complete block with six replications. Temperature regimes in the greenhouse studies ranged from 30-21^0 C, while temperature in the growth chamber studies ranged from 21-10^0 C. Moisture regimes in greenhouse and growth chamber studies were saturated and dry soils. Saturated conditions were maintained by keeping the pots submersed in water, and dry conditions were maintained by only adding water to pots as needed to keep the cotton under normal growing conditions. These moisture conditions were maintained four days prior to applications, and four days following applications. All applications were applied with a CO_2 backpack sprayer calibrated to deliver a 140 or 187 l/ha volume.

In field studies, injury was produced in the form of stunting and necrosis following postemergence applications of trifloxysulfuron, at rates ranging from 5.3 to 13.2 g ai/ha. Stunting ranged from 55 to 62 %, and necrosis ranged from 42 to 50 % with no significant differences in injury observed between application rates of trifloxysulfuron 7 DAT. However, at 15 and 19 DAT significant increases in injury were observed with trifloxysulfuron at 13.2 g ai/ha, as compared to 5.3 and 7.8 g ai/ha. Yield was not affected due to early season injury with no significant differences observed in yield as compared to the untreated check. Various formulations of glyphosate at 0.84 kg ai/ha were combined with trifloxysulfuron at 10.5 g ai/ha. Injury was significantly higher when glyphosate was combined with trifloxysulfuron, as compared to applications of trifloxysulfuron and glyphosate alone.

In greenhouse trials, injury levels were not affected due to the different soil moisture regimes; however, plant dry weights were significantly less in saturated soil moisture regimes. In greenhouse and growth chamber studies, injury levels were significantly higher in treatments where plants were exposed to saturated soils and cool temperatures before and after applications of trifloysulfuron. However, there were no significant differences in injury observed between various rates of trifloxysulfuron in the various environmental conditions.

WEED CONTROL AND COTTON TOLERANCE WITH CGA 362,622. D.K. Miller, P.R. Vidrine, S.T. Kelly, and D.R. Lee; Louisiana State University AgCenter, Baton Rouge, LA 70803.

ABSTRACT

Field studies were conducted in 2001 at the Northeast Research Station in St. Joseph, La, to evaluate weed control and crop tolerance with CGA 362,622. In the crop tolerance study, EPOST, LPOST, and PD timings were over-the-top to four-leaf cotton, over-the-top to 13-leaf cotton, and directed underneath cotton at 13 leaf, respectively. Treatments evaluated included CGA 362,622 at the following rates and timings: 0.0047, 0.007, or 0.012 lb ai/A EPOST; 0.007 or 0.012 lb ai/A LPOST or PD; 0.0047 lb ai/A EPOST followed by 0.007 lb ai/A PD; 0.012 lb ai/A EPOST followed by 0.012 lb ai/A PD; and 0.0047 lb ai/A in combination with Touchdown IQ (glyphosate) at 0.75 lb ae/A EPOST. Nonionic surfactant at 0.25% v/v was included with all CGA 362,622 treatments except when combined with Touchdown IQ. The study was conducted in a relatively weed-free area, however, Prowl (pendimethalin) at 0.75 lb ai/A plus Cotoran (fluometuron) at 1.12 lb ai/A and Bladex (cyanizine) at 1.0 lb ai/A were applied PRE and at layby, respectively. In the weed control study, EPOST, EPD, and LPD timings were over-the-top to three to four-leaf cotton, directed underneath six to eight-leaf cotton, and directed underneath 11 to 12-leaf cotton, respectively. Treatments evaluated included CGA 362,622 at the following rates and timings: 0.0047 lb ai/A EPOST; 0.0047 lb ai/A EPOST followed by 0.007 or 0.012 lb ai/A LPD; 0.007 or 0.012 lb ai/A EPD; 0.007 or 0.012 lb ai/A EPD followed by 0.007 lb ai/A LPD; 0.007 or 0.012 lb ai/A following Touchdown IQ at 0.75 lb ae/A EPOST; and 0.007 lb ai/A in combination with Touchdown IQ at 0.75 lb ae/A LPD following Touchdown IQ at 0.75 lb ae/A EPOST. Touchdown IQ at 0.75 lb ae/A applied EPOST followed by LPD and a nontreated check were included for comparison. Treflan (trifluralin) at 0.75 lb ai/A PPI and nonionic surfactant at 0.25% v/v were included with all programs that did not include Touchdown IQ. Weeds evaluated included barnyardgrass (*Echinochloa crus-galli*), goosegrass (*Eleucine indica*), hemp sesbania (*Sesbania exaltata*), sicklepod (*Senna obtusifolia*), smooth pigweed (*Amaranthus hybridus*), pitted morningglory (*Ipomoea lacunosa*), and entireleaf morningglory (*Ipomoea hederacea*). Experimental design in both studies was a randomized complete block replicated four times. Treatments were applied at 15 GPA to DP 458BR cotton on May 24, June 25, and June 25 in the tolerance study and May 24, June 1, and June 18 in the weed control study. Treatments were applied to all rows of each 4 x 12 m, four row plot. PD treatments were applied broadcast using a layby spray rig. To assess possible negative treatment effects in the tolerance study, injury was visually rated 7 and 40 d after EPOST application. In addition, lint fraction; lint yield; and fiber micronaire, strength, and length were determined following machine harvest of the center two rows of each plot. Final plant height and total number of nodes were determined from 10 randomly selected plants. In the weed control study, plots were visually rated for weed control 37 and 60 d after EPOST application. Lint yield was determined following machine harvest of the center two rows of each plot.

In the tolerance study, visual injury 7 d after EPOST application (DAT) with the 0.007 or 0.0012 lb ai/A rate ranged from 24 to 26% and was greater than that for the 0.0047 lb ai/A rate (13 to 16%). At 40 DAT, injury was not evident for any treatment. Lint fraction, lint yield, final plant height, total number of nodes, fiber micronaire, fiber strength, and fiber length averaged 0.41, 902 lb/A, 112 cm, 16, 4.8, 27, and 1.05, respectively, for nontreated plants. Negative effects were not noted with CGA 362,622 applications for any parameter measured.

In the weed control study, 37 d after EPOST treatment (DAT) all treatments except CGA 362,622 at 0.007 or 0.012 lb ai/A LPD following Touchdown IQ (84 and 88%) resulted in barnyardgrass control ranging from 93 to 95%. Treatments that included Touchdown IQ LPD resulted in 95% goosegrass control, which was greater than all other treatments (63 to 85%). All treatments except CGA 362,622 at 0.0047 lb ai/A EPOST (71%) and the Touchdown IQ sequential treatment (84%) resulted in at least 93% hemp sesbania control. All treatments except the lowest rate of CGA 362,622 EPOST (74%) resulted in 88 to 94% control of sicklepod. Programs including CGA 362,622 alone resulted in 88 to 95 and 93 to 95% control of pitted and entireleaf morningglory, respectively. At 60 DAT, all treatments including Treflan resulted in 94 to 95% barnyardgrass control. Treatments including Touchdown IQ resulted in 79 to 81% control. CGA 362,622 applied sequentially at 0.0047 lb ai/A EPOST followed by 0.007 lb ai/A or 0.012 lb ai/A LPD and treatments including Touchdown IQ LPD resulted in 85 to 95% goosegrass control while all other treatments controlled goosegrass 46 to 76%. All treatments resulted in good control of smooth pigweed (86 to 95%). All treatments except CGA 362,622 at 0.0047 lb ai/A EPOST resulted in at least 86, 89, 85, and 85% control of sicklepod, hemp sesbania, pitted and entireleaf morningglory, respectively. CGA 362,622 at 0.007 lb ai/A EPD alone or followed by 0.007 lb ai/A LPD and treatments that included Touchdown IQ LPD resulted in lint yield of 619 to 674 lb/A, which were the only treatments resulting in yield greater than the nontreated

check (444 lb/A). Yields were very low due to heavy late season weed infestation caused by excessive late season rainfall.

ECONOMIC ASSESSMENT OF DICLOSULAM AND FLUMIOXAZIN IN STRIP- AND CONVENTIONAL-TILLAGE PEANUT (*ARACHIS HYPOGAEA* L.). S.B. Clewis, S.D. Askew, W.E. Thomas, and J.W. Wilcut, North Carolina State University, Raleigh, NC 27695-7620.

ABSTRACT

Experiments were conducted in Lewiston, NC in 1999 and 2000 and Rocky Mount, NC in 1999 to evaluate weed management systems in strip- and conventional-tillage peanuts (*Arachis hypogaea*). The peanut cultivars grown were ‘NC 10C, ‘NC 12C, and ‘NC 7’, respectively. Peanuts were planted in 91-cm rows on sandy loam soil. Peanuts were planted into a wheat (*Triticum aestivum* L.) cover crop at Rocky Mount in 1999 and corn (*Zea mays* L.) and cotton (*Gossypium hirsutum* L.) stubble at Lewiston in 1999 and 2000, respectively. Glyphosate at 1.12 kg ai/ha was applied three to four weeks before planting to control emerged vegetation. Two new preemergence (PRE) herbicides, diclosulam and flumioxazin, were evaluated along with standard PRE and postemergence herbicide systems. The PRE herbicide options included: 1) dimethenamid alone (1.4 kg ai/ha), 2) dimethenamid plus diclosulam (0.027 kg ai/ha), 3) dimethenamid plus flumioxazin (0.071 kg ai/ha), and 4) nothing. The postemergence herbicide options included: 1) bentazon (0.28 kg ai/ha early postemergence [EPOST]) plus paraquat (0.14 kg ai/ha EPOST) followed by (fb) acifluorfen (0.28 kg ai/ha) plus bentazon (0.56 kg ai/ha) (postemergence [POST]), or 2) nothing. All postemergence options included a nonionic surfactant (NIS) at 0.25% (v/v PRE). The strip tillage systems required paraquat at 0.7 kg ai/ha plus NIS for burndown of emerged vegetation. The experimental design was a split plot with a factorial treatment arrangement and three replications of treatments.

Only diclosulam systems controlled yellow nutsedge (*Cyperus esculentus*) greater than 90% late season. Diclosulam systems were the most consistent for purple nutsedge (*Cyperus rotundus*) control (minimum control = 85%). Grass control was not adequate and required clethodim for full season control, regardless of tillage system. Dimethenamid plus diclosulam or flumioxazin (PRE) controlled common lambsquarters (*Chenopodium album*), eclipta (*Eclipta prostrata*), and prickly sida (*Sida spinosa*) at least 91%. Both diclosulam and flumioxazin provided good control of *Ipomoea* species EPOST and POST herbicides was required for >90% control. Dimethenamid plus diclosulam or flumioxazin PRE produced equivalent yields and net returns with no significant differences between the two PRE options. Both systems produced higher yields and net returns than dimethenamid PRE regardless of the postemergence herbicide option. The tillage production system did not influence weed control of eight weeds, peanut yields, or net returns. The addition of diclosulam or flumioxazin to dimethenamid PRE improved weed control compared to dimethenamid alone.

WEED CONTROL IN PEANUTS WITH VALOR AND STRONGARM. D.T. Gooden, Clemson University, Pee Dee Research and Education Center, Florence, S.C. 29506.

ABSTRACT

Valor (flumioxazin) and Strongarm (diclosulam) are labeled herbicides for peanuts. Both herbicides show excellent crop tolerance and limited impact on rotational crops. How these herbicides will best fit into peanut production systems is still being determined.

At the Pee Dee Research and Education Center in 2000, field trials were initiated to determine the best fit of Valor and Strongarm in South Carolina peanut production. In 2000, two tests were conducted on a Norfolk loamy sand soil; in 2001, three tests were conducted on a Wagram loamy sand soil. Four row plots, 30 feet long, were planted to peanuts in a field naturally-infested with tropic croton, common ragweed, ivyleaf morningglory and yellow nutsedge. A tractor-mounted compressed air sprayer was used to apply all herbicides. The sprayer used 8002 nozzles set at 40 psi to deliver 26.5 gallons per acre. Plots were arranged in a randomized complete block design with four replicates . Crop damage ratings and weed control were determined 2, 4,and 8 weeks after planting and at harvest. The two center rows were harvest for yields.

Valor and Strongarm gave excellent control of tropic croton and common ragweed. Control of tropic croton was better than for Cadre while common ragweed control tended to be better than for Cadre. Control for ivyleaf morningglory was good for Strongarm and fair to good for Valor while control for Valor and Strongram tended to be lower as compared to Cadre. In one study, Cadre gave better control of yellow nutsedge than Strongarm. Authority gave excellent control of yellow nutsedge and tropic croton while control of common ragweed was poor. In two, 2000 studies, control of Palmer amaranth was less for Strongarm and Authority compared to Cadre and Valor. Strongarm and Valor had no impact on crop injury or final yield compared to Cadre. Authority did show crop injury in 2000 but did not impact yields. Strongarm and Valor should fit into many cropping systems based on the weed species present. Additionally, the crop tolerance and limited impact on rotational crops associated with application of Strongarm or Valor should promote usage.

WEED CONTROL AND PEANUT RESPONSE TO DICLOSULAM. J.R. Karnei, P.A. Dotray, J.W. Keeling, and T.A. Baughman. Texas Tech University and Texas Agricultural Experiment Station, Lubbock, and Texas Cooperative Extension Service, Vernon.

ABSTRACT

Field studies were conducted in West Texas at six locations in 2000 and 2001 to evaluate weed control and peanut (*Arachis hypogaea*) response to diclosulam applied preplant incorporated (PPI) and preemergence (PRE). All plots received a PPI treatment of ethalfluralin at 0.75 lb ai/A or pendimethalin at 0.50 to 0.75 lb ai/A for Palmer amaranth (*Amaranthus palmeri*) control. Diclosulam was applied PPI and PRE at 0.016 (2/3x), 0.024 (1x), and 0.048 (2x) lb ai/A. Other treatments included imazapic postemergence (POST) at 0.063 lb ai/A, flumioxazin PRE at 0.094 lb ai/A, and a non-treated check.

Weed control studies were conducted in Brownfield in 2000 and Lamesa in 2001. Diclosulam at 0.024 lb controlled purple nutsedge (*Cyperus rotundus*) 60 to 70% in 2000 and 50 to 60% (late-season) in 2001. Ivyleaf morningglory (*Ipomoea hederacea*) was controlled 60 to 70% when diclosulam was applied PPI or PRE at 0.024 lb in 2000. In 2001, diclosulam applied PPI or PRE controlled Ivyleaf morningglory > 85% early-season, and at 124 days after planting (DAP), diclosulam at 0.024 lb provided 80% (PRE) and 40% (PPI) control. Control of both weed species with diclosulam increased as rate increased for both PPI and PRE applications.

Peanut tolerance trials were conducted in Lamesa in 2000 and 2001 and in Seminole in 2001. All plots were kept weed-free throughout the season. Soil pH ranged from 7.6 to 8.2 and organic matter was less than 0.5% at all locations. At 14 DAP, diclosulam at 0.024 lb injured peanut 28 to 30% (PPI) and 17 to 27% (PRE) in both years. Diclosulam at 0.048 lb injured peanut 40 to 50% regardless of application. Diclosulam at 0.024 lb applied PPI or PRE injured peanut less than 8% late-season. In 2000 and 2001, plots treated with diclosulam at 0.048 lb PPI produced the lowest yields. Plots treated with diclosulam at 0.024 lb PPI yielded less than plots treated with diclosulam at 0.024 lb PRE in both years. Peanut grade was not affected by any treatment when compared to the non-treated check. At Seminole, injury was less than injury observed at Lamesa early-season, and less than 10% injury was observed late-season. No differences were observed in yield or grade at Seminole.

RAINFALL AS A FACTOR IMPACTING PEANUT TOLERANCE TO FLUMIOXAZIN. C.W. Swann, Tidewater Agricultural Research and Extension Center, 6321 Holland Road, Suffolk, VA 23437

ABSTRACT

Field studies were conducted in 2000 and 2001 at the Tidewater AREC, Suffolk, VA to evaluate peanut (Arachis hypogaea L.) response to flumioxazin. In both years 42% metam sodium (7.5 g/h) was applied as an in-furrow treatment, at least 2 weeks prior to planting for suppression of Cylindrocladium black rot (CBR).

In 2000 flumioxazin was surface applied at 0.096 lb ai/A either at time of metam sodium application (AF) or with 2 pt/A COC, 3 days after planting (3DAP). All plots received a base treatment of s-metolachlor at 1.25 lb ai/A, AF. Flumioxazin AF plots were treated with sequential applications of paraquat + bentazon + NIS at 0.125 + 0.5 lb ai/A + 0.25% v/v at ground cracking (GC) and clethodim 0.096 lb ai/A + COC 2 pt/A late postemergence (LPO). Flumioxazin 3DAP plots were treated with 2 pt/A COC + flumioxazin at 0.096 lb ai/A and followed with a sequential treatment of clethodim + COC at 0.094 lb ai/A + 2 pt/A LPO.

In 2001 flumioxazin was surface applied in separate field trials at 0.096 lb ai/A either with s-metolachlor at 1.25 lb ai/A at planting or following preplant soil incorporated (PPI) of pendemethalin at 0.75 lb ai/A or AF with s-metolachlor at 1.25 lb ai/A.

In 2000 flumioxazin treatment resulted in 43.3 and 68.3% crop growth suppression for AF and 3DAP treatments respectively at the initial rating date (6/5), however at the final evaluation date (8/7) crop growth suppression had declined to 3.3% for both flumioxazin treatment systems. In 2001 flumioxazin applied at planting resulted in 66.7% crop growth suppression at the initial rating date (6/5) and declined to 8.3% growth suppression at the final evaluation date (8/7). In a separate trial in 2001 flumioxazin applied at the time of metam sodium application resulted in 10% crop growth suppression at the initial evaluation date, 20% crop growth suppression at the second evaluation (6/18) and 10% crop growth suppression at the final evaluation date (7/5). In both years yield of flumioxazin treated plots did not differ significantly from yield of plots treated with commonly used standard treatments.

In both 2000 and 2001 peanut crop growth suppression in flumioxazin treated plots was dramatically reduced in plots where rainfall followed flumioxazin application and preceded crop emergence. In 2000 at the initial evaluation date (6/5) flumioxazin AF plots which received 0.25 in rainfall the day following application were rated at 43.3% crop growth suppression, while the flumioxazin preemergence treatment which did not receive rainfall (0.43 in) until early crop emergence (5/20) were rated at 68.3% crop growth suppression. In 2001 plots treated with flumioxazin AF (4/24) which received 1.04 in rainfall 4 days after application and prior to planting were rated at 10% crop growth suppression at the initial rating date (6/5) while plots in an adjacent trial with an identical planting date which were treated with flumioxazin at planting and received no rainfall until early crop emergence (0.5 in, 5/21) were rated at 66.7% crop growth suppression. These observations indicated that splashing of herbicide treated soil on to emerging peanut seedlings may be an important factor contributing to instance of severe early season crop injury resulting from flumioxazin treatment.

VARIETAL TOLERANCE TO DICLOSULAM AND FLUMIOXAZIN IN TEXAS PEANUT. T.A. Murphree, P.A. Dotray, J.W. Keeling, B.L. Porter, T.A. Baughman, W.J. Grichar, R.G. Lemon, Texas Tech University and Texas Agricultural Experiment Station, Lubbock; Texas Cooperative Extension Service, Vernon, Yoakum, and College Station

ABSTRACT

Diclosulam and flumioxazin have been reported to have broad-spectrum broadleaf weed control when applied preemergence (PRE), but some peanut injury has been observed. Peanut injury on the Texas Southern High Plains was first observed following excessive rates of diclosulam (0.048 lb/A). In 1999 injury was also observed at the 0.024 lb ai/a applied PRE, but no injury was apparent by the end of season (Karnei et al. 2000). Due to injury in 2000 from diclosulam, a peanut variety trial was conducted in Gaines County to test peanut varietal tolerance to diclosulam and flumioxazin. In addition, diclosulam application timing was also investigated. Four high oleic peanut lines: Flavor Runner 458, Sunoleic 97R, TX 977006, Georgia Hi O/L and one conventional variety, Tamrun 96, were used in this study.

Treatments were replicated three times in a split-plot design. Plot size was 7 by 30 ft. Diclosulam was applied at two rates, 0.016 and 0.024 lb ai/A, both PRE and postemergence (POST). Flumioxazin was applied PRE at 0.063 and 0.094 lb/A. Peanuts were planted and PRE treatments were applied May 15, while POST treatments were applied June 12. All treatments were applied using a CO_2 backpack sprayer calibrated to deliver 10 GPA. Evaluations were made on PRE treatments 14, 42, and 118 days after treatment (DAT) while POST treatments were evaluated 14, 58 and 90 DAT. Peanut grades and yields were determined at the end of the season.

At 14 DAT diclosulam applied PRE at 0.016 and 0.024 lb ai/A injured peanut 10 to 40% in all varieties except Tamrun 96. At 42 DAT, diclosulam PRE injured Flavor Runner 458 and the Sunoleic 97R 20 to 25% while injury to Georgia Hi O/L from diclosulam at 0.024 lb ai/A was 35 to 45%. At 118 DAT, all injury decreased to < 5% and yield was not affected by diclosulam PRE. Less than 5% peanut injury was observed on all varieties from flumioxazin applied PRE at 14 DAT. No injury was observed at 42 and 118 DAT and yield was not affected by any flumioxazin treatment. At 14 DAT, diclosulam applied POST at both rates injured peanut < 5% in all varieties and no injury was observed 90 DAT. Yield was not affected by diclosulam (POST).

At the South Texas location in Yoakum, no peanut response was observed following any treatment of diclosulam and flumioxazin applied PRE. When flumioxazin was applied PRE at the Rolling Plains location in Motley County, no injury was observed to any variety, at any rate, throughout the growing season and yield was not reduced.

Future studies will be conducted to evaluate diclosulam POST and to examine factors contributing to injury caused by diclosulam and flumioxazin PRE.

WEED MANAGEMENT IN PEANUT WITH STRONGARM AND VALOR. J.R. Sholar, J.N. Nickels and V.B. Langston. Department of Plant and Soil Sciences, Oklahoma State University, Stillwater, OK 74078 and Dow AgroSciences, Indianapolis, IN.

ABSTRACT

Strongarm and Valor have been effective in controlling eclipta, (95-100%), and hophornbeam copperleaf, (95-100%), in Oklahoma peanut research. Cadre is a widely used herbicide but it does not provide effective control of these two troublesome weeds. Despite the effectiveness of Strongarm and Valor, there have been observations of early season crop injury. Field studies were conducted in 2000 and 2001 at three locations in Oklahoma to evaluate the yield and grade response of four peanut cultivars to Strongarm and Valor. The locations were the Caddo Research Station in Caddo Co. and growers fields in Bryan Co. and Jackson Co. Peanut cultivars used were Tamspan 90, Okrun, AT 120, and Tamrun 96. Tamspan 90 is a spanish market type and the other three cultivars are in the runner market type. Herbicides used were Strongarm at 0.024 lb ai/ac, Valor at 0.078 lb ai/ac, Cadre at 0.063 lb ai/ac, and a hand hoed check. Experimental areas were selected with a history of low weed infestations to minimize the effects of weed interference with the evaluations of cultivar response. Prowl was applied PPI to all plots. Early season crop injury in the form of stunting was observed in some situations with both Strongarm and Valor. However, the symptoms disappeared during the growing season and there was no effect of herbicide on either pod yield or grade (Total Sound Mature Kernels). There was no differential cultivar response in either pod yield or grade. These results mean that growers can select from these herbicides based on weeds expected or present and herbicide cost and not be required to change their herbicide selection as they change cultivars.

Field experiments were conducted in 1998 to evaluate eclipta and peanut response to new, soil-applied herbicide treatments as compared to currently available herbicides. Soil-applied Strongarm (diclosulam) and Authority (sulfentrazone) provided season-long control of eclipta with no detectable crop injury. Basagran (bentazon) and Pursuit + Dual (imazathapyr + metolachlor) also provided season-long control (90-100%) control of eclipta. All herbicides increased peanut pod yields and gross returns over the check. Herbicide treatments did not affect pod quality as measured by Total Sound Mature Kernels. Additional research is needed to confirm these results in wetter years.

EVALUATION OF REDUCED RATES OF CADRE, STRONGARM, AND VALOR IN PEANUT PRODUCTION. C.S. Bray, J.Tredaway Ducar, J.W. Wilcut, D.L. Jordan, B.J. Brecke, G.R. Wehtje, P. Dotray, J.W. Grichar, W.C. Johnson III, and C.W. Swann. Agronomy Department, University of FL, Gainesville, FL 32611; Crop Science Department, NCSU, Raleigh, NC 27695; West FL REC, University of FL, Jay, FL 32656; Agronomy and Soils, Auburn University, AL 36849; TX A&M University, Lubbock, TX 77995; and Crop and Soil and Environmental Science Department, VA Technical University, Blacksburg, VA 24061.

ABSTRACT

Strongarm (diclosulam) is a peanut herbicide that may be applied pre-plant incorporated (PPI), pre-emergence (PRE), or at true peanut cracking (AC) at rates of 0.016 to 0.024 lb A/A (1x) for broadleaf weed control and nutsedge suppression. Valor (flumioxazin) is new pre-emergence peanut herbicide that may be applied at rates of 0.063 to 0.094 lb A/A (1x) for control of many broadleaf weeds. Cadre (imazapic) is a postemergence (POST) herbicide that is used early post-emergence extensively in peanut production at rate of 0.063 lb A/A (1x) for control of many broadleaves, grasses and nutsedges.

Studies were conducted to determine if herbicide rates could be reduced and used in combination to achieve broad spectrum weed control. Research was conducted in nine locations within six states in the major peanut production areas. Rates evaluated were Strongarm 0.012 lb A/A (1/2x), Strongarm 0.024 lb A/A (1x), Valor 0.047 lb A/A (1/2x), Valor 0.094 lb A/A (1x), and Cadre 0.032 lb A/A (1/2x). Strongarm and Valor were applied PRE with Cadre applied POST. The experimental design was a randomized complete block with a factorial treatment arrangement. The treatments included all possible combinations of Strongarm, Valor, and Cadre. A regional standard (selected by regional study director) and an untreated check were included for comparison. Applications were made using a CO_2 backpack sprayer or CO_2 tractor sprayer delivering 20 gpa. Plots were four rows on 36 in row spacing with lengths of 25 ft. Evaluations were control of yellow nutsedge (*Cyperus esculentus*), sicklepod (*Senna obtusifolia*), pitted morningglory (*Ipomoea lacunosa*), and Florida beggarweed (*Desmodium tortuosum*) and peanut yield.

Strongarm 1/2x applied PRE did not differ for control of sicklepod and pitted morningglory over the Strongarm 1x rate alone. Valor at the 1x rate controlled nutsedge, sicklepod, and Florida beggarweed greater than Valor ½x. Strongarm ½x + Valor ½x increased control over Strongarm ½x treatments for sicklepod and Florida beggarweed and increased the Valor ½x for all weeds except IPOLA. Regardless of Strongarm rate, Valor ½x was as effective as the 1x rate for all weeds except nutsedge A POST application of Cadre 1/2x increased nutsedge control over any PRE alone applications. Strongarm ½x fb Cadre ½x gave equal control as Strongarm 1x fb Cadre ½x for all weeds except Florida beggarweed. Valor 1/2x gave equal control as Strongarm 1/2x resulting in over 84% control of nutsedge, sicklepod and Florida beggarweed. Valor 1x fb Cadre 1x did not increase control over Valor 1/2x fb Cadre1/2x for any of weeds evaluated. Strongarm 1/2x + Valor 1/x fb Cadre 1/2x controlled nutsedge and Florida beggarweed greater than 92%. Strongarm 1x or Valor 1x alone did not increase control of any weeds over the 1/2x rates when applied tank-mixed. Valor 1x fb Cadre ½x did not increase control over Valor ½x fb Cadre ½x. Strongarm ½x + Valor ½x fb Cadre ½x controlled CYPES and DEDTO greater than 92%. Strongarm 1x or Valor 1x did not increase control of any weeds over the ½x rates when applied tank-mixed.

Strongarm and Valor applied PRE alone at 1/2x rates did not control nutsedge and sicklepod over 59%. Tank-mixing of Strongarm and Valor at the 1/2x rates allowed greater control over Strongarm 1/2x and Valor 1/2x applied PRE alone. A POST application of Cadre at 1/2x rate increased control of all weeds for either of the reduced rates of Strongarm and Valor. Strongarm 1/2x alone fb Cadre 1/2x and Strongarm 1/2x + Valor 1/2x fb Cadre 1/2x yielded highest. Strongarm 1x PRE alone, Valor 1/2x PRE alone, and Strongarm 1/2x + Valor 1/2x PRE yielded lowest.

WEED MANAGEMENT IN PEANUT WITH CONTACT AND RESIDUAL HERBICIDES. D.L. Jordan, J.W. Wilcut, P.D. Johnson, J.F. Spears, J.B. Beam, and J.E. Lanier, Department of Crop Science, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

Peanut (*Arachis hypogaea* L.) growers use a combination of contact and residual herbicides to achieve season-long weed control. Many of the residual herbicides that are available do not control emerged weeds. Likewise, many of the herbicides that control emerged weeds do not provide residual weed control. While imazethapyr (Pursuit), imazapic (Cadre), and possibly diclosulam (Strongarm) offer control of certain emerged weeds along with providing residual control, each of these herbicides has limitations. Growers often apply contact and residual herbicides in mixtures to broaden the spectrum of control and extend the period of time in which control is maintained. Injury potential of applying herbicides in mixtures is often a question. For this reason, paraquat (Gramoxone MAX at 5.6 oz/acre) plus bentazon (Basagran at 0.5 pt/acre) alone or with the residual herbicides metolachlor (Dual Magnum at 1.33 pt/acre), dimethenamid (Outlook at 16 oz/acre), diclosulam (0.45 oz/acre), flumioxazin (Valor at 3 oz/acre), and imazethapyr (Pursuit at 1.44 oz/acre) were applied 2 wks after peanut emergence to evaluate crop injury. Paraquat alone was also included. This experiment was conducted at three times. In a separate experiment conducted four times, acifluorfen plus bentazon (Storm at 1.5 pt/acre) alone or with 2,4-DB (Butyrac 200 at 0.5 pt/acre) was applied alone or with metolachlor (Dual Magnum at 0.88 pt/acre), dimethenamid (Frontier at 22 oz/acre), diclosulam (Strongarm at 0.12 oz/acre), or flumioxazin (Valor at 1.5 oz/acre). Residual herbicides were also applied alone in this experiment. In a third experiment conducted four times, peanut injury following imazapic (Cadre at 1.44 oz/acre) alone or with diclosulam (Strongarm at 0.12 oz/acre) or flumioxazin (Valor at 1.5 oz/acre) was compared. A nonionic surfactant at 0.125% (v/v) (paraquat treatments) or 0.25% with all other herbicide combinations. In a final experiment, tolerance of peanut to 2,4-DB (Butyrac 200) at 1.0 pt/acre applied approximately 7, 5, and 3 weeks before digging was evaluated in nine experiments.

In the study evaluating paraquat and residual herbicides, bentazon reduced injury by paraquat (33% versus 18%). When paraquat plus bentazon was applied with flumioxazin, diclosulam, dimethenamid, metolachlor, or imazethapyr, injury 1 wk after treatment (WAT) was 81, 22, 24, 28, and 20%, respectively. When evaluated 3 WAT, these respective residual herbicides applied with paraquat plus bentazon injured peanut 66, 6, 7, 8, and 5%. At this evaluation, injury by paraquat alone or with bentazon was 9 and 2%, respectively. Applying flumioxazin alone or with acifluorfen plus bentazon or acifluorfen plus bentazon plus 2,4-DB injured peanut similarly and greater than all other combinations. Although diclosulam did not increase injury by the contact herbicides, dimethenamid and metolachlor did increase injury. With the exception of flumioxazin-treated peanut, very little injury was noted 4 weeks after treatment (WAT). Under weed-free conditions, flumioxazin-treated peanut yielded 553 lb/acre lower than non-treated peanut. When pooled over the four trials and residual herbicide treatments, acifluorfen plus bentazon alone or with 2,4-DB reduced yield by 180 and 136 lb/acre, respectively. Injury by imazapic pus flumioxazin ranged from 38 to 68% which exceeded that by imazapic alone or with diclosulam (0 to 20%). Diclosulam did not increase injury by imazapic. Peanut yield and seed germination were not affected by 2,4-DB.

PEANUT RESPONSE TO VALOR APPLICATION TIMINGS. E. P. Prostko, The University of Georgia, Tifton, GA 31793; W.C. Johnson, III, USDA/ARS, Tifton, GA 31793; W. J. Grichar, Texas Agricultural Experiment Station, Yoakum, TX 77995; D.L. Jordan, North Carolina State University, Raleigh, NC 27695; and G.E. MacDonald, University of Florida, Gainesville, FL 32611.

ABSTRACT

Valor (flumioxazin) is a new preemergence broadleaf herbicide that was registered for use in peanuts in 2001. It provides good to excellent control of many of the troublesome broadleaf weeds in peanuts including Florida beggarweed (*Desmodium tortuosum*) and tropic croton (*Croton glandulosus*). Because the tolerance of peanuts to Valor declines from planting to emergence, it has a narrow window of application. Therefore, the objective of this research was to evaluate the effects of the timing of Valor applications on peanut growth and yield.

Research was conducted at five locations across the peanut belt including Tifton, GA; Attapulgus, GA; Citra, FL; Lewiston, NC; and Yoakum, TX. Valor 51WDG was applied at 3 ozs/A at various timings ranging from 0 to 10 days after planting (DAP). Applications made after 3 DAP are not labeled and peanut cracking or emergence occurred at 7 DAP. Traditional small plot research techniques were used and the plot areas were maintained weed-free. Yield data were obtained from all locations. The peanut variety 'Georgia Green' was planted at all locations except Attapulgus (C-99R) and Lewiston (NC-12C).

Generally, Valor caused significant crop injury, particularly when applied at 6 DAP or later. Typical injury symptoms from Valor included stunting and leaf burn. Peanut yields were not reduced by any application of Valor in 4 of the 5 tests conducted. However, in Tifton, Valor caused significant reductions in peanut yield when applied 3 DAP or later. Peanut maturity at this location was delayed approximately 7 to 14 days by all applications of Valor and likely contributed to these yield losses since all plots were harvested on the same date.

WEED CONTROL AND TOLERANCE OF PEANUT TO STRONGARM POSTEMERGENCE. J. W. Wilcut, Z. Taylor, S. C. Troxler, B. Robinson, and S. B. Clewis; Department of Crop Science, North Carolina State University, Raleigh, NC 27695-7620.

ABSTRACT

A series of studies have been conducted since 1994 investigating weed control and peanut tolerance to Strongarm (diclosulam) applied at various timings postemergence (POST). Initial work in 1994-1996 in North Carolina and Georgia indicated good to excellent tolerance with Strongarm at rates as high as 0.048 lb ai/ac applied early postemergence when peanuts were cracking. Further investigations from 1996-1997 determined that peanut tolerance to POST treatments (peanuts 3-6 inches in diameter) of Strongarm was good when used with a nonionic surfactant at 0.25% (v/v). But injury increased from approximately 10% with NIS to greater than 20% if Strongarm was applied with COC at 1% (v/v). In weed control evaluations, Strongarm was applied alone and in tank mixtures with paraquat at 0.125 lb ai/ac or Blazer. The addition of paraquat antagonized Strongarm control of velvetleaf. Weed control was similar with use of NIS and COC. More intensive studies were conducted from 1998-2001.

Experiments at three locations in 2000 and 2001 evaluated Strongarm POST at 0.004, 0.008, 0.012, 0.024, or 0.048 lb/ac plus 0.25% NIS (v/v) in weed-free environments for crop tolerance. Injury at 7 DAT was a function of Strongarm rate with the two highest rates injuring peanuts 12 to 16%. The lower rates injured peanuts 9% or less while Starfire plus Basagran followed by (fb) Storm injured peanuts 17%. At 30 DAT, injury for all treatments was less than 9%. Yields were not affected by herbicide treatments.

In 2001, experiments were conducted that evaluated peanut tolerance in a weed-free environment to Strongarm applied at 0.004, 0.008, 0.012, or 0.024 lb/ac applied in a factorial treatment arrangement with application dates of June 1, June 15, July 1, or July 15. Injury increased with higher rates of Strongarm rates but injury was not influenced by date of application. Peanut yields were not influenced by herbicide rate or application date. Another experiment was conducted with the same rate structure and date of Strongarm application to evaluate weed control. Common ragweed was cot-2L, cot-4L, 6 inches – 2 feet tall, or >4 feet tall for application dates of June 1, June 15, July 1, and July 15, respectively. Strongarm at all rates applied June 1 or June 15 controlled common ragweed at least 98% when evaluated in late September just before digging. All rates of Strongarm applied July 1 controlled common ragweed at least 90%. Only Strongarm applied at 0.012 or 0.024 lb/ac controlled common ragweed at least 93% when applied July 15. Entireleaf morningglory was controlled at least 91% with all rates of Strongarm applied June 1 or June 15. Strongarm POST will not control annual grasses, common lambsquarters, sicklepod, or prickly sida. It has some activity on spurred anoda at rates of 0.012 lb/ac or higher and POST control of eclipta and tropic croton is unknown at this time. POST control of purple and yellow nutsedge will be dependent on irrigation and or rainfall.

Other experiments conducted in 2000 and 2001at three locations evaluated peanut tolerance in a weed free environment to Strongarm applied alone at 0.012 or 0.024 lb/ac or tank mixed with Tough at 0.94 lb ai/ac or Blazer at 0.25 lb ai/ac. Tough and Blazer were also evaluated when applied alone. Injury levels were no more than additive with all tank mixtures and peanut yields were not influenced by herbicide treatments.

Control of the annual grasses (broadleaf signalgrass, fall panicum, goosegrass, large crabgrass, and Texas panicum) was evaluated with Select and Select tank mixtures with Strongarm at 0.012 lb/ac. All Select treatments included COC at 1.0% (v/v). Herbicide timings included Strongarm and Select applied alone, in tank mixture, and sequential treatments of Select applied 3, 7, or 14 days before or after Strongarm. Antagonism was likely with tank mixtures and sequential treatments when Select was applied within 3 days of Strongarm. As expected, application to large grasses and or drought stressed annual grasses increased the likelihood and magnitude of antagonism.

AMAZON SPRANGLETOP CONTROL IN DRY SEEDED RICE. B.J. Williams, A.B. Burns and D.B. Copes; Northeast Research Station, St. Joseph, LA, Louisiana State University Agricultural Center, Baton Rouge, LA 70803.

ABSTRACT

The effect of cyhalofop rate and timing on Amazon sprangletop (*Leptochloa panicoides*) control in dry-seeded rice was evaluated in 2000 and 2001 at the Northeast Research Station near St. Joseph, LA on a Sharkey clay soil. Cyhalofop at 0.19, 0.21, 0.25 and 0.28 lb ai/A was applied at the 1 to 2 and 3 to 4 leaf rice stages and postflood. Efficacy of bispyribac-sodium, fenoxaprop plus AEF04360, and cyhalofop combinations in controlling sprangletop was evaluated in a second study between 1999 and 2001. In all years and studies, rice 'Cypress' at 115 lb/A was drill seeded in rows 7.5 inches apart. Permanent floods were established 4 to 5 weeks after planting. Nitrogen, in the form of prilled Urea, was applied at 126 kg/ha just before permanent flood. At panicle initiation an additional 42 kg/ha of nitrogen was applied. Herbicide treatments were applied, in 140 L/ha of water using a CO_2 pressurized backpack sprayer, to plots measuring 7 by 15 feet. The experimental design for both studies was a randomized complete block in a factorial treatment arrangement. Weed control ratings, rice injury ratings, and rice yield data were subjected to analysis of variance. Means were separated using Fisher's Protected LSD at the 5% level.

In 2000, sprangletop did not respond to higher rates of cyhalofop applied at 1 to 2 leaf stage. Sprangletop control (73%) from cyhalofop applied to 1 to 2-leaf rice was 15 to 20% lower than control from cyhalofop applied at the 3 to 4 leaf rice stage and postflood. The difference in control was due to late emerging spangletop after the 1 to 2 leaf timing. Cyhalofop at 0.25 and 0.21 lb ai/A resulted in the best control (90% or better) at the 3 to 4 leaf rice stage and postflood timings, respectively. In 2001, 0.25 lb ai/A cyhalofop resulted in better control at the 1 to 2-leaf timing than lower rates. Sprangletop did not respond to higher cyhalofop rates at the 3 to 4 leaf rice stage and postflood. Overall, sprangletop was best controlled by 0.25 lb ai/A cyhalofop applied at the 3 to 4-leaf rice stage and postflood. In study 2, sprangletop control from fenoxaprop plus AEF04360 and cyhalofop applied at the 4 to 5 leaf rice stage was 90% or better. Tank mixing bispyribac with cyhalofop or fenoxaprop plus AEF04360 reduced sprangletop control 10 to 25% compared to cyhalofop alone. In 2000 and 2001, sprangletop control was better when COC was mixed with bispyribac plus cyhalofop compared to NIS. In all three years, rice yield was maximized by cyhalofop plus bispyribac combinations.

These results indicate that fenoxaprop plus AEF04360 and cyhalofop will be excellent tools for managing escaped sprangletop preflood. Additionally, cyhalofop may be an excellent tool for managing sprangletop postflood. Sprangletop control from cyhalofop and fenoxaprop plus AEF04360 was antagonized when tank mixed with bispyribac. However, the antagonism between cyhalofop and bispyribac may be reduced with the selection of an appropriate adjuvant.

COMMAND USE IN WATER-SEEDED RICE. E.P. Webster, C.T. Leon, W. Zhang, and K.J. Pellerin. LSU AgCenter, Louisiana State University, Baton Rouge, LA 70803.

ABSTRACT

Studies were established at the LSU AgCenter Rice Research Station near Crowley, LA in 2000 and 2001 to evaluate the use of clomazone in water-seeded rice. This research focused on different carriers for clomazone application and total weed control programs containing clomazone as the initial herbicide used in a water-seeded rice production system.

In the first study, 0.4 lb ai/A clomazone was applied preplant incorporated (PPI), surface prior to planting (SURFACE), early pegging (EPEG), and late PEG (LPEG) with a CO_2-pressurized backpack sprayer set to deliver 15 GPA. The same rate was impregnated on three different fertilizers and applied at 150 lb/A of fertilizer at the EPEG and LPEG timings. The three fertilizers used were ammonium sulfate, urea, and a 50:50 blend of ammonium sulfate and urea. EPEG treatments were applied when green leaf tissue had emerged from the seed and the root had begun to extend downward into the soil, and the LPEG treatments were applied approximately 5 days later. Barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.], rice flatsedge (*Cyperus iria* L.), and Amazon sprangletop [*Leptochloa panicoides* (Presl) Hitchc.] control, crop injury, and rough rice grain yield were evaluated. This study was conducted in 2000.

At 10 d after LPEG (DALPEG), barnyardgrass control was 83 to 95% with all EPEG treatments and 55 to 80% with all LPEG clomazone treatments. Rice flatsedge control was less than 70% for all treatments at 10 DALPEG. Halosufuron at 1.0 oz/A was applied to control rice flatsedge and other escaped broadleaf weeds after the initial rating. At 70 DALPEG, clomazone PPI and LPEG applied with the CO_2-pressurized backpack sprayer and an EPEG application of clomazone impregnated on a 50:50 blend of ammonium sulfate and urea fertilizer controlled barnyardgrass 69 to 81%. All other clomazone treatments controlled barnyardgrass 86 to 95% regardless of carrier. Amazon sprangletop control was 95% when treated EPEG with clomazone applied with the CO_2-pressurized backpack sprayer at 15 GPA at 70 DALPEG. Control decreased to 70 to 85% with all other EPEG treatments. Delaying initial application to the LPEG timing resulted in Amazon sprangletop control of 54 to 80%. At 10 DALPEG, all EPEG applications of clomazone impregnated on fertilizer injured rice 13 to 21%, and rice treated LPEG was injured 20 to 26%. Rice yield reflected the reduced barnyardgrass control with clomazone applied with a CO_2-pressurized backpack sprayer at the PPI and LPEG timings. Rice yield increased when treated with clomazone impregnated on ammonium sulfate or the 50:50 blend applied EPEG and LPEG.

In the second study, a total weed control program was evaluated containing clomazone at the EPEG stage as the initial treatment. The design was a 3-way factorial in a randomized complete block design with four replications. Factor A consisted of 0.4 lb/A clomazone impregnated on 150 lb/A of a 50:50 blend of ammonium sulfate and urea fertilizer or no clomazone. Factor B consisted of 0.75 oz ai/A halosulfuron or no halosulfuron applied mid-postemergence (MPOST), and Factor C was the addition of 9 g ai/A bispyribac-sodium, 0.25 lb ai/A cyhalofop-butyl, 0.067 lb ai/A fenoxaprop plus safener, or no grass herbicide MPOST. Factors B and C were applied with a CO_2-pressurized backpack sprayer set to deliver 15 GPA. Barnyardgrass, rice flatsedge, and toothcup [*Rotala ramosior* (L.) Koehne] control, crop injury, and rice rough grain yield were evaluated. This study was conducted in 2001.

Barnyardgrass control was above 90% for all treatments that contained a grass control product at 21 DAMPOST. Rice flatsedge, ducksalad [*Heteranthera limosa* (Sw.) Willd.], and toothcup control were 90 to 98% with all treatments containing halosulfuron or bispyribac-sodium. At 14 DAPEG, rice injury was 20 to 30% with all clomazone treatments; however, by 21 DAMPOST no injury was observed. Rice yields were 6400 to 7480 lb/A.

In conclusion, this research indicates that clomazone can effectively be used in a water-seeded system when applied impregnated on ammonium sulfate, urea, or a 50:50 blend of ammonium sulfate and urea fertilizer. This will allow clomazone to be applied by air on rice in the pegging stage and at the same time possibly reduce the potential of off-site movement and drift.

POSTFLOOD BARNYARDGRASS CONTROL IN RICE WITH NEW POSTEMERGENCE APPLIED HERBICIDES. M.E. Kurtz, and J.E. Street. Delta Research and Extension Center, Stoneville, MS, 38776.

ABSTRACT

Two experiments were initiated on May 1, 2001, to evaluate the efficacy of postemergence herbicides applied postflood in rice for control of barnyardgrass (*Echinocloa crus-galli*) ECHCG. Each study was conducted one time on Sharkey clay soil. Herbicides were applied with a back pack sprayer calibrated to deliver 20 gal/A spray solution and treatments were arranged in a RCB design and replicated 4 times. The treatments were subjected to ANOVA and means were separated using Waller Duncan's K ratio t-test P=0.05.

In experiment 1, Stam (propanil) 3 lb ai/A was applied as a blanket treatment on June 11 to suppress 4-to5-leaf barnyardgrass. The permanent flood was applied on June 15 and postflood treatments of Clincher (cyhalofop-butyl) at 0.19, 0.25, and 0.28 lb ai/A; Ricestar (fenoxaprop-ethyl) at 0.08 lb ai/A; Aura (Bas 625) at 0.133 lb ai/A; Regiment (bispyribac-sodium) at 0.02 lb ai/A; Facet (quinclorac) at 0.5 lb ai/A; Ordram (molinate) at 4.5 lb ai/A; were applied on June 20, to 9-inch ECHCG. All treatments with the exception of Ordram, Ricestar, and Stam (less than 80% at both rating dates) resulted in greater than 80 and 95 % ECHCG control 8 and 22 days after treatment(DAT) respectively. All treatments resulted in increased yield over the untreated control and Stam alone. The Ricestar treatment resulted in a reduction in yield compared to the two highest rates of Clincher and Aura.

In experiment 2, Command (clomazone) at 0.5 lb ai/A preemergence (PRE) was compared to Command 0.3 lb/A PRE followed by (fb) Clincher at 0.25 lb/A 1-week postflood (pstfld 1) or 2-week postflood (pstfld 2) and Clincher at 0.28 lb/A 3-week postflood (pstfld 3) or Clincher 0.25 lb/A early post fb Clincher 0.25 lb/A late post. On June 28, eight DAT pstfld 1, Clincher 0.25 lb/A fb Clincher 0.25 lb/A resulted in greater (99%) ECHCG control than Command 0.5 lb/A (63%) and Command 0.3 lb/A fb Clincher 0.25 lb/A (71%). On July 16, 24 DAT pstfld 1, 17 DAT pstfld 2, 10 DAT pstfld 3, Clincher 0.25 lb/A fb Clincher 0.25 lb/A and Command 0.3 lb/A fb Clincher 0.25 lb/A pstfld 1 were equal in ECHCG control with 99 and 97 % control respectively. Command 0.3 lb/A fb Clincher 0.25 lb/A pstfld 2 resulted in less control (89%). These results show that Clincher at 0.25 lb/A following Command 0.3 lb/A can effectively control ECHCG up to 2 weeks postflood.

Yield data show that the Clincher 0.25 lb/A fb Clincher 0.25 lb/A resulted in the highest yield of 168 bu/A. Even though the pstfld 1 and 2 treatments with Clincher controlled ECHCG, season long ECHCG competition reduced rice yield to 151 to 145 bu/A respectively when compared to the Clincher 0.25 lb/A fb Clincher 0.25 lb/A (160 bu/A).

ANTAGONISM WITH TANKMIXES OF NEW RICE AND COTTON HERBICIDES. K.L. Smith, R.C. Namenek, J.W. Branson, and F.L. Baldwin, University of Arkansas Southeast Research and Extension Center, Monticello and University of Arkansas Cooperative Extension Service, Little Rock.

ABSTRACT

New herbicide technology continues to promise improved weed control systems for agronomic crops. Even with the broad spectrum herbicides and transgenic or herbicide tolerant crops currently available, no single herbicide provides adequate control of all weed species. Herbicide mixtures and program approaches to weed management is necessary. Rates, timing and weed spectrum are usually well known when a herbicide becomes labeled for use in a particular crop. Less is often known about antagonism with other herbicides commonly used in that crop. Field studies were initiated at the University of Arkansas Southeast Research Station in Rohwer, Arkansas to evaluate antagonism to activity of several new herbicides with commonly used herbicides in rice and cotton. The rice trials were established on a Sharky clay soil and the cotton trials were on a Hebert silt loam. All were grown under conventional cultural practices for dry seeded and flooded rice and sprinkler irrigated cotton for the area. The experimental design was a randomized complete block with four replications in all studies. Herbicides were evaluated for efficacy alone and in tankmixes to fill niches or improve weed management programs in five different areas of rice and cotton weed control. (1) Clomazone postemergence in rice, (2) postemergence control of broadleaf and grass weeds with one application in rice (3) reduced herbicide load or more economical broadleaf treatments in rice (4) salvage grass treatments in rice, and (5) replacement for cyanazine as a layby herbicide in cotton were the five areas identified for study.

The hypothesis that clomazone applied postemergence to rice and annual grasses would allow rice farmers to build levees before herbicide application and achieve good weed control on levees as well as paddies requires a graminicide in combination with the clomazone postemergence to remove established grass seedlings. Cyhalofop and fenoxaprop plus safener were tankmixed with clomazone and evidence of antagonism was examined on barnyardgrass (*Echinochloa crusgalli* L.) and broadleaf signalgrass [*Brachiaria platyphylla* (Griseb.) Nash]. Control of both species was >90% with both herbicides applied postemergence alone or in combination with clomazone, indicating antagonism does not appear to be a limiting factor for this practice.

Annual grass and broadleaf weeds often escape soil applied herbicides due to lack of moisture for activation or other environmental factors. To fill this niche of controlling both broadleafs and grasses in a single application that is more effective, more economical or with less drift potential than propanil or quinclorac may require a combination of graminicides and broadleaf herbicides. Efficacy of combinations of cyhalofop with bentazone, triclopyr, halosulfuron and bispyribac were studied on barnyardgrass, broadleaf signalgrass and pale smartweed (*Polygonum lapathifolium* L.) No antagonism to smartweed control was observed with the tankmixes. However, control of both grass species was reduced when triclopyr, bentazone, halosulfuron and bispyribac was tankmixed with 0.019 lbs ai/A cyhalofop. When the rate of cyhalofop was increased to 0.025 lbs ai/A in the mixture, the tankmix with bentazone, bispyribac and triclopyr provided similar control to cyhalofop alone.

Commonly used soil applied herbicides in rice such as clomazone, quinclorac, and pendimethalin are more effective on grasses than broadleaf weeds. Use of these products in a preemergence or delayed preemergence application often requires a postemergence herbicide application for broadleaf weed control. A postemergence herbicide that would broaden the weed spectrum, reduce the total herbicide load or reduce the cost while maintaining acceptable weed control would make a contribution to rice weed management programs. The hypothesis that carfentrazone would lower costs and lower the herbicide load when mixed with other broadleaf herbicides was tested by evaluating hemp sesbania [*Sesbania exaltata* (Raf.) Cory] and pitted morningglory (*Ipomea lacunose* L.) control with tankmixtures of carfentrazone with bentazone, bispyribac, halosulfuron, bensulfuron, propanil and quinclorac. Morningglory control was antagonized only when bensulfuron was mixed with carfentrazone. However, hemp sesbania control with carfentrazone was antagonized with bentazone, bispyribac, halosulfuron, and bensulfuron. No antagonism was observed when propanil or quinclorac was tankmixed with carfentrazone.

Quinclorac is widely used to suppress large barnyardgrass that has escaped early herbicide applications. To measure the benefit and test for antagonism of the over-the-top graminicides when mixed with quinclorac, cyhalofop, fenoxaprop, and bispyribac were tested alone and in quinclorac tankmixes for efficacy on large barnyardgrass.

Barnyardgrass control with all mixtures was equal or greater than with quinclorac alone indicating no antagonism and a possible contribution of the graminicides in salvage situations.

Cyanazine was widely used and considered a standard for weed control in layby applications in cotton. With the withdrawal of cyanazine from the market, a niche has been created for an effective, low use rate herbicide to be used at layby in cotton. Carfentrazone and flumioxazin were tested in combination with MSMA and glyphosate for antagonism and efficacy on prickly sida (*Sida spinosa* L.) and pitted morningglory. There was no antagonism noted to carfentrazone with tankmixtures of glyphosate or MSMA. However, when MSMA was added to flumioxazin, control of prickly sida was lower than with flumioxazin alone.

CONTROL OF VOLUNTEER ROUNDUP READY CROPS IN SOYBEAN AND COTTON SYSTEMS. C.J. Gray, D.R. Shaw, and M.L. Tagert. Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

A field experiment was conducted near Starkville, MS to evaluate the control of both volunteer glyphosate-resistant soybean and cotton in desired glyphosate-resistant soybean and cotton systems. The volunteer species were drilled in 19 cm rows 6.35 to 0.61 cm deep approximately three weeks prior to planting, and again immediately prior to planting. The cultivars of the volunteer soybean and cotton planted were Asgrow 4702RR and DP 450 BG/RR, respectively. The desired soybean and cotton cultivars were Asgrow 5001RR and PayMaster 1218 BG/RR, respectively. A variety of herbicide treatments were included to simulate the actions a producer might take to control unwanted volunteer glyphosate-resistant species. The timings for the cotton treatments included herbicide applications preplant 2 weeks before planting, over the top at 2-leaf and 4-leaf cotton, cultivation at 4-leaf cotton, and post-directed at 10-leaf cotton. The application timings for soybean treatments included preplant 2 weeks before planting, post-directed 3 weeks after planting (WAP) and postemergence at 3 and 5 WAP. Herbicide efficacy and crop injury were visually evaluated 7 and 9 WAP.

Observing the cotton treatments at 7 WAP, glyphosate plus urea-ammonium nitrate applied preplant 2 weeks before planting followed by glyphosate at 2-leaf cotton followed by glyphosate and cultivation at 4-leaf cotton followed by glyphosate plus diuron post-directed at 10-leaf cotton controlled volunteer cotton and soybean 81 and 74%, respectively. This treatment also had the least amount of cotton injury (6%). Glyphosate applied preplant 2 weeks before planting, 2-leaf cotton, and 4-leaf followed by paraquat plus urea-ammonium nitrate post-directed at 10-leaf cotton controlled volunteer cotton and soybean 75 and 76%, respectively. However, this treatment also injured the desired cotton 45%. All treatments that included a post-direct application at 10-leaf cotton consisting of an herbicide labeled for post-directing, injured the desirable cotton at least 23%. For the soybean treatments at 7 WAP, volunteer soybean control ranged from 23 to 54%, while volunteer cotton control ranged from 44 to 62% for all treatments. As observed with the 7 WAP results, the best cotton treatment 9 WAP included glyphosate plus urea-ammonium nitrate applied preplant 2 weeks before planting followed by glyphosate at 2-leaf cotton followed by glyphosate and cultivation at 4-leaf cotton followed by glyphosate plus diuron post-directed at 10-leaf cotton. This treatment controlled the volunteer cotton 90% and volunteer soybean 83%. All other treatments controlled the volunteer cotton from 23 to 55% and volunteer soybean from 31 to 50%. From these data, cultivation incorporated into a producer's herbicide program will increase control of volunteer glyphosate-resistant crops. Herbicide applications alone may not control volunteer crops adequately, particularly if no desirable crop to volunteer crop height differential is established. This may result in volunteer glyphosate-resistant crops being particularly problematic in no-till production systems.

CONTROL OF VOLUNTEER ROUNDUP READY COTTON IN ROUNDUP READY SOYBEANS. A.C. York, Crop Science Department, North Carolina State University, Raleigh, NC 27695; A.M. Stewart and P.R Vidrine, Dean Lee Research Station, Louisiana State University, Alexandria, LA 71302; and A.S. Culpepper, Department of Crop and Soil Sciences, University of Georgia, Tifton, GA 31793.

ABSTRACT

Volunteer Roundup Ready cotton has occasionally been observed in Roundup Ready soybean fields. The volunteer cotton does not adversely impact soybean production but could jeopardize the Boll Weevil Eradication program. Soybean fields are not trapped for weevils, hence a population could build up undetected if a gravid female was introduced into a soybean field with volunteer cotton plants.

An experiment was conducted at four locations in North Carolina during 2000 and 2001 to evaluate various herbicides for control of volunteer Roundup Ready cotton in Roundup Ready soybeans. Soybeans were planted in 30-inch rows, and two rows of Roundup Ready cotton were planted between the five soybean rows. Preemergence herbicides included Sencor DF at 8 oz/A (0.38 lb ai/A metribuzin), Canopy at 8 oz/A (0.32 lb ai/A metribuzin + 0.05 lb ai/A chlorimuron ethyl), Canopy XL at 5.1 oz/A (0.15 lb ai/A sulfentrazone + 0.03 lb ai/A chlorimuron ethyl), Python at 0.8 oz/A (0.04 lb ai/A flumetsulam), and Scepter DG at 2.8 oz/A (0.123 lb ai/A imazaquin). Postemergence herbicides and rates represent those likely to be mixed with glyphosate for enhanced morningglory control. These herbicides included Classic at 0.33 oz/A (0.005 lb ai/A chlorimuron ethyl), FirstRate at 0.2 oz/A (0.01 lb ai/A chloransulam methyl), Reflex at 12 oz/A (0.19 lb ai/A fomesafen), Resource at 4 oz/A (0.027 lb ai/A flumiclorac pentyl ester), and Butyrac 200 at 2 oz/A (0.03 lb ai/A 2,4-DB). Additional treatments included Canopy applied PRE followed by each of the POST herbicides. Roundup Ultra at 1 qt/A (0.75 lb ae/A glyphosate) was applied overtop of 3-trifoliate and 7-trifoliate soybeans. The POST herbicides mentioned above were mixed with Roundup at the first application.

Pooled over locations, Sencor, Canopy XL, Canopy, Scepter, and Python controlled cotton 62, 79, 87, 90, and 93%, respectively, and reduced cotton fruit production late in the season 70, 77, 94, 96, and 98%, respectively. The PRE herbicides did not injure soybeans. Canopy XL did not increase soybean yield, but the other PRE herbicides increased yield an average of 12%. FirstRate, Classic, Reflex, 2,4-DB, and Resource controlled cotton 21, 71, 72, 74, and 84%, respectively, and reduced late-season cotton fruit production 39, 86, 87, 89, and 93% respectively. Soybean injury was noted only with 2,4-DB. All POST herbicides except FirstRate increased soybean yield an average of 10%. Cotton control and fruit reduction was most consistently effective with Canopy applied PRE followed by a POST herbicide. PRE plus POST combinations controlled cotton 98 to 100% and reduced fruit production 99 to 100%.

A similar study was conducted at one location in Louisiana in 2001. Treatments were the same as in North Carolina. Python, Canopy, and Canopy XL controlled cotton 82 to 87% and reduced fruit production 67 to 83%. Sencor and Scepter controlled cotton only 23 and 41%, respectively, and reduced fruit production only 1 and 43%. FirstRate and Classic controlled cotton only 25 to 26%. Reflex and Resource controlled cotton 51% while 80% control was noted with 2,4-DB.

EFFECT OF REDUCED AND SPLIT APPLICATIONS OF BENTAZON ON VELVETLEAF CONTROL AND SEED PRODUCTION IN SOYBEAN. M.T. Bararpour, S. Aghajani, I. Amini and S. Ziahosseini; Faculty of Agricultural Sciences, Department of Agronomy and Plant Breeding, University of Mazandaran, Sari, Iran.

ABSTRACT

A field study was initiated at the Agricultural Experiment Station in Sari, Mazandaran in Iran, to determine the effect of reduced and split applications of bentazon on velvetleaf (*Abutilon theophrasti*)control and seed production in soybean (*Glycine max*). The experiment was conducted as a randomized complete block design with eleven treatments and four replications in a field with a uniform natural velvetleaf infestation. Treatments were the application of bentazon at 0, 0.25, 0.42, 0.58, 0.75, 0.84 (recommended rate), 0.25 followed by (fb) 0.58, 0.25 fb 0.42, 0.42 fb 0.42, 0.25 fb 0.25 fb 0.25 kg ai/ha, weedy, and weed-free check. First application of bentazon was applied 4 wk after soybean emergence. The second and the third bentazon applications were made 6 and 7 wk after soybean emergence, respectively. Velvetleaf height was 20, 45, and 52 cm at the first, second, and third application timings, respectively.

The first application of bentazon at 0.84, 0.75, 0.58, 0.42, and 0.25 kg/ha provided 93, 85, 76, 75, and 60% control of velvetleaf. Velvetleaf control was 90, 85, 81, 75, 66, 96, 95, and 88% from bentazon application at 0.84, 0.75, 0.58, 0.42, 0.25, 0.42 fb 0.42, 0.25 fb 0.58 and 0.25 fb 0.42 kg/ha 2 wk after the second application. Velvetleaf control was 95, 90, 86, 76, 69, 99, 95, 89, and 99% from the third application of bentazon at 0.84, 0.75, 0.58, 0.42, 0.25, 0.42 fb 0.42, 0.25 fb 0.58, 0.25 fb 0.42, and 0.25 fb 0.25 fb 0.25 kg/ha, respectively. Velvetleaf interference reduced soybean pods 76% in untreated plots and 1, 4, 5, 6, 27, 1, 3, 3, and 2% in plots receiving bentazon (as listed above). Soybean produced 3,428, 889, 3,400, 3,381, 2,934, 2,312, 2,148, 3,254, 3,165, 3,195, and 3,223 kg/ha yield in weed-free, weedy, and plots that received 0.84, 0.75, 0.58, 0.42, 0.25, 0.42 fb 0.42, 0.25 fb 0.58, 0.25 fb 0.42 and 0.25 fb 0.25 fb 0.25 kg/ha of bentazon application, respectively. Velvetleaf population, dry weight, and seed production were reduced 95, 96 and 81%; 89, 95 and 78%; 89, 90 and 63%; 79, 87 and 59%; and 74, 79 and 55% from a single application of bentazon at 0.84, 0.75, 0.58, 0.42, and 0.25 kg/ha, and reduction were 95, 98 and 86%; 89, 98 and 83%; 89, 98 and 86%; and 95, 99, and 94% from split application of bentazon at 0.42 fb 0.42, 0.25 fb 0.58, and 0.42 fb 0.42 and 0.25 fb 0.25 fb 0.25 kg/ha, respectively. In general, there were no significant differences between the recommended rate of bentazon and a 10% (0.75 kg/ha) reduced rate in terms of soybean yield and velvetleaf control, population, and seed production. However, a 30% (0.58 kg/ha) reduced rate of bentazon also provided good results. Soybean yield production was not significantly different with the recommended rate of bentazon compared to all split applications. However, the split application of bentazon at 0.25 fb 0.25 fb 0.25 kg/ha provided the same results as the recommended rate in terms of soybean yield and velvetleaf control, but provided a better result in terms of reducing velvetleaf seed production which will reduce the velvetleaf soil seedbank which may benefit long-term weed management programs.

INFLUENCE OF PREEMERGENCE HERBICIDES ON GROWTH, DEVELOPMENT, AND YIELD OF EARLY-PLANTED SOYBEANS IN THE MS DELTA. D.H. Poston*, R.M. Griffin, and R.T. Coleman. Delta Research and Extension Center, Mississippi State University, Stoneville, MS

ABSTRACT

Nearly half of all soybean [*Glycine max* (L.) Merr.] acres in Mississippi were planted on or before April 22, 2001 with many of these acres planted in March and early-April. Producers have widely adopted the Early Soybean Production System in Mississippi in an effort to avoid drought and stabilize yields especially in non-irrigated fields. Unfortunately, the use of preemergence (PRE) herbicides has not been thoroughly evaluated for these early plantings. Furthermore, the potential for considerable injury from PRE herbicides is greater for soybeans planted in March and April compared to May plantings due to the likelihood of heavy rainfall events and cool soil and air temperatures.

Studies were conducted in 2001 at the Delta Research and Extension Center in Stoneville, MS to evaluate the impact of PRE herbicides on growth, development, and yield of soybeans planted in early-April. The study was conducted using a randomized complete block design with a factorial arrangement of treatments. Treatment factors included PRE grass herbicide (none, Prowl @ 1.0 lb ai acre^{-1}, or Dual @ 1.9 lbs ai acre^{-1}), PRE broadleaf herbicide (none, Scepter @ 0.125 and 0.084 lb ai acre^{-1}, Sencor @ 0.62 and 0.42 lb ai acre^{-1}, Canopy XL @ 0.24 and 0.16 lb ai acre^{-1}, Valor @ 0.078 and 0.052 lb ai acre^{-1}, and Python @ 0.066 and 0.044 lb ai acre^{-1}), and soybean variety (Deltapine 3478 and Deltapine 4748S). Soybeans were planted on a Sharkey clay soil and PRE herbicide applications made April 3, 2001. Plots were 10 x 40 ft and herbicide applications were made using a tractor-mounted sprayer calibrated to deliver a spray volume of 15 gpa at a spray pressure of 33 psi. All plots received a follow-up postemergence application of Storm @ 0.75 lbs ai acre^{-1} to maintain weed free plots. Injury from herbicides was visually assessed periodically throughout the growing season and harvest height and soybean yield was determined.

Maximum and minimum air temperatures during the wk following planting ranged from 78 to 88 and 64 to 69 F, respectively. Maximum and minimum soil temperature at a 2 in depth ranged from 76 to 90 and 64 to 70 F, respectively. Warm temperatures combined with adequate soil moisture resulted in rapid soybean emergence. However, incorporating rainfall (0.71 inches) did not occur until April 12, 2001. An additional 2.31 inches of rainfall fell between April 13 and April 16, 2001. By April 18, nighttime soil temperatures were less than 50 F and nighttime air temperatures dropped below 40 F. Extensive soybean injury from some PRE herbicides was very apparent within 7 d following heavy rains and low temperatures.

DP 3478 and DP 4748S responded differently to PRE broadleaf herbicides 8 wk after planting (WAP). Injury from full rates of all PRE broadleaf herbicides except Valor at 8 WAP was less with DP 4748S than with DP 3478. Increased tolerance of DP 4748S compared to DP 3478 to Canopy XL and Python was also apparent with reduced herbicide rates 8 WAT. Additionally, harvest height of DP 3478 was reduced by nearly all herbicide treatments compared to the untreated control. In contrast, harvest heights for DP 4748S were generally similar to the untreated control. Soybean injury 8 WAP from PRE broadleaf herbicides alone ranged from 0% in the untreated control to 31% with full rates of Valor and Canopy XL. In contrast, soybean injury from PRE broadleaf herbicides applied in combination with Prowl ranged from 31% with prowl alone to 49% with Prowl + a full rate of Sencor. Soybean injury 8 WAT with combinations of PRE broadleaf herbicides and Dual ranged from 11% with Dual alone to 49% with Dual and a full rate of Valor.

Soybean yields were reduced 4% in plots treated with Prowl compared plots receiving no PRE grass herbicide. Full rates of Sencor, Canopy XL, and Python reduced yields 13, 9, and 6% compared to the untreated control, respectively. No yield reductions compared to the untreated control were recorded in plots treated with reduced rates of PRE broadleaf herbicides.

The level of injury observed with some herbicide treatments at various points during the growing season may severely limit the ability of the crop to compete with weeds and consequently limit the use of these herbicides in early-planted soybean systems. Successful soil-applied weed management programs in early-planted conventional soybeans will likely involve matching tolerant soybean varieties to specific herbicide programs.

PREPLANT BURNDOWN AND NUTSEDGE CONTROL IN SOYBEAN. F.S. Kelley, D.R. Shaw, and R.M. Griffin. Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Research was conducted in 2001 at Newton (Prentiss very fine sandy loam) and Starkville (Marietta silt loam), MS to evaluate burndown treatments and control of yellow and purple nutsedge. The weed spectrum for Newton consisted of yellow nutsedge, pitted morningglory, sicklepod, and entireleaf morningglory. Purple nutsedge, tall waterhemp, entireleaf morningglory, eclipta, and prostrate spurge comprised the weed spectrum at Starkville. Herbicides evaluated were 1.12 kg ai/ha glyphosate applied as a premergence (PRE), postemergence four and six weeks after planting (PO-4WAP, 6WAP), 0.070 kg ai/ha flumioxazin PRE, 0.131, 0.280, and 0.421 kg ai/ha sulfentrazone PRE, 1.19 kg ai/ ha V-10080 PRE, 0.056 and 0.084 kg ai/ha chlorimuron PRE, 0.14 kg ai/ha oxyfluorfen PRE, 0.26 kg ai/ha diclosulam PRE, 0.70 kg ai/ha imazethapyr PRE, 0.035 and 0.070 kg ai/ha halosulfuron PRE, and 1.68 kg ai/ha metolachlor PRE.

Results from Newton indicated that flumioxazin and glyphosate preemergence (PRE) provided excellent control of the entire weed spectrum 2 WAP, with the exception of yellow nutsedge (73%). A sequential application of glyphosate increased control of yellow nutsedge to 88% by 9WAP. Flumioxazin injured soybean 30% initially, but 63 DAP no injury was observed. Sulfatrazone at 0.421 kg/ha plus 0.084 kg/ha chlorimuron plus glyphosate PRE also provided excellent control of the entire weed spectrum with the exception of sicklepod (61%); yellow nutsedge control 2 WAP was 90% with this treatment. Sequential application of glyphosate increased weed control to greater than 89% by 9 WAP for the entire weed spectrum. There was no observable injury from the sulfentrazone plus chlorimuron treatment for any of the rating periods. Halosulfuron at 0.035 kg/ha plus glyphosate PRE also provided excellent control of the yellow nutsedge (95%) 2 WAP; however sicklepod control was poor (41%) at 2 WAP. Control increased for sicklepod to 95% 5 WAP when a sequential application of glyphosate was applied PO-4WAP; yellow nutsedge control remained high 9 WAP (89%). Soybean injury from this treatment was 19% 5 WAP; however, was no injury was observed 9 WAP. Results for Starkville indicate that halosulfuron at 0.070 kg/ha plus glyphosate PRE provided excellent control (94%) across weed species evaluated 2 WAP; however, soybean injury was 30% with this treatment 2 WAP. The soybeans in these plots grew out of the injury by 9 WAP and did not differ in injury when compared to those treated with Roundup alone. A sequential application of glyphosate PO-4WAP provided 94% control of purple nutsedge 6 WAP. Sulfentrazone at 0.421 kg/ha plus 0.084 kg/ha chlorimuron and glyphosate PRE controlled of all weed species greater than 81% 2 WAP and a sequential application of glyphosate increased control to greater than 84% control across species. Soybean injury was less than 10% at the 3 WAP and 6 WAP rating dates. Glyphosate PRE followed by two sequential applications of glyphosate at PO-4WAP and PO-6WAP controlled purple nutsedge 80% and tall waterhemp more than 95% at 3 and 9 WAP. However, this treatment controlled entireleaf morningglory only 59% at 9 WAP. Soybean treated with in-season sequential glyphosate applications yielded 22 bu/A. Most treatments containing a residual herbicide tank-mixed with glyphosate applied PRE followed by a mid-season application of glyphosate resulted in yields similar to the glyphosate standard. However, 0.035 kg/ha halosulfuron injured soybeans and reduced yields compared to the other PRE treatments.

WILDLIFE FOOD PLOTS: HERBICIDE TOLERANCE IN SUNFLOWER (HELIANTHUS ANNUUS), SESAME (SESAMUM INDICUM), AND COWPEA (VIGNA UNGUICULATA). E.C. Murdock and R.F. Graham Clemson University, Florence, SC 29506.

ABSTRACT

Field trials were conducted in 2001 to evaluate tolerance of sunflower, sesame, and cowpea to soil-applied, postemergence (POST), and POST-directed herbicides.

In preliminary trials conducted in 2000, sunflower exhibited no tolerance to Staple, Canopy XL, Scepter, Pursuit, or Reflex applied preemergence (PRE). However, reasonable tolerance to PRE applications of Spartan and Cotoran was observed. In 2001, no injury or stand reduction occurred following PRE application of Prowl (2.4 pt/ac), Micro-Tech (2 qt/ac), Dual Magnum(1.33 pt/ac), and Frontier 6 (20 oz/ac). Cotoran applied PRE @ 1, 1.5, and 2 qt/ac caused 7, 27, and 50% injury 35 days after planting. Cotoran @ 1 qt/ac did not reduce plant population or plant height. However, at 1.5 qt/ac plant height was reduced 21%; Cotoran @ 2 qt/ac reduced plant population and plant height 45 and 26%, respectively. Spartan applied PRE @ 6,8, and 10 oz/ac caused only 3 to 8% injury 35 days after planting, (DAP) and had no effect on plant population or plant height.

POST-directed applications of Linex (1.5 pt/ac), Direx (0.8 qt/ac), Cotton-Pro (1.33 pt/ac), Cotoran (1.5 qt/ac), Evik (2 lb/ac), MSMA (2.67 pt/ac), Reflex (1.5 pt/ac), 2,4-DB (1 pt/ac), and Classic (0.5 oz/ac) did not cause significant injury. However, Gramoxone Max (1 pt/ac) applied POST-directed resulted in complete crop loss.

In sesame, Prowl (2.4 pt/ac), Micro-Tech (2 qt/ac), Dual Magnum (1.33 pt/ac), and Frontier 6 (20 oz/ac) applied PRE caused 0,17,42, and 77% injury 38 DAP. Cotoran (1.5 qt/ac) applied PRE caused minimal injury (0 to 10%). PRE applications of Reflex (1.5 pt/ac), Spartan (8 oz/ac), and Scepter (2.9 oz/ac) caused 93 to 97% injury. Sesame did not exhibit adequate tolerance to POST applications of Classic, Permit, Accent, Scepter, 2,4,-D, Basagran, Blazer, or Buctril at normal use rates.

In cowpea, PRE applications of Prowl, Dual Magnum, Micro-Tech, Frontier 6, Scepter, and Spartan caused no significant crop injury. Basagran (1qt/ac), FirstRate (0.3 oz/ac), Scepter (2.9 oz/ac) and Reflex (1.5 pt/ac) applied POST resulted in 3,15,13, and 65% injury 24 days after treatment.

TOBACCO RESPONSE TO CGA 362622. L.R. Fisher, S.B. Clewis, C.D. Porterfield, W.D. Smith, and J.W. Wilcut; Department of Crop Science, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

Experiments were conducted to determine tobacco tolerance to pre-transplanted (PRE-T) and postemergence (POST) treatments of CGA-362622 and to determine the potential for CGA-362622 applied preemergence (PRE) and POST to cotton to injure tobacco grown in rotation the following year. CGA-362622 at 0.0536 and 0.107 oz product/A PRE-T injured 'K326' flue-cured tobacco 1% while POST treatments resulted in 4 to 5% injury. Tobacco injury was transient with no mid- and late-season injury noted. Tobacco yields from all CGA-362622 POST treatments were not different from the untreated weed-free check. Tobacco treated with CGA-362622 at 0.107 oz product/A PRE-T yielded higher than untreated weed-free tobacco or tobacco treated with CGA-362622 POST. When grown in rotation, tobacco was not injured nor were yields influenced by CGA-362622 applied PRE or POST to cotton the previous year.

IMAZAPIC EFFECTS ON QUALITY AND YIELD OF BERMUDAGRASS HAY. L.S. Warren, Jr., F.H. Yelverton, T.W. Gannon and J.D. Hinton; Department of Crop Science, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

In North Carolina, imazapic (Plateau) and imazapic + 2,4-D (Oasis) were evaluated on a 'Coastal' bermudagrass pasture for yield effects in 2000. A 'Tifton 44' bermudagrass pasture was treated with Oasis in 2000 and with Plateau and Oasis in 2001 for yield and hay quality effects. The 'Coastal' bermudagrass trial consisted of a nontreated check with and without 30% N carrier, Oasis at 4 and 6 oz / acre in 30% N carrier, Oasis at 4 oz / acre in water carrier and Plateau at 4 oz / acre in 30% N carrier. Treated plots also received X-77 Spreader at 0.25% v/v and were applied on August 23, 2000. Plots were harvested on October 4, 6 weeks after treatment (WAT). Oasis was applied to 'Tifton 44' bermudagrass on May 23, 2000 at 4 and 6 oz / acre. X-77 Spreader was added at 0.25% v/v. Plots were harvested on June 21, July 28 and October 4 (4, 9 and 19 WAT, respectively). Yield effects were evaluated as well as quality effects consisting of predictions for neutral detergent fiber (NDF), acid detergent fiber (ADF), hemi-cellulose and crude protein (CP). Plateau and Oasis, at 4 and 6 oz / acre each, were applied to 'Tifton 44' bermudagrass on June 27, 2001. X-77 Spreader was added at 0.25% v/v. Plots were harvested on August 14 and October 1 (7 and 14 WAT, respectively). Yield and quality effects were evaluated.

The addition of 30% N to the nontreated 'Coastal' bermudagrass check increased 1st cut yields by 22% over the nonfertilized check. All Plateau and Oasis treated plots produced yields that were approximately 50% of the fertilized check plots. 'Tifton 44' bermudagrass quality (NDF, ADF, hemi-cellulose and CP) was not affected by any treatment in 2000 and 2001. In 2000, 1st cut yields of 'Tifton 44' bermudagrass were reduced approximately 75% by either Oasis rate while total production was reduced 22 to 24%. In 2001, 1st cut yields of 'Tifton 44' bermudagrass were reduced 20 to 30% from either of the Plateau or Oasis treatments. Total production was reduced up to 20% in Oasis treated plots and in plots treated with Plateau at 6 oz / acre.

These data suggest that 'Tifton 44' bermudagrass quality is not affected by Plateau or Oasis at 4 to 6 oz / acre. These treatments cause a yield decrease from 1st cut after application in 'Coastal' and 'Tifton 44' bermudagrass with total production not being able to completely recover by season's end.

EVALUATION OF IMAZAPIC FOR GRASS CONTROL IN BERMUDAGRASS HAYFIELDS AND PASTURES. J. Tredaway Ducar, D.A. Dinkins, K.K. Dollar, A.M. Andreason, and J.W. Wasdin; Agronomy Department, Gainesville; Bradford County Extension, Starke; Clay County Extension, Green Cove Springs; Washington County Extension, Chipley; and Animal Science Department, University of Florida, Gainesville, FL.

ABSTRACT

Experiments were conducted in three Florida locations to determine the efficacy of imazapic on vaseygrass (*Paspalum urvelli*), sandbur (*Cenchrus* spp.), and johnsongrass (*Sorghum halepense*) and to evaluate tolerance of coastal bermudagrass (*Cynodon dactylon*) to imazapic. All experiments utilized a randomized complete block design with 3 or 4 replications. Herbicide treatments were applied with a CO_2 backpack sprayer with Turbo Teejet 03 nozzles at 20 GPA.

The first study was conducted to determine if vaseygrass control would be enhanced if applied in a liquid nitrogen carrier. Plateau (imazapic) was applied at 4, 6, and 8 fl. oz/A in liquid nitrogen and water carriers. A non-ionic surfactant was included at 0.25% v/v. Treatments were applied after a hay cutting when the coastal bermudagrass was 8 inches tall and vaseygrass was 6 to 8 inches tall. The second study was conducted to determine the best rates and timings of Oasis (imazapic + 2,4-D ester) for johnsongrass control. Treatments included Oasis at 4, 6, 8, 10, and 12 fl. oz/A and Roundup UltraMax at 51 fl. oz/A. All treatments were applied Pre-bloom and Post-bloom. The third study was conducted to determine the efficacy of imazapic on sandbur. Oasis was applied at 4, 6, 8, 10, and 12 fl. oz/A, Plateau at 8 fl. oz/A, and Plateau (8 fl.oz/A) + Ally (metsulfuron) (0.3 oz/A).

In the first study, vaseygrass control exceeded 90% regardless of rate or carrier at 39 DAT (days after treatment). Control remained >88% at 53 DAT with all treatments except Plateau applied at 4 fl. oz/A in water. Bermudagrass injury was <10% at 39 DAT and with all rates of Plateau applied in water or Liquid nitrogen. No bermudagrass injury was present at 53 DAT. In the second study, Oasis applied pre-bloom provided 30 - 58% control of johnsongrass 28 DAIT (days after initial treatment) with the greatest amount of control resulting from the highest application rates of 10 and 12 fl. oz/A. Roundup UltraMax provided > 90% johnsongrass control. Pre-bloom applications of Oasis controlled johnsongrass 80% or greater with all rates except 5 fl.oz/A 28 DAIT. Roundup UltraMax declined to 60% 28 DAIT. Pre-bloom Oasis treatments controlled johnsongrass >85% at all applications rates 42 DAIT compared to Roundup UltraMax at <60%. Post-bloom treatments of Oasis (at all rates) and Roundup UltraMax exceeded 80%. At 73 DAIT, all Oasis treatments controlled johnsongrass >80% pre- and post-bloom regardless of rate. Roundup UltraMax control was <10% and 80% applied pre-bloom and post-bloom, respectively. Bermudagrass injury was <10% for all Oasis treatments and >90% for Roundup UltraMax at 73 DAIT, regardless of timing. In the third study, sandbur was controlled >80% with Oasis at 4, 6, and 10 fl.oz/A 30 DAT. All other treatments provided < 60% sandbur control. At 60 DAT, Oasis at 4 fl.oz/A provided >90% control. Oasis at any other rate or combination controlled sandbur <75%.

In conclusion, Plateau controlled vaseygrass >90% regardless of carrier or rate. Johnsongrass was controlled >80% with all Oasis rates applied pre-bloom, while all post-bloom treatments provided >88% control. All Oasis rates were more effective than Roundup UltraMax. Sandbur control varied depending on the density. In a heavy infestation, the 6 fl.oz rate is necessary to provide good control (>80%); in a lighter infestation, the 4 fl.oz rate provides good sandbur control.

MORPHOLOGICAL RESPONSES OF BAHIAGRASS TO PLATEAU (IMAZAPIC). I.R. Rodriguez, J.K. Higingbottom, and L.B.McCarty. Clemson University, Clemson, SC 29634.

ABSTRACT

Bahiagrass (*Paspalum notatum*) is a warm-season grass often used for pastures and as a low maintenance, utility turf. Bahiagrass is established by seeding and is very drought resistant. The prolific production of seedheads in summer requires mowing to maintain an acceptable aesthetic appearance. These seedheads are also very tough, causing excess wear on mowing equipment. The objective of this study was to evaluate seedhead suppression and other morphological effects of Plateau (imazapic) on bahiagrass.

Studies were conducted in 2000 and 2001 on a bahiagrass pasture in Batesburg, SC. Treatments were arranged in a randomized complete block design with 3 replications of 2 treatments in 2000, and 3 treatments in 2001. Plot size was 5 ft by 10 ft. In 2000, treatments consisted of a control and Plateau 2EC at 0.0625 lb a.i. A^{-1} with methylated seed oil (0.0125%, v/v) applied on 29 June. In 2001, treatments consisted of a control, Plateau 2EC at 0.0625 lb a.i. A^{-1}, and Plateau at 0.0313 lb a.i. A^{-1}, both with a non-ionic surfactant (0.25%, v/v) and applied on 2 July. In both years, seedheads were not present at the time of application. Data was collected at 2, 4, 6, and 8 WAT in 2000, and up to 10 WAT in 2001. Turf injury was rated visually on a scale of 0 to 100%, where 30% represented maximum acceptable injury and 100% represented dead turf. Turf color was rated visually on a scale of 1 to 10 where 1 represented dead, brown turf and 10 represented healthy, green turf. Seedhead counts were made by counting every seedhead in each plot. Shoot width was measured in cm by averaging six randomly selected shoot widths per plot. At each rating date, two 4-in diameter by 6-in deep cores were taken in each plot. Roots were dried and weighed after washing in both years. In 2001, lengths of six randomly selected shoots were measured from collar to tip at each rating date.

In 2000, Plateau showed significantly greater turf injury and lower turf color ratings than the control, although damage never reached unacceptable levels. Plateau inhibited seedheads for the duration of the 2000 study, with no more than 1 seedhead per plot at any rating date. Plateau decreased root dry weights by as much as 1.8 g on the 4 and 6 WAT sampling dates. Shoot widths and shoot counts were not affected by Plateau in 2000. In 2001, turf injury was greater and color was lower for both Plateau treatments for all rating dates, steadily worsening for the full rate while leveling off by 8 WAT for the half rate, possibly due to extended drought during 2001. Plateau at the high rate exceeded maximum acceptable turf injury by 10 WAT. Both rates of Plateau also suppressed seedheads in 2001 beginning 4 WAT, without difference between rates. Shoot lengths were not affected by Plateau treatments until 6 WAT, with shorter lengths by as much as 15 cm under both rates for the remainder of the study. Shoot widths were increased >1.6cm by the high rate beginning at 6 WAT, and there were no differences in root dry weights in 2001. Based on results from this study, Plateau applied at 0.0313 lb a.i. A^{-1} suppressed seedhead production in bahiagrass without the adverse morphological effects of a higher rate.

THE ADDITION OF FLUROXYPYR TO TRICLOPYR OR PICLORAM FOR THE CONTROL OF WOODY PLANTS IN PASTURES. P.L. Burch, J.A. Nelson, and W.N. Kline. Dow AgroSciences LLC. Indianapolis, IN 46268.

ABSTRACT

Upon their registration, Dow AgroSciences plans to introduce two new herbicide products for pasture weed and brush control. Both product registrations are pending US EPA approval of the use of the active ingredient fluroxypyr for pasture uses. Fluroxypyr is registered in the United States for cereals and roadside uses. Fluroxypyr use in corn was granted reduced risk designation and the final Section 3 registration for corn, sorghum, turf and range and pasture is expected by 2003. The two new products are Pasturegard[d] and LAF-004 herbicides. Pasturegard is a 1:3 ratio of fluroxypyr ester and triclopyr ester. LAF-004 contains a 1:1 ratio of fluroxypyr ester and picloram salt. This paper will review the unique fit of these two products for pasture brush control.

Current trials indicate that Pasturegard will have a similar use pattern to Remedy[*] herbicide but with increased activity on several important pasture brush species. In trials to date, Pasturegard applied as a broadcast treatment has shown excellent activity on wax myrtle, blackberry and Chinese tallowtree. As a foliar applied individual plant treatment (IPT), Pasturegard has displayed excellent activity on black locust, blackberry, and persimmon. Other IP treatments being explored are basal and dormant stem treatments.

LAF-004 is a planned new product offering to control brush where traditional standards utilize tank mix combinations. Among the species tested, LAF-004 applied as a broadcast treatment controls pricklypear, wax myrtle, Chinese tallowtree, blackberry and rose. As an IP foliar treatment, LAF-004 has shown excellent activity on the same species and on black locust. In addition LAF-004 has shown excellent activity on many broadleaf weed species.

Pasturegard uses will be similar to those of Remedy, but with the addition of fluroxypyr the spectrum of control as a foliar treatment will be increased. LAF-004 will be a single product to control pasture brush with the added benefit of broad-spectrum broadleaf weed control.

[*] Trademark of Dow AgroSciences LLC

BROADLEAF WEED MANAGEMENT OPTIONS IN TALL FESCUE PASTURES. G.K. Breeden and G.N. Rhodes, Jr., University of Tennessee.

ABSTRACT

To produce a high quality and optimum yielding forage, a weed management plan must be executed. Unlike other crops, many forages are more competitive with weeds. This can decrease the need fora herbicide application on a yearly basses. Management of weeds is often complicated by lack of pasture management intensity, expense of herbicides, damage to legumes, and proximity of sensitive crops such as cotton, tobacco, and tomatoes and other vegetables. Herbicides as well as other factors play an important role in a weed management plan.

In 2001, field research was initiated at Alcoa and Sweetwater, TN on natural infestations of buttercup (*Ranunculus sardous*), musk thistle (*Carduus nutans*), common cocklebur (*Xanthium strumarium*) and wingstem (*Verbesina* sp.) in permanent grass (tall fescue) *(Festuca arundinacea)* pastures with established white clover (*Trifolium repens*). Spring applications were evaluated at both locations. A separate trial was established at Sweetwater to evaluate summer applications. Treatments applied in spring experiments included Redeem R&P (0.75, 1, 1.5 and 2 pt/A), 2,4-D ester (2 and 4 pt/A), Banvel (1 pt/A), Weedmaster (2 pt/A) and Grazon P+D (2 and 3 pt/A). Treatments for the summer experiments included Plenum (1, 1.5 and 2 pt/A), Garlon EV (2, 3, 4 and 5 pt/A), Garlon GS (1.33, 2, 2.66 and 3.33 pt/A), Grazon P+D (2 pt/A), Weedmaster (2 pt/A), Redeem R&P (2 pt/A) and Banvel (1.5 pt/A). Experimental units were 10 ft. wide by 30 ft. long. Treatments were replicated 3 or 4 times in a randomized complete block design. Herbicides were applied with a CO_2 pressurized sprayer mounted on a 4-wheeler in a water carrier volume of 15 GPA. Weed control and crop injury were evaluated visually utilizing a 0 to 99% scale.

At Alcoa, excellent (88% or greater) control of buttercup was observed at 5 weeks after treatment (WAT) with 2,4-D ester (4 pt/A), Weedmaster (2 pt/A) and Grazon P+D (2 and 3 pt/A). At 8 WAT control of buttercup was 95% or greater for 2,4-D ester (2 and 4 pt/A), Weedmaster (2 pt/A) and Grazon P+D (2 and 3 pt/A). At both 5 and 8 WAT white clover injury of 97% or greater was observed for all treatments except 2,4-D ester (2 and 4 pt/A). White clover injury from 2,4-D ester (2 and 4 pt/A) was observed to be 34% or less.

At Sweetwater, spring applications of 2,4-D ester (2 and 4 pt/A), Redeem R&P (2 pt/A), Weedmaster (2 pt/A) and Grazon P+D (2 and 3 pt/A) provided excellent (91% or greater) control of buttercup at 5 WAT. Excellent (90% or greater) control of musk thistle was observed at 5 WAT with 2,4-D ester (2 and 4 pt/A), Redeem R&P (0.75, 1, 1.5 and 2 pt/A), Weedmaster (2 pt/A) and Grazon P+D (2 and 3 pt/A). At 5 WAT white clover injury of 94% or greater was observed for Banvel (1 pt/A), Redeem R&P (0.75, 1, 1.5 and 2 pt/A), Weedmaster (2 pt/A) and Grazon P+D (2 and 3 pt/A). White clover injury from 2,4-D ester (2 pt/A) was observed to be 33%. All treatments applied in the summer provided excellent (91% or greater) control of common cocklebur and wingstem. Injury to white clover was 98% or greater for all treatments except 2,4-D.

Redeem R&P will need a rate of 2 pt/A for adequate control of buttercup. All of the products evaluated had substantial white clover damage except 2,4-D. Plenum, Garlon EV and Garlon GS have possibility for use in Tennessee.

REDEEM, A NEW TOOL FOR THE TEXAS URBAN RANCHER. P.A. Baumann, F.T. Moore and L.M. Etheredge Jr., Texas Cooperative Extension, College Station, TX 72701

ABSTRACT

Redeem is a new herbicide developed by Dow AgroSciences containing triclopyr and clopyralid. This product is of interest to small landowners in Texas since it is a non-restricted use herbicide, and non-regulated by the state of Texas. Research was conducted during 2001 to evaluate the efficacy of this herbicide on several troublesome Texas weed species. These included annual broomweed (*Gutierrezia dracuculoides*), marshelder (*Iva annua*), giant ragweed (*Ambrosia trifida*), western ragweed (*Ambrosia psilostachya*) and woolly croton (*Croton capitatus*). Weed heights at application were 6-12", 4-8", 4-12", 4-10" and 4-10", respectively, for the five weed species. Plot size was 10 ft. x 30 ft. and each treatment was replicated three times and arranged in a RCB design. Treatments were applied with a CO2 backpack sprayer calibrated to deliver 15 GPA. Redeem was applied at 1, 1.5, 2 and 2.5 pts./A and compared to Ally (0.2 oz./A), Amber (0.56 oz./A) and Tordon 22K (0.5 pt./A) plus Ally (0.2 oz./A).

All rates of Redeem evaluated provided in excess of 95% annual broomweed, giant ragweed, and wooly croton control. Marshelder and western ragweed were controlled 90% or greater at Redeem rates equal to or exceeding 1.5 pts/A. Ally and Amber were significantly less effective than 1 pt./A of Redeem for controlling giant ragweed, marshelder, and western ragweed. The combination of Tordon 22K and Ally provided giant ragweed, annual broomweed, western ragweed, and wooly croton control equal to the lowest rate of Redeem examined. Weed infestation levels and dry growing conditions prevented accurate crop injury assessments. Redeem was shown in these studies to be a highly effective herbicide for controlling several pernicious Texas pastureland weeds.

UPDATE ON IRON ANTAGONISM OF MSMA. G.E. Coats, J.M. Taylor, J.H. Massey, and R.S. Wright. Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS

ABSTRACT

Previous work has demonstrated that non-chelated sources of Fe were antagonistic to MSMA when used for southern crabgrass control. This work also suggested that chelated sources of Fe antagonized MSMA, but possibly less than non-chelated sources of Fe.

Studies were conducted to determine if $FeSO_4$ was also antagonistic to CMA and DSMA. Applications of 2 lb ai/A MSMA, 2.5 lb ai/A CMA, and 3.0 lb ai/A DSMA were made in 25 gpa with or without $FeSO_4$ at rates ranging from 6 to 43 oz ai/A. All treatments included 0.25%, by vol., Activator 90 (Loveland Industries). Averaged across herbicides, $FeSO_4$ significantly antagonized control with all rates of all arsenical herbicides. Common bermudagrass injury was 20% 30 days after treatment with arsenical herbicides and 0% when $FeSO_4$ was used.

In a separate study, chelated Fe (Sprint 330) at rates up to 11 oz ai Fe/A did not antagonize crabgrass control with 2 lb/A MSMA applied in 25 gpa.

In a third study, crabgrass control was not different when $FeSO_4$ and 2 lb/A MSMA were applied as a tank mix versus applied separately.

EFFECT OF IRON CONCENTRATION, pH and CHELATING AGENTS ON THE IRON ANTAGONISM OF MSMA HERBICIDE. J.H. Massey*, G.E. Coats*, W.P. Henry**, and J.M. Taylor*, *Department of Plant and Soil Sciences, **Department of Chemistry, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Previous research has indicated that when certain iron-containing products are tank-mixed with MSMA in order to reduce herbicide injury to Bermudagrass (*Cynodon dactylon* (L.) Pers.), the control of southern crabgrass (*Digitaria ciliaris* (Retz.)Koel) is also reduced. There exists evidence of the formation of insoluble methanearsonate salts of MSMA when the herbicide is mixed in hard waters containing Ca, Mg and Fe ions. In using iron (Fe) to safen MSMA, relatively high concentrations of Fe are intentionally mixed in the spray tank with the herbicide. As a result, laboratory and field experiments were initiated in 2001 to investigate the chemical nature of reactions occurring between MSMA and high concentrations of Fe.

Aqueous solutions were prepared to contain 59 mM MSMA (formulated as 912 Herbicide) and Fe concentrations of 0, 35, 70 and 140 mM Fe (formulated as $FeSO_4 \cdot 7\ H_2O$). The MSMA concentration was equivalent a field application rate of 2 lb ai applied in 25 GPA. The Fe concentrations were equivalent to the field application rates of 6 oz Fe/A(1/2-X), 13 oz Fe/A (1-X) and 26 oz Fe/A (2-X) applied in 25 GPA. The pH of the solutions was adjusted to 3.1, 4.1 (pK_A) and 5.1, and the UV-visible absorption spectra of MSMA alone, $FeSO_4$ alone and MSMA + $FeSO_4$ mixtures measured from 200 to 800 nm. Whenever Fe(II) as $FeSO_4$ was added to MSMA, a unique absorption feature was observed at 458 nm, indicating the formation of a new chemical complex. The formation of the Fe-$MSMA_{458}$ complex increased with increasing Fe concentration and solution pH. The greatest complex formation occurred at pH 5.1. These results agree with expectations that the negatively-charged (i.e., deprotonated) form of MSMA will serve as a better electron donor (i.e., ligand) to Fe(II) than the neutral herbicide species. Thus, complex formation is favored by increasing Fe concentration and pH. Unlike reactions with Ca(II) and Mg(II) that are ionic in nature, reactions between MSMA and Fe(II) result in the formation of covalent bonds and stable complexes.

When MSMA plus $FeSO_4$ solutions were applied to Bermudagrass turf in field tests, control of southern crabgrass 14 days after application (DAA) decreased with increasing Fe concentration and solution pH. For solutions containing 59 mM MSMA and 70 mM Fe, crabgrass control was reduced from 75 to 45% at pH 3.1 and from 83 to 10% at pH 5.1 ($LSD_{0.05}$ =14.6%). These results correlated with the increased formation of the Fe-$MSMA_{458}$ complex. Concomitant with the loss of southern crabgrass control was a reduction in Bermudagrass injury by MSMA. As $FeSO_4$ addition increased, visual injury 14 DAA declined from 20 to 0%. In contrast, when MSMA was reacted with Fe formulated as Sprint 330, where Fe is strongly chelated by diethylenetriamine pentaacetate, the Fe-$MSMA_{458}$ complex was not observed and there were no differences in crabgrass control when up to 22 oz/A Sprint 330 was added.

Taken together, these results suggest that the antagonism of MSMA by Fe(II) (applied as $FeSO_4$) is the result of the formation of an inactive Fe-MSMA complex(s). Complexation of MSMA by Fe(II) ions protects Bermudagrass from injury by also reduces crabgrass control; both occur as a result of inactive complex formation. Chelation of Fe reduces complexation of MSMA by Fe and, therefore, reduces MSMA antagonism in terms of southern crabgrass control. However, it is anticipated that the lack of MSMA complexation by chelated Fe forms will not protect Bermudagrass from MSMA injury. Thus, there is a dichotomy whereby the protection of Bermudagrass from MSMA injury by the addition of Fe(II) ions comes at the expense of reduced crabgrass control. Chelated forms of Fe should not affect crabgrass control but neither will they protect Bermudagrass against MSMA injury.

***POA ANNUA* AND PERENNIAL RYEGRASS REMOVAL FROM BERMUDAGRASS TURF WITH TADS 14776**. J.L. Belcher and R.H. Walker. Agronomy and Soils Department, Auburn University, Auburn Univ., AL 36849-5412.

ABSTRACT

Traditional compounds used for postemergence control of annual bluegrass (*Poa annua*) in turf often produce marginal results. Factors such as leaching, residual activity, and overseeding safety may limit their use. Similarly, products used to selectively remove perennial ryegrass overseeding may only be partially effective while others may cause injury to desirable warm-season turfgrass. The objectives of these studies were to evaluate TADS 14776 (foramsulfuron) for control of annual bluegrass and perennial ryegrass (*Lolium perenne*) removal.

A study was initiated in the fall of 2000 on a non-overseeded 'Tifway' bermudagrass (*Cynodon dactylon x C. transvaalensis*) research plot to evaluate postemergence annual bluegrass control. Experimental design was a randomized complete block with 3 replications. Plot size measured 4 ft. by 8 ft. Treatments were applied using a CO_2 backpack sprayer set to deliver 30 GPA. Herbicides and rates (lb ai/A) were: TADS 14776 (foramsulfuron) at 0.013, 0.027, 0.041; and Prograss, (ethofumesate) at 1.13. Applications were made for each herbicide rate Nov. 28, 2000, Feb. 26, 2001, or Nov. 28, 2000 followed by a sequential application Feb. 26, 2001. Visual ratings of control (0-100%) were taken over time with 0% representing no control and 100% representing total control. Ratings of percent Tifway greenup was taken 126 days after Nov. treatment, 37 days after treatment when application made in Feb. (126/37 DAT). Data was subjected to ANOVA and means separated using LSD (p=0.05).

A separate study was conducted beginning May 1, 2001 to evaluate perennial ryegrass removal from overseeded 'Tifway' bermudagrass. Plot size measured 4 by 10 ft. Experimental design was a randomized complete block replicated 3 times. Treatments were applied with a CO_2 backpack sprayer set to deliver 30 GPA. Herbicides and rates (lb ai/A) included TADS 14776 at 0.013, 0.027, and 0.041; Manor (metsulfuron) at 0.019; Kerb (pronamide) at 1.0; and Illoxan (fenoxaprop) at 1.0. Additionally, some treatments received Genapol X150, a non-ionic surfactant (NIS), at 1.25% and/or additional nitrogen applied May 7 and May 23, 2001 at a rate of 1.0 lb N/1000 ft^2. Visual ratings were taken over time and included perennial ryegrass control (0-100%) and percent 'Tifway' density (0-100). Data was subjected to ANOVA with means separated with LSD (p=0.05).

Two applications of foramsulfuron at any rate controlled annual bluegrass >97% 126/37 DAT and remained at this level until study's end. The only single application made in Nov. to provide >80% control was foramsulfuron at 0.041 lb ai/A (81%). Foramsulfuron at 0.027 and 0.041 applied in Feb. provided 78-83% annual bluegrass control 55 and 72 DAT. Tifway percent greenup was highest (82-84%) 126/37 DAT with all rates of foramsulfuron applied twice. No other treatment approached this level of greenup at this rating. Ethofumesate failed to control annual bluegrass above acceptable levels (70%) at any rating.

Control of perennial ryegrass 31 DAT was 91, 89, and 94% with foramsulfuron at 0.041, 0.027+NIS+N, and 0.041+N, respectively. Control ranged from 80-86% with foramsulfuron at 0.027, 0.027+NIS, 0.027+N and metsulfuron at 0.019. Greatest Tifway density 31 DAT was 85%-86% with foramsulfuron 0.027+NIS+N and 0.041+N.

FACTORS AFFECTING ANNUAL BLUEGRASS (*Poa annua* L.) CONTROL WITH RIMSULFURON. G.R. Wehtje* and R.H. Walker. Agronomy and Soils Department; Auburn University, Auburn University, AL 36849-5412.

ABSTRACT

Rimsulfuron, a sulfonylurea herbicide, has recently been registered for the control of annual bluegrass (*Poa annua* L. var. *annua*) in bermudagrass turf. Considerable genetic diversity exists within the species *Poa annua.* Populations in our area frequently consist of both a short-lived perennial variety (i.e. variety *reptans*), as well as the more common true winter annual (i.e. variety *annua*). It remains unclear whether these two varieties are equally sensitive to rimsulfuron. Furthermore, it has not been established whether rimsulfuron-based control of annual bluegrass is the result of either foliar and/or root absorption.

In greenhouse studies, flowering-size annual bluegrass was treated postemergence with rimsulfuon at 0.048 lb ai/A in such a manner as to have soil-only, foliar-only and soil+foliar exposure. Foliar-only exposure was obtained by covering soil surface with charcoal prior to herbicide application. Soil-only application was obtained by applying the correct amount of spray solution directly to soil surface so as to avoid any foliar contact. With var. *annua*, both foliar+soil and soil only were equally effective. However, with var *reptans*, foliar+soil was the more effective exposure. Across both varieties, foliar-only exposure was consistently the least effective, indicating that root absorption is of equal importance to foliar absorption. Growth media (field soil versus a sand-peat moss mix) had minimal effect on postemergence activity.

Also in greenhouse studies, preemergence activity of rimsulfuron against germinating *P. annua* seeds was only slightly greater in the sand-peat mix relative to the soil. Preemergence activity was also slightly greater with var. *annua* than with var. *reptans*. Preemergence activity was also rimsulfuron rate dependent. This rate response was more evident

SULFONYL UREA HERBICIDES FOR *POA ANNUA* CONTROL IN BERMUDAGRASS TURF. R.H. Walker and J.L. Belcher. Agronomy and Soils Department, Auburn University, Auburn Univ., AL 36849-5412.

ABSTRACT

Poa annua var. *annua* (POANN) and the perennial, *P. annua* var. *reptans* are common and troublesome weed species in Alabama turf. Research at Auburn University has shown seeds of eight ecotypes to germinate 49 to 89% in a day/night temperature regime of 84/66 F and from 1 to 23% at 102/84 F. These data suggests that *P. annua* has the potential to germinate throughout the growing season in many parts of the Southeast. Therefore, herbicides that lack postemergence (POST) activity may not provide acceptable control.

Rimsulfuron received Federal Registration fall 2001 for use in bermudagrass turf. It has POST activity through both shoot and root absorption and a soil half-life of approximately 5 to 7 days. One labeled use allows for application of rimsulfuron to bermudagrass 10 to 14 days prior to overseeding with perennial ryegrass (LOLPE) and/or rough bluegrass (POATR). This POST application is for control of emerged POANN.

Research was initiated fall 2001 on a Tifway bermudagrass sod to evaluate effects of four sulfonyl urea herbicides applied at two rates and three application dates for POANN control and safety to overseeded LOLPE and POATR. Herbicides and rates (lb ai/A) were: rimsulfuron 0.016, 0.032; trifloxysulfuron 0.016, 0.032, foramsulfuron 0.013, 0.027; and sulfosulfuron 0.04, 0.06. Each treatment was applied either 21, 14 or 7 days before overseeding (DBOS) with LOLPE and POATR on October 19, 2001. LOLPE and POATR were seeded in a monoculture at 15 and 8 pounds/1000 square feet, respectively. Each monoculture occupied one third of each plot and the remaining one third was not overseeded. LOLPE and POATR density and Tifway injury were evaluated 26 days after overseeding (DAOS). POANN counts (number/1.5 square feet) were made 93 DAOS in an area of each plot that had not been overseeded. Data analysis indicated herbicides and applications were significant but rates were not.

LOLPE density was reduced by trifloxysulfuron while all herbicides except foramsulfuron reduced POATR density when averaged over applications and rates. However, density was not unacceptable with treatments that caused some density loss. Application 7 DBOS produced a lower LOLPE and POATR density when averaged over herbicides and rates but density loss was not unacceptable. All herbicides reduced POANN numbers when compared to the non-treated. Reduction was greatest with trifloxysulfuron (82%) and intermediate with rimsulfuron, foramsulfuron and sulfosulfuron (60 to 65%). All treatments produced 10% or less injury to Tifway bermudagrass which did not go dormant until mid-December 2001.

CONTROL OF VA BUTTONWEED AND PURPLE NUTSEDGE IN BERMUDAGRASS WITH CGA-362622. F.H. Yelverton, T.W. Gannon, and J.D. Hinton; Department of Crop Science, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

Trifloxysulfuron (CGA-362622) is a sulfonylurea herbicide developed by Syngenta Crop Protection, Inc. that has activity on hard to control weeds such as Virginia buttonweed (*Diodia virginiana*) and purple nutsedge *(Cyperus rotundus*) while displaying tolerance to common bermudagrass (*Cynodon dactylon*) turf. In 2000, test plots were established at Thorndale Country Club near Oxford, North Carolina to evaluate Virginia buttonweed control and common bermudagrass injury against industry standards. Treatments were initiated July 12 with sequential applications on August 23. Rates (per application / acre) included trifloxysulfuron at 0.47 and 0.59 oz, triclopyr + clopyralid (Confront) at 1 pt and 2,4-D amine + clopyralid + dicamba (Millennium Ultra) at 2.5 pt. A separate test was established at the Plymouth Country Club near Plymouth, North Carolina in 2001 to evaluate purple nutsedge control. Treatments were initiated June 21 with sequential applications on August 2. Rates (per application / acre) included trifloxysulfuron at 0.35 to 0.59 oz, trifloxysulfuron + msma (Bueno 6) at 0.35 oz + 1.33 pt, halosulfuron (Manage) at 1.27 oz and imazaquin (Image LC) at 2.67 pt. Virginia buttonweed was evaluated at 2, 4 and 10 weeks after initial treatment (WAIT) followed by 1 year after initial treatment (YAIT) using a 0 to 100 scale with 0 = no control and 100 = complete control. Common bermudagrass injury was evaluated at 2, 4 and 8 WAIT using a 1 to 9 scale with 1 = complete kill, 5 = minimally acceptable, 9 = no effects. Purple nutsedge ratings were at 4, 6 and 14 WAIT using a 0 to 100 scale.

By 4 WAIT, Confront and Millennium Ultra were providing excellent Virginia buttonweed control (93-100%) while both trifloxysulfuron rates resulted in only fair control (71-81%). 10 WAIT data showed trifloxysulfuron treatments providing excellent control (98-100%) as well as Millennium Ultra (99%). Confront was providing good control (88%) at this time. These trends were similar 1 YAIT. Common bermudagrass injury 2 WAIT with Confront was minimally acceptable (5.0) but recovered by 4 and 8 WAIT. The remaining treatments displayed acceptable tolerance at each of the rating dates. Purple nutsedge control with Image LC was less than with any rate of trifloxysulfuron at all evaluation dates. The final control rating 14 WAIT was 63%. Manage and the tank mix of trifloxysulfuron + Bueno 6 also provided less purple nutsedge control than trifloxysulfuron at all dates except 2 WAIT with 14 WAIT ratings of 63 and 69%, respectively. By 14 WAIT, trifloxysulfuron at 0.35 and 0.47 oz / acre provided good purple nutsedge control (78 to 85%) while the 0.59 oz / acre rate provided excellent control (94%).

SPRING TRANSITION OF OVERSEEDED BERMUDAGRASS FAIRWAYS WITH TRIFLOXYSULFURON SODIUM. S.D. Askew, P.L. Price, E.H. Ervin, and D.R. Chalmers, Virginia Tech, Blacksburg, VA 24061.

ABSTRACT

Trifloxysulfuron (CGA 362622) is a new sulfonylurea herbicide under evaluation by Syngenta™ for use in warm-season turf. The herbicide has activity on both broadleaf and grass weeds including Virginia buttonweed (*Diodia virginiana*)and perennial ryegrass (*Lolium perenne*). Selective removal of perennial ryegrass from bermudagrass (*Cynodon dactylon*) would allow use of trifloxysulfuron as a transition aid in overseeded bermudagrass. Field studies were conducted to evaluate trifloxysulfuron sodium for control of perennial ryegrass 'Common Wealth II' and effects on transition back to bermudagrass 'Vaymont' monoculture.

The study was conducted in cooperation with Peter McDonnough at Keswick Club near Keswick, VA in spring 2000 and 2001. Ten treatments were arranged in a randomized complete block design with three replications. Herbicides were first applied mid May each year in a carrier volume of 280 L/ha. Trifloxysulfuron was applied at 2.5, 5.0, 10, and 15 g ai/ha either as single applications or with a second application one month after the first. A single application of pronamide at 1.1 kg ai/ha was applied mid May as a comparison treatment. Trifloxysulfuron was applied with nonionic surfactant at 0.25% (v/v). A nontreated check was included to facilitate visual estimation of turf quality, ryegrass control, and bermudagrass injury.

At 18 days after initial treatment (DAT), trifloxysulfuron controlled ryegrass between 13 and 93% as herbicide rate increased from 2.5 to 15 g ai/ha. Pronamide controlled ryegrass 67% 18 DAT. Only the high rate of trifloxysulfuron caused noticeable bermudagrass injury (10%). At 28 DAT, trifloxysulfuron controlled ryegrass between 30 and 99% depending on rate. No significant injury was apparent as bermudagrass began to green up. At 42 DAT, all trifloxysulfuron treatments controlled ryegrass at least 90% except single applications at 5 g ai/ha or lower. This level of ryegrass control was equivalent to pronamide. At this later rating, bermudagrass injury became more apparent as decreased growth and turf density compared to the nontreated check. At rates $\geq$ 10 g ai/ha, two applications of trifloxysulfuron injured bermudagrass at least 28%. Pronamide and other treatments of trifloxysulfuron did not significantly injure bermudagrass. At 70 DAT, all treatments except trifloxysulfuron applied once at or below 5 g ai/ha controlled ryegrass at least 97%. Bermudagrass had fully recovered and no significant injury was noted. All treatments increased turf quality compared to the nontreated check. Results indicate that trifloxysulfuron applied once at 10 g ai/ha controls perennial ryegrass quicker than pronamide but may slow bermudagrass post-dormancy transition. Trifloxysulfuron applied twice at 2.5 to 5 g ai/ha controls perennial ryegrass slower than pronamide and does not injure bermudagrass.

WEED MANAGEMENT IN WARM-SEASON TURFGRASS WITH CGA 362622. B.J. Brecke and J.B. Unruh; West Florida Research and Education Center, University of Florida, Jay, FL 32565.

ABSTRACT

Studies were conducted at the University of Florida, West Florida Research and Education Center, Jay, FL to evaluate CGA 362622 for control of both annual and perennial weed species in bermudagrass and turfgrass tolerance in bermudagrass and St. Augustinegrass. At 2 wk after treatment (WAT), CGA 362622 (30 g a.i./ha) controlled southern crabgrass [*Digitaria ciliaris* (Retz.) Koel.] equal to MSMA (95%) but was less effective than MSMA 5 WAT (60 vs. 95%). CGA 362622 applied twice at 50 g/ha, with treatments spaced 6 wk apart, provided better torpedograss (*Panicum repens* L.) control (95%) than a single treatment at 75 g/ha (65%) when evaluated 12 WAT. Torpedograss control with the sequential program was comparable to that observed with the standard quinclorac + diclofop. Bahiagrass (*Paspalum notatum* Fluegge) control was similar for both CGA 362622 (30 g/ha) and MSMA (85% 2 WAT, 65% 15 WAT). Control was improved to 95% 15 WAT when CGA 362622 (20 g/ha) was mixed with MSMA. CGA 362622 (25 g/ha applied twice) provided 90% Virginia buttonweed (*Diodia virginiana* L.) control 9 WAT but control declined to 70% 15 WAT. Single applications of CGA 362622 (50 g/ha) controlled purple nutsedge (*Cyperus rotundus* L.) (90%) nearly as well as sequential treatments (95%) and better than halosulfuron or MSMA alone. A sequential treatment of CGA 362622 (25 g/ha) provided 95% control of cocks-comb kyllinga (*Kyllinga squamulata* Thonn. ex Vahl) 17 WAT, better than halosulfuron (80%). Bitterblue, Delmar, Floratam, Palmetto, and Raleigh cultivars of St. Augustinegrass tolerated single application of CGA 362622 up to 50 g/ha. Bitterblue, Floratam and Raleigh tolerated one application at 75 g/ha. None of the cultivars tolerated multiple application of CGA 362622. The dwarf bermudagrass cultivars TifEagle, Floradwarf and Tifdwarf tolerated CGA 362622 at rates up to 75 g/ha.

EVALUATION OF EXPERIMENTAL SULFONYLUREA HERBICIDES IN TURFGRASS. L.B. McCarty and J.K. Higingbottom, Dept. of Horticulture, Clemson Univ., Clemson, SC 29634-0375.

ABSTRACT

Various experimental and recently labeled sulfonylurea herbicide were screened for turf tolerance and selective weed control. Several experiments were conducted in 2000 and 2001 all arranged as randomized complete blocks with three replications. Plot size were 1.5 sq.m. with treatments applied using a CO_2- powered backpack sprayer calibrated at 20 GPA (187 l/ha). Data takened included visual weed control percentages and turf injury from 0 to 100 where 30% was maximum acceptable. Data was analyzed using ANOVA with means separated with LSD (0.05).

Centipedegrass (*Eremochloa ophiuroides*, ‘Common’), Tifway bermudagrass (*Cynodon dactylon* x *C. transvaalensis*), and zoysiagrass (*Zoysia japonica*, ‘Meyer’) tolerance to flazasulfuron 25DG up to 5.71 oz/a with or without 0.02% w/w nonionic surfactant was excellent with no detectable damage to the zoysiagrass and a maximum injury of 10% to the bermudagrass and centipedegrass through 14 days after treatment (DAT). ‘Palmetto’ St. Augustinegrass (*Stenotaphrum secundatum*) damage was between 23 and 27% 7DAT and 38 to 42% damage 28DAT with rates ranging from 1.43 to 5.71 oz/a. By 42DAT, the 5.71 oz/a rate still had 30% turf damage while the others were within acceptable ranges.

Postemergence purple nutsedge (*Cyperus rotundus*) control was a maximum of 35% 21DAT with 2.86 oz/a applied once. With sequential applications 21 days after the initial, 78% control was achieved with 1.43 oz/a fb 1.43 oz/a. The 2.15 fb 2.15 oz/a rate yielded a maximum of 85% control 42 days after the initial application. As a comparison, Manage 75 WP (halosulfuron) at 1 fb 1 oz/a provided 95% control 42 days after initial treatment. Crabgrass (*Digitaria* spp.) control with flazasulfuron 25DG was <25% with rates up to 2.86 oz/a.

Postemergence purple nutsedge control with CGA-362 75WG was ≤25% at 0.5 oz/a 4 weeks after treatment. Control increased to >90% with sequential applications 5 weeks after the initial at either the 0.35 or 0.5 oz/a rate. Perennial kyllinga (*Kyllinga brevifolia*) control was 100% with 0.35 fb 0.35 oz/a, 0.5 fb 0.5 oz/a with or without MSMA combinations. Pensacola bahiagrass (*Paspalum notatum*) control was ~30% with single 0.5 oz/a applications and ~80% control with 0.5 fb 0.5 oz/a 5 weeks after the initial. Dallisgrass (*Paspalum dilatatum*) control was <40% with 0.5 fb 0.5 oz/a made 5 weeks apart. ‘Tifway’ bermudagrass injury was <10% 14DAT with 0.5 fb 0.5 oz/a.

In 2000-01, Perennial ryegrass (*Lolium perenne*) establishment was unaffected with rimsulfuron 25DG applied preemergence at 1 oz/a either 45 or 21 days before overseeding (DBO) in September. Ryegrass stand was reduced between 15 to 45% when applied just prior to overseeding through March. *Poa annua* control was 90% in February when rimsulfuron was applied just prior to overseeding but only 13 to 60% control when applied 21 to 45 DBO. By April, *Poa annua* control was ~60% when 1 oz/a rimsulfuron was applied just prior to overseeding, ~50% when applied 21 DBO and <5% control when applied 45 DBO. In 2002, *Poa trivialis* (Roughstalk bluegrass) stand establishment was unaffected with either 1 or 2 oz/a rimsulfuron applied 14 DBO.

In 2001-2002, perennial ryegrass turf tolerance 3 weeks after postemergence V-10029 80WP (bispyribac-sodium, Velocity) was unaffected with 0.7 oz/a, marginal acceptable with 1.4 oz/a and unacceptable with 2.8 oz/a. Turf color recovered to equal the untreated 4 weeks later.

In 2001-2002, perennial ryegrass turf quality in December following November application of Mon449 (sulfosulfuron) 75WP was unaffected at 0.4 and 0.6 oz/a but unacceptable with 0.8 oz/a.

COMPETITION OF GIANT SMUTGRASS IN A BAHIAGRASS PASTURE. J. Mullahey, J. Dusky, and A. Bennett, West Florida Research and Education Center, Milton, FL 35281; Univ Florida, Gainesville, FL, 32611; Everglades Research and Education Center, Belle Glade, FL 33430.

ABSTRACT

Giant smutgrass (*Sporobolus indicus* var. pyramidalis) is an invasive non-native plant that has become a serious weed problem in pastures throughout Florida and the southeastern United States (Mislevy et al. 1980). Two types of smutgrass (SPOIN) exist in Florida; small SPOIN (*Sporobolus indicus* var. indicus) and giant SPOIN or West Indian dropseed grass. In a recent survey in south Florida, a majority of ranchers had 30% of their pastures heavily infested with smutgrass (SPOIN) (Adjei et al. 2000). SPOIN shades bahiagrass resulting in lower forage production and forage quality. Control options include grazing and herbicides. Giant SPOIN is taller, more robust, and is more invasive compared to the small SPOIN. Information is lacking on the competition of SPOIN with pasture grasses like bahiagrass as it relates to pasture production and pasture grass recovery following the application of herbicides. The objective of this study was to evaluate the effect of three SPOIN populations and the application of Velpar herbicide on bahiagrass production.

A competition experiment between bahiagrass and SPOIN was conducted in 1998 and 1999. Plots (20' X 20' in 1998; 30' X 30' in 1999) were arranged in a completely randomized design and replicated ten times. Treatments consisted of SPOIN populations that were based on percent ground cover (low= <20%, medium= >20% but < 70%, high= >70%). A single application of Velpar herbicide (1.0 lb a.i./a) was applied (7-28-98 &99) to a half of each plot. All plots were fertilized (50 lb N/a) 1 month after applying the herbicide. Bahiagrass and SPOIN yield was measured by clipping the standing grass within a 4 ft^2 frame, separating by species, and drying the samples to determine a final dry weight. Plots were clipped in June, July, Aug, September, October, and one and two years after study initiation. Data were analyzed as a split plot and treatment differences (0.05 level) were determined using the LS Means procedure. Yield data were analyzed to determine possible SPOIN population effects and then for population and Velpar effects. When no interaction was detected the data were pooled over years.

Bahiagrass yield in October from the high SPOIN population was reduced by 62% and yield was reduced by 26% for the medium SPOIN population compared to the low population. In both years, SPOIN yield (no herbicide) steadily increased from June through October with highest yields recorded in October. SPOIN yield in October from the high population (10,202 kg/ha) was 3.5 times greater than the medium population (5,128 kg/ha) and 7 times greater than the low population (1,402 kg/ha). During the same time period, bahiagrass yields increased across all three SPOIN populations with yields from the low and medium populations averaging 2242 kg/ha, while yield was 1568 kg/ha from the high population. After two growing seasons, the SPOIN yield from the low population was similar to the yield from the high population, indicating continued dispersal of seed and spread of SPOIN if not controlled.

Velpar controlled SPOING successfully (>90%) 5 WAT. In the low and medium smutgrass populations, Velpar application at 12 WAT in the low and medium SPOIN populations injured the bahiagrass, resulting in a 17-32% reduction in bahiagrass yield. However, at 1-year post treatment, bahiagrass yield from the Velpar treated areas was 55%, 36%, and 23% higher compared to yield from the untreated areas for the high, medium, and low SPOIN populations. Low yields (0-152 kg/ha) of SPOIN were measured in the Velpar treated areas 1-year post treatment which indicated that follow-up patch spraying might be needed to control escape plants and new plants from seed.

1. Adjei, M.B., J. J. Mullahey, P. Mislevy and R. S. Kalmbacher. 2000. Smutgrass control in perennial grass pastures. Univ Florida, EDIS AA261.
2. Mislevy P. and W.L. Currey. 1980. Smutgrass (Sporobolus poiretii) control in South Florida. Weed Science 28:316-320.

MANAGEMENT AND DALLISGRASS (*Paspalum dilatatum*) AND SMUTGRASS (*Sporobolus indicus*) IN MISSISSIPPI PASTURES. K.D. Burnell*, J.D. Byrd, Jr., J.W. Barnett, Jr., P.R. Marchbanks, and D.B. Mask. Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Accord 4 L at 2 % (v/v) and 4 qt/A, Arsenal 2 AS at 8 oz/A, Fusilade DX 2 EC at 10 oz/A, Oasis 6 AS at 8 and 12 oz/A, Select 2 EC at 8 oz/A, Touchdown IQ 3 AS at 2 % (v/v) and 4 qt/A, Velpar 2 L at 3 pt/A, and an untreated. Applications were made May 9, 2001 with Burch Wet Blade delivering 1 GPA to 10 by 40 ft plots arranged in a randomized complete block design with three replications. Smutgrass was 6 to 10 inches tall and mowed to four-inch height with the Burch Wet Blade. Visual ratings were taken 20, 40, and 90 day after treatment (DAT).

Results from Monticello data indicated that postbloom applications provided a 20% higher control of smutgrass 100 and 160 DAIT. Dowpon at 4 lb/A applied prebloom provided 83% control compared to 22% for all other treatments 100 DAIT. Applied postbloom, Dowpon at 4 lb/A (75%), Velpar at 3 pt/A (64%), and Oasis at 10 oz/A (85%), were the only treatments that provided above 50% control 100 DAIT. At 160 DAIT, only Velpar at 3 pt/A applied prebloom provided < 50% smutgrass control. At both rating dates, Dowpon caused 30 to 50% bahiagrass injury. Injury from Oasis at 10 oz/A applied prebloom was 32 and 17% 100 and 160 DAIT, respectively. Injury from Oasis at 10 oz/A applied postbloom was 43% and 32% 100 and 160 DAIT, respectively. Oasis at 6 and 8 oz/A and Velpar at 3 pt/A provided <20% injury at all rating dates. No differences between timings were seen.

Raymond data indicated that postbloom provided 70% control and prebloom control was only 35% for dallisgrass control 100 DAIT. Dowpon at 4 lb/A (90%) and Oasis at 8 or 10 oz/A (91 and 93%) when applied postbloom compared to all other treatments (73%) at 100 DAIT. By 160 DAIT, Oasis at 8 or 10 oz/A and Dowpon at 4 lb/A applied postbloom were the only treatments to provided >50% control. Oasis at 10 oz/A and Dowpon at 4 lb/A applied postbloom controlled dallisgrass 75 and 63%, respectively. Timing differences were seen only 100 DAIT. All treatments caused < 30% bermudagrass injury 100 DAIT, with highest injury caused by Oasis at 8 oz/A (28%) and Dowpon at 4 lb/A (25%) applied postbloom. By 160 DAIT, only Velpar at 3 pt/A and Oasis at 6 oz/A provided <20%. Dowpon at 4 lb/A and Oasis at 8 or 10 oz/A caused between 37 and 63% injury at both application timings.

Experiment 2 results indicated that Touchdown IQ at 4 qt/A and Accord at 4 qt/A provided > 90% smutgrass control 40 and 90 DAT, but caused unacceptable injury at both rating dates. Control with Arsenal at 8 oz/A was approximately 70%, and while unacceptable injury occurred 40 DAT, by 90 DAT, injury was acceptable. Oasis at 8 oz/A 40 and 90 DAT provided 57 and 67% control, respectively, and after the 40 DAT rating (38%), injury was acceptable. Control with Select at 8 oz/A at 90 DAT was identical to Oasis at 8 oz/A (67%), but dropped below 50% control by 40 DAT. Injury from Select was acceptable by 90 DAT. Fusilade at 16 oz/A and Oasis at 12 oz/A performed similarly and provided approximately 50% control by 40 and 90 DAT.

MANAGEMENT OF MUSK AND OTHER INVASIVE THISTLES IN OKLAHOMA. J.F. Stritzke, Department of Plant and Soil Sciences, Oklahoma State University, Stillwater, OK 74078.

ABSTRACT

Three invasive thistles, bull thistle (*Cirsium vulgare*), musk thistle (*Carduus nutans*), and scotch thistle (*Onopordum acanthium*), are currently the three invasive thistles documented as growing in Oklahoma. Canada thistle (*Cirsium arvense*) and distaff thistle (*Carthamus lanatus*), have been identified in the past, but currently no known infestations of either exist. Canada thistle plants were collected from the Oklahoma panhandle in 1944, but no additional plants have been identified. Two infestations of distaff thistle were identified in central Oklahoma about 20 years ago, but were eradicated with Grazon P+D (picloram + 2,4-D, ½ lb + 2 lb ae/gallon, respectively). The "Oklahoma Thistle Law" as currently amended states: 1) all landowners must prevent seed production of musk, Scotch and Canada thistles on their land; 2) Oklahoma Department of Agriculture must do an annual survey to determine thistle infestations; 3) Extension Service is to provide recommendations on control; and 4) landowners are subject to be fined $1000/day for each violation.

From 1990 t0 2000, 11 herbicide studies were conducted on infestations of invasive thistle to determine effective herbicide treatments for stopping seed production. This included seven studies on musk, and two each on bull and scotch thistles. Herbicide treatments in the early experiments included: fall and spring treatments to rosette plants of 2,4-D alone (1.5 lb ae/A), Weedmaster (1pt product/A), Grazon P +D (1 pt product /A, and 3/10 oz of Ally (metsulfuron, 80%)/A). Additional herbicide treatments were evaluated in some of the later studies, plus some experiments only included spring applications to rosettes and bolted plants. All herbicide applications were made with a pressurized CO_2 backpack sprayer, and 20 gallons per acre spray volume. All herbicide treatments had 0.25 % v/v non-ionic surfactant added to the spray mixture. The experiments were arranged in a randomized complete block design with 3-4 replications. In six of the studies, control estimates were based on plant density of plants remaining at flowering in sprayed plots compared with unsprayed check. In the remaining studies, control estimates were visual estimates of thistles remaining in sprayed plots compared to unsprayed check.

Control of musk thistle with fall and spring applications to rosettes was 92 to 100% control of plants with 1.5 lb ae/A of 2,4-D and 2 pt/A of Weedmaster, and 98-100 with 2 pt/A of Grazon P +D. The excellent control with these treatments is attributed to having annual rosettes, since plants are acting like annuals. Two pints of Grazon P +D applied to bolted plants in late April and Late May was also very effective at stopping seed production of musk thistles. Control of flowering was 100% in five of 7 studies, and 99% and 82% in the other 2 studies. The 82% control resulted on a site where some biennial plants were present in the population. Control of flowering with 2,4-D alone and Weedmaster applied to bolted plants was not that effective at stopping seed production. Flower reduction with 2,4-D varied from 43 to 100%, and with Weedmaster, it varied from 62 to 100%. With Ally, good suppression of musk thistle plants resulted, but quite often plants were not killed and there would be axillary growth, especially with fall sprayings. However, Ally applied to bolted plants resulted in 100% control of flowering in five of 7 studies, and 94 and 96% at the other two locations.

In Oklahoma, control of bull thistle is more difficult than control of musk thistle. Control of bull thistle was 100% when 1 and 2 lb/A of 2,4-D amine were applied in fall, but control was no better than 83% when applied to rosettes in spring. Applications of 2 pt/A of Weedmaster or Grazon P +D resulted in better than 94% with fall and spring applications to rosettes, and to annual bolted plants. Allied was not very effective on bull thistle. Control ratings were less than 58% except for one 82% control with one fall application.

Control of Scotch thistle was not acceptable with applications of 2,4-D alone. Control with 2 lb/A was 18% when applied in fall and 74% when applied to rosettes in spring. Ally (3/10 oz/A) and 2 pt of Grazon P +D or Weedmaster applied to rosette plants in the fall resulted in better than 94% control. However, spring applications of Ally and Weedmaster to rosettes was only 84 and 85%, respectively, compared to 92% control with 2 pt/A of Grazon P + D. Getting adequate control of bolted scotch thistles may require mixing Ally with Weedmaster or Grazon P + D. Ally at 0.15 oz/A plus 1 pt/A of Weedmaster applied to bolted plants resulted in 97% control, compared to only 82 % control with 2 pt /A of Weedmaster alone.

HORSENETTLE (*SOLANUM CAROLINENSE*) CONTROL WITH GRAZON P+D® IN TALL FESCUE PASTURES. J.E. Beeler, T.C. Mueller, and G.N. Rhodes Jr.; University of Tennessee, Department of Plant Science and Landscape Systems, Knoxville, TN 37996.

ABSTRACT

Industries associated with pastures (beef and dairy cattle) and hay production accounted for over 32% of Tennessee's total agricultural income between 1994 and 1999. Successful weed control is a vital part of any forage or haying operation. Horsenettle (*Solanum carolinense*) is a problematic weed in Tennessee pastures and hayfields. Its tuberous root system makes it difficult to control with either mowing or herbicides. Grazon P+D® has shown promise for horsenettle control. This herbicide is a premix combination of 2 lb/gal 2,4-D and 0.5 lb/gal picloram.

Two experiments were conducted in Hamilton County, TN to evaluate Grazon P+D® for horsenettle and buttercup control and ladino clover tolerance in a tall fescue pasture. Treatments included 2 and 4pt/A early (4-6"), mid (early flower), and late (1st fruit) POST. All applications included 0.25% non ionic surfactant and were made using a CO_2 backpack sprayer calibrated to deliver 10 gallons per acre of water carrier. Due to sporadic density of this weed, a large plot size (10X30ft) was used and two untreated control plots per replication were included. Treatments were applied between 12 June and 30 July (early summer experiment) and then repeated between 30 July and 7 Sept. (late summer experiment). Plots were mowed prior to applications. Visual evaluations (based on a scale of 0-100%, with 0 indicating no forage injury or weed control and 100 indicating forage death or complete weed control) were recorded every 2 weeks between 25 June and 26 Sept. for the early summer treatments, and 10 Aug. to 26 Sept. for the late summer treatments. Horsenettle stem density was measured from a 4' X 10' sample in all plots on 26 Sept. The sample area equaled approximately 13% of the plot area. Data was subjected to analysis of variance and means were separated using Fischer's Protected LSD test at the 0.05 level of probability.

For ease of discussion, all results will focus on late season (Sept. 26) evaluation time. Buttercup control and ladino clover injury was >95% for all treatments. All early summer treatments provided greater than 80% control of horsenettle. All late summer treatments applied early and mid post provided 99% control. Late summer treatment applied late post provided < 60% control at 20 days after treatment, although this was similar to the control provided by all other applications at 20 days after treatment. Plant senescence did not allow for evaluations of these treatments after 26 Sept. The number of horsenettle stems in all early summer treatments plots was statistically equal to 0 plants/sample on 26 Sept., while untreated checks contained >30 stems/sample. Late summer treatments applied early and mid post contained 0 horsenettle stems/sample. The stem density of horsenettle in the late post treatments was not significantly different from that in the untreated checks (>20 stems).

Though the second year of data has yet to be collected, Grazon P+D® provided good horsenettle control and may be valuable to forage producers.

USING DIGITAL PHOTOGRAPHY TO QUANTIFY THE EFFECTS OF HERBICIDES ON TURFGRASS GROWTH. J.W. Boyd, M.D. Richardson and D.E. Karcher. University of Arkansas, Little Rock, AR.

ABSTRACT

The usual method of evaluating the effect of herbicides on warm-season turfgrass sprig grow-in is to visually estimate the percent turfgrass cover at regular intervals and compare it to a weed-free control or a standard herbicide treatment. Visual ratings may be subjective, especially when a variety of researchers collect data. A study was undertaken to evaluate the potential of digital image analysis as a tool to provide an accurate and objective measure of turfgrass groundcover. Plot photographs were taken with an Olympus Camedia C-3040ZOOM digital camera equipped with a wireless, remote shutter release. An L-shaped stand made from 1.5 inch PVC pipe with a camera bracket attached was used to hold the camera 6 feet above the center of the plots. Digital images were analyzed using SigmaScanâ software; a program that separates specific colors within a digital image and then quantifies the area of that image that containing that color. Tifway bermudagrass was sprigged at 400 bushels per acre on a center pivot irrigated, sandy loam soil in central Arkansas. The sprigs were treated on July 10, 2001. Visual and digital estimates of percent turfgrass cover were made at 27, 35, 45, 72 and 86 DAT (days after treatment). Visual estimates of percent groundcover at 27 DAT were greater than those generated with image analysis. Careful evaluation of the data showed that digital estimates were more accurate than visual ratings. In other words, we tended to see more than what was there. At the 35 and 45 DAT evaluation dates, visual and digital image analysis values were very consistent. However, at 72 and 86 DAT, the SigmaScanâ software underestimated the percent turfgrass cover. It was determined that this error was due to shadows in the digital images. The cover analysis macro was rewritten so that the program analyses could be corrected by using a calibration image from the current set of images to compensate for shadows. This alteration in the program brought late season digital values in line with visual estimates. This methodology offers an inexpensive, rapid and objective method of evaluating turfgrass grow-in.

USE OF IMAGE PROCESSING FOR MONITORING VIRGINIA BUTTONWEED (*DIODIA VIRGINIANA* L.) REGROWTH AFTER HERBICIDE TREATMENT. J.T. Staples* and R.H. Walker, Alabama Agric. Exp. Stn., Auburn University, Auburn, AL. 36849-5412

ABSTRACT

The most common method of evaluating herbicide efficacy is visual observation. Visual observation is prone to variation due to individual color perception, degree of plant necrosis, and experience. A study was initiated to investigate to use of digital image classification as a quantitative method of monitoring Virginia Buttonweed (*Diodia virginiana* L.) control and regrowth in the spring of 2001at the Auburn University Turfgrass Research Unit, Auburn, Alabama.

Virginia buttonweed seeds were germinated in a greenhouse using a 90:10 sand peat growing media. Seedlings were transplanted mid-March when they were 3-4 cm in size into 1-L styrofoam cups containing the same media. Plants were fertilized weekly until they were transplanted into the field study on April 27. Study contained seven treatments. A randomized complete block design with four replications was used. Plots were 1.2 by 6.1 m with three Virginia buttonweed plants per plot on 1.5 meter spacing (ie. 3 plants per plot).

Herbicide treatments selected had shown potential for controlling Virginia buttonweed in previous experiments. They were: metsulfuron, chlorsulfuron, trifloxysulfuron, fluroxypyr, triclopyr + diflufenzapyr, triclopyr + clopyralid + diflufenzapyr applied at 0.043, 0.28, 0.037, 0.28, 0.42 + 0.14, and 0.63 + 0.21 + 0.14 kg of active ingredient per hectare, respectively. CoHort DC surfactant was included in all treatments at 1.5 g per L. Prior to the herbicide application on July 9, digital photographs were taken of a 1-square meter area surrounding each plant with a Nikon 990 Coolpix. The Nikon 990 Coolpix provided high-resolution images where 1 pixel = 0.75 mm (ie 1.76 million pixels/m^2). This camera was placed directly above each plant, 1 meter from the soil surface using a rigid PVC stand and a permanent grid system to ensure the camera was repositioned consistently for each image throughout this study. Both visual ratings and photographs were taken at 2-week intervals after herbicide application. Upon completion of the fourth week after treatment evaluations, all above ground tissue and seeds were removed to insure continued monitoring of the original plant. Regrowth was then monitored until November 2, 2001. Collected images were classified using ERDAS Imagine 8.5 software. Using the supervised classification and a tailor-made signature file for each imaging date, the percent surface area containing Virginia buttonweed in each image was determined.

All data were subjected to ANOVA and treatment means separated by LSD comparison at the 0.05 level. Analysis of both visual and digital evaluations concluded that Triclpopyr + clopyralid + diflufenzapyr provided the best control of Virginia Buttonweed at greater than 90% four weeks after treatment. Following this treatment, only one of the twelve treated plants across all replications showed regrowth. Metsulfuron-treated plants displayed the largest regrowth potential with some plants regaining their initial size one month after top growth removal (8 weeks after herbicide treatment). Digital image classifications showed the same trends as visual observations, but allowed each plant to be compared to its initial pretreated condition throughout the evaluation process. Digital classifying can be an effective, quantitative method for evaluating herbicide performance through plant response.

POA ANNUA CONTROL OPTIONS IN OVERSEEDED TURF. B.T. Bunnell*, L.B. McCarty, and J.K. Higingbottom. Clemson University, Department of Horticulture, Clemson, SC. 29634-0375.

ABSTRACT

Poa annua control in overseeded turf poses a long-term challenge to turfgrass managers. The growth habit and noxious seedhead production of *Poa annua* reduces the quality and aethestic value of overseeded golf course fairways and greens during winter and spring months. The objective of this research was to provide selective control of *Poa annua* while allowing the establishment of overseeded perennial ryegrass (*Lolium perenne*) fairways following a variety of pesticide applications at various rates and timings.

Two *Poa annua* control studies were performed during fall and spring of 2000 and 2001 on perennial ryegrass overseeded 'Tifway' bermudagrass (*Cynodon dactylon x transvaalensis*). Each study was performed on a golf course fairway and research plots in Clemson, SC. The first study observed treatment combinations of Barricade 65 WG (prodiamine) at 0.38, 0.5, and 0.75 lbs ai/A and dual postemergence applications of Primo 1 EC (trinexapac-ethyl) at 0.12 lbs ai/A in October, 2 weeks apart. Barricade applications were made at 8 or 10 weeks before overseeding (WBO) or 4 weeks after overseeding (WAO). The second study evaluated Dimension 0.25 G, 40 WP, and 1EC (dithiopyr) at 0.5 lbs ai/A at various timings and Kerb 50 WP (pronamide) at 1.5 lbs ai/A at 6 WBO, Rubigan 1 AS (fenarimol) at 2.0 followed by (fb) 2.0 fb 0.68 lbs ai/A at 45 days before overseeding (DBO), 30 days after overseeding (DAO), and a December application, respectively. Other treatments included Ronstar 2 G (oxidiazon) at 2.0 lbs ai/A at 45 DBO, and Barricade 65 WG at 0.5 lbs ai/A at 45 DBO.

Visual ratings were taken monthly. *Poa annua* control and overseeded grass cover and injury was rated on a 0-100% scale with 0%=worst and 100%=best. Minimum acceptable overseeded grass cover was 70%.

In the Barricade/Primo study, no differences occurred in perennial ryegrass cover as all treatments allowed >70% cover in February and March at both locations. On the golf course fairway, best *Poa annua* control (>90%) followed all applications of Barricade and Barricade/Primo applications at both ratings in February and March. On the research plots, ≥70% control followed all treatment combinations except Barricade at 0.38 lbs ai/A (8 WBO), an application of Barricade 0.5 lb ai/A (10 WBO) fb the dual application of Primo, and a sequential application of Barricade at 0.38 (8 WBO) fb 0.5 lb ai/A (8 WAO) at the February rating date. By March, >80% controlled followed sequential applications of Barricade at 0.38 lbs ai/A (8 WBO fb 4 WAO) and an application of Barricade at 0.75 lbs ai/A (10 WBO) fb the dual application of Primo.

In the Dimension study, differences occurred between the two locations. On the research plots, >70% perennial ryegrass cover followed all treatments applications at all rating dates. The golf course fairway showed <70% perennial ryegrass cover with Kerb, Ronstar, and Barricade. *Poa annua* control was not consistent between locations. On the research plots, >70% *Poa annua* control followed Ronstar at 2.0 lbs ai/A (45 DBO). All other treatments failed to provide >70% control through March. The low control on the research plots may be attributed to the artificial seeding of *Poa annua* because of soil fumigation 3 years prior. On the golf course fairway, good (>80%) *Poa annua* control followed all treatments except those including the 40 WP formulation of Dimension at 0.5 lbs ai/A.

In summary, good long-term *Poa annua* control followed most applications of Barricade. In the Dimension study, only Ronstar gave acceptable control in both trial locations, however it did not provide acceptable ryegrass cover at all rating dates. Research will continue on long-term *Poa annua* control with varying pesticide combinations, timings, and rates. Sulfonylurea herbicides and DMI fungicides may potentially open new avenues of *Poa annua* control in overseeded turf. Additionally, improvements in establishment of overseeded turf species are necessary by adjusting seeding rates and dates.

PERENNIAL RYEGRASS TOLERANCE AND ANNUAL BLUEGRASS CONTROL IN OVERSEEDED BERMUDAGRASS. T.W. Gannon, F.H. Yelverton, and L.S. Warren; Department of Crop Science, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

Bermudagrass (*Cynodon dactylon*) is often overseeded in North Carolina to provide winter color and a uniform playing surface. Along with the advantages of overseeding come disadvantages including reduced weed control options leading to increased weed incidence.

Annual bluegrass (*Poa annua*) is a specific example of a winter annual weed that becomes more difficult to control in overseeded areas. Annual bluegrass is a bunch type winter annual, yellow-green in color which contrasts with overseeded perennial ryegrass (*Lolium perenne*), making it undesirable in highly maintained turf areas.

A field trial was initiated in the fall of 2000 to evaluate herbicides applied prior to planting at various intervals for annual bluegrass control and perennial ryegrass establishment. Another trial was initiated in the fall of 2001 to measure perennial ryegrass establishment only. Treatments included various rates and timings of Balan (benefin), Barricade (prodiamine), Dimension (dithiopyr), Pendulum (pendimethalin), and Ronstar (oxadiazon).

Treatments were compared for annual bluegrass control and perennial ryegrass establishment and categorized based on data collected. Excellent treatments, or treatments providing greater that 90% control of annual bluegrass and did not reduce the perennial ryegrass establishment greater than 10% as compared to the nontreated, included Barricade applied at 0.5 lb ai/a 10 WBO (weeks before overseeding), Barricade at 0.38 and 0.5 lb ai/a 8 WBO, and a split application of Balan applied at 2.75 lb ai/a each at 6 WBO and 6 WAO (weeks after overseeding). Good treatments, providing 80 – 89% of annual bluegrass and reducing perennial ryegrass establishment between 11 and 20%, included Barricade 0.75 lb ai/a 10 WBO, Barricade applied in a split application 0.38 lb ai/a each at 8 WBO and 4 WAO, and Balan 2.75 lb ai/a and Dimension 0.5 lb ai/a applied 6 WBO. Treatments evaluated with limited success included Dimension 0.5 lb ai/a, Pendulum 2 lb ai/a, and Ronstar 2 lb ai/a all applied 8 WBO.

SPLIT SEASON APPLICATION TIMINGS FOR PREEMERGENCE CONTROL OF SUMMER ANNUAL GRASSES. M.J. Fagerness; Department of Horticulture, Forestry, and Recreation Resources, Kansas State University, Manhattan, KS 66506.

ABSTRACT

Preemergence (PRE) herbicides have been the recognized standard for control of summer annual grasses in turf. However, recent concerns over summer breakdown of PRE herbicides has fostered new debate over how to optimize summer annual grass control in the transition zone. One option to achieve this goal may involve splitting application timings of PRE herbicides to extend their control period further into summer. Two application timing studies were therefore conducted to address this issue, one targeting large crabgrass (*Digitaria sanguinalis*) and the other goosegrass (*Eleusine indica*). The study targeting large crabgrass was conducted at the John Pair Horticultural Research Center in Wichita, KS while the goosegrass study was conducted at Manhattan Country Club in Manhattan, KS. Both studies featured three PRE herbicides, prodiamine, dithiopyr, and pendimethalin, applied at 0.73, 0.56, and 3.36 total kg a.i./ha, respectively. Applications timings for each study were early December only, late March only, and early December followed by late May/early June. The latter timing regime included splitting the applied a.i. equally between the two application dates. Results showed that control of both weed species was better with prodiamine or dithiopyr than with pendimethalin. Split application timings enhanced control of large crabgrass with either dithiopyr or pendimethalin but not with prodiamine. The split application timing regime only improved goosegrass control with pendimethalin. Evidence of summer PRE herbicide breakdown for either weed species was only discernible with pendimethalin treatments. The author concludes that split application timings may offer significant improvements in summer annual grass control, especially when using pendimethalin. However, the increased costs associated with using either prodiamine or dithiopyr instead of pendimethalin may be justified, considering both the improved weed control these PRE herbicides offer and the costs associated with using a suitable postemergence herbicide to supplement weed control in pendimethalin treated turf.

EFFECTS OF POSTEMERGENCE HERBICIDES ON CENTIPEDEGRASS SEED PRODUCTION J.A. Ferrell, T.R. Murphy, and W.K. Vencill; Department of Crop and Soil Sciences, University of Georgia, Athens, GA, 30602 and Griffin, GA, 30223.

ABSTRACT

Field studies were initiated in summer of 2001 to determine the effect of postemergence herbicide application timing on seedhead suppression, seed yield and percent seed germination of centipedegrass (*Eremochloa ophiuroides*). Clethodim, sethoxydim and halosulfuron were applied at 0.25, 0.28, and 0.06 lb ai A^{-1}, respectively, at 4 WBS (weeks before seedhead emergence), 2 WBS, 0 WBS, 2 WPS (weeks post seedhead emergence) and 4 WPS. Surfactants were added to each treatment as indicated by the product label. The clethodim treatments were more injurious to centipedegrass compared to sethoxydim and halosulfuron. Two weeks after treatment, clethodim suppressed seedhead emergence by 50% and 32% when applied 0 WBS and 2 WPS, respectively. Sethoxydim treatments also demonstrated 20% and 18% seedhead suppression, 2 weeks after treatment, when applied 0 WBS and 2 WPS, respectively. Clethodim and sethoxydim significantly decreased seed yield when applied 0 WBS, 2 WPS and 4 WPS with the greatest decline occurring at the 2 WPS treatment timing for both herbicides. Percent seed germination was decreased when clethodim was applied 2 WPS and 4 WPS. Sethoxydim treatment timing had to effect on percent seed germination. Halosulfuron had no effect on seedhead emergence, seed yield or percent seed germination, regardless of application timing.

ANNUAL WEED CONTROL WITH OASIS (*Imazapic + 2,4-D*). M.F. Gregg*, J.K. Higingbottom, and L.B. McCarty. Department of Horticulture, Clemson University, Clemson S.C. 29634-0375.

ABSTRACT

Annual ryegrass (*Lolium multiforum*), little barley (*Hordeum pusillum*) and field sandspur (*Cenchrus incertus*) are common annual grass weeds in turf. These species invade poorly maintained sites in sandy soils, such as bermudagrass roadsides and pastures. Field studies were conducted in April and September 2001 to evaluate herbicides for postemergence control of annual ryegrass, little barley and field sandspur.

Postemergence annual ryegrass and little barley control was evaluated in a roadside rough turf area in Clemson, S.C. Plot size measured 5 x 5 ft and three replications utilized. Field sandspur control was established in a coastal bermudgrass pasture in Hopkins, S.C. Plot size measured 5 x 10 ft with three replications. Experimental design of each study was a randomized complete block with data subjected to ANOVA with means separated using LSD (α=0.05).

The annual ryegrass and little barley control study included 8 treatments. Annual ryegrass control was applied on March 9, 2001 to dormant turf, and April 19, 2001 to 50% green turf. Little barley control was applied initially to dormant turf on March 28, 2001 and April 19, 2001 to 50% green turf. Treatments applied on dormant turf included Oasis 6 EC (imazapic + 2,4-D) at 0.18 lb ai/A, 0.28 lb ai/A, or 0.37 lb ai/A; Gramoxone 1.0 SL (paraquat) at 0.18 lb ai/A. Treatments applied to 50% green turf consisted of Oasis 6 EC at 0.18 lb ai/A, 0.28 lb ai/A or 0.37 lb ai/A. All treatments applied to dormant and 50% dormant turf were applied with Optima surfactant at 0.25% V/V. Treatments were applied with a CO_2 pressurized sprayer calibrated to deliver 20 gal/A.

The sandspur control study included 10 treatments applied on July 2, 2001. Treatments included Oasis 6 EC at 0.18 lb ai/A, 0.18 lb ai/A + 32-0-0, 0.28 lb ai/A, 0.28 lb ai/A + 32-0-0; Drive 75 DF (quinclorac) at 0.75 lb ai/A; MSMA 6.6 EC; and Princep 4L (simazine) at 1.0 lb ai/A. Treatments applied on July 13, 2001 included Image 70 DG (imazaquin) at 0.375 lb ai/A and Image 70 DG at 0.375 lb ai/A + MSMA 6.6 EC at 1.0 lb ai/A. Oasis treatments without fertilizer were applied with Optima surfactant at 0.25% V/V. Oasis treatments with fertilizer delivered 65 lbs. of actual nitrogen/acre. Drive 75 DF & MSMA 6.6 EC treatments were applied with a MSO surfactant at 1.5 pt/A. Treatments were applied with a CO_2 pressurized sprayer calibrated to deliver 20 gal/A.

Annual ryegrass control was rated May 1, 2001; little barley seedhead suppression rated April 19, 2001; and field sandspur rated August 30, 2001. Weed control was visually rated on a 0-100%, scale with 0% = no control, and 100% = complete control. Seedhead suppression was visually rated with 0% = no suppression and 100% = full suppression.

Oasis 6 EC at 0.28 lb ai/A initially applied to dormant turf provided 100% annual ryegrass control on May 1, 2001. Treatments providing >90% control include Oasis 6 EC at 0.18 lb ai/A, 0.37 lb ai/A and Gramoxone 1.0 SL at 0.18 lb ai/A. On May 1, 2001, Oasis 6 EC at 0.18 lb ai/A, 0.28 lb ai/A, and 0.37 lb ai/A provided greater than 70% annual ryegrass control on 50% treated green turf.

Oasis 6 EC at 0.37 lb ai/A provided >80% seedhead suppression on little barley while Oasis at 0.28 lb ai/A provided >75% suppression when treatments were initially applied to dormant turf. No measurements were recorded past May 1, 2001 due to drought weather and recent mowing inhibiting true herbicide effects.

MSMA 6.6 EC at 2.0 lb ai/A provided >95% control of field sandspur. Image 70 DG at 0.37 lb ai/A + MSMA 6.6 EC at 1.0 lb ai/A and Oasis 6 EC at 0.28 lb ai/A + 32-0-0 provided >60% control. All other treatments provided < 35% control at this rating date.

EFFECTS OF OASIS APPLICATION TIMING, CARRIER, AND RATE ON BERMUDAGRASS TOLERANCE. L.M. Etheredge, Jr., P.A. Baumann, F.T. Moore, T.J. Butler; Texas Cooperative Extension, College Station, TX 77843-2474.

ABSTRACT

There are approximately 15 million acres of improved pastureland in Texas where broad-spectrum weed control is an important component of bermudagrass (*Cynodon dactylon*) hay production. Although many broadleaf herbicides are available, grass control has been a recurring problem. Several herbicides have been evaluated in an effort to achieve broad-spectrum weed control of both broadleaves and annual grasses, but significant crop injury has occurred.

Recently, BASF Corp. has developed Oasis herbicide which contains the active ingredients imazapic and 2-4,D. It provides broadleaf weed and annual grass control in pasturelands, however, bermudagrass injury from Oasis has been a problem that requires remediation. Research was conducted during 2001 to evaluate the effects of Oasis on two popular Texas bermudagrass varieties at two locations. These included Coastal and Tifton 85 bermudagrasses. Plot size was 8 ft. x 20 ft. and treatments were replicated four times and arranged in a RCB design. Treatments were applied with a CO_2 backpack sprayer calibrated to deliver 20 GPA. Two herbicide application timings were evaluated at crop heights of 2-3 in. (stubble) and 6-8 in. (regrowth) within both varieties. Water or urea ammonium nitrate (UAN 32-0-0) were evaluated as herbicide carriers, and Oasis was applied at 2, 4, 6, 8 oz./A. Dry Nitrogen fertilizer (70 lbs./A) was applied in the water carrier treatments to compensate for the 32% UAN applications in the other treatments. Three harvests were collected at 30, 80, and 130 days after initiating the study.

All rates of Oasis significantly decreased crop yields in the first harvest, regardless of application timing, carrier or variety. No yield reduction was observed in the sequential harvests. In fact, there were significant yield increases in the second harvest from all Oasis treatments in the Tifton 85 bermudagrass study, and from the 8 oz./A treatment in the Coastal bermudagrass study. All other treatments in the Coastal bermudagrass study were equal in yield to the untreated areas. All yields collected in the third harvest were equal. However, the initial injury in the first harvest was substantial and resulted in significant seasonal yield reductions. Neither application timing or herbicide carrier influenced seasonal yields.

PERFORMANCE OF OASIS FOR CONTROLLING DALLISGRASS, WOOLLY CROTON, FIELD SANDBUR, AND PURPLE NUTSEDGE. F.T.Moore, P.A. Baumann, and L.M. Etheredge, Jr.; Texas Cooperative Extension, College Station, TX 77843.

ABSTRACT

Oasis is a herbicide developed by BASF Corporation that contains imazapic and 2,4-D. There are few products that effectively control grass and sedge weed species that are labeled in pasturelands and hay meadows. Therefore, Oasis herbicide was evaluated in field trials during 2001 to assess control of dallisgrass (*Paspalum dilatatum*), woolly croton (*Croton capitatus*), field sandbur (*Cenchrus incertus*), and purple nutsedge (*Cyperus rotundus*). Oasis herbicide was applied to shredded dallisgrass at 2-3" tall and non-shredded dallisgrass at 6-12" tall in one study. The shredded dallisgrass applications were an attempt to simulate post hay harvest applications. In another study, woolly croton control was evaluated for effectiveness of PRE applications of Oasis. PRE and POST applications of this herbicide were examined in the same study for controlling field sandbur and purple nutsedge. Plot size was 10 ft. x 30 ft. and treatments were replicated three times and arranged in a RCB design. Treatments were applied with a CO_2 backpack sprayer calibrated to deliver 20 GPA. The Oasis rates evaluated included 2.0, 4.0, 6.0, 8.0, 10.0, and 12.0 oz./A.

A rate of 12.0 oz./A of Oasis wase required to provide 70% control or greater of dallisgrass. No consistent differences were observed between shredded and non-shredded plots. Oasis provided excellent (>95%) season-long preemergence control of woolly croton. With the exception of the 2.0 oz./A rate, both PRE and POST applications at rates of 4.0 oz./A or greater provided excellent (>96%) control of field sandbur through mid season. However, control diminished by late season. POST applications to purple nutsedge at rates of 4.0-8.0 oz./A were required to achieve 90% control or greater. PRE applications at rates of 2.0-8.0 oz./A provided only fair (78% to 82%) control. Weed infestation levels and dry growing conditions prevented accurate crop injury assessments. It was determined that Oasis herbicide provided fair control of dallisgrass and excellent control of woolly croton, field sandbur and purple nutsedge.

TOLERANCE OF SEASHORE PASPALUM (*PASPALUM VAGINATUM*) TO COMMON TURF HERBICIDES.
J. B. Unruh, B.J. Brecke, and L. E. Trenholm. University of Florida, Institute of Food and Agricultural Sciences, West Florida Research and Education Center, Jay, FL 32565.

ABSTRACT

Seashore paspalum (*Paspalum vaginatum*) is a warm-season grass that grows naturally in coastal environments, often found in brackish marsh water or in close proximity to ocean waters. Seashore paspalum produces a high quality turfgrass and is gaining popularity in Florida. Weed management in Seashore paspalum, as in any turfgrass species, is an important component of an overall turfgrass management system. Though a wide array of herbicides is available for effective weed control in many turfgrass species, Seashore paspalum tolerance to many of these herbicides has not been fully investigated. Preliminary research has indicated that Seashore paspalum may tolerate pendimethalin, halosulfuron, and mixtures of 2,4-D + dicamba + MCPP. However, information about Seashore paspalum's tolerance to other herbicides applied preemergence or postemergence under Florida's environmental conditions is not available.

In order to determine the tolerance of Seashore paspalum to herbicides commonly used for weed management in turfgrass, studies were conducted at two sites in Florida. Herbicides used for preemergence and postemergence control of grass, broadleaf, and sedge species were evaluated in 2000 at Old Collier Golf Club, Naples and in 2001 at the West Florida Research and Education Center, Jay on 'Salam' Seashore paspalum. Preemergence treatments were applied in early March while postemergence herbicides were applied during mid-May. Seashore paspalum injury was visually rated each week after herbicide application using a scale of 0 (no injury) to 100% (dead turf).

Prodiamine 65WG (1.12 kg ai/ha), pendimethalin 60WG and 2G (2.24 kg ai/ha), benefin + trifluralin 0.86G (3.36 kg ai/ha), oxadiazon 2G (3.36 kg ai/ha), dithiopyr 1EC (0.43 kg ai/ha), metolachlor 7.62L (2.24 kg ai/ha), pronamide 50WP (1.12 kg ai/ha), and fenarimol 1AS (2.24 kg ai/ha) caused minimal injury (5 to15%) to the Seashore paspalum when applied in March. Oryzalin 4FL (2.24 kg ai/ha) and benefin + oryzalin 2G (3.36 kg ai/ha) slowed growth of Seashore paspalum more than the other preemergence treatments (20 to 25% injury) and caused some yellowing of the turfgrass. The turfgrass recovered quickly from most of the preemergence treatments, however, injury from oryzalin and benefin + oryzalin was still evident 4 weeks after treatment (WAT).

The postemergence grass herbicides quinclorac 75DF (1.68 kg ai/ha), metsulfuron 60DF (0.032 kg ai/ha), and metribuzin 4F (0.28 kg ai/ha) caused little or no injury to Seashore paspalum. Ethofumesate 1.5EC (3.36 kg ai/ha), clethodim 0.94EC (0.28 kg ai/ha), sethoxydim 0.28EC (0.31 kg ai/ha), and asulam 3.34EC (2.24 kg ai/ha), however, severely damaged (35 to 70%) the turfgrass and injury was still observable 6 WAT. 2,4-D + MCPP + dicamba 4.58SC (1.12 kg ai/ha), dicamba 4S (0.28 kg ai/ha), bromoxynil 2EC (0.56 kg ai/ha), and atrazine + bentazon 5L (1.68 kg ai/ha) commonly applied postemergence for broadleaf weed control, caused slight (<10%) early injury from which the Seashore paspalum rapidly recovered. Clopyralid 3SC (0.42 kg ai/ha) did not injure Seashore paspalum. Bentazon 4SC (2.24 kg ai/ha), halosulfuron 75WG (0.071 kg ai/ha), and imazaquin 70DG (0.42 kg ai/ha) had no negative affect on Seashore paspalum. Imazapic 70DG (0.11 kg ai/ha), CGA362622 75DG (0.05 kg ai/ha), and MSMA 6EC (2.24 kg ai/ha), however, severely (40 to 45%) damaged the Seashore paspalum turfgrass. While the turfgrass recovered from the MSMA treatment, CGA 362622 and imazapic injury remained at 25% 6 WAT. The results from this two-year study suggest that several herbicides commonly used for weed management in turfgrass are tolerated by Seashore paspalum and cause no long-term damage to the turfgrass.

PREEMERGENCE CRABGRASS (*DIGITARIA ISCHAEMUM)* CONTROL IN TURF TYPE TALL FESCUE (*FESTUCA ARUNDINACEA*). C.J. Cox*, L.B. McCarty, J.K. Higingbottom.

ABSTRACT

Tall fescue (*Festuca arundinacea)*, a bunch type perennial grass, is used in the transition zone of the Southern United States, where year-round turf cover is desirable, primarily in home lawns. Crabgrass, however, is a persistent C_4 summer annual grass, which effectively competes with the C_3 fescue during summer months. The objective of this investigation was to determine the efficacy of commercial and experimental herbicides for crabgrass control in turf type tall fescue.

Two studies were conducted at Clemson, University. Study one investigated the treatment efficacy of commercially available chemicals including Pendulum (Pendimethalin), Surflan (Oryzalin), Ronstar (Oxadiazon) and three experimental formulations of dithiopyr designated as MON-29882, MON-58430, and MON-8459. Study two investigated the efficacy of Dimension (Dithiopyr), Pendulum (Pendimethalin), Barricade (Prodiamine) and various rates of experimental herbicides designated as XF-00090, XF-00091, XF-00272, XF-01005 and SARS-295. The experiments subjectively determined the control of smooth crabgrass (*Digitaria ischaemum*) on a percentage scale with 100% designated as total control.

Both studies were designed in a randomized complete block arrangement with individual plots measuring 1.5 m x 2.0 m replicated three times. Plots were mowed to simulate a home lawn and maintained at 2.5 inches. Treatments were applied using a CO_2 backpack spray boom or granular shaker-can depending on herbicide formulation. Treatments for study one were applied on March 13 with a sequential application on May 8. Treatments for study two were applied on March 13, April 24, and May 8. For each study, ratings were taken between June and August at 90, 102, 120, 150 days after the initial application.

In study one, Pendimethalin at 3.0 lb ai/A, split applications of Pendimethalin at 1.5 lb ai/A, split applications of Surflan at 1.5 lb ai/A, and one application of Surflan at 3.0 lb ai/A provided greater than 90% control throughout the study. MON-58430 at 1.83 lb ai/A followed by a sequential application of 0.92 lb ai/A provided 75% throughout the study.

In study two, five formulations of the XF herbicides [0.164 G (0.25 lb ai/A), 0.25 G (0.38 lb ai/A), 2.5 SC (0.25 lb ai/A), 2.5 SC (0.38 lb ai/A), 2.0 SC (0.38 lb ai/A)] were successful (> 90%) at controlling crabgrass throughout the study. Additionally, Dimension [1EC (0.38 lb ai/A), 40 WP (0.38 lb ai/A)], Pendulum [3.8 CS (1.5 lb ai/A X 2), 3.8 CS (3.0 lb ai/A), 3.3 EC (1.5 lb ai/A X 2), 3.3 EC (3.0 lb ai/A), 2 G (3.0 lb ai/A)], Barricade [65 DF (0.38 lb ai/A X 2), 65 DF (0.5 lb ai/A)], also controlled crabgrass at greater than 90%.

Future research in this area may include experimentation with additional herbicides. Further, it is necessary to investigate more rates and timings with the herbicides utilized in this study to maximize crabgrass efficacy while insuring the integrity of the tall fescue.

PROHEXADIONE CALCIUM FOR TURFGRASS AND WEED MANAGEMENT. J.B. Beam, S.D. Askew, Virginia Tech, Blacksburg, VA 24061, and K.M. Jennings, BASF Corp., RTP, NC 27709.

ABSTRACT

Gibberellin inhibitors, e.g. paclobutrazol and trinexapac-ethyl, reduce clipping weights and mowing requirements in most turfgrass species. Paclobutrazol also controls annual bluegrass (*Poa annua*). Prohexadione calcium, a new gibberellin inhibitor for turfgrass, was tested for turfgrass growth management and annual bluegrass control in Virginia. In growth management experiments, plots were mowed weekly for 10 wk and clippings collected, dried, and weighed beginning on August 15, 2001. Field-tested species included established stands of bermudagrass (*Cynodon dactylon* (L.) Pers. 'Vamont'), Kentucky bluegrass (*Poa pratensis* L. 'Midnight'), perennial ryegrass (*Lolium perenne* L. 'Prosport'), and zoysiagrass (*Zoysia japonica* Steud. 'Mayer'). Greenhouse-tested species included perennial ryegrass 'Prosport', tall fescue (*Festuca arundinacea* Schreb 'Chewings') and Kentucky bluegrass 'Viva'. One day after the second weekly mowing, prohexadione calcium was applied with 0.25% v/v Kinetic™ nonionic surfactant (NIS) at 0, 0.14, 0.27, 0.41, 0.54, and 0.68 kg ai/ha. Comparison treatments included NIS alone and trinexapac-ethyl at the label rate for each species. A second application was applied 3 wk after the first for prohexadione calcium and 4 wk for trinexapac-ethyl. Data were subjected to analysis of variance and regression analysis was used to describe the effects of prohexadione calcium rate on clipping biomass.

Based on regression trends from field experiments, prohexadione calcium reduced 8 wk cumulative clipping biomass of all species and reduced turfgrass growth equivalent to trinexapac-ethyl at rates of 0.2 kg ai/ha in Kentucky bluegrass, 0.7 kg ai/ha in perennial ryegrass, 0.7 kg ai/ha in bermudagrass, and 0.3 kg ai/ha in zoysiagrass. In greenhouse experiments, prohexadione calcium reduced 6 wk cumulative clipping biomass equivalent to trinexapac-ethyl at rates of 0.4 kg ai/ha in tall fescue, 0.2 kg ai/ha in Kentucky bluegrass, and 0.7 kg ai/ha in perennial ryegrass. Significant discoloration of Kentucky bluegrass and perennial ryegrass was noted with trinexapac-ethyl and prohexadione calcium in field experiments following first frost. Discoloration did not occur in greenhouse experiments.

In annual bluegrass control experiments, prohexadione calcium was applied at the same rates and timings as in growth management experiments, although additional treatments were added. Field studies were conducted at Virginia Tech Golf Course in Blacksburg, VA and Chantilly Turf Farms in Chantilly, VA. At Blacksburg, prohexadione calcium was applied three times at 3 wk intervals and ethofumesate at 1.5 kg ai/ha (applied twice at 3 wk intervals) was included as a comparison. At Chantilly, prohexadione calcium was applied twice at 3 wk intervals and paclobutrazol at 0.56 kg ai/ha (applied twice at 3 wk intervals) was the comparison treatment. Two additional comparison treatments were included at both locations to evaluate adjuvants [1% v/v crop oil concentrate (COC) and 1% v/v methylated seed oil (MSO)] with prohexadione calcium at 0.41 kg ai/ha. At Blacksburg, tests were conducted on a Kentucky bluegrass fairway with 5 to 90% annual bluegrass coverage. At Chantilly, tests were conducted in a fallow area with 95% or greater annual bluegrass coverage. Ethofumesate controlled annual bluegrass > 90% 8 and 12 wk after initial treatment (WAT). Prohexadione calcium + NIS at increasing rates controlled annual bluegrass 40 to 70% 8 WAT and 50 to 80% 12 WAT. Annual bluegrass control by prohexadione calcium was not affected by adjuvant type. Prohexadione calcium controlled annual bluegrass equivalent to paclobutrazol at rates of 0.41 kg ai/ha or greater.

PREEMERGENCE CRABGRASS CONTROL WITH WEED AND FEED PRODUCTS. A.G. Estes*, J.K. Higingbottom, and L.B. McCarty. Clemson University, Department of Horticulture, Clemson, SC. 29634-0375.

ABSTRACT

Crabgrass (*Digitaria spp.*) is a summer annual grass weed common in home lawns and golf courses. Crabgrass is a tufted type grass that produces unsightly seedheads, which disrupts the uniformity of the turf. The purpose of this research was to investigate the efficacy of various preemergent herbicides impregnated on various fertilizer sources for crabgrass control.

In the spring of 2001, several studies were conducted at Clemson University investigating preemergent crabgrass control in bermudagrass and fescue. Plot size for each treatment measured 1.5 m by 1.5 m, replicated three times. Granular treatments were applied using a shaker can in multiple directions to ensure uniformity. Bermudagrass was maintained at 0.5 inches, while fescue was maintained at 2.5 inches throughout the study duration. Initial preemergence applications were made on March 30, 2001 with various Nature Safe fertilizers impregnated with preemergent herbicides. Treatments included a 20-1-5; 20-1-5 + Dimension (Dithiopyr) (0.23G) at 0.25 lb ai/A or 0.5 lb ai/A; 20-1-5 + Barricade (Prodiamine) (0.3G) at 0.25 lb ai/A or 0.5 lb ai/A; 20-1-5 + Ronstar (Oxadiazon) (1.5G) at 1.5 lb ai/A or 3.0 lb ai/A; 11-1-0; 11-1-0 + Dimension (0.23G) at 0.25 lb ai/A or 0.5 lb ai/A; 11-1-0 + Barricade (0.3G) at 0.25 lb ai/A or 0.5 lb ai/A; 11-1-0 + Ronstar (1.5G) at 1.5 lb ai/A or 3.0 lb ai/A. In a third study, various commercial grade weed and feed products were evaluated. This study consisted of five treatments replicated three times. Plot size for each of the treatments measure 2.0 m by 2.0 m. Initial applications were made on March 13, 2001 with Turf Builder (30-3-4) + Halts (Pendimethalin) at 1.5 lb ai/A, Sta-Green (28-3-4) Premium Crab-Ex (Dithiopyr) at 0.237 lb ai/A, Vigoro (30-3-4) Crabgrass Preventer (Dithiopyr) at 0.237 lb ai/A, and Schultz (29-3-3) Crabgrass Preventer (Prodiamine) at 0.314 lb ai/A.

Visual crabgrass ratings were taken on June 12, June 28, July 15, and August 13, 2001. Ratings were based on a scale of 0-100% with 0% representing no control and 100% representing no crabgrass present.

In the final visual ratings on August 13, 2001 excellent control (90%-100%) in bermudagrass resulted from all four Dimension treatments. Fair control (70%-79%) in the bermudagrass study resulted from the 20-1-5 + Barricade at the 0.5 lb ai/A rate. All other treatments in the bermudagrass study resulted in unacceptable control (<70%). In the fescue study, good control (80%-89%) resulted from the 20-1-5 + Dimension at 0.5 lb ai/A rate. Fair control (70%-79%) followed the 11-1-0 + Dimension at 0.5 lb ai/A rate. All other treatments in the fescue study had unacceptable control (<70%). With the commercial grade weed and feed products, excellent control (90%-100%) was achieved with Turf Builder + Halts. Good Control (80%-89%) followed the Sta-Green Premium Crab-Ex. Unacceptable (<70%) control resulted from both Vigoro and Schultz Crabgrass Preventer.

NIMBLEWILL CONTROL IN COOL-SEASON TURF. S.D. Askew, J.B. Beam, and S.R. King, Virginia Tech, Blacksburg, VA 24061.

ABSTRACT

Nimblewill (*Muhlenbergia schreberi*) is one of the most common perennial grass weeds in Virginia lawns. Often mistaken for common bermudagrass (*Cynodon dactylon*), nimblewill ranges from the mountains to the coastal plain and can be found in many turf species and settings. A search of extension recommendations from seven universities, including Virginia Tech, did not uncover any guidelines for selective control of nimblewill in cool-season turfgrass. Two new herbicides, mesotrione and isoxaflutole, show promise for selective postemergence control of nimblewill in cool-season turf. Studies were conducted to evaluate herbicide programs including the agricultural formulations of mesotrione and isoxaflutole for postemergence control of nimblewill and turf tolerance.

Two field experiments were conducted in mature turfgrass (> 10 yr) at different locations in Blacksburg. Areas with uniform nimblewill infestation were selected. Turf species were predominately Kentucky bluegrass (*Poa pratensis*) and tall fescue (*Festuca arundinacea*) with occasional perennial ryegrass (*Lolium perenne*). Nimblewill infestation ranged from 10 to 100% coverage in all plots at densities between 100 to > 1000 plants per m^2. Plots were two by two meters. The study design was a randomized complete block with treatments replicated three times. Experimental areas were mowed at 9 cm with the mulching attachment in place to prevent movement of clippings between adjacent plots. Herbicides were sprayed with a CO_2 pressurized backpack sprayer at 280 L/ha. Treatments included: isoxaflutole applied once at 0.03, 0.08, and 0.17 kg ai/ha or twice at 0.03 kg/ha; mesotrione applied once at 0.03, 0.08, 0.17, and 0.28 kg ai/ha or twice at 0.03 kg/ha; triclopyr applied once at 1.1, 2.2, and 3.4 kg ai/ha or four times at 1.1 kg/ha; and fenoxaprop applied four times at 0.10 kg ai/ha. All sequential applications were applied at 10 d intervals. Weed control was visually evaluated at 4 and 8 weeks after initial treatment (WAT).

Only mesotrione at 0.28 kg ai/ha injured turf (10 to 20%). No injury was noted at lower rates of mesotrione or from other herbicide treatments. Triclopyr at any rate controlled white clover (*Trifolium repens*) at least 99%. Clover control increased with increasing isoxaflutole rate between 83 and 99%, while the lowest rate applied sequentially controlled clover 100%. Mesotrione and fenoxaprop did not effectively control white clover. Triclopyr at ≥ 1.1 kg ai/ha, isoxaflutole at ≥ 0.08 kg ai/ha, and mesotrione at ≥ 0.08 kg ai/ha controlled ground ivy (*Glechoma hederacea*) at least 88%. Repeated applications of triclopyr were more effective than repeated applications of fenoxaprop for nimblewill control. However, these herbicides did not control nimblewill greater than 47%. Nimblewill control increased with increasing mesotrione and isoxaflutole rates. At four WAT, mesotrione and isoxaflutole at ≥ 0.08 kg ai/ha controlled nimblewill at least 70%. At eight WAT, more nimblewill regrowth was evident in mesotrione-treated plots compared to isoxaflutole-treated plots. Sequential applications provided better control than single applications. For example, isoxaflutole and mesotrione at 0.08 kg ai/ha controlled nimblewill 62 and 30%, respectively 8 WAT; two 0.03 kg ai/ha treatments controlled nimblewill 87 and 55%, respectively. Results indicate that triclopyr and fenoxaprop are not viable options for selective nimblewill control in cool-season turfgrass. Mesotrione and isoxaflutole at appropriate rates selectively control nimblewill without harming desirable turf.

BERMUDAGRASS CONTROL PRIOR TO TALL FESCUE ESTABLISHMENT WITH CLETHODIM AND GLYPHOSATE. C.L. Main, D.K. Robinson, T.C. Mueller, University of Tennessee, Knoxville.

ABSTRACT

Common bermudagrass (Cynodon dactylon) is an invasive, perennial weed of cool-season turfgrass in Tennessee. Complete renovation of the infested area is typically the only practical method of restoring desirable cool-season turfgrasses. Two experiments were initiated in 2001 to determine the utility of clethodim in eradication of common bermudagrass for reestablishment of tall fescue (Festuca arundinacea) lawns.

The first trial evaluated clethodim alone and in combination with glyphosate for bermudagrass control. Glyphosate and clethodim application rates were 1.5 qt/A and 17 oz/A, respectively. All sequential applications were applied 14 days apart. Treatments included: glyphosate followed by (fb) glyphosate; clethodim + non-ionic surfactant (NIS) fb glyphosate; glyphosate + clethodim + NIS fb glyphosate; clethodim + NIS fb clethodim + NIS; glyphosate + clethodim + NIS fb glyphosate + clethodim + NIS; and an untreated control.

A second trial investigated re-seeding intervals following clethodim applications to determine clethodim persistence. Clethodim was applied at 17 oz/A with NIS four, three, two, and one weeks prior to re-seeding and at re-seeding. Glyphosate (1.5 qt/A) was applied to the entire test area two weeks prior to re-seeding to control unwanted vegetation. Treatments in both tests were applied using a CO_2 backpack sprayer calibrated to deliver 18 gallons of herbicide solution per acre. Tall Fescue was seeded using a slit-seeder on October 5. The studies utilized a randomized complete block design with either three or four replications. Evaluations included common bermudagrass control 14, 28, 42, and 56 days after treatment and tall fescue quality rankings.

Common bermudagrass control was excellent (99%) with all treatments except clethodim fb clethodim (67%) and the untreated check. Tall Fescue quality was 8.0 on a 9 point scale for all treatments except clethodim fb clethodim (4.0) and the untreated check (2.0). Additionally, plots not receiving a glyphosate application displayed more broadleaf weed pressure. Tall Fescue establishment rated a 8.0 for clethodim applications two, three, and four weeks prior to seeding. Clethodim applications one week prior to seeding and at seeding reduced stand quality to 4.3 and 3.7, respectively. Treatments will be evaluated in the spring of 2002 for common bermudagrass control after green up.

WARM-SEASON TURFGRASS RENOVATION USING ROUNDUP PRO AND TILLAGE COMBINATIONS. F.C. Waltz Jr.*, T.R. Murphy, J.K. Higingbottom, A.G. Estes, and L.B. McCarty. University of Georgia, Griffin, GA, 30223 and Clemson University, Clemson, SC 29634.

ABSTRACT

Weedy grass species like common bermudagrass (*Cynodon* sp.), a warm-season perennial that reproduces by seed, stolons, and rhizomes, is difficult to selectively control in other warm-season turfs like hybrid bermudagrass (*Cynodon dactylon* X *C. transvaalensis*) and zoysiagrass (*Zoysia* sp.). Common Bermudagrass is common in the Southeastern United Sates and is has been used along roadsides, as a forage, for soil stabilization, and a fine turf. However, due to its coarse texture and intolerance to low mowing heights, common bermudagrass is not a desirable species for golf course fairways. Likewise, bermudagrass is a common weed in zoysiagrass sod fields and home lawns. Two field experiments were initiated to evaluate various rates of Roundup Pro (glyphosate) and tillage combinations for long term control of bermudagrass and efficacy on reestablishment of other turfgrass species into previously infested areas.

Study 1 was conducted at the turfgrass research facility at Clemson University, Clemson, South Carolina. The study was established in a five-year old stand of an off-type hybrid bermudagrass. Plots were 2 m x 5 m in a randomized complete block design with 3 replications. Using a CO_2 backpack sprayer set to deliver 187 l ha^{-1}, initial postemergence treatments were applied beginning on May 26, 2001. Treatments were based on four tillage and sprigging regimes. Regime A consisted of tilling and sprigging the treated area 10 days after initial herbicide application. Treatments consisted of a single application of Roundup Pro at 5.6 kg ai ha^{-1} and Roundup Pro at 4.5 kg ai ha^{-1} with a sequential 4.5 kg ai ha^{-1} application 72 hours later. The first treatment in regime B consisted of 2 applications of Roundup Pro at 4.5 kg ai ha^{-1} with the second application 31 days following the initial. Plots were tilled and sprigged 7 days following the sequential application. The second treatment in regime B used the same rates and timings, but plots were tilled after the first application and tilled and sprigged following the second application. All plots in regime C were tilled and sprigged following the last herbicide application. The first treatment consisted of three applications of Roundup Pro at 2.2 kg ai ha^{-1} spaced 31 and 21 days apart. In the second treatment, Roundup Pro was applied at 3.5 kg ai ha^{-1} followed by 2.2 kg ai ha^{-1} at 31 days after initial and 2% v/v 21 days later. Similarly, the third treatment used the same timings but Fusilade II (fluazifop) at 0.4 kg ai ha^{-1} was tank mixed with the Roundup Pro at 2.2 kg ai ha^{-1} for the first two applications. Plots in regime D were tilled 10 days following each of 3 Roundup Pro applications (3.4 kg ai ha^{-1}, 2.2 kg ai ha^{-1}, and 2% v/v, respectively). Plots were sprigged 7 after the last application. Fresh sprigs were cut on the day of sprigging from a known stand of 'Tifway' bermudagrass and applied at 1 bushel 100 ft^{-2}. Sprigs were applied, rolled to ensure good soil contact, watered, and fertilized (3 applications totaling 49 kg N ha^{-1}).

Study 2 was initiated July 9, 2001 at the University of Georgia Griffin Campus on an established stand of common bermudagrass. Tillage and sprigging regimes, along with herbicide rates, were identical to study 1. However, plots were reestablished with zoysiagrass sod and the spray volume increased to 234 l ha^{-1}. For both studies, an untreated control was included and ratings for visual bermudagrass control were made on a 0% to 100% scale, 0%= no control, and 100%= complete control, 80% control was considered minimally acceptable.

In both studies, acceptable (> 80%) bermudagrass control was observed 10 days after initial treatment (DAIT) for plots treated with Roundup Pro at the 5.6 and 4.5 kg ai ha^{-1}rates. In the Clemson study, the 3.5 kg ai ha^{-1} provided acceptable control, also. A similar trend was observed at 40 DAIT with plots treated with the Fusilade / Roundup Pro tank mix providing 90 and 88% control at the Clemson and Georgia locations respectively. Herbicide application did not appear to inhibit turfgrass establishment at either site.

From these studies, it appears for effective control of bermudagrass, multiple applications will be necessary and Roundup Pro at 4.5 kg ai ha^{-1} is needed for acceptable, long-term control. However, evaluation of spring green-up is forthcoming and turfgrass established later in the summer following multiple applications may be less vigorous and more susceptible to winter injury. Future studies may evaluate the effectiveness of these programs based on the age of established bermudagrass and the application of a Roundup Pro treatment the fall preceding the next year's summer establishment.

EVALUATION OF TOUCHDOWN PRO, A NEW DIAMMONIUM SALT FORMULATION OF GLYPHOSATE IN BERMUDAGRASS & AGAINST INVASIVE PERENNIAL SPECIES. S.J. Kammerer, R. Keese, and D.C. Ross; Syngenta Crop Protection, Inc., Greensboro, NC 27409.

ABSTRACT

Syngenta Crop Protection, Inc. contracted a series of field trials across the U.S. in 2001 investigating the efficacy of a diammonium salt formulation of glyphosate, Touchdown Pro (trade name), in comparison to isopropylamine formulations of glyphosate. A primary use of isopropylamine glyphosate is over-the-top applications to dormant or semi-dormant bermudagrass in the golf course, industrial, right-of-ways, and general vegetation management markets for winter annual weed control. Isopropylamine glyphosate is also widely used for cut-stump applications of invasive perennial species, where the tree or shrub is cut with a chain saw or bush-hog and then treated with herbicide soon afterwards. No significant differences in weed efficacy were consistently observed between diammonium glyphosate and isopropylamine glyphosate at 1 and 2 pts/acre on various winter annual weeds in dormant bermudagrass. Differences were apparent in several studies on spring green-up of bermudagrass, where there was less of a delay in spring green-up of diammonium glyphosate treated bermudagrass when applications were made at full dormancy. In one trial where the bermudagrass was intentionally treated while 25% green, there was quicker green-up of diammonium glyphosate treated bermudagrass at both the 1 and 2 pt/acre rates versus the isopropylamine glyphosate formulation. Melaleuca and Brazilian pepper cut stump trials testing diammonium glyphosate at 50% & 100% concentrate compared to isopropylamine formulations of glyphosate and other labeled herbicides, triclopyr and imazapyr, all gave 100% inhibition of re-sprouting versus the untreated.

DIFFERENTIAL CONTROL OF *Kyllinga* SPP. AT FAIRWAY AND ROUGH MOWING HEIGHTS. J.S. McElroy, F.H. Yelverton and L.S. Warren. NC State University, Raleigh, NC.

ABSTRACT

Kyllinga brevifolia (green kyllinga) and *K. gracillima* (false-green kyllinga) are rhizomatous, perennial sedge species that thrive as weeds in golf course fairways and roughs. Both species are similar in appearance and difficult to distinguish under mowed conditions. While, control of *K. brevifolia* has been reported, little information is available for either of these species at fairway and rough mowing heights.

Studies were initiated May 2001 to evaluate POST herbicides for control of both species at fairway (0.5 in) and rough (1.5 in) mowing heights. Four separate locations were selected to represent both species at fairway and rough mowing height. Treatments (lb ai/A) included: Single and sequential applications of msma (2.0), bentazon (1.0), halosulfuron (0.062), trifloxysulfuron (0.022), single applications of sulfentrazone (0.375 and 0.5), and single applications of imazaquin alone (0.5) and imazaquin (0.5) plus msma (2.0). Sequential applications of trifloxysulfuron and imazaquin came 6 weeks after initial treatment (WAIT). Sequential applications of msma and bentazon came 1 WAIT. Treatments with adjuvants were: halosulfuron (0.5% v/v non-ionic surfactant), imazaquin alone and trifloxysulfuron (0.25% v/v non-ionic surfactant), and bentazon (1qt/A crop oil concentrate).

In general, *K. gracillima* at rough height was more difficult to control. At 18 WAIT, sequential applications of trifloxysulfuron provided >90% control of both species at both mowing heights. Single applications of trifloxysulfuron provided <60% control for rough height *K. gracillima*, but >90% for other locations. Single and sequential applications of halosulfuron provided 60-90% control at all locations 18 WAIT, except for single applications on rough height *K. gracillima* (~20%). Imazaquin alone provided 85 to 92% control of all locations except for rough height *K. gracillima*. No differences were detected between imazaquin alone vs. imazaquin plus msma at any location. Sulfentrazone, 0.375 and 0.5, provided 86 to 93% control at all locations except rough height *K. gracillima* (40 & 58%, respectively). No differences were detected between sulfentrazone rates at any location. All msma and bentazon treatments provided unacceptable control 18 WAIT at all locations.

COMPARISON OF BURCH WET BLADE® AND CONVENTIONAL BOOM APPLICATIONS FOR CONTROL OF COGONGRASS (*Imperata cylindrica*) P.R. Marchbanks,* J.D. Byrd.,Jr., J.W. Barnett.,Jr., D.B. Mask, and K.D. Burnell. Mississippi State University, Mississippi State, MS.

ABSTRACT

Field research conducted in the summer of 2001 near Poplarville, MS compared conventional boom application of herbicides to application with the Burch Wet Blade for control of cogongrass. Treatments were applied on May 9, 2001 and included Arsenal AC at 8 and 16 oz/A, Touchdown IQ at 2% (v/v) and 4 qt/A, Select 2 EC at 8 oz/A, and glyphosate (4lb ai/gal) at 2% (v/v) and 4 qt/A. Roundup Pro was used for conventional applications, while Accord was used for application with the Wet Blade. The Burch company recommends the use of glyphosate with no surfactant in the formulation. No treatment applied with the Burch Wet Blade contained any additional surfactant. Conventional boom applications of Arsenal AC included 0.5% (v/v) non-ionic surfactant and 1 qt/A crop oil concentrate was added to Select 2EC. The conventional plots were 6 by 20 ft and treatments applied with a CO_2 pressurized backpack delivering 20 gpa through 11003 flat fan nozzles. The Burch Wet Blade plots were 10 by 40 ft with treatments applied at 1 gpa. Plots were visually rated at 7, 30, and 90 days after treatment (DAT). Conventional boom applications resulted in better cogongrass control than Burch Wet Blade at 90 DAT. Roundup Pro at 2% (v/v) and 4 qt/A and Touchdown at 2% (v/v) and 4 qt/A provided > 95% control with conventional boom application compared with Arsenal at 16 oz/A which provided 52% control through the Burch Wet Blade at 30 DAT. All other herbicides applied with Burch Wet Blade showed < 10% control.

HERBICIDE TOLERANCE OF SELECTED NATIVE GRASS SPECIES IN NORTH CAROLINA. J.D. Hinton and F.H. Yelverton. Department of Crop Science. North Carolina State University, Raleigh, NC.

ABSTRACT

Several golf courses are beginning to use native grass species for deep roughs and ornamental beds. Many of these native grass species are not as competitive as the weeds that are present. Broomsedge (*Andropogon virginicus*) and lovegrass (*Eragrostis spp.*) are two of these native grass species. Smooth crabgrass (*Digitaria ischaemum*) and ragweed (*Ambrosia spp.*) are two weeds that are problems in these plantings.

In an effort to control these weeds and give the native grass species an advantage, herbicides need to be tested for efficacy and tolerance. Field trials were conducted in 2001 evaluating different rates of Plateau (imazapic) and single rates of Confont (triclopyr + clopyralid), Trimec Classic (2,4-D + MCPP + dicamba), and Image (imazaquin). Plateau and Image treatments had a nonionic surfactant (X77) added at a rate of 0.25%v/v.

Broomsedge was treated with Plateau (2 to 12 oz/a), Confront (1 pt/a), Trimec Classic (3.5 pt/a), and Image (0.5 lb ai/a). Lovegrass was treated with Plateau (2 to 6 oz/a), Confront (1 pt/a), Trimec Classic (3.5 pt/a), and Image (0.5 lb ai/a). Neither broomsedge nor lovegrass showed a significant reduction in quality when comparing the treatments to the nontreated.

Smooth crabgrass and ragweed were treated with Plateau (2 to 12 oz/a), Confront (1 pt/a), Trimec Classic (3.5 pt/a), and Image (0.5 lb ai/a). At 11 weeks after treatment, Plateau at 6, 8, 10, and 12 oz/a provided greater than 85% control of smooth crabgrass. At 11 weeks after treatment, Plateau at 10 and 12 oz/a, Confront, and Trimec Classic provided greater than 90% control of ragweed.

TOLERANCE TO FLUROXYPYR AND CLOPYRALID IN BERMUDAGRASS (*Cynodon dactylon*) AND ST. AUGUSTINEGRASS (*Stenotaphrum secondatum*). B.J. Tucker*, J.K. Higingbottom, and L.B. McCarty. Clemson University, Department of Horticulture Clemson, SC. 29634-0375.

ABSTRACT

St. Augustinegrass (*Stenotaphrum secondatum*) is a popular turf for home lawns in the southeastern United States, and for shaded areas on golf courses. St. Augustinegrass is a turf of coarse texture and medium density. Bermudagrass (*Cynodon dactylon*) is a medium texture, high-density, dark green turfgrass. Common bermudagrass is a popular turf for home lawns and low management athletic fields in warm-season areas. The hybrid bermudagrass 'Tifway' has become the standard for golf course fairways and sports fields in warm-season areas. The objective of this study was to determine tolerance of these grasses to fluroxypyr and clopyralid.

A study was performed in spring 2001 on common bermudagrass on a local golf course driving range. Treatments included single applications of Fluroxypyr 1.5 EC and Lontrel T&O (clopyralid) 3 SL at 0.09lbs ai/A and 0.12 lbs ai/A. Single applications of Fluroxypyr 1.5 EC and Lontrel T&O 3 SL at 0.17lbs AE/A and 0.24 lbs AE/A. Single applications of Fluroxypyr 1.5 EC and Lontrel T&O 3 SL at 0.36 lbs ai/A and 0.49 lbs ai/A. Single applications of Fluroxypyr 1.5 EC and Lontrel T&O 3 SL at 0.72 lbs ai/A and 0.99 lbs ai/A. Single applications of Trimec Southern (2,4 D + Dicamba + MCPP) 4.58 SL at 1.19 lbs ai/A. Initial applications for this study were made on May 16, 2001. Visual turf injury was rated on a 0-100% scale with 30% maximum level of acceptable injury.

Three studies were performed in the summer of 2001 on Clemson University research plots. Two varieties of St. Augustinegrass ('Raleigh' and 'Palmetto'), and 'Tifway' bermudagrass received similar treatments. Treatments included single applications of Fluroxypyr 1.5 EC and Lontrel T&O (clopyralid) 3 SL at 0.09 lbs ai/A and 0.12 lbs ai/A. Single applications of Fluroxypyr 1.5 EC and Lontrel T&O 3 SL at 0.17 lbs ai/A and 0.24 lbs ai/A. Single applications of Fluroxypyr 1.5 EC and Lontrel T&O 3 SL at 0.36 lbs ai/A and 0.49 lbs ai/A. Single applications of Fluroxypyr 1.5 EC and Lontrel T&O 3 SL at 0.72 lbs ai/A and 0.99 lbs ai/A. Single applications of Trimec Southern (2,4 D + Dicamba + MCPP) 4.58 SL at 1.19 lbs ai/A. Single applications of Confront (clopyralid + triclopyr) 3 EC at 0.75 lbs ai/A. Single applications of Bo Fix (fluroxypyr + clopyralid + MCPA) 2.3 L at 0.86 lbs ai/A. Initial applications for all three studies were made on July 26, 2001. Visual turf injury was rated on a 0-100% scale with 30% maximum level of acceptable injury.

The common bermudagrass exhibited excellent tolerance (<10% injury) to all herbicides in this study. The 'Raleigh' and 'Palmetto' St. Augustine displayed tolerance (<30% injury) to all herbicides in this study. Confront caused the most injury to 'Raleigh', with 23.3% injured observed on August 13, 2001. 'Palmetto' was also least tolerant to Confront, with 26.7% injured observed on August 13, 2001. 'Tifway' showed poor (>30% injury) tolerance to Fluroxypyr and Lontrel T&O at 0.72 lbs ai/A and 0.99 lbs ai/A. 'Tifway' also showed poor tolerance (>35% injury) to Confront at 0.75 lbs ai/A, and was least tolerant (>50% injury) to Bo Fix at 0.38 lbs ai/A.

In conclusion, common bermudagrass exhibited excellent tolerance to all herbicides in this study Confront caused the most injury in both varieties of St. Augustinegrass, but both 'Palmetto' and 'Raleigh' displayed acceptable tolerance to all herbicides in this study. However, 'Tifway' had poor tolerance to higher levels of fluroxypyr and clopyralid. The herbicides Confront and Bo Fix caused the most injury in 'Tifway' Bermudagrass.

SEASHORE PASPALUM RESPONSE TO TRINEXAPAC-ETHYL AND PACLOBUTRAZOL. T.R. Murphy, The University of Georgia, Griffin.

ABSTRACT

Seashore paspalum (*Paspalum vaginatum* Swartz) is a prostrate growing, salt tolerant grass that is indigenous to tropical and coastal areas worldwide. This grass can be irrigated with salt and brackish water and tolerates drought and low mowing heights. Traffic stress (wear) tolerance is similar to bermudagrass (*Cynodon* spp.). Because of these attributes improved cultivars of seashore paspalum have been recently released for use in the southern United States and tropical areas of the world. Various growth regulators are used commonly used on turfgrasses to reduce mowing requirements and/or problems with grass clippings. There is no published research on the response of seashore paspalum to turfgrass growth regulators commonly used in turfgrass management.

Experiments were conducted in 2000 and 2001 at Griffin, GA to determine the tolerance of seashore paspalum (cv. 'Sea Isle I') to summer applications of trinexapac-ethyl and paclobutrazol. Experiments were located on an established stand of seashore paspalum that was clipped at a mowing height of 0.75 and 0.625 inches in 2000 and 2001, respectively. Irrigation was applied as needed to prevent drought stress. Trinexapac-ethyl at at 0.09, 0.13, 0.17, 0.25 and 0.34 lbs. ai/acre, and paclobutrazol at 0.25, 0.37 and 0.5 lbs. ai/acre were applied in mid-July and followed by (fb) an application in mid-August of each year. Spray volume was 25 gpa. Plot size was 5 by 10 ft. Treatments were replicated 3 times and arranged in a randomized complete block design. Seashore paspalum injury and dry clipping weights were recorded at two wk intervals for up to 10 wks after the initial growth regulator application. The same plots were treated in both years. A repeated measures ANOVA showed no difference between years, thus data were combined for presentation.

Paclobutrazol was essentially non-injurious to seashore paspalum and injury was < 5% at all evaluations. However, paclobutrazol did not effectively reduce seashore paspalum clipping weights. Trinexapac-ethyl at rates ≤ 0.13 lbs. ai/acre injured seashore paspalum < 20% at all evaluations. At rates of 0.17 and 0.25 lbs. ai/acre, trinexapac injured seashore paspalum > 20% at 2 of 5 evaluations. At the highest rate evaluated, 0.34 lbs. ai/acre, trinexapac-ethyl injured seashore paspalum > 20% at 3 of 5 evaluations. Trinexapac-ethyl was highly effective in reducing seashore paspalum clipping weights. Over the 10 wk evaluation period, two applications of trinexapac-ethyl at 0.09 lbs. ai/acre reduced seashore paspalum dry clipping weights 57% compared to the untreated plot. The highest rate of trinexapac-ethyl, 0.34 lbs. ai/acre, applied twice, reduced clipping weights 90% over the same time period.

This research showed that seashore paspalum vegetative growth can be effectively reduced over an extended time period with trinexapac-ethyl. However, on highly maintained seashore paspalum sites such as golf course fairways, rates of trinexapac-ethyl should be limited to no more than 0.13 lbs. ai/acre in order to avoid excessive injury (> 20%).

PRE AND POST CONTROL OF ANNUAL BLUEGRASS. J.M. Taylor, G.E. Coats, and K.C. Hutto; Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

PRE and POST control of annual bluegrass experiments were initiated in 2000 and 2001. Herbicide treatments were applied on fairways at two golf courses. Studies were conducted at Starkville (triazine-resistant biotype) and Macon (triazine susceptible biotype), MS.

The first POST experiment was at both locations, and treatments were applied February 23, 2001 to 10-tiller annual bluegrass. The best treatment at both locations was 0.035 lb ai/A rimsulfuron, which controlled annual bluegrass 83 to 90% 60 days after treatment (DAT). Azafenidin at 0.5 to 0.75 lb ai/A controlled annual bluegrass 70 to 73% at Starkville and 90% at Macon. Control with 0.05 to 0.1 lb ai/A sulfosulfuron was 5 to 23% at Starkville and 53 to 75% at Macon. Imazaquin also provided less control at the Macon location with 0.375 to 0.5 lb ai/A controlling annual bluegrass 10 to 18%, while at Starkville 48 to 75% control was observed. Clethodim at 0.28 lb ai/A provided 60 to 70% control while 0.5 lb ai/A pronamide controlled annual bluegrass 13% at Starkville and 55% at Macon. Control with glufosinate at 0.5 to 1.0 lb ai/A or glyphosate at 0.375 to 0.75 lb ai/A did not differ at each location with 68 to 85% control at Starkville and 55 to 70% control at Macon. Diquat was applied at 0.25 to 0.5 lb ai/A and did not control annual bluegrass more than 25%.

The second POST experiment was initiated at Macon on February 1, 2001 to evaluate rimsulfuron for control of annual bluegrass. Rimsulfuron was applied at 0.004, 0.008, 0.017, or 0.035 lb ai/A. Rimsulfuron treatments were applied with 0.5% v/v methylated seed oil. Pronamide was also applied at 0.5 lb ai/A for comparison. At 55 DAT, 0.008 lb/A or greater rimsulfuron or pronamide controlled annual bluegrass 83% or greater while 0.004 lb/A rimsulfuron only provided 65% control. At 83 DAT, 0.017 lb/A or greater rimsulfuron or pronamide controlled annual bluegrass 88% or greater and 0.008 lb/A or less rimsulfuron controlled annual bluegrass 68 to 40%. None of the rimsulfuron treatments delayed common bermudagrass regrowth following dormancy. A 5 to 10% increase in bermudagrass density following rimsulfuron treatments was observed at 55 DAT compared to the untreated plots, while at 83 DAT a 20 to 27% increase in bermudagrass density was observed following rimsulfuron treatments as compared to the untreated.

In the PRE experiment which was conducted at both Starkville and Macon, initial applications of 0.5 or 0.25 lb ai/A dithiopyr, 0.75 or 0.375 lb ai/A prodiamine, 3.0 or 1.5 lb ai/A pendimethalin, or 3.0 or 1.5 lb ai/A oryzalin were applied in August. These initial applications were followed by no sequential treatment or the lower rate was applied sequentially in October, November, December, January, or February. Increased control was observed when sequential applications were made October through December compared to the single application made in August. However sequential applications made in October or November provided better control of annual bluegrass than sequential applications made after November (72% control compared to 61% with December sequentials). Control decreased when sequential applications were made January or February compared to applications made prior to December.

EVALUATION OF CORN GLUTEN MEAL IN VIRGINIA. J.B. Beam, S.D. Askew, and P.L. Hipkins, Virginia Tech, Blacksburg, VA 24061.

ABSTRACT

While corn gluten meal is readily available to homeowners in Virginia, the state's extension recommendations do not mention corn gluten meal. Research was conducted at Virginia Tech's Turfgrass Research Center to determine utility of corn gluten meal for preemergence weed control in turf and to evaluate corn gluten meal compared to other commercially available preemergence herbicides for large crabgrass (*Digitaria sanguinalis*) control in perennial ryegrass (*Lolium perenne*). The experiment was a randomized complete block with 3 replications and 11 treatments. Large crabgrass was seeded into perennial ryegrass at 12 kg/ha. Spring fertilizer was not applied to experimental areas. Herbicides and corn gluten were applied with shaker jars. Corn gluten containing products (feed grade corn gluten, WeedBan™, and Necessary Organic™) were purchased locally and applied at 975 kg/ha. Commercially-available herbicides were purchased from local hardware stores and other "home-owner" outlets and applied at the following product and herbicide rates (product, kg/ha, herbicide, kg ai/ha, respectively): SAMS™, 390, prodiamine, 1.1; Scotts™, 146, pendimethalin, 1.6; Sta-Green™, 146, dithiopyr, 0.3; K-gro™, 195 kg/ha, dithiopyr, 0.2; Vigaro™, 146, dithiopyr, 0.3; Statesman™, 98 kg/ha, trifluralin+benefin, 2.2. A control consisted of fertilizer (30-3-3) applied at 2 lbs/1000 sq ft (29% N). Turf quality and crabgrass control were visually estimated 4, 8, 12, and 16 WAT.

Necessary Organic™ or WeedBan™ controlled crabgrass > 75% for 8 wk. Feed-grade corn gluten did not control crabgrass. Necessary Organic™ controlled crabgrass comparable to commercially available synthetic herbicides 4, 8, and 12 WAT. Feed-grade corn gluten pelletized for livestock did not dissolve readily in field conditions. Slow breakdown of feed-grade pellets likely reduced effectiveness for weed control.

A second experiment was conducted at Independence Golf Course near Richmond, VA on newly sprigged bermudagrass (*Cynodon dactylon*). Herbicides included: feed-grade corn gluten (crushed and non crushed) at 488 and 975 kg/ha, WeedBan at 488 and 975 kg/ha, pendimethalin at 2 kg ai/ha, prodiamine at 3 kg ai/ha, oxadiazon at 1 kg ai/ha. A control treatment included fertilizer at 15 kg N/ha. Ratings of bermudagrass injury and weed control were made at various times for 15 wk. No bermudagrass injury was observed. Weed emergence was sporadic. Tall fescue (*Festuca arundinacea*) and ryegrass were observed in plots and may have emerged from sprouts following bermudagrass sprigging. No significant differences were observed in number of plants per plot 15 WAT.

Commercially available corn gluten meal products control crabgrass preemergence. However, duration of control is not as long as with commercial herbicides. Prolonged weed control will likely require multiple corn gluten meal applications. However, multiple corn gluten applications in cool-season lawns will surpass recommended nitrogen rates for cool-season turf. Although cheaper, feed-grade corn gluten does not adequately control crabgrass.

USE OF GIBBERELLIC ACID TO REVERSE THE EFFECTS OF GIBBERELLIC ACID INHIBITING PLANT GROWTH REGULATORS. H.D. Cummings, F.H. Yelverton, and J.D. Hinton; Crop Science Department, North Carolina State University, Raleigh, NC 27695-7620

ABSTRACT

Gibberellic acid (GA) inhibiting plant growth regulators (PGRs) like trinexapac-ethyl (TE) and paclobutrazol (PZL) may be applied in spring and fall to creeping bentgrass for growth management or to control *Poa annua*, respectively. GA_1 is a growth hormone that promotes cell elongation. It is not known if the effects of GA-inhibiting PGRs can be reversed by applying GA_3. The objectives of this experiment were to determine the relative effects of adding GA_3 to bentgrass treated and not treated with GA-inhibiting PGRs and to determine if an over application of a GA-inhibiting PGR could be reversed. Experiments were conducted on established 'Penncross' creeping bentgrass (*Agrostis stolonifera* L.) maintained at 4 mm at the Raleigh Field Laboratory in NC.

Experiments were conducted using a RCB design with a 3 X 5 factorial arrangement (TE, PZL, and nontreated X five rates of GA_3). Trinexapac-ethyl was applied at 1 kg ai/ha (20X rate), and paclobutrazol was applied at 0.6 kg ai/ha (2X rate). Unlike TE, PZL blocks all GA synthesis in plants; thus a 20X rate of PZL would have been too injurious. GA_3 was applied 2 days later to plots treated and not treated with PGRs at 0, 0.4, 0.8, 1.5, and 3.0 kg ai/ha. Plots were mowed twice weekly, and clippings were collected during the second mowing for six weeks. Clippings were oven dried for two weeks and dry weights recorded. Visual quality ratings were taken weekly using a scale of 1 to 9 where 1=dead, 5=marginally acceptable, 7=average, and 9=perfect.

The GA_3 without PGR treatments reported significant increases in clippings compared to nontreated for the first three weeks at all rates applied. The low rate and high rate of GA_3 increased clipping dry weight 200 and 300 %, respectively 1 week after treatment (WAT). By 3 WAT, only GA_3 at 3 kg ai/ha produced clipping weights significantly greater than the nontreated. Similarly, the TE or PZL followed by GA_3 treatments reported significant increases in clipping dry weight when compared to the nontreated for the first three weeks. Therefore, these data demonstrated that an exogenous application of GA_3 was able to counteract the growth regulation of GA-inhibiting PGRs. All GA_3 treatments reported significantly lower visual quality ratings than the nontreated for all six weeks. Quality decreased significantly with increasing rates of GA_3. Quality ratings were lowest 2 WAT through 5 WAT. However, quality ratings for GA_3 at 0.4 kg ai/ha were above 5 for all six weeks; 5 was the cut off for minimally acceptable quality; thus the except for the low rate for GA_3, the TE or PZL followed by GA_3 treatments were significantly lower than the nontreated. Quality ratings from either PGR treatments without GA_3 were not different from the nontreated.

PERENNIAL WEEDS AND FRUIT TREES RESPONSE TO FLUROXYPYR. W.E. Mitchem, A.W. MacRae, and D.W. Monks; Mountain Horticultural Crops Research and Extension Center, Department of Horticultural Science, N.C. State University, Fletcher, NC 28732.

ABSTRACT

Perennial weeds are a significant problem in orchard crops. They reduce worker efficiency, can reduce tree vigor, and are controlled only by carefully timed glyphosate applications. Glyphosate is effective, however application time is weed species specific and there are concerns related to fruit crop tolerance to late summer glyphosate applications.

Fluroxypyr is being developed for use in fruit crops in Europe and is known to control perennial weed species. Trials were conducted in 2000 and 2001 to determine the response of apple (*Malus domestica*) and peach (*Prunus persica*) trees to fluroxypyr at 0.28, 0.42, and 0.56 kg ae ha^{-1}. In addition to crop tolerance trials, two trials were conducted in 2000 and 2001 to determine woody perennial weed response to fluroxypy at 0.28, 0.42, and 0.56 kg ae ha^{-1} and 0.5, 0.75, and 1.0 % v/v, respectively. All herbicides were applied in May.

Apple and peach trees exhibited excellent tolerance to fluroxypyr regardless of application rate. There were no visual signs of crop injury and increases in trunk cross-sectional area was similar for treated and non-treated trees.

Fluroxypyr provided excellent woody perennial weed control. Blackberry (*Rubus* sp.) and Poison ivy (*Toxicodendron radicans*) control ranged from 87 to 95 % and 88 to 94 %, respectively. Although only at one site, Virginia creeper (*Parthenocissus quinquefolia*) control ranged from 91 to 94 %.

PEACH TREE (*PRUNUS PERSICA*) RESPONSE TO FLUMIOXAZIN, HALOSULFURON, AND SULFENTRAZONE. A.W. MacRae, W.E. Mitchem, R.B. Batts, and D.W. Monks. Department of Horticultural Science, North Carolina State University, Raleigh, NC 27695-7609.

ABSTRACT

Trials were conducted in 2000 and 2001 at the Sandhills Research Station in Windblow, N.C. to evaluate peach tree response to flumioxazin, halosulfuron, and sulfentrazone. Test design was a randomized complete block with four replications. Herbicides were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 187 L ha^{-1} at 267 kPa using TeeJet 8002DG flat fan nozzles. Herbicides were applied to newly planted peach trees once soil settled after transplanting. In 2001, prior to herbicide application, tree trunks were painted with white latex paint to shield green bark from direct contact with herbicides. Sulfentrazone and flumioxazin were evaluated in 2000 and 2001, respectively. Halosulfuron was evaluate both years. Flumioxazin was applied at 0.28, 0.42, 0.56, and 0.84 kg ai ha^{-1}. Halosulfuron was applied at 0.05, 0.07, and 0.14 kg ai ha^{-1}. Sulfentrazone was applied at 0.28, 0.35, and 0.42 kg ai ha^{-1}. Each trial included a weed-free, non-treated check. Visual estimates of peach tree injury were made on a scale of 0 to 100; 0 equals no peach tree injury, 100 is complete tree death. Trunk diameter was measured to determine trunk cross-sectional area (TCSA). Measurements were taken after transplanting and in the fall to determine the percent increase in TCSA to quantify tree growth.

Flumioxazin, regardless of rate, did not injure peach trees or reduce TCSA.

In 2000, halosulfuron applications at 0.07 and 0.14 kg ai ha^{-1} reduced TCSA relative to the weed-free check. Visual phytotoxicity estimates on August 25th were 0, 39, and 33 % for the peach trees treated with 0.05, 0.07, 0.14 kg ai ha^{-1} of halosulfuron, respectively. Early summer ratings were more severe, however peach trees recovered as the season progressed. In 2001 peach tree tolerance to halosulfuron improved. This improvement may be attributed to the shielding of the green bark with latex paint. Halosulfuron treatments did not reduce TCSA. Visual injury estimates to peach trees were 8, 4, and 9 % on August 16th for peach trees treated with halosulfuron at 0.05, 0.07, 0.14 kg ai ha^{-1}, respectively.

Sulfentrazone at 0.35 and 0.42 kg ai ha^{-1} reduced peach tree growth relative to peach trees in the non-treated check. Peach tree phytotoxicity increased at the season progressed. Visual estimates of peach tree injury on August 25th were 20, 50 and 55 % for the peach trees treated with sulfentrazone at 0.28, 0.35, and 0.42 kg ai ha^{-1}, respectively.

WIDTH OF WEED-FREE STRIP REQUIRED FOR YOUNG PECAN (*CARYA ILLINOIENSIS*) TREES.

W.H. Faircloth[1], M.G. Patterson[2], M.L. Nesbitt[3], W.G. Foshee[2], and W.D.Goff[2]. [1]Dept. of Agronomy & Soils, [2]Alabama Cooperative Extension System, and [3]Dept. of Horticulture, Auburn University, Auburn, AL.

ABSTRACT

Previous research indicates that chemical weed management in pecan (*Carya illinoiensis*) orchards increases growth, yield, and profitability and decreases the age at which trees begin to bear nuts. In a continuance of these studies, an experiment was initiated in January 1998 at the Gulf Coast Research and Extension Center in Fairhope, AL, to determine the optimum width of a weed-free zone to be implemented around newly established trees. Treatments consisted of variations on four weed-free strip widths (widths centered on tree): 1) three ft. continuous; 2) seven ft. continuous; 3) 10 ft. continuous; 4) 13 ft. continuous; 5) three ft. yr one, seven ft. yr. two and three, 10 ft. thereafter; 6) three ft. year one and two, 10 ft. thereafter; 7) seven ft. year one and two, 10 ft. thereafter; 8) seven ft. yr. one and two, 10 ft. yr. three, four, and five, 13 ft. thereafter; and 9) untreated. Treatments were arranged in a randomized complete block design with six replications. Newly transplanted trees var. Desirable were placed in a 30 ft. by 35 ft. grid. Weed-free strips were maintained with the application of preemergence herbicides (oryzalin, simazine, norflurazon) in the early spring and late fall, and applications of postemergence herbicides (glyphosate) as needed in the summer. Herbicides were applied with a CO_2 backpack sprayer calibrated to deliver a volume of 15 gallons per acre. Excepting weed control, orchard maintenance was conducted by experiment station staff in accordance with Alabama Cooperative Extension System recommendations. Data taken from the study and included in analysis (α=0.05) were tree diameter measured 18 inches above ground (annually, from initiation) and nut yield (2002 only). Average tree diameter at planting was 0.5 inches.

Tree diameter increased for all treatments during the first year but no significant differences were observed. The 10 ft. continuous treatment was numerically highest (1.16 in.) in year two (2000). A seven ft. or larger weed-free strip during the first two years resulted in the largest trees (1.77-2.00 in.) by year three. Those trees that were subjected to a three ft. weed-free strip in year one and/or two showed no difference from the untreated (1.26 in.). The largest trees at the end of year four were those that maintained 10 or 13 ft. strips or that began with a seven ft. weed-free strip in years one and two then switched to 10 ft. at year three (> 2.8 in.). Net growth as calculated from initiation through the fourth year revealed that greatest growth was achieved with a minimum seven ft. weed-free strip during years one and two, and a minimum 10 ft. thereafter. Some trees began bearing at the fourth year. Reflecting the growth data, a minimum seven ft. weed-free strip during the first two years of establishment resulted in highest yields (3.95-5.33 lb/tree). Trees that were subjected to three ft. strips at any time yielded no differently that the untreated. In summary, a seven ft. weed-free strip is needed the first two years of orchard establishment, with an increase to 10 ft. at year three resulting in more growth and yield. A 10 ft. or 13 ft. continuous weed-free strip also resulted in high growth and yield. This study shall be continued for at least four more years to determine optimum width of weed-free strip.

HALOSULFURON (SANDEA 75 DF) USE IN CUCURBITS, SNAPBEANS, AND SOUTHERNPEAS. R.E. Talbert, M.L. Lovelace and E.F. Scherder, University of Arkansas, Fayetteville, AR 72704

ABSTRACT

Herbicide strategies for weed control in vegetables continue to be few as compared to those in major crops. Herbicide evaluation studies are conducted each year in the various vegetables grown commercially in our region. Sandea (common name halosulfuron) has been an interesting new herbicide with considerable potential to selectively control a number of problem weeds such as sedges, pigweeds, and a number of other broadleaved weeds in a number of these vegetable crops. This report summarizes our results of studies conducted in 2000 and 2001. The protocols were generally developed to refine rates and timings of halosulfuron use in herbicide programs for weed control and to assess crop tolerance issues. The snapbean studies were conducted in an on-farm site near Newtonia in Southwest Missouri. The southernpea studies were conducted at the Main Agricultural Research Station near Fayetteville, AR in 2000 and at the Vegetable Substation near Kibler, AR in 2001. In 2001, the squash study was conducted at Fayetteville and the watermelon study was conducted at Kibler. In 2001, fall greens crops, mustard and spinach, were planted following the summer use of halosufuron at Kibler in order to assess halosulfuron's residual carryover potential.

In snapbean, Sandea at 0.032 lb/A was selectively used postemergence (POST)and gave excellent, 95 to 100 %, control of common ragweed and Palmer amaranth, but did not control common lambsquarters. Compatible mixtures included with Basagran (bentazon) and Reflex (fomesafen), which improved the control of common lambsquarters to 95 and 85 %, respectively. There appears to be adequate tolerance with Sandea in snapbean applied POST. In southernpea postemergence treatments caused excessive damage at 0.026 and 0.032 lb/A, but when used PRE, there was excellent tolerance and 95 % control of Palmer amaranth. Command plus Sandea was a good PRE tank mixture in our southernpea trial. In the squash trail there was modest stunting and reduced yields when Sandea was used at 0.016, 0.024 and 0.032 lb/A PRE. But POST there was slight stunting, 20 %, at the highest rate of 0.032 lb/A and yields were about 40 % lower than lower rates where stunting was less noticeable. The use of Command at 0.15 lb/A plus Curbit (ethylfluralin) at O.56 lb/A PRE followed by Sandea at 0.024 lb/A early POST was an outstanding treatment in squash. In watermelon the three-way combination of Command at 0,15 lb/A plus Curbit at 0.56 lb/A plus Sandea at rates of 0.016 to 0.32 lb/A applied PRE were outstanding. POST treatments with Sandea in the watermelon trial were timed too late and gave inadequate Palmer amaranth control. Presently there are a number of rotational restrictions for planting subsequent crops. Neither fall planted mustard or spinach were affected at the Kibler site with the highest rate of Sandea, a total of 0.064 lb/A, in the same area where Pursuit (imazethapyr) at 0.063 lb/A caused 55 % stunting of mustard and 65 % stunting of spinach.

PUMPKIN TOLERANCE TO CURBIT AND COMMAND COMBINATIONS. D.K. Robinson*, D.L. Coffey and R.A. Straw. Department of Plant Sciences and Land Scape Systems, The University of Tennessee, Knoxville, TN

ABSTRACT

Tennessee vegetable growers produced approximately 4,500 acres of pumpkins for non-food use (or for the fall decoration market). Important in this production is effective weed management. Needed is a preemergence treatment that would provide broadspectrum control. COMMAND (clomazone) applied in combination with CURBIT (ethalfluralin) provides effective broadspectrum preemergence control of several grass and small seeded broadleaf weeds. However, pumpkin tolerance to this combination is known to be variety dependent. 'Magic Lantern' and 'Prize Winner' pumpkin varieties were evaluated for tolerance to COMMAND 3ME [at 0, 1.3 and 2.6 pints (product)/ acre] and CURBIT 3E [at 0, 3.0 and 4.5 pints (product)/acre] alone and in combination. Treatments were applied preemergence after planting and activated with ½ inch of over-head irrigation within 48 hours of application. 'Magic Lantern' was tolerant of both COMMAND 3ME and CURBIT 3E at all rates and combinations. 'Prize Winner' was tolerant to COMMAND 3ME applied alone at either 1.3 or 2.6 pts./A. and CURBIT 3E applied alone at 3.0 pts./A. At 4.5 pts./A. CURBIT 3E applied alone reduced plant stand by 44% at 30 days after treatment (30 DAT). Combination of COMMAND 3ME at 2.6 pts/A. with CURBIT 3E at either 3.0 or 4.5 pts./A. resulted in significant stand loss 30 DAT. COMMAND 3ME at 1.3 pts./A. with CURBIT 3E at 4.5 pts./A. caused significant stand loss 30 DAT. However, 'Prize Winner' was tolerant to COMMAND 3ME at 1.3 pts./A. applied in combination with CURBIT 3E at 3.0 pts./A. The combination of COMMAND 3ME and CURBIT 3E would provide pumpkin producers with an effective preemergence weed control option. However, screening for tolerance to the combination would need to be included in state evaluations of pumpkin varieties.

MANAGEMENT OF PURPLE NUTSEDGE (*Cyperus rotundus*) IN TOMATO (*Lycopersicon esculentum* Mill.) WITH HALOSULFURON. J.P. Morales-Payan, W.M. Stall, D.G. Shilling, J.A. Dusky, T.A. Bewick, and R. Charudattan. Institute of Food and Agricultural Sciences. University of Florida, Gainesville. FL 32611.

ABSTRACT

A field study was performed in Gainesville, Florida, to determine the effects of halosulfuron rates on the growth and asexual reproduction of purple nutsedge, its impact on the weed-crop relationships, and possible phytotoxic effects in tomato. 'Solarset' fresh market tomato was transplanted onto plastic-mulched soil beds the same day as purple nutsedge (0 and 50 tubers per m^2). Halosulfuron was applied in post-emergence, 15 days after transplanting the crop and 12 days after nutsedge emergence. The halosulfuron rates were 0, 4, 10, 24, 58, 144, 360, 900, and 2250 g a.i./ha. Treatments were established in randomized complete blocks with four replications. Analysis of variance and regression was performed on the resulting data for crop growth and yield, and for weed suppression. When halosulfuron was not applied, purple nutsedge interference caused nearly 30% yield loss in tomato. As halosulfuron rates increased, plant height, shoot biomass, shoot number, tuber number, and tuber biomass in purple nutsedge decreased. At the rate of 24 g/ha, halosulfuron suppressed the growth and interference of purple nutsedge to an extent that yield loss in tomato was about 10%. When the rate of 58 g of halosulfuron/ha was applied, crop yield loss due to purple interference was not significant. At rates between 144 and 360 g/ha, halosulfuron caused approximately 100% purple nutsedge mortality. Regression analysis showed that about 100% suppression of purple nutsedge growth and asexual reproduction could be achieved at a rate of about 100 g/ha. In weed-free tomato, growth and yield were not affected by halosulfuron at rates of up to 144 g/ha. Based on these results, a halosulfuron rate of about 58 g/ha would be sufficient to manage a purple nutsedge population density of 50 plants per m^2 in fresh market tomato.

A REGIONAL STUDY OF LOBLOLLY PINE PLANTATION DEVELOPMENT THROUGH 15 YEARS AFTER EARLY COMPLETE WOODY AND/OR HERBACEOUS PLANT CONTROL (COMP). J.H. Miller, B.R. Zutter, S.M. Zedaker, M.B. Edwards, and R.A. Newbold, US Forest Service and School of Forestry, Auburn, AL, Virginia Tech Univ., Blacksburg, VA, US Forest Service, Athens, GA, Louisiana Tech Univ., Ruston, LA.

ABSTRACT

Pine plantations are increasingly cultured using early woody and/or herbaceous plant control. Developments in sustainable cultural practices are hindered by the absence of long-term data on productivity gains relative to competition levels, crop-competition dynamics, and compositional succession. To gain baseline data, this study examined loblolly pine (*Pinus taeda* L.) plantations, across 13 southeastern sites, grown with near-complete control of woody and/or herbaceous competitors for the first 3-5 years. Each site used the same study design and uniform procedures. After 15 years, pine and competition dynamics remained significantly altered by early control treatments and were most influenced by the amounts of hardwoods and shrubs present or controlled. Early woody control significantly increased 15-year pine merchantable volume on 11 sites by 14-118%, while early herbaceous control significantly increased volume on 10 sites by 4-50%. Gains with the control of both components were generally additive. Pine volume was decreased by about 1% for each 1 ft^2/ac of hardwood basal area (BA) present at age 15 as determined by regression analysis. Culmination of current annual increment (CAI) with complete control occurred in years 8-11 at 250-480 ft^3/ac/yr. CAI's for pine height, BA, and volume were decreased by about 5-27% when growing season rainfall (Mar-Nov) was less than 36 in. Culmination of mean annual increment (MAI) had not been reached by year 15 for any treatment at any location, with Total Control MAI's averaging 195-250 ft^3/ac. Fusiform rust mainstem galls (*Cronartium quercuum* [Berk.] Miyabe *ex* Shirai *f. sp. fusiforme*) in high severity areas increased with control of both components, more so with herb control, and their effects were additive. Associated flora in these plantations included 140 genera of herbaceous plants, 34 genera/species of shrubs, and 71 species of trees.

RELATIONSHIPS AMONG WOODY AND HERBACEOUS COMPETITION AND LOBLOLLY PINE THROUGH MID-ROTATION (COMP). J.H. Miller, B.R. Zutter, S.M. Zedaker, M.B. Edwards, and R.A. Newbold, US Forest Service and School of Forestry, Auburn, AL, Virginia Tech Univ., Blacksburg, VA, US Forest Service, Athens, GA, Louisiana Tech Univ., Ruston, LA.

ABSTRACT

To gain baseline data, this study examined loblolly pine (*Pinus taeda* L.) plantations, across 13 southeastern sites, grown with near-complete control of woody and/or herbaceous competitors for the first 3-5 years. Data through 15 years was analyzed. Contrary to the wide spread assumption that hardwoods out compete pines, the hardwood proportion of stand basal area (BA) decreased from years 5 to 15 when BA in year 5 exceeded 10 ft^2. Hardwood BA was increased on average by 28% by year 15 following early herb control. Woody control initially increased herbaceous cover, with component covers remaining significantly greater at year 15 on high woody sites. Herb cover declined on all treatments with mid- and overstory canopy closure. When combining 15-year data from all sites for No Controls and Herb Controls, highly significant linear relationships were identified between measures of woody competition and merchantable pine volume. These relationships indicated that woody competition detracted pine growth in a similar proportion whether herbaceous plants were present or absent. Y-intercepts of No Controls yielded estimates of the of the average 15-year loss in merchantable volume attributed to herbaceous competition and ranged from 712-768 ft^3/ac or detractions of 15-19% of potential productivity. Pine volume was decreased by about 1% for each 1 ft^2/ac of hardwood BA present at age 15.

MIDROTATION RESPONSE OF LOBLOLLY PINE TO FERTILIZATION AND VEGETATION CONTROL. H.E.Quicke and D.K.Lauer, BASF Corporation, Auburn, AL 36830 and Silvics Analytic, Richmond, VA 23233.

ABSTRACT

Response of 12-year-old loblolly pine to vegetation control, fertilization and a combination of vegetation control + fertilization was monitored for a period of 4 years following treatment. The study site was in Russell County, Alabama on a Luverne sandy loam in the Upper Coastal Plain. Experimental design was a randomized complete block with 3 replications. Treatment structure was a 2x2x2 factorial with two levels of vegetation control (none, treated), two levels of fertilization (none, treated) and two hardwood levels (low, high). Vegetation was controlled in August 1997 by injecting hardwood stems 1 inch in dbh or larger with imazapyr. Smaller vegetation was controlled with a foliar spray of imazapyr + glyphosate. Fertilization treatment was 200 lbs/A elemental N + 25 lbs/A elemental P, applied by ground in February 1998. Initial pine basal area was 118 ft^2/A and height of dominant and co-dominant pines 35.4 ft. Major hardwood species were sweetgum and water oak. Vegetation control treatments reduced hardwood basal area to below 1 ft^2/A after 4 years. Without vegetation control, hardwood basal area increased from 11 to 15 ft^2/A on low hardwood plots and from 18 to 24 ft^2/A on high hardwood plots.

Pine growth over four years was compared using analysis of variance for basal area and height of dominant and co-dominant trees, and analysis of covariance for merchantable volume over bark to a 3-inch top. Vegetation control (VC) increased pine basal area and volume (p=0.044 and 0.092, respectively). Fertilization (Fert) increased pine basal area, height and volume (p=0.015, 0.004 and 0.003, respectively).

With low hardwood levels, pine basal response in ft^2/A over 4 years was 6.7 (VC), 6.6 (Fert) and 13.1 (VC+Fert). Height response varied between the first period (0-2 years after treatment) and second period (2-4 years after treatment). During the first period height response in feet was -0.4 (VC), 0.9 (Fert) and 0.4 (VC+Fert). During the second period height growth on VC plots increased rapidly and was lowest on Fert plots. Response in feet was 1.1 (VC), 0.9 (Fert) and 1.5 (VC+Fert). Volume response in ft^3/A over 4 years was 189 (VC), 269 (Fert) and 419 (VC+Fert). Volume growth on VC plots increased from 636 to 650 ft^3/A between periods, whereas volume growth on fertilized plots decreased from 697 to 669 ft^3/A. If this trend continues, the difference between VC and Fert response will decrease in the future.

With high hardwood levels, volume response in ft^3/A over four years was 237 (VC), 447 (Fert) and 362 (VC+Fert). Volume growth on VC plots increased from 643 to 735 ft^3/A between periods, whereas volume growth on Fert plots decreased from 812 to 776 ft^3/A. If this trend continues, the difference between VC and Fert response will decrease in the future.

MECHANICAL MID-STORY REDUCTION TREATMENTS FOR FOREST FUEL MANAGEMENT. B. Rummer[1], K. Outcalt[2], and D. Brockway[1]; USDA Forest Service, Southern Research Station, [1] Auburn, AL, [2] Athens, GA.

ABSTRACT

There are many forest stands where exclusion of fire or lack of management has led to dense understorys and fuel accumulation. Generally, the least expensive treatment is to introduce a regime of prescribed fire as a surrogate for natural forest fire processes in these stands. However, in some cases prescribed fire is not an option. For example, heavy fuel loadings may require some kind of pre-treatment before prescribed fire can be safely introduced. Restrictions on burning and smoke in the urban interface may preclude the use of prescribed fire in any condition. In these situations, mechanical methods to reduce understory materials are an option for resource managers.

There are a wide variety of machines that can be adapted for use in forest fuel treatment. They vary in size, cutter type, type of prime mover, and the attachment of the cutterhead. These differences affect the cost of the treatment, impact on the residual stand, degree of fuel reduction and the need for subsequent treatments. Two study sites were installed to examine some of these effects. On the Kisatchie National Forest, a rubber-tracked mulching machine was compared to a rubber-tired mulching machine utilizing the same cutterhead. At Ft. Benning, GA, a high-horsepower rubber-tired mulching machine was used to treat two blocks in mixed pine-hardwood. Vegetative surveys were conducted before and after treatment on all plots. The Ft. Benning site was divided into subplots to examine the effect of varying intervals before the reintroduction of prescribed fire.

Treatment costs with the three different machines ranged from $120 to $350 per acre. Terrain limitations affected the machine requirements with soft soils and steep slopes resulting in delays and reduced productivity. Vegetative assessment on the Kisatchie found hardwood density was reduced by 33% in the midstory and 64% in the understory. Herbaceous cover did not increase in the treated areas, although there was a small increase in understory species richness. It appears the readjustment of understory composition to a more herbaceous-dominated layer will take more time and/or additional treatments to accomplish.

This work was partially supported by funding from the Joint Fire Sciences Program. In addition, the support and assistance of the Winn District, Kisatchie National Forest, LA and of the Natural Resources staff at Ft. Benning, GA are gratefully acknowledged.

EFFECT OF APPLICATION TIMING AND PRODUCT APPLICATION RATE ON HERBACEOUS WEED CONTRL DURING THE GROWING SEASON FOLLOWING SITE PREPARATION USING TANK MIXES WHICH INCLUDE SULFOMETURON. A.W. Ezell and J.L. Yeiser, Mississippi State University, Starkville and Stephen F. Austin State University, Nacagdoches, TX.

ABSTRACT

A total of 10 herbicide treatments (Table 1) were replicated these times at locations in Mississippi and Texas. These herbicide treatments were applied at three separate timings (August, September and October). In addition, three replications of untreated check plots were installed and evaluated. The purpose of the study was to evaluate the effect of application timing and application rate on the herbaceous weed control resultant from the inclusion of sulfometuron methyl in the site preparation tank mixture. Plots were evaluated prior to treatment (August, 2000) to assess woody stem coverage and then in April, May, June, July, and August of 2001 to evaluate herbaceous weed control. Final woody stem assessments were completed in November, 2001.

In Mississippi, the only effect from application timing was the reduced amount of clear ground in the September treatment plots. The study site was extremely droughty at the September application time, and since these type treatments had been tested twice previously using September applications with excellent results, the reduced control is attributed to site conditions and not timing. Otherwise, the study indicated that August or October timings could be effective for such treatments (Table 2). In Texas, control varied somewhat and the early season follow-up (Trt. 1) and the higher rate in September provided better control than the August treatments (Texas site had no October treatments).

In an evaluation of rate response, the consistent trend was that 2 ounces of Oust® provided notably less control than the 3 ounce rate. However, increasing the application rate to 4 ounces did not improve control (Table 2).

Overall the site prep tank mixture provided very good to excellent control of the tree species, irrespective of application timing. Differences in total stem reduction were related more to species presence in plots than to application timing (Table 3).

In summary, inclusion of Oust®in fall site prep applications can provide herbaceous weed control during the ensuing growing season with little concern regarding application timing. Extremely droughty site conditions should be avoided for best results. Also, 3 ounces of Oust® appears to be the most cost effective rate.

Table 1. Treatment list for 2000 DuPont Fall Oust site prep study.

Treatment No.	Herbicide and Rate/A[1]	Timing
1	4 qts. Krenite + 24 oz. Chopper (fb 3 oz. Oust in 03/01)	August 1
2	4 qts. Krenite + 24 oz. Chopper + 2 oz. Oust XP	August 1
3	4 qts. Krenite + 24 oz. Chopper + 3 oz. Oust XP	August 1
4	4 qts. Krenite + 24 oz. Chopper + 4 oz. Oust XP	August 1
5	4 qts. Krenite + 24 oz. Chopper + 2 oz. Oust XP	September 1
6	4 qts. Krenite + 24 oz. Chopper + 3 oz. Oust XP	September 1
7	4 qts. Krenite + 24 oz. Chopper + 2 oz. Oust XP	October 1
8	4 qts. Krenite + 24 oz. Chopper + 3 oz. Oust XP	October 1
9	4 qts. Krenite + 24 oz. Chopper	October 1
10	64 oz. Chopper	October 1
11	Untreated	n/a

[1] 1% v/v X-77 surfactant was added to all treatments.

Table 2. Average percent clear ground by time of observation (herbaceous cover only) – (average all reps)

	Time of Observation				
Trt. No	April	May	June	July	August
August	percent				
1	100a	100a	98a	98a	82a
2	100a	100a	97a	93a	50b
3	99a	98a	97a	93a	76a
4	100a	99a	98a	95a	67ab
September					
5	100a	99a	96a	93a	38b
6	99a	98a	94a	86a	39b
October					
7	100a	100a	98a	97a	67ab
8	100a	100a	96a	96a	76a
9	100a	96a	86a	41b	15c
10	100a	97a	72b	41b	15c
11	28b	2b	0c	0c	0c

1Values in a column followed by the same letter do not differ at $\alpha = 0.05$

Table 3. Percent reduction of principal woody species in 2000 DuPont Fall Oust study – Mississippi (Average all reps).

	Species[1]				
Trt. No	SWG	REM	BLC	Trees	Total
	percent				
1	100.0a[2]	100.0a	96.7a	97.7a	89.3a
2	100.0a	96.3a	100.0a	95.9a	81.5ab
3	100.0a	100.0a	100.0a	100.0a	91.1a
4	98.3a	93.3a	93.3a	90.0a	83.5ab
5	100.0a	100.0a	100.0a	93.5a	82.4ab
6	91.7a	93.3a	100.0a	87.0a	62.2b
7	97.8a	95.8a	00.0a	97.1a	76.2ab
8	100.0a	94.9a	87.8a	87.3a	79.1ab
9	100.0a	100.0a	88.3a	95.6a	85.6ab
10	100.0a	100.0a	100.0a	93.9a	88.2ab
11	50.6b	41.7b	-133.3b[3]	15.1b	0.4c

[1]SWG = sweetgum, REM = red maple, BLC = black cherry, Trees = all tree species (no shrubs), Total = all woody species (including shrubs).
[2]Values in a column followed by the same letter do not differ at $\alpha = 0.05$
[3]Negative values indicate an increase in the number of stems

FIRST-YEAR WOODY PLANT CONTROL FOLLOWING SEVERAL FORMULATIONS AND TIMINGS OF GLYPHOSATE WITH OR WITHOUT IMAZAPYR. T.B. Harrington, A.W. Ezell, J.L. Yeiser, and J.O. Cobb; University of Georgia, Athens, GA 30602, Mississippi State University, Starkville, MS 39762, Stephen. F. Austin State University, Nacogdoches, TX 75962, and Dow AgroSciences, Auburn, AL 36830.[1]

ABSTRACT

Several formulations of glyphosate were applied with or without imazapyr in June and October 2000 at sites located in Georgia, Mississippi, and Texas. The objective of the research was to compare control of woody species between experimental and conventional formulations of glyphosate with or without imazapyr. Percentage change in total length of woody stems was evaluated immediately before treatment and one year following treatment. In general, the experimental formulations of glyphosate provided similar levels of woody control as that observed for Accord® SP or generic glyphosate. Woody control from Accord® SP was often greater than that observed from generic glyphosate, especially at the Georgia site.

INTRODUCTION

In 2000, several new formulations of glyphosate were being developed by the Monsanto Corporation prior to their sale of the Accord® line of products to Dow AgroSciences. In this study, three new formulations of glyphosate with or without imazapyr were compared to currently labeled products applied at the same rate, including combinations of Accord® SP and generic glyphosate applied with or without Chopper® or Arsenal® AC.

METHODS AND MATERIALS

The study was conducted at three study sites in the southeastern U.S.: Oglethorpe County GA, Winston County MS, and Angelina County TX. Soil types include a sandy clay loam in Georgia, a silty clay loam in Mississippi, and a sandy loam in Texas. Pine or mixed pine-hardwood stands were harvested at each site one to two years prior to study initiation resulting in a relatively uniform coverage of hardwood and shrub sprouts. At each site, 48 plots of dimension 30’ x 100’ were permanently marked. Seven herbicide treatments (Table 1) and an untreated check applied at each of two timings (June and October 2000) were randomly assigned to plots according to either a completely randomized design (Georgia) or a randomized complete block design (Mississippi and Texas) with three replications of each treatment. Treatments were applied with a CO_2 backpack-pole sprayer fitted with a KLC9 nozzle to apply a uniform spray swath approximately 30’ wide. Spray volume was 15 gallons per acre.

Immediately before and one year following treatment, total length of woody stems was assessed for each woody species within a centrally located 10’- x-80’ area in each plot. Stems were counted according to each of seven 1-ft. height classes between 1.5’ and 9.5’. Total stem length was calculated per species by multiplying each stem frequency by its respective height-class midpoint and summing these products for each plot. Percentage change in total stem length (hereafter referred to as stem reduction) was calculated as 100*(T01-T00)/T00, where T00 and T01are total stem lengths in 2000 and 2001, respectively, for a given plot and species.

For each species having adequate representation among treatments, data were subjected to analysis of variance to determine if stem reduction varied significantly (α=0.05) among months and treatments. Duncan’s Multiple Range Test was used to conduct multiple comparisons of treatment means.

RESULTS AND DISCUSSION

Woody plant responses to the herbicide treatments varied considerably among the study sites. Woody plant control was excellent for most of the herbicide treatments at the Georgia and Mississippi sites, especially for the October treatments (Tables 2-3). At the Georgia site, stem reduction for sweetgum (*Liquidambar styraciflua*) was greater for October treatments than for June treatments, while the reverse trend was true for black cherry (*Prunus serotina*). At

[1]This research was supported by financial and in-kind assistance from the Monsanto Corporation. The authors thank the Timber Company and other members of forest industry for providing study sites for the research.

the Texas site, stem reduction of yaupon (*Ilex vomitoria*) was greater for June treatments than for October treatments (Table 4). No clear timing differences were detected at the Mississippi site.

In general, the dry ammonium salt of glyphosate (MON78015) plus Chopperâ provided an equivalent level of stem reduction as Accordâ SP plus Chopperâ (treatment 2 versus treatment 1). Stem reduction from Accordâ SP was often greater than that observed from generic glyphosate plus X-77â surfactant (treatment 3 versus treatment 6), especially at the Georgia site. The glyphosate and imazapyr blend (MON78229) provided similar or slightly better control of woody stems as the generic glyphosate plus Arsenalâ AC treatment (treatment 4 versus treatment 5). The ether amine formulation of glyphosate (MON78128) provided similar to slightly lower levels of control as that observed for generic glyphosate (treatment 7 versus treatment 5).

Results indicate that woody stem control from the new formulations of glyphosate do not differ markedly from that observed from conventional combinations of Accordâ SP, Chopperâ , or Arsenalâ AC. In addition, Accordâ SP may provide a higher level of woody control as generic glyphosate plus X-77â surfactant on specific sites.

TABLES

Table 1. Formulations and rates of herbicides and surfactant applied in June and October 2000 to control woody vegetation at study sites in Georgia, Mississippi, and Texas.

Trmt .no.	Glyphosate formulation[2]	Glyphosate rate	Imazapyr formulation	Imazapyr rate	Surfactant	Surfactant rate
1	Accordâ SP	5 lbs. a.i./acre	Chopperâ	0.31 lbs. a.i./acre		
2	MON78015	5 lbs. a.i./acre	Chopperâ	0.31 lbs. a.i./acre		
3	Accordâ SP	8 lbs. a.i./acre				
4	MON78229	6 lbs. a.i./acre				
5	Generic	6 lbs. a.i./acre	Arsenalâ AC	0.19 lbs. a.i./acre	X-77â	2.5% by vol.
6	Generic	8 lbs. a.i./acre			X-77â	2.5% by vol.
7	MON78128	6 lbs. a.i./acre	Arsenalâ AC	0.19 lbs. a.i./acre		

[2]MON78015 is a dry ammonium salt of glyphosate. MON78229 is a glyphosate and imazapyr blend with the same rates of active ingredients as found in treatment 5. Generic glyphosate is a product that is 54% active ingredient. MON78128 is an ether amine salt of glyphosate plus surfactant.

Table 2. Percentage change in total stem length of several hardwood species one year following seven herbicide treatments and an untreated check at the Georgia study site. For each timing, means within a column followed by the same letter(s) do not differ significantly (*P*>0.05).

Timing	Treatment number	Species				
		red maple	sweetgum	black cherry	white oak	water oak
		% change in total stem length				
June	1	-100.0c	-93.6a	-100.0b	-100.0b	-95.3cde
	2	-100.0c	-96.2a	-100.0b	-100.0b	-100.0e
	3	-99.7c	+18.1a	-100.0b	-100.0b	-62.6bc
	4	-100.0c	-87.9a	-100.0b	-100.0b	-97.8de
	5	-98.4c	-34.8a	-100.0b	-100.0b	-74.4bc
	6	-61.0ab	+164.5a	-100.0b	-85.2a	+42.2ab
	7	-85.9b	-77.4a	-100.0b	-100.0b	-90.5cd
	untreated check	-13.0a	+192.7a	-45.1a	-13.4a	+306.3a
October	1	-97.2b	-96.3b	-72.2a	-100.0b	-97.9b
	2	-100.0b	-98.5b	-100.0a	-100.0b	-100.0b
	3	-100.0b	-96.4b	-96.4a	-100.0b	-99.2b
	4	-100.0b	-98.1b	-97.3a	-100.0b	-97.1b
	5	-100.0b	-97.9b	-100.0a	-100.0b	-97.9b
	6	-95.5b	-97.2b	-96.9a	-100.0b	-96.7b
	7	-100.0b	-91.3b	-95.0a	-100.0b	-89.9b
	untreated check	+62.1a	+62.9a	-71.4a	-79.8a	+134.3a

Table 3. Percentage change in total stem length of several hardwood species one year following seven herbicide treatments and an untreated check at the Mississippi study site. Means within a column followed by the same letter(s) do not differ significantly (*P*>0.05).

Timing	Treatment number	Species				all species combined
		sweetgum	red maple	post oak	black gum	
		% change in total stem length				
June	1	-93.0a	-93.3a	-87.5a	-100.0a	-84.0a
	2	-64.3b	-100.0a	-100.0a	-100.0a	-93.0a
	3	-97.0a	-100.0a	*	-80.0ab	-85.3a
	4	-100.0a	-96.3a	-100.0a	-85.7a	-92.3a
	5	-100.0a	-94.7a	-97.0a	*	-87.3a
	6	-92.7a	-97.0a	-91.3a	-80.0ab	-81.3ab
	7	-100.0a	-94.0a	-87.7a	*	-78.3b
October	1	-62.7b	-78.0a	-100.0a	-100.0a	-89.7a
	2	-98.0a	-87.7a	-100.0a	-100.0a	-94.0a
	3	-100.0a	-90.0a	-100.0a	-60.9b	-76.3b
	4	-100.0a	-83.3a	-100.0a	-100.0a	-90.3a
	5	-97.3a	-66.7ab	-100.0a	-100.0a	-89.0a
	6	-98.3a	-72.0ab	-100.0a	-5.0c	-70.7b
	7	-98.7a	-66.7ab	-100.0a	-81.3a	-84.3a
	untreated check	-18.0c	-53.3b	-25.0c	*	+25.3c

Table 4. Percentage change in total stem length of several hardwood species one year following seven herbicide treatments and an untreated check at the Texas study site. For each timing, means within a column followed by the same letter(s) do not differ significantly (P>0.05).

Timing	Treatment number	Species		
		yaupon	southern red oak	sweetgum
		% change in total stem length		
June	1	-87.0a	-11.0ab	-3.0b
	2	-42.0b	-12.0ab	-10.0b
	3	-40.0b	-2.0b	-4.0b
	4	-65.0ab	-5.0ab	-10.0b
	5	-62.0ab	-19.0ab	0.0b
	6	-57.0ab	-35.0a	-27.0a
	7	-73.0ab	-29.0ab	-15.0ab
	untreated check	+6.0	-41.0	-8.0
October	1	-49.0ab	-17.0b	-12.0a
	2	-44.0ab	-64.0a	-6.0a
	3	-73.0a	-15.0b	-3.0a
	4	-72.0a	-18.0b	-8.0a
	5	-29.0b	-12.0b	-18.0a
	6	-30.0b	-19.0b	-12.0a
	7	-26.0b	-16.0b	0.0a
	untreated check	+6.0	-40.0	-10.0

SECOND-YEAR EVALUATION OF RESPROUT POTENTIAL FOLLOWING BASAL HERBICIDE APPLICATIONS TO VARIOUS BRUSH SPECIES. L.R. Nelson and A.W. Ezell. Clemson University, Clemson, SC, and Mississippi State University, Mississippi State, MS.

ABSTRACT

Dormant season basal sprays were applied to the lower 46 cm of sweetgum (*Liquidambar styraciflua* L.) and black cherry (*Prunus serotina* Ehrh.) stems in South Carolina and to pecan (*Carya illinoensis*), green ash (*Fraxinus pennsylvanica* Marsh.), and cherrybark oak (*Quercus falcata* var. *pagodaefolia* Ell.) in Mississippi. Herbicides were mixed as a % V/V in Hygrade EC (petroleum based carrier with emulsifiers). Treatments included 25% triclopyr (butoxyethyl ester-480 g ae/l; 15% triclopyr + 3 % imazapyr (isopropylamine salt-240 g ae/l); 15 % triclopyr + 5% imazapyr; and 15% triclopyr. Treatments were applied in the late dormant season of 2000 (late February in Mississippi and early March in South Carolina).

Treatments provided 100% control of sweetgum, green ash, pecan and cherrybark oak. Triclopyr at 25% V/V provided 72% control of black cherry while control with the other treatments ranged from 97 to 100%. None of the treatments resulted in resprouting two years after application.

RATE RESPONSE FROM APPLICATIONS OF PREMIX IMAZAPYR AND GLYPHOSATE FOR USE IN SITE PREPARATION. A.W. Ezell and J.L. Yeiser. Mississippi State University, Starkville, and Stephen F. Austin State University, Nacagdoches, TX.

ABSTRACT

To evaluate the efficacy of premix combinations of imazapyr and glyphosate, a total of six herbicide treatments were replicated three times at sites in Mississippi and Texas. Three replications of an untreated check were also evaluated (table 1) to evaluate treatment efficacy, woody stems were counted pretreatment (Aug, 2000) and one year after treatment (Aug, 2001). Brownout was evaluated at 4 WAT, and herbaceous competition control was evaluated in May and August of the growing season after application (2001).

The three higher rates of the premix (Trts. 3,4,5,6) resulted in acceptable brownout, and would adequately carry a site preparation burn. In herbaceous control, all treatments except the lowest premix rate (Trt. 3) provided good response in May, 2001, but by August, only the highest rate (Trt 6) maintained substantial amounts of clear ground.

Control of woody stems varied by species. In Texas, principal species were yaupon, American beautyberry, and loblolly pine, all of which are resistant to imazapyr and lower rates of glyphosate (Table 3).

On that site, overall control was poor and treatments could not be separated statistically. In Mississippi, woody species included sweetgum, red maple, black cherry, sassafras, and post oak. All herbicide treatments were extremely effective on these species (Table 4), and only when all species were examined could any treatment differences be found. Although not statistically significant, a rate response difference was noted between Trt. 3 and Trt. 4. This response was also evident when "sums of heights" was used as the evaluation criterion (Table 4).

Overall, this premix product appears to work well. As always, the species complex on the site should dictate choice of products and rates. Of the applications tested in this study, the 102.2 oz/A rate appeared to be most cost-effective.

Table 1. List of Treatments in BASF Site Prep Study.

Treatment No.	Herbicide and Rate/A
1	Untreated
2	48 oz Chopper + Sun – It oil (12.5% v/v)
3	Imazapyr/Glyphosate Numbered Cpd – 51.1 oz
4	Imazapyr/Glyphosate Numbered Cpd – 102.2 oz
5	Imazapyr/Glyphosate Numbered Cpd – 153.3 oz
6	Imazapyr/Glyphosate Numbered Cpd – 204.4 oz

Table 2. Percent stem reduction for principal woody species in 2000 BASF site prep study by treatment (avg. all reps)-TX

	Species			
Treatment No.	Yaupon	AMB[1]	Pine	Total
	Percent			
1	-78b[2 3]	-98a	-60a	-79a
2	57a	-97a	-139a	-59a
3	8ab	-59a	-77a	-43a
4	-39ab	-58a	-21a	-39a
5	-62b	-43a	-92a	-66a
6	-2ab	-27a	-44a	-25a

[1]AMB=American beautyberry
[2]Values in a column followed by the same letter do not differ at x-0.05
[3]Negative values indicate an increase in stems

Table 3. Percent stem reduction for principal woody species in 2000 BASF site prep study by treatment (avg. all reps.)

	Species[1]					
Treatment No.	SWG	REM	BLC	SAS	POO	Total
	percent					
1	3.0b[2]	41.7b	-200.0b[3]	50.0b	-126.7b	1.4b
2	100.0a	100.0a	100.0a	100.0a	100.0a	98.4a
3	100.0a	100.0a	100.0a	100.0a	100.0a	90.4a
4	100.0a	100.0a	100.0a	100.0z	100.0a	97.7a
5	100.0a	100.0a	100.0a	100.01	100.0a	98.3a
6	100.0a	100.0a	100.0a	100.01	100.0a	99.5a

[1] SWG= sweetgum, REM = red maple, BLC = black cherry, SAS = sassafras, POO = post oak.

[2] Values in a column followed by the same letter do not differ at $\alpha = 0.05$.

[3] Negative values indicate and increase in stems.

Table 4. Percent reduction in "sum of heights" for all woody species in 2000 BASF site prep study (avg. all reps)

Percent Reduction		
Treatment No.	TX	MS
1	-121b [1 2]	-20.6c
2	4a	98.6a
3	-44a	88.6b
4	-23a	97.5a
5	-19a	99.0a
6	-4a	99.8a

[1]Values in a column followed by the same letter do not differ at x-0.05

[2]Negative values indicate an increase

EARLY SEASON SITE PREPARATION WITH DIFFERENT IMAZAPYR FORMULATIONS. D.K. Lauer*, Silvics Analytic, Richmond, VA 23233, H.E. Quicke, BASF Corporation, Auburn, AL 36830 and P.J. Minogue, BASF Corporation, Redding, CA 96003.

ABSTRACT

Operational scale site preparation herbicide treatments were applied by helicopter in May 1995 at four locations in the southeastern United States. The objective was to examine early season treatments of Chopper herbicide applied in a low volume oil emulsion carrier. Treatments were selected to provide a comparison of Chopper in oil emulsion to Chopper in water carrier or an equivalent rate of Arsenal herbicide Applicators Concentrate in water carrier. Chopper tank mixes with Accord and Garlon 4 were also examined.

Chopper at 48 oz applied in an oil emulsion carrier improved crop pine growth and hardwood control over an equivalent rate of imazapyr formulated as Arsenal and applied in a water carrier. Age 5 crop pine stem volume index was 35 ft^3/acre for Arsenal in water compared to 60 ft^3/acre for Chopper in oil, a 71% increase. Control of competing hardwood was also improved. Five years after treatment, arborescent (tree forming) hardwood , expressed as sum of rootstock heights, was reduced from 2710 ft/acre for Arsenal in water to 1788 ft/acre for Chopper in oil, a 34% reduction.

For oil emulsion applications, decreasing the Chopper rate from 48 to 32 oz reduced hardwood control, even when Chopper was combined with Accord or Garlon 4. Competing arborescent hardwood was reduced from 3775 ft/acre for 32 oz straight Chopper to 1788 ft/acre for 48 oz straight Chopper, a 53% reduction. Arborescent hardwood was reduced from 1902 ft/acre for 32 oz Chopper + 2 qt Accord to 1288 ft/acre for 48 oz Chopper + 1 qt Accord, a 32% reduction. Competing arborescent hardwood was reduced from 7130 ft/acre for 32 oz Chopper + 32 oz Garlon 4 to 2284 ft/acre for 48 oz Chopper + 16 oz Garlon 4, a 68% reduction.

There was antagonism between Chopper and Garlon 4. Adding Garlon 4 to Chopper reduced crop pine growth and hardwood control compared to straight Chopper. This was particularly apparent for the higher Garlon 4 rate added to 32 oz Chopper. Crop pine volume index was 39 ft^3/acre for 32 oz Chopper + 32 oz Garlon 4 compared to 54 ft^3/acre for 32 oz straight Chopper. Competing arborescent hardwood was reduced from 7130 ft/acre for 32 oz Chopper + 32 oz Garlon 4 to 3775 ft/acre for 32 oz straight Chopper.

Oil emulsion applications of Chopper or Chopper with Accord provided the best age 5 pine volume response. Pine response was poorest for water carrier treatments and oil emulsion tank mixes of Chopper with Garlon 4.

INTRODUCTION

Chopper herbicide is an emulsifiable concentrate formulation of imazapyr that contains 2 lbs acid equivalent imazapyr per gallon. Chopper may be mixed with water as the spray carrier or an emulsion carrier may be prepared by mixing Chopper into water and then adding a suitable seed oil. Use of an emulsion carrier improves the efficacy of imazapyr mainly by increasing uptake through leaf surfaces (1). This is particularly important for applications early in the growing season (full leaf to July) and for hard to control species at any time during the growing season.

Objectives of this study were to examine crop pine and competing vegetation responses to early season operational site preparation with different Chopper rates and tank mixes on upland sites. Chopper in oil emulsion carrier was also compared to Chopper with water carrier and Arsenal herbicide Applicators Concentrate with water carrier. Arsenal is a soluble concentrate formulation of imazapyr that contains 4 lbs acid equivalent imazapyr per gallon.

METHODS

Operational helicopter applications of 9 herbicide treatments were tested at four locations in the southeastern United States. Locations were Calhoun, GA; Great Falls, SC; Bartow, GA and Curtis, AR. Physiographic provinces are Ridge and Valley, Piedmont, Middle Coastal Plain and Hilly Coastal Plain, respectively.

Treatments: Applications were made between May 15 and 23, 1995. Treatment strips were a minimum of five swaths wide and 5-10 acres in size depending on tract layout. Treatments included three rates of straight Chopper, two Chopper + glyphosate (Accord) tank mixes, and two Chopper + triclopyr (Garlon 4) tank mixes (Table 1). These treatments were applied using an oil emulsion carrier containing 5 quarts per acre Sun-It II methylated seed oil. Total spray volume was 5 gallons per acre. Two additional treatments were 48 oz Chopper in water with 1 qt liquid nitrogen (30-0-0), and 24 oz Arsenal in water with 1% (v:v) glycol surfactant. Loblolly pine was operationally planted at each location the dormant season after application.

Assessments: Five permanent 1/40 acre subplots were installed 2 chains apart along line transects in the middle of the center spray swath. Evaluations on these plots included an initial and years 1, 2, and 5 tally of volunteer pine and hardwoods (arborescent and non-arborescent) over 1.5 ft tall by species and height. Crop pine groundline diameter and height were measured after planting and at age 1 and 2. Crop pine dbh and height were measured at age 5.

Statistical analysis: Treatments were compared using analysis of variance or covariance with contrasts to test specific planned comparisons of interest (Table 2). Age 5 crop pine basal area per acre and volume index per acre were analyzed using analysis of covariance with initial crop pines per acre as the covariate. This analysis compares treatments at a common planting density. Volume index was calculated as 1/3 x basal area x height. Age 5 crop pine survival, height, and dbh were compared using analysis of variance. The arcsine of the square root of percent survival transformation was used but actual percents are reported (2). Study locations were treated as blocks. Height and volume were not available at the Curtis location because trees were bent over by severe ice storms a few weeks before assessment.

Competing vegetation was grouped into categories of arborescent (tree forming) hardwood species, non-arborescent (non-tree forming or shrub-like) hardwood species, and volunteer pine. Sum of rootstock heights 5 years after treatment was the variable used to compare competition levels among treatments. Analysis followed that of a randomized complete block design with study locations treated as blocks. Analysis of variance was used for arborescent and non-arborescent hardwoods. However, sum of heights for arborescent hardwood was transformed using log(x+1), where x = sum of rootstock heights (2) to provide homogeneous error over the range of this variable. This transformation was not required for non-arborescent hardwood. Analysis of covariance was used in the analysis of volunteer pine with initial volunteer pine per acre as the covariate. This accounted for the initial variation in stocking of volunteer pine both within and across locations.

RESULTS

Pine response: Chopper at 48 oz in oil emulsion carrier resulted in better pine stem volume growth than the same rate of Chopper applied in water carrier or an equivalent rate of imazapyr formulated as Arsenal AC and applied in water ($p<0.037$, $p<0.056$). Adding Garlon 4 to Chopper reduced pine stem volume growth over the same rates of straight Chopper, indicating that Garlon 4 is antagonistic in combination with Chopper ($p=0.06$). The addition of Accord to Chopper had no effect on pine response. Overall, the best pine volume growth was achieved with straight Chopper at 48 oz applied in oil emulsion carrier. Treatment means and results of statistical tests for all pine attributes are provided in Table 3.

Competing vegetation control by category: Arborescent and non-arborescent hardwood control improved as Chopper rate increased. For arborescent hardwood, control increased as rate increased from 32 to 64 oz ($p=0.066$ for linear rate trend). For non-arborescent hardwood there was a major improvement in control when Chopper rate increased from 32 to 48 oz ($p=0.096$ for quadratic rate effect).

Chopper at 48 oz in an oil emulsion carrier resulted in better arborescent hardwood control than an equivalent rate of imazapyr formulated as Arsenal AC and applied in water ($p<0.039$). For Chopper + Accord combinations, arborescent hardwood control improved as the Chopper rate increased ($p=0.069$). Chopper at 48 oz + 1 qt Accord resulted in the best control of all treatments. For Chopper + Garlon combinations, arborescent hardwood control improved as the Chopper rate increased ($p<0.021$). Straight Chopper at 48 oz resulted in better control than any Chopper combination with Garlon. Chopper at 32 oz + 32 oz Garlon resulted in the worst control of all treatments.

Non-arborescent hardwood control improved with the addition of 2 qt Accord to 32 oz Chopper, but there was no benefit from adding 1 qt Accord to 48 oz Chopper ($p=0.039$ for the Accord x Chopper interaction). For Chopper +

Garlon combinations, non-arborescent hardwood control improved as Chopper rate increased ($p<0.028$). Straight Chopper at 48 oz resulted in better control than any Chopper combination with Garlon.

Volunteer pine rootstocks per acre decreased with increasing Chopper rate ($p=0.02$). Volunteer pine also decreased when Accord was combined with Chopper ($p=0.07$), and decreased when Garlon 4 was combined with Chopper ($p=0.01$).

Treatment means and results of all statistical tests for competing vegetation categories are provided in Table 4.

CONCLUSION

Chopper applied in a low volume oil emulsion carrier improved early season performance of imazapyr for forestry site preparation. The best performing treatments were 48 or 64 oz Chopper in oil and 48 oz Chopper in oil + 1 qt Accord. Crop pine performance for these treatments was supported by the analysis of treatment effects on competing arborescent (tree-forming) vegetation which found that 1) 48 oz Chopper applied in an oil emulsion carrier provided better control than Chopper applied in water carrier or an equivalent rate of imazapyr formulated as Arsenal and applied in water carrier, 2) control was improved by increasing the Chopper rate from 32 to 48 to 64 oz, 3) Chopper at 48 oz + 1 qt Accord provided better control than increasing the Accord rate and decreasing the Chopper rate to 32 oz, and 4) Garlon 4 was antagonistic when used with Chopper, especially at the higher rate of 32 oz Garlon 4.

These results suggest that uptake on leaf surfaces and not translocation within the plant was limiting efficacy of early season imazapyr applications. The Chopper formulation applied as an oil emulsion with water has mitigated early season limitations to uptake.

REFERENCES

1. Esen, D. and S.M. Zedaker. 1999. Surfactants affect foliar uptake and translocation of triclopyr and imazapyr in Rhododendron. Proc. Southern Weed Sci. Soc. 52:126-127.

2. Snedecor, G.W. and W.G. Cochran. 1967. Statistical Methods. The Iowa State University Press. Ames, Iowa. 593 pp.

Table 1. Treatment details.

Tmt #	Herbicides (rates are per acre)	Carrier	Additional surfactant	Total spray Volume
1	Chopper 32 oz	water + 5 qt oil	None	5 gpa
2	Chopper 48 oz	water + 5 qt oil	None	5 gpa
3	Chopper 64 oz	water + 5 qt oil	None	5 gpa
4	Chopper 32 oz + Accord 2 qt	water + 5 qt oil	None	5 gpa
5	Chopper 48 oz + Accord 1 qt	water + 5 qt oil	None	5 gpa
6	Chopper 32 oz + Garlon 4 32 oz	water + 5 qt oil	None	5 gpa
7	Chopper 48 oz + Garlon 4 16 oz	water + 5 qt oil	None	5 gpa
8	Chopper 48 oz	water	1 qt 30-0-0	5 gpa
9	Arsenal AC 24 oz*	water	1% v:v NIS	15 gpa (2 sites), 5 gpa (2 sites)

NIS=nonionic surfactant

* 24 oz Arsenal and 48 oz Chopper each provide 0.75 lb. acid equivalent imazapyr per acre

Table 2. Contrasts to test planned comparisons.

Contrast name	Description	Treatment numbers*
Chopper rate effect		
Chopper linear	Is there a linear response to increasing Chopper rate?	1,2,3
Chopper quadratic	Is there a quadratic response to increasing Chopper rate?	1,2,3
Accord effects		
Chopper rate	Is there a rate response for Chopper with or without Accord?	1,4 vs. 2,5
Accord response	Does Chopper + Accord differ from straight Chopper?	1,2 vs. 4,5
Accord x Chopper	Is there a difference between Accord added to 32 or 48 oz Chopper?	1,5 vs. 2,4
Garlon 4 effects		
Chopper rate	Is there a rate response for Chopper with or without Garlon?	1,6 vs. 2,7
Garlon response	Does Chopper + Garlon differ from straight Chopper?	1,2 vs. 6,7
Garlon x Chopper	Is there a difference between Garlon added to 32 or 48 oz Chopper?	1,7 vs. 2,6
Other effects		
Chopper carrier	Is there a difference between Chopper + oil and Chopper + water + N?	2 vs. 8
Chopper vs Arsenal	Is there a difference between Chopper + oil and Arsenal + water + NIS?	2 vs. 9

* Treatment numbers from Table 1.

Table 3. Analysis of age 5 pine attributes and treatment means. The covariate used for volume index and basal area was initial crop pines per acre.

	Vol. Index	Basal area	Height	DBH	Survival
Source of variation[1]	*……………………Probability of a greater F-value………………………*				
Chopper rate effect					
Chopper linear	0.951	0.980	0.188	0.340	0.551
Chopper quadratic	0.621	0.636	0.240	0.152	0.747
Accord effects					
Chopper rate	0.271	0.262	0.121	0.076	0.945
Accord response	0.376	0.862	0.358	0.262	0.218
Accord x Chopper	0.638	0.569	0.411	0.523	0.967
Garlon 4 effects					
Chopper rate	0.887	0.577	0.499	0.225	0.725
Garlon response	0.060	0.082	0.875	0.582	0.346
Garlon x Chopper	0.621	0.991	0.094	0.222	0.746
Other effects					
Chopper carrier	0.037	0.070	0.219	0.292	0.665
Chopper vs Arsenal	0.056	0.115	0.172	0.150	0.398
Covariate	0.005	0.001	…	…	…
……………………………………Treatment means[2] **……………………………………**					
	…ft^3/acre…	*…ft^2/acre…*	*…ft…*	*…inches…*	*…%…*
Chopper 32 oz	54	11.8	10.7	1.9	62
Chopper 48 oz	60	12.6	12.2	2.3	62
Chopper 64 oz	55	11.7	11.9	2.1	65
Chopper 32 oz + Accord 2 qt	41	10.7	11.8	2.2	67
Chopper 48 oz + Accord 1 qt	55	13.1	12.3	2.3	68
Chopper 32 oz + Garlon 4 32 oz	39	8.9	11.9	2.0	65
Chopper 48 oz + Garlon 4 16 oz	35	9.7	11.2	2.0	68
Chopper 48 oz (no oil)	27	8.5	11.1	2.1	65
Arsenal 24 oz (no oil)	35	9.4	11.0	2.0	56

[1] Detailed description of effects in Table 2

[2] Means adjusted for significant covariate

Table 4. Analysis of year 5 sum of rootstock heights per acre for competing vegetation categories and treatment means for sum of rootstock heights and number of rootstocks.

	Arborescent	Non-arborescent	Volunteer pine
Source of variation[1]	*………Probability of a greater F-value………*		
Chopper rate effect			
Chopper linear	0.066	0.018	0.020
Chopper quadratic	0.167	0.096	0.921
Accord effects			
Chopper rate	0.069	0.094	0.328
Accord response	0.508	0.175	0.067
Accord x Chopper	0.241	0.039	0.515
Garlon 4 effects			
Chopper rate	0.021	0.028	0.348
Garlon response	0.202	0.269	0.006
Garlon x Chopper	0.525	0.127	0.489
Other effects			
Chopper carrier	0.203	0.300	0.262
Chopper vs Arsenal	0.039	0.494	0.444
Covariate	---	---	0.001
Treatment means[2]	*………Sum of rootstock heights (ft/acre)………*		
Chopper 32 oz	3775	2815	29239
Chopper 48 oz	1788	850	16775
Chopper 64 oz	1394	1010	2457
Chopper 32 oz + Accord 2 qt	1902	1024	9572
Chopper 48 oz + Accord 1 qt	1288	1240	7043
Chopper 32 oz + Garlon 4 32 oz	7130	1458	1328
Chopper 48 oz + Garlon 4 16 oz	2284	1074	-577
Chopper 48 oz (no oil)	1912	1600	4559
Arsenal 24 oz (no oil)	2710	1342	8383
Treatment means[2]	*………Number of rootstocks per acre………*		
Chopper 32 oz	600	707	3121
Chopper 48 oz	324	220	1671
Chopper 64 oz	246	282	217
Chopper 32 oz + Accord 2 qt	266	278	964
Chopper 48 oz + Accord 1 qt	234	338	699
Chopper 32 oz + Garlon 4 32 oz	978	402	57
Chopper 48 oz + Garlon 4 16 oz	360	304	-101
Chopper 48 oz (no oil)	306	400	452
Arsenal 24 oz (no oil)	464	342	920

[1] Detailed description of effects in Table 2
[2] Means are adjusted means if the covariate is significant

WOODY STEM CONTROL USING TREATMENTS OF MON 78015, MON 78229, MON 78128 AND OTHER GLYPHOSATE PRODUCTS. L.R. Nelson, A.W. Ezell and J.L. Yeiser. Clemson University, Clemson, SC; Mississippi State University, Mississippi State, MS; and Stephen F. Austin State University, Nacogdoches, TX.

ABSTRACT

A total of ten herbicide site preparation treatments were applied on recently cutover forest sites in South Carolina, Mississippi, and Texas. All treatments included glyphosate either alone, tank mixed with imazapyr, or in a premix formulation with imazapyr. Applications were completed in late July with a CO_2-powered backpack sprayer using 10 gpa total spray volume to simulate aerial application for site preparation. Each treatment included three replications at all locations. A pretreatment inventory of woody stems was completed by species and height class. An inventory of live stems by species and height class was conducted at the end of the second growing season after treatment.

Dominant species included red maple (*Acer rubrum* L.) and water oak (*Quercus nigra* L.) in South Carolina, hickory (*Carya spp.*), post oak (*Quercus stellata* Wangenh,) and American beautyberry (*Callicarpa Americana* L.) in Mississippi and southern red oak (*Quercus falcate* Michx.) and yaupon (*Ilex vomitoria* Ait.) in Texas. An evaluation of percent stem reduction by species resulted in no distinct differences between formulations and/or tank mixtures.

PREPARING PINE SITES WITH VELPAR+DUPONT GLYPHOSATE MIXTURES. J.L. Yeiser and E.W. Ezell. Arthur Temple College of Forestry, Stephen F. Austin State University 75962 and Department of Forestry, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

The objective of this study was to assess the potential of Velpar L+DuPont Glyphosate for the control of unwanted competitors occupying pine sites.

Two sites, one in MS and one in TX, were selected for testing. In MS, the study was installed on a recently harvested site three miles north of Sturgis. Previous cover was mixed pine-hardwood. Soils at the site are clay loam with a pH=5.5. In TX, the study was established near Wells. The soil there was a sandy clay loam with pH=5.5. The site supported a mixed hardwood-pine stand that was clearcut in January 2000 before planting in January 2001.

A total of nine treatments were tested in MS. Three of the treatments were applied early (May 12, 2000) and five were applied late (June 26). Test treatments were: in May, Velpar L+DuPont Glyphosate (6+2q, 4+4q), Velpar L (8q); and in June, Velpar L+DuPont Glyphosate (6+2q, 4+4q), Velpar (8q), Chopper+Accord SP+surfactant (48+32+16oz, 16+160+16oz). In TX, seven treatments were tested. Velpar L (6q), an industry check, was applied on May 22. The five, July 22 treatments were: Accord+Chopper (160+16oz), Velpar L+DuPont Glyphosate (4+4q, 6+2q), Velpar (8q), Chopper+Accord+X77 (48+32+16oz). An untreated check and eight herbicide treatments in MS and six herbicide treatments in TX were replicated three times in a randomized complete block design.

MISSISSIPPI
All treatments and timings provided excellent control of hickory and winged elm. Similar and best control was achieved for winged elm, hickory, post oak, and overall species with Velpar+DuPont Glyphosate (6q+2q), Velpar L early (8q), and Chopper+Accord+surfactant (48oz+32oz+16oz and 16oz+160oz+16oz). Early application of Velpar+DuPont Glyphosate (4q+4q) provided poor post oak control. Values for total control may be misleading, in that the majority of stems not controlled were loblolly pine and American beautyberry. Grass and broadleaf re-colonization of plots during spring 2001 was light. By July, grass cover was similar with only one treatment, Velpar L+DuPont Glyphosate applied early (4+4q), being significantly different from other treatments. Overall, grass cover in July 2001, one year following treatment in June 2000, averaged 6% for best treatments. Similarly, significant differences in broadleaf cover were not detected until July 2001. Late applications of Velpar L+DuPont Glyphosate (6+2, 4+4) had significantly more broadleaf cover than other treatments. Best treatments yielded 10% broadleaf cover in July. Grass and broadleaf cover on untreated checks were very comparable to treatment plots suggesting herbaceous cover was not related to herbicide treatments.

July seedling survival was similar for all treatments. Early treatments averaged 60% and late 49%. The study average survival was 53%.

TEXAS
All treatments similarly controlled rootstocks of winged elm (average 83%). Ingrowth of 3 rootstocks on checkes was numerically the greatest. Greater percent stem reduction resulted from treatments of Velpar L+DuPont Glyphosate (160+16oz) and Velpar L (6q), with an average of 98%, than on check, Velpar L (6+2q), Velpar L (8q), and Chopper+Accord SP (48+32+16oz) plots, which averaged 55%. Treatments providing significantly less ingrowth (0.0%), more stem reduction (98%) and more height reduction of surviving rootstocks were the industry check (Velpar L 6q in May) and Accord+Chopper (160oz+16oz). Herb re-colonization of plots during the spring of 2001 was similar in March for all treatments with 47% cover. Differences in April, May, and June were among the treated plots and untreated checks. In April, May, and June cover for treated plots and checks were: 59% 99%, 68% 101%, and 84% 113%, respectively.

After one growing season, survival (92%), height (1.36 ft), ground line diameter (0.267 in), and volume index (0.00103 ft^3) were similar for all treatments.

In conclusion, Velpar+DuPont Glyphosate combinations provided excellent control of winged elm and hickory. Control of post oak and total species was inconsistent. Control of 2001 herbaceous weeds by 2000 applications was detected but insufficient to yield increases in pine seedling survival or growth.

SPLIT SEASON HERBACEOUS WEED CONTROL FOR A FIRST-YEAR LOBLOLLY PINE PLANTATION IN SOUTHEAST ARKANSAS. R.A. Williams and J.A. Earl, Arkansas Agricultural Experiment Station and School of Forest Resources, University of Arkansas at Monticello, 71656.

ABSTRACT

A total of 12 plots replicated four times was established in southeast Arkansas in Drew County to evaluate herbaceous weed control in planted loblolly pine seedlings using several herbicides and a split season application. Applications included Early (pre-emergent), Late (post-emergent) and Full (both pre- and post-emergent). Seedlings with herbaceous weed control had slightly higher levels of survival compared to untreated seedlings. Height and ground line diameter growth was significantly greater on treated seedlings compared with untreated seedlings. The seedlings receiving the Late season herbicide application had the greatest height and diameter growth compared with seedlings with Early and Full applications. The seedlings with herbaceous weed control had more than twice the ground line diameter growth as seedlings left untreated.

INTRODUCTION

Herbaceous weed control studies are typically dual-purpose: they allow the chemical companies to test new products and also develop guidelines for industrial spraying. In this study, we are testing different rates of a fairly new product called Oustar, which is a granular mixture of both Oust and Velpar, along with the industry standard rates of Oust alone, Arsenal+Oust and Velpar alone. Split season refers to two treatment periods. The first treatments were applied pre-emergent and the second application was applied post-emergent. Some plots received no herbaceous weed control, others received the pre-emergent only (early) or post-emergent only (late) and full treatment means that the plots received both pre- and post-emergent applications of herbicide.

MATERIALS AND METHODS

This herbaceous weed control study was established in February of 2001 on The Timber Company site in central Drew County, AR. The soil type is a silt loam (Henry or Calloway series). Site index for loblolly pine at age 50 is 85 feet. This site was harvested and site prepared using a shear in combination with bedding. Planting occurred during January of 2001 with improved loblolly pine seedlings on an approximate spacing of 8'x10'.

Because of the slight down slope from west to east, four replicated blocks were installed. Twelve treatment plots were set up in each block. Each plot is a 100-ft strip along a bed; because of the variability in spacing, each plot initially contained between 12 and 17 planted seedlings. All measurement trees were alive at establishment, but some have not survived the spring either due to poor planting or being browsed by deer. After the plots were established and before spraying, treatments were assigned randomly to all 48 plots, giving the experiment a Randomized Compete Block Design (RCBD) with 12 treatments and 4 replications.

There are both pre- and post-emergent applications among the eleven herbicide combinations (Table 1). Four rates are classified as EARLY and were applied in early March 2001 to pre-emergent plots. One treatment is called LATE and only had a post-emergent application in mid-May 2001. The seven FULL plots received herbicide applications in both March and May. Finally, there was one UNTREATED control. All herbicide applications were done with a CO_2-powered backpack sprayer using a two nozzle boom and stainless steel 110-015 tips. The boom was centered over the seedlings and sprayed over-the-top of the pine seedlings at a volume equal to 10 gallons per acre.

Heights (ft) and ground line diameters (in) were measured before treatment and after the first growing season. Initial measurements were evaluated using the Shapiro-Wilkes test to make sure the data was normal before analysis. Volume growth was computed using the following formula: (current height – previous height) x (current diameter – previous diameter) (1). The incremental growth was analyzed with Proc GLM (2) as a RCBD using increment as the dependent variable and treatment as the independent variable. Means were separated using Duncan's at an alpha level of 0.05. All 48 plots were tallied for initial survival. Because of a poor planting job in some spots, survival was tallied in mid-May to get an idea of how planting affected survival. Survival was taken again at the end of growing season one. The percentages were transformed using the Arcsine Squareroot technique to take them to an approximately normal distribution, then taken into SAS for analysis of variance.

For herbicide efficacy, two trees per plot were evaluated every 30 days after treatment (DAT) through 150 DAT, and then again at the end of the first growing season (approximately 270 DAT). At each evaluation period, a one square meter frame was placed over a randomly-selected seedling, and the percent bare ground and percent of brownout were estimated visually. From these two measures, a percent green was calculated. Around July 1st, twelve biomass samples were taken from the 6 untreated areas adjacent to the treated plots using a square frame one meter long on each side. Major herbaceous competitor species were identified, and then the samples were oven-dried and weighed. Projections for biomass per unit area were calculated after the vegetation was dried.

RESULTS AND DISCUSSION

Tree growth

Seedling height growth was impacted by an infestation of Nantucket pine tip moth (*Rhyacionia frustrana* Comstock). Tip moths were readily apparent from late spring throughout the summer. While another study we were monitoring at the same time showed about 98 percent tip die-back by season's end, this study had very few signs of tip moth by December 2001, probably less than one percent (visually noted). Tip moths infested seedlings in every plot so no one treatment were impacted more than others.

Pine seedlings receiving herbaceous weed control (.612 feet) outgrew untreated seedlings (.378 feet) of height growth. Table 1 shows the readings for each treatment along with the associated significance. Pine seedling height growth for early treatments was .59 feet while the height growth for seedlings receiving late treatments were .629 feet. Seedlings receiving full treatments had height growth of .624 feet.

The individual treatments ground line diameters are shown in Table 1. The treated seedlings significantly outgrew the untreated seedlings in ground line diameter measurements. For all herbicide treated seedlings, the ground line diameters averaged .275 inches which more than doubled the GLD growth of the untreated seedlings (.136 inches).

The seedlings treated by herbicides on the early cycle had GLD measurements of .239 inches while the late cycle treated seedlings had .326 inches of GLD. The seedlings receiving the full treatments averaged .291 inches of GLD.

Volume calculations are shown in Table 2. The untreated seedling volume calculations were .14 cubic inches compared to 1.11 cubic inches for the treated seedlings. The early treated seedlings had volumes of .92 cubic inches while the late treated seedlings had 1.26 cubic inches of volume. The herbicide treated seedlings clearly outgrew the untreated seedlings.

Herbicide efficacy

The effectiveness of each herbicide treatment is shown in Table 3. Untreated plots had significantly more vegetation than treated plots. The 60 day evaluations found that the untreated plots were already down to only 28 percent bare ground and the 120 day evaluation found only 7 percent bare ground on these plots. The poorest treated plot had over 40 percent bare ground at the 120-day evaluation. Treatments 6, 9, 11 and 12, that were full treatments receiving both early and late applications of herbicides had the greatest amount of bare ground at the 120 day evaluation. The early only treatments had 55 percent bare ground at the 120 day evaluation while the late only treatment had 67 percent bare ground. All of the treated plots had significantly more bare ground compared to untreated plots throughout the growing season.

Herbaceous competition and biomass

Herbaceous weed competition was great on this site despite the intense mechanical site preparation. There was 2.54 tons per acre of herbaceous competition or 4,543 kg/ha. The principle competitions included panic grass, ragweed, burnweed, goatweed, flatsedge, wood sorrell, and purple cudweed. Woody vines also very competitive on this site. The vines included peppervine, honeysuckle and blackberry. The herbicides used in this study did little to control these woody vines.

Survival

Overall survival was an acceptable 81 percent. The yearly rainfall was more even throughout the summer months although late summer and early fall was dry in southeast Arkansas. However, the rainfall that did occur during the summer kept survival rates acceptable even on the untreated seedlings (77 percent). One treatment had survival at less than 70 percent (Table 2), however, we suspect that many of those trees were dead by May, and died due to being poorly planted rather than through the traditional stresses of a southeast Arkansas summer. Seedlings released with early treatments had 81 percent survival rates. The seedlings receiving the late treatment had survival rates of 89 percent; the highest recorded for this study. The seedlings receiving some herbaceous weed control averaged over 79 percent survival while the untreated seedlings survival was 77 percent. There were no statistical differences among treatments.

CONCLUSIONS

Herbaceous weed control was very effective in increasing pine seedling growth. Height and ground line diameter growths were all greater on seedlings treated for herbaceous weed control compared to seedlings without control. The increased growth lead to substantially more volume that was calculated from the height and diameter measurements. Herbicide effectiveness was evident throughout the growing season as determined by the percent of bare ground.

All herbicide treatments were effective in increasing seedling growth, however, the early only treatments were the least effective compared to full and late treatments. The best height and ground line diameter growth was found on the late only treatment. One note, only one plot had the late only treatment, five plots had the early treatments and six plots received the full treatments.

LITERATURE CITED

1. Earl, J. A. and R. A. Williams. 2001. Comparing rate ranges of Oustar herbicide with industry standards. P. 162-165 *in* Proc. South. Weed Sci. Soc., Biloxi, MS 332 p

2. SAS Institute Inc. 1988. SAS/STAT user's guide. SAS Institute Inc., Cary, NC. 1028 p.

Table 1. Comparison of groundline diameter (in) and height (ft) for first growing season

Trt	Pre-emerge	Post-emerge	GLD	Ht
1	Untreated	Untreated	0.14 b	0.38 c
2	Untreated	2 oz OU XP+1/2 oz ES+12 oz Eagre	0.32 a	0.63 abc
3	3 oz Oust XP	Untreated	0.24 a	0.63 abc
4	13 oz Oustar	Untreated	0.24 a	0.61 abc
5	19 oz Oustar	Untreated	0.25 a	0.55 abc
6	13 oz Oustar	1/2 oz Escort	0.31 a	0.68 ab
7	13 oz Oustar	2 oz Oust XP	0.31 a	0.79 a
8	13 oz Oustar	12 oz Eagre	0.24 a	0.51 bc
9	13 oz Oustar	2 oz OU XP+1/2 oz ES+12 oz Eagre	0.31 a	0.61 abc
10	4 oz AR + 2 oz Oust XP	Untreated	0.22 ab	0.58 abc
11	4 oz AR + 2 oz Oust XP	2 oz OU XP+1/2 oz ES+12 oz Eagre	0.26 a	0.45 bc
12	32 oz Velpar or equiv. DF	2 oz OU XP+1/2 oz ES+12 oz Eagre	0.32 a	0.68 ab

Table 2. Comparison of volume (in^3) and survival (%) for first growing season

Trt	Pre-emerge	Post-emerge	Vol	Survival
1	Untreated	Untreated	0.14 b	77 a
2	Untreated	2 oz OU XP+1/2 oz ES+12 oz Eagre	1.26 a	89 a
3	3 oz Oust XP	Untreated	0.93 ab	74 a
4	13 oz Oustar	Untreated	0.98 ab	82 a
5	19 oz Oustar	Untreated	0.89 ab	93 a
6	13 oz Oustar	1/2 oz Escort	1.23 a	69 a
7	13 oz Oustar	2 oz Oust XP	1.46 a	90 a
8	13 oz Oustar	12 oz Eagre	0.79 ab	77 a
9	13 oz Oustar	2 oz OU XP+1/2 oz ES+12 oz Eagre	1.40 a	83 a
10	4 oz AR + 2 oz Oust XP	Untreated	0.89 ab	77 a
11	4 oz AR + 2 oz Oust XP	2 oz OU XP+1/2 oz ES+12 oz Eagre	0.87 ab	77 a
12	32 oz Velpar or equiv. DF	2 oz OU XP+1/2 oz ES+12 oz Eagre	1.35 a	80 a

Table 3. Bare ground (%) comparison throughout the first growing season

	Days After Treatment[1]					
Treatment	30	60	90	120	150	270
1	58 c	28 c	17 e	7 e	4 d	28 e
2	71 b	58 b	76 abcd	67 bc	53 ab	58 abc
3	98 a	88 a	68 cd	57 cd	32 c	45 d
4	93 a	92 a	76 abcd	57 cd	31 c	53 bcd
5	97 a	96 a	63 d	59 cd	52 ab	45 d
6	93 a	92 a	83 abc	70 bc	52 ab	52 cd
7	96 a	88 a	61 d	66 bc	54 ab	55 bcd
8	97 a	91 a	77 abcd	68 bc	52 ab	55 bcd
9	97 a	95 a	91 a	80 ab	63 a	68 a
10	93 a	90 a	64 d	47 d	37 bc	52 cd
11	98 a	89 a	88 ab	87 a	68 a	64 abc
12	80 b	69 b	70 bcd	70 bc	59 a	65 ab

[1]Means within a column sharing the same letter are not significantly different (Tukey's Studentized Range Test, p=0.05)

SPLIT-SEASON HERBICIDE TREATMENTS FOR FULL SEASON HERBACEOUS WEED CONTROL.
J.L. Yeiser. Arthur Temple College of Forestry, Stephen F. Austin State University, Nacogdoches, TX 75962; A.W. Ezell. Department of Forestry, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Soil moisture is commonly abundant in spring. Weeds around newly planted loblolly pine seedlings are usually sparse. In summer, soil moisture is low and herbaceous weeds around seedlings are often abundant. Treatments for herbaceous weeds can be timed to coincide weed free conditions and seedling performance. When is the most effective time of application for maximum seedling performance? Information from this study will assist managers in determining the best time to apply herbicides for maximum seedling performance.

Tests were established in Mississippi and Texas. The TX site was located in Angelina County near Huntington, TX. The clay loam soil had a pH=5.2 and organic matter > 1.5%. The mixed pine-hardwoods occupying the sites were clearcut in October 1999. The aerial treatment of Arsenal+Garlon (16oz+2qt) was applied in July 2000 and followed with a burn and subsoiling, both in October. Bare-root seedlings were planted on an 8- X 10-ft spacing on January 4, 2000. In MS, the soil was a silt loam with pH=5.0. The natural stand of mixed hardwoods and pine were clearcut in May 2000 before shearing and windrowing in September. The site was planted with bare-root seedlings in January 2001.

In TX, forbs dominated the site. Commonly present were dogfennel and purple cudweed with lesser amounts of late boneset, yankeeweed, American burnweed, Hypericum spp., Virginia buttonweed, yellow thistle, and Polypremum procumbens. Winter ryegrass, panicgrasses, sedges, rushes and broomsedge were lightly distributed across plots. In MS, near equal proportions of forbs (goldenrod, prickly sida,horseweed, late boneset, common ragweed, dog fennel, wild garlic, wooly croton, beggar lice (Desmodium sp)) and grasses (Andropogon spp, broadleaf signalgrsss, panic grasses and foxtail) occupied the site.

In TX, test herbicides were applied early on March 10, 2001 and late on May 11, 2001. Similarly, MS treatments were applied on March 6 (Early) and June 1 (Late). Early treatments were applied with a center-weighted AI11004VS nozzle and late treatments were applied with twin 11002VS nozzles. Herbicides were applied in a 5-foot band centered over the top of planted pine seedlings. Treatment plots contained 16-seedlings. Measurement plots consisted of the middle 12 seedlings. Measurement plots were visually evaluated at 30-day intervals for efficacy. Seedlings were measured for resultant total height and ground line diameter at study onset and in November after one growing season.

In MS, and TX, herbicide treatments effectively provided none, early, late, and full-season weed-free growing conditions. Early use rates of Oust XP (3oz), Oustar (13oz, 19oz) and Arsenal+Oust XP (4+2oz) provided excellent weed-free growing conditions through July (120 DAT) at which time weeds slowly invaded plots. Early treatments followed by late treatments of Oust XP+Escort+Eagre (2+0.5+12oz), Oust XP (20z), Eagre (12oz) provided excellent full-season growing conditions through August with early treatments receiving Eagre maintaining excellent weed-free conditions through October.

At mid-growing season in TX, treatment differences in growth were minor. Competitor ground cover was a significant predictor of seedling height, ground line diameter and volume index. By the end of the growing season, data patterns suggested similar growth would result from early and full-season, as well as none and late season weed-free conditions.

At the end of the growing season, time of application significantly impacted seedling performance. In TX, total height for check=late<early=full=total; for ground line diameter and volume index, check < late < early =full=total.

In conclusion, test treatments effectively established none, early, late and full-season weed-free conditions. A single early treatment provided excellent control through August. Two treatments provided full-season control that lasted through September. Full season control that contained Oust XP+Escort+Eagre as the second application provided excellent weed-free conditions through October.

PREEMERGENT VS POSTEMERGENT APPLICATIONS FOR HERBACEOUS WEED CONTROL IN SLASH PINE PLANTATIONS USING SLUFOMETURON, HEXAZINONE, IMAZAPYR, AND METSULFURON. A.W. Ezell and J.L. Yeiser. Mississippi State University, Starkville, and Stephen F. Austin State University, Nacogdoches, TX.

ABSTRACT

A total of 13 herbicide treatments (Table 1) were applied to recently established slash pine plantations in Alabama and Louisiana. Six treatments were applied early (March) and seven were applied late (May). All treatments were replicated four times, and four replications of an untreated check were also evaluated. Total spray volume was 10 gpa for all applications. Pine heights and groundline diameters (GLD) were measured in March and December, 2001. Competition control was evaluated ocularly at 30-day intervals April-October, 2001.

At the Alabama site, early applications generally controlled competition better than the same treatments applied late. The 13 oz/A Oustar applied early provided superior control, but the Arsenal/Escort mix performed well also. In Louisiana, neither early nor late treatments could be separated statistically. Generally, the early treatments performed as well as or better than late applications, but notable exceptions (13 oz Oustar) existed. Overall, season-long control was evident in many of the treatments.

In tree heights, little separation of means could be accomplished at the Alabama site (only 2 of 13 treatments differed significantly), and heights in most plots averaged 2.5-2.8 feet tall (Table 2). In Louisiana, tree heights were generally less (1.9-2.3 feet) but more separation of treatments was evident statistically. The Oustar (Trts 2 and 8) and Velpar (Trts. 3 and 9) treatments had the tallest trees.

In groundline diameter (GLD), none of the treatments could be statistically separated in Alabama (Table 3). The Oustar (Trts 2 and 8) and Oust XP (Trts 7 and 13) resulted in the largest GLD. In Louisiana, treatments could be separated more easily. Generally, the Oustar treatments (2 and 8) had the largest GLD, but early applications of Velpar and Arsenal/Escort and Oust XP also had good growth.

Overall, early treatments provided better competition control, and to a lesser extent, better height and GLD growth during the first year for slash pine in this study. While a number of treatments performed well, first-year responses indicate that 13 oz/a. of Oustar applied early may be a preferred treatment for slash pine.

Table 1: List of Treatments in 2001 DuPont Slash Pine Study

Treatment No.	Herbicide and Rate/Acre
Early(March)	
1	Untreated
2	13 oz. Oustar
3	32 oz. Velpar L (AL) or 10.7 oz. Velpar DF (LA)
4	4 oz. Arsenal AC
5	4 oz. Arsenal AC +1 oz. Escort
6	32 oz. Velpar L + 4 oz. Arsenal AC
7	2 oz. Oust XP
Late(May)	
8	13. oz. Oustar
9	32 oz. Velpar L (AL) or 10.7 oz. Velpar DF (LA)
10	4 oz. Arsenal AC
11	4 oz. Arsenal AC +1 oz. Escort
12	32 oz. Velpar L + 4 oz. Arsenal AC
13	2 oz. Oust XP
14	2 oz. Oust XP + 0.5 oz. Escort + 12 oz. Eagre

Table 2: First-year average heights of trees by treatment in 2001 DuPont Slash Pine study – AL and LA (avg. all reps)

Tree Heights		
Treatment No.	AL	LA
Early	Feet	
1	2.56ab[1]	2.07cd
2	2.65ab	2.35a
3	2.79a	2.40a
4	2.34ab	2.00cd
5	2.47ab	2.03cd
6	2.20b	1.91d
7	2.72ab	2.32ab
Late		
8	2.45ab	2.38a
9	2.57ab	2.24abc
10	2.23b	2.03cd
11	2.59ab	1.92d
12	2.58ab	2.24abc
13	2.79a	2.17abc
14	2.53ab	2.15abcd

[1] Values in a column followed by the sale letter do not differ at $\alpha = 0.05$

Table 3: First-year average groundline diameter of trees by treatment in 2001 DuPont slash pine study – AL and LA (avg. all reps)

	Groundline Diameter	
Treatment No.	AL	LA
Early	inches	
1	0.68b[1]	0.51e
2	0.96a	0.91a
3	0.95a	0.82ab
4	0.83ab	0.65cd
5	0.89a	0.88ab
6	0.83ab	0.80b
7	0.94a	0.86ab
Late		
8	0.94a	0.84ab
9	0.82ab	0.67cd
10	0.83ab	0.58de
11	0.92a	0.68c
12	0.87a	0.69c
13	1.00a	0.64cd
14	0.85ab	0.70c

[1] Values in a column followed by the same letter do not differ at $\alpha = 0.05$

ESCORT+STRONGARM POST-EMERGENCE COMBINATIONS FOR HERBACEOUS WEED CONTROL. J.L. Yeiser. Arthur Temple College of Forestry, Stephen F. Austin State University, Nacogdoches, TX 75962.

ABSTRACT

Pine managers of East Texas commonly apply herbicides then plow when intensively preparing sites for planting. Grasses are slow to re-invade these prepared areas, leaving broadleaf weeds as the primary early competitor. Escort and Strongarm are recognized in forestry for more forb than grass control. The objective of this study is to compare the herbaceous weed control and resultant pine seedling performance of post-emergence Strongarm, Escort, and Strongarm+Escort combinations on intensively prepared pine sites. Potential use of this information is in (1) single, early post-emergence applications and (2) the second application in a split-season prescription.

The test site was located in Angelina County near Huntington, TX. The clay loam soil had a pH=5.2 and organic matter > 1.5%. The mixed pine-hardwoods occupying the sites were clearcut in October 1999. The aerial treatment of Arsenal+Garlon (16oz+2qt) was applied in July 2000 and followed with a burn and subsoiling, both in October. Bare-root seedlings were planted on an 8- X 10-ft spacing on January 4, 2000.

On application day, forbs commonly occupying the site were dogfennel and purple cudweed with lesser amounts of late boneset, yankeeweed, American burnweed, Hypericum spp., Virginia buttonweed, yellow thistle, and Polypremum procumbens. Winter ryegrass, panicgrasses, sedges, rushes and broomsedge were lightly distributed across plots.

Test herbicides were applied on April 24, 200 in a 5-foot band centered over the top of planted pine seedlings. Treatment plots contained 16-seedlings. Measurement plots consisted of the middle 12 seedlings. Measurement plots were visually evaluated at 30-day intervals extending from May 24th through August 24th. Assessment parameters were percent bare ground as well as percent control of forbs, dogfennel and purple cudweed. Grass, although in major proportions on some plots, was insufficiently distributed for analysis of herbicide efficacy. Seedlings were measured for total height and ground line diameter on February 21 and again after one growing season on Dec 18th.

Chemical and mechanical site preparation was performed in 2000 and carryover weed control exceeded 30% bare ground in May and June 2001 in check plots. July and August weed pressure increased leaving only 8% bare ground in checks. May and June assessments of test treatments revealed plots were 45% (low) to 89% (high) weed free. In July and August, bare ground had decreased in checks (8%) and test plots were 30% (low) to 50% (high) weed free. However, no significant differences in bare ground were detected among herbicide treatments for May, June, July or August assessments. Inconsistent and major clumping of grasses across plots probably inflated the error test term and contributed to non-significant differences in bare ground. Forb (0.84 or 1.68+0.75 or 1.0) and dogfennel (0.84+0.75 or 1.68+0.75 or 1.0) control was greatest in May for Strongarm+Escort mixtures. Weeds initially exhibited topkill. Residual stems and lower leaves died gradually from May through July before plants succumbed in August. In July and August, best forb and dogfennel control was achieved with Escort (1.0 oz), Strongarm (1.68oz) and all mixtures. Species of Hypericum, Polypremum, Solanum, Cirsium, and Diodia were at least moderately tolerant to test treatments and exhibited little efficacy.

Best seedling performance commonly resulted from Strongarm+Escort mixtures (0.63+1.0, 0.84+0.75,1.0; 1.68+0.75, 1.0) providing 0.38 ft (29%) more height, 0.21in more ground line diameter (60%), and 0.00366 ft^3 (282%) more volume index than checks.

In conclusion, Strongarm+Escort mixtures (0.84+0.75oz and higher) provided better forb and dogfennel control and better seedling performance than Strongarm, Escort, or checks. Pine tolerance was high for all use rates tested. Test mixtures need a tank partner enhancing grass control. In a split-season prescription of early and late spring herbaceous weed applications, early Oustar and Arsenal+Oust treatments (industry standards) commonly fail to control species of Hypericum, Polypremum, Solanum, Diodia, and Cirsium. Observations suggest the Strongarm+Escort mixtures tested here provide little control of these species and will not broaden the spectrum of season-long control when used as the second application following early Oustar or Arsenal+Oust applications.

IMPACT OF VEGETATION MANAGEMENT ON DIFFERENT TYPES OF LOBLOLLY PINE PLANTING STOCK. T.R. Clason, Hill Farm Research Station, Louisiana Agricultural Experiment Station, Louisiana State University Agricultural Center, Homer, LA 71040

ABSTRACT

Efficient vegetation management practices, genetically improved seed and containerized planting stock afford the opportunity to develop commercial loblolly pine plantations planted on widely spaced rows. To evaluate the impact of low planting density on pine plantation growth, a study was established on a recent regeneration harvest site located on the Hill Farm Research Station in northwest Louisiana. The predominant soil is a Darley-Sacul complex gravelly fine sandy loam with a site index of 18 m at age 25. Pine growth responses were evaluated using treatment plots that combined planting stock types, soil structure amendments, and chemical site preparation practices. A site specific, single half-sib family second generation seed source was used for all planting stock treatment seedlings. Planting stock treatments included containerized seedlings planted in November 1993 (IC), bare root seedlings planted in December 1993 (EBR) and bare root seedlings planted in March 1994 (LBR). Planting stock treatments were planted with and without a soil structure amendment. Each treatment combination plot was assigned one of four chemical site preparation practices, 2 lbs. ai/acre hexazinone, spring pre plant application (LH); LH + 1.5 oz. ai/acre sulfometuron methyl, spring post plant application (LHS); 4 lbs. ai/acre hexazinone, fall pre plant application (HH); and 12 oz. ai/acre imazapyr + 0.6 oz. ai/acre metsulfuron-methyl, fall pre plant application (IM). Resulting 24 treatment plots were compared with a commercial check plot treated with the LHS practice and planted with EBR seedlings.

Treatment plots were 75 ft x 54 ft in size and contained three 54 ft rows. All herbicides were applied at 20 gal./acre using a CO_2-pressurized hand-held backpack sprayer fitted with a TK 2.5 Flood Jet nozzle. Soil structure amendment treatment was applied in the summer, fracturing the soil to a depth of 20 inches. Following the site preparation and soil amendment treatments, the site was burned and seedlings were planted at 6 ft spacings along each row, resulting in planting density of 302 tree/acre (TPA). Check plot seedlings were planted at a 6 ft x 12 ft spacing , resulting in a density of 605 TPA. Treatment plots were replicated three times and arranged in a randomized complete block design. Pine tree height was measured at planting and at age 1, and diameter and height were measured at ages 4 and 8.

After one growing season, pine seedling survival averaged 86 percent and did not differ among treatments. By age 8, treatment survival differed among treatments, IC treatment combination mean survival (91 percent) exceeded check, EBR and LBR treatment combinations by 27, 16 and 18 percent. Mean age 8 treatment tree height, basal area and merchantable volume was 23.0 ft., 0.120 ft^2 and 0.831 ft^3, and differed among treatments. IC trees were significantly larger than the check, EBR and LBR trees with height, basal area and merchantable volume averaging 24.0 ft, 0.134 ft^2 and 1.002 ft^3. Soil structure fracturing had no impact on planting stock tree growth.

At age 8, site preparation treatments had no impact on tree survival, but tree growth differed significantly among site preparation treatments. LH mean tree growth was the least, HH and IM growth was similar and greater than LH, and LHS growth significantly exceeded all other treatments. There was no interaction detected between site preparation and planting stock treatments. Mean tree growth was optimized when IC trees were combined with either LHS or IM site preparation treatments.

LHS and IM IC treatment stand development and growth at age 8 was comparable to the commercial check plot treatment. IC treatment stand stocking density and merchantable volume was 260 TPA and 290 ft^3/acre, while commercial check stand density and volume was 391 TPA and 307 ft^3/acre.

The eight-year data suggest that loblolly pine plantations can established on widely spaced rows by planting early, using containerized seedling, and employing a competition suppression measure that includes chemical site preparation and achieves first growing season weed suppression.

VOLUNTEER VEGETATION RESPONSE TO WEED CONTROL ON A BOTTOMLAND SITE. J.W. Groninger, Department of Forestry, Southern Illinois University, Carbondale, IL 62901.

ABSTRACT

Bottomland hardwood afforestation is practiced to satisfy a wide range of objectives including improvement of water quality, production of timber, and enhancement of wildlife habitat. While the rapid growth of planted trees is recognized to be a critical consideration for successful afforestation, less often considered are the transitory communities of herbaceous vegetation that dominate the site prior to crown closure. Grassland bird species in particular benefit from the vegetative cover associated with these still open areas. Herbicidal weed control treatments have been demonstrated to accelerate the growth of planted hardwoods on bottomland sites, but the impacts of these treatments on the composition of volunteer vegetation communities are not known.

The objective of this study was to evaluate herbaceous community vegetation dynamics associated with common afforestation practices during the first three years following establishment of a green ash (*Fraxinus pennsylvanica*) planting. The site was located on the floodplain of the Little Saline River in southern Illinois that had been in row crop production prior to enrollment in the Wetlands Reserve Program. Treatments consisted of a full factorial combination of tillage (tilled with a tandem disk versus an untilled control) and herbicide (sulfometuron (Oust) applied over the top in May at 2 oz product/acre, glyphosate (Roundup) spot sprayed as a shielded application during July of the first growing season, and a no herbicide control).

Planted green ash were 40 and 50 percent taller in herbicide treatments relative to the no herbicide control following the second and third growing seasons, respectively. The sulfometuron treatment resulted in 100 percent higher grass cover than the glyphosate and control treatments, but no differences were observed during the third growing season. Percent cover of broomsedge (*Andropogon virginicus*), the most abundant grass species, was significantly higher during both the second and third growing seasons in the sulfometuron treatment relative to the glyphosate and no herbicide control. By the third growing season, the glyphosate treatment had 60 percent higher forb cover than the sulfometuron treatment with the no herbicide control treatment intermediate. Goldenrod (*Solidago* spp.) cover was significantly lower in the sulfometuron treatment relative to both glyphosate and the no herbicide control. Tillage did not effect green ash growth and had little impact on herbaceous vegetation cover after the first growing season.

These results suggest that the use of herbicides can accelerate planted green ash establishment on a bottomland site. Whether changes in herbaceous community composition resulting from these treatments will have a long term effect on any of the aforementioned management objectives has yet to be determined.

LONGLEAF PINE SEEDLING RESPONSES TO OUST, VELPAR, AND ARSENAL; EFFECTS ON NET PHOTOSYNTHESIS AND ROOT COLLAR DIAMETER C.L. Ramsey*, B.J. Brecke, and S. Jose. University of Florida, Milton campus, Milton FL. 32583.

ABSTRACT

Planting longleaf pine seedlings has had a resurgence in demand under the Conservation Reserve Program. However, there are still many unknowns about how best to accelerate the seedlings out of the grass stage through the use of herbaceous weed control. To further understand the interactions between weed competition, herbicide toxicity, and pine growth, a study was conducted for six herbaceous weed control treatments applied overtop of one year old longleaf seedlings. One of the study objectives was to measure the physiological responses of the pine seedlings, including net photosynthesis (Pn), stomatal conductance (Gs), and transpiration(E). Each of these responses offers either direct or indirect evidence for the degree of weed competition and herbicide toxicity. Another objective was to measure root collar diameter (RCD), survival, and heights at the end of the growing season. A third objective was to determine if there was a relationship between foliar responses and RCD.

The study was a randomized, complete block design with four blocks. The treatments included Velpar (0.56 and 1.12 kg ai ha^{-1}), Oust (0.21 and 0.42 kg ai ha^{-1}), Arsenal (0.56 kg ai ha^{-1}), and a control treatment. The pines were planted on January 26, 2001, and herbicides were applied on April 20-24, 2001. The soil was a Red Bay sandy loam, with 69 % sand, 16 % silt, and 15 % clay. Photosynthetic measurements were taken in mid-October (6 MAT), and the root collar diameters, heights, and survival was measured in mid-December (8 MAT). Herbicides were band applied (1.2 m) over top of the pines with a CO_2 backpack sprayer and a three nozzle boom. Kinetic, a blended organo-silicone surfactant, was added to all treatments at 0.1 % (v/v). Sample size for foliar responses was 24 seedlings, and 40 seedlings were used to determine RCD and survival responses.

All three foliar responses, Pn, Gs, and E were directly proportional to increasing rates for Velpar and Oust, with one exception for Pn for Velpar. These positive, linear relationships indicate that the pines are capturing more of the site resources, as the herbicides control more of the weedy competition. Either increased light, water, and/or nutrients should lead to increased Pn, Gs, and E rates. The whole plant responses, 8 MAT, however resulted in quadratic relationships with increasing Velpar and Oust rates. Root collar diameters reached a plateau in growth at the highest Velpar and Oust rates. Seedling survival was not related to Oust rates, but did show a trend towards decreasing survival at the highest Oust rate. Seedling survival decreased at the highest Velpar rate. There was no relationship between RCD, or survival, and Arsenal at 0.56 kg ae ha^{-1}. The whole plant responses indicate increasing herbicide injury to the seedling at the highest rates of Velpar and Oust. Therefore, the recommended rates for this type of soil is Velpar at 0.56 kg ai ha^{-1}, and Oust at 0.21 kg ai ha^{-1}. There was a quadratic relationship between RCD and Pn for Velpar ($r^2 = 0.62$), and for Oust ($r^2 = 0.41$).

INTERAGENCY WEED ACTION GROUPS -- AN EFFECTIVE WEAPON IN THE WAR ON INVASIVE WEEDS. A. P. Fletcher*, Division of Resource Management, U.S. Fish and Wildlife Service, Albuquerque, NM

ABSTRACT

Interagency Weed Action Groups (IWAGs) are proving to be quite effective in "getting things done" to address invasives weeds issues in both New Mexico and Arizona. The New Mexico IWAG was organized first in May 1999 as a Federal Weed Action Group, and later expanded to bring in State agency weed folks as well, acquiring the name "IWAG" at that time. So far the New Mexico group has accomplished two major tasks: They prepared a template for an MOU for control of invasive plants on State highway corridors through Federal (and possibly State) lands; and they held a Symposium on Invasive Weeds on June 19-20, 2001, for executives of Federal and State agencies in New Mexico. The Arizona IWAG just got off the ground in March of this year, and has held only two meetings. Nevertheless, through the IWAG, the Sweet Resinbush Task Force has acquired donations of herbicides and some equipment for control of the spread of a sweet resinbush infestation in the Safford area.

IWAGs are ad-hoc groups that operate without charter, without time-consuming paperwork, but with considerable personal commitment. They have been established as action groups, with participation limited to Federal and State agency weed folks in order to remain small enough to work efficiently and effectively together to address concerns and issues the agencies have in common. The participants decide what issues they want to address, identify actions needed, and then focus attention primarily on those issues.

ACCORD, CHOPPER, AND GARLON SITE PREPARATION TREAMENTS FOR YAUPON CONTROL.

J.L. Yeiser*. Arthur Temple College of Forestry. Stephen F. Austin State University, Nacogdoches, TX.

ABSTRACT

Yaupon is a thicket-forming, evergreen shrub with an aggressive rootstock supporting one stem 10 to 20 ft. in height or many shorter stems beneath a low, dense crown. Herbicidal penetration of its thick, coriaceous, waxy leaves is notoriously difficult.

Best control of unwanted hardwood competitors occupying pine sites is often achieved during June through September. Summer days are commonly hot, dry, and bright, ideal conditions for leaf wax development. Currently, managers combine prescribed fire with mechanical and chemical treatments to reduce yaupon during site preparation. Yaupon commonly re-emerges early in the rotation. By mid-rotation, its dense, impenetrable thickets impede field crews and presumably reduce pine growth. Yaupon control with conventional dates and treatments is commonly poor. Reducing yaupon levels during site preparation potentially increases pine growth, thereby reducing the number of years to crown closure.

The objective of this study was to screen selected Accord SP, Chopper, and Garlon 4 mixtures applied in October, December, February and April for control of yaupon during preparation of sites for planting loblolly pine seedlings.

The test site is near Groveton in Trinity County, TX. The site was clearcut in fall of 1998. Plots were treated in fall 1999 and spring 2000. Herbicide treatments were applied with a backpack CO_2 aerial simulator with a boom supporting one KLC-9 nozzle to plots 30-ft X 100-ft. Total application volume was 10 GPA. Test treatments were: (1) Accord SP (6 qt), (2) Accord SP+Rebound (6 qt+2.5%), (3) Accord SP+MON59120 (6 qt+2.5%), (4) Accord SP+Chopper (6 qt+28 oz, 4 qt+28 oz, 2 qt+28 oz), (5) Accord SP+Chopper (2 qt+56 oz, 2 qt+48 oz, 2 qt+36 oz, 2 qt+28 oz) and (6) Chopper+Garlon 4 (52 oz+1.5 qts, 40 oz+1.5 qts, 28 oz+1.5 qts). Plots were visually evaluated in July 2000 and again in 2001 for percent control.

In July 2000, medium (1.5qt+40oz) and high (1.5+52oz) rates of Garlon 4+Chopper provided best control of yaupon in October (72%, 86%) and in December (90%, 93%). Low (1.5qt+28oz), medium and high rates were best in February (89%, 92%, 90%) and April (82%, 86%, 93%). Accord SP (6 qt) treatments with additional surfactant (2.5% Rebound) or penetrant (2.5% MON 59120) provided least control in all timings. Numerous Accord SP+Chopper treatments were intermediate in yaupon control. New flushes of twig growth were absent from Garlon+Chopper plots. New twig growth was evident on all Accord SP+Chopper treatments with the exception of Accord SP+Chopper 2qt+56oz+25% oil. Other hardwoods and residual pines on the site (< 70 stems/rootstocks per acre) were evaluated for control. Evaluations indicated Garlon 4+Chopper control in April of persimmon, oak, and ash was modest and better than for other timings. Non-yaupon hardwoods were seldom controlled in October, December and February. Other treatments, such as combination plowing, post harvest aid, or prescribed burning, may precede or follow foliar sprays and sufficiently reduce already low numbers of hardwoods per acre, to an acceptable level. None of the treatments provided pine control. Test rates of 6 qts of Accord Sp have previously demonstrated effective pine control. Drought and dormancy probably influenced hardwood, pine and yaupon control in this study.

In July 2001, further yaupon recovery was evident in all plots. Plots exhibited an average recovery of 12%. Best control was accomplished with Chopper+Garlon (52oz+1.5qt) in all timings of application – Oct 68%, Dec 73%, Feb 78%, Apr 80%).

FIRST-YEAR CHINESE PRIVET RESPONSES TO VARIOUS RATES, TIMINGS, AND FORMULATIONS OF GLYPHOSATE AND TRICLOPYR. T.B. Harrington and G. Ahuja; School of Forest Resources, University of Georgia, Athens, GA 30602.[1]

ABSTRACT

At a bottomland hardwood forest near Athens, GA, two non-soil-active herbicides (glyphosate and triclopyr) were tested at various rates (0, 1.5, 3.0, 4.5, and 6.0 lbs. acid equivalent/acre), timings (April, June, August, October, and December 2000), and formulations (Accord® SP vs. Roundup® Pro Dry and Garlon® 3A in water vs. Garlon® 4 in JLB® improved plus oil) to identify cost-effective methods for controlling Chinese privet (*Ligustrum sinense* Lour.). Herbicides were applied to 10-ft x 20-ft plots replicated 4 times for each treatment in a randomized complete block design. Immediately prior to and approximately one year following each treatment, privet cover (%) was estimated visually within each of three 1-m^2 quadrats per plot. An angular transformation was applied to homogenize the variance, and the data were subjected to analysis of variance with pre-treatment cover as a covariate. Multiple comparisons of covariate-adjusted means (α=0.05) were performed using Bonferroni adjusted probabilities.

First-year cover of privet in herbicide-treated plots was less than that of the untreated check regardless of treatment timing. Cover following the October timing of Accord® SP was less than that following the June timing, while cover following the December timing of Garlon® 3A was less than that following either the June or October timings. Responses following the December treatments did not differ between Accord® SP and Garlon® 3A treatments, with both treatments reducing privet cover to 2% or less. For either Accord® SP or Garlon® 3A plots, privet cover did not differ among rates. For each rate, privet cover in Garlon® 3A plots exceeded that of Accord® SP plots. Privet cover did not differ between plots treated with Accord® SP or Roundup® Pro Dry, or between those treated with Garlon® 3A in water or Garlon® 4 in oil.

These first-year results indicate that low rates of Accord® SP can strongly reduce privet cover, especially when applied in either April, August, October, or December. Summer drought during 2000 may have contributed to the reduced efficacy of June-applied Accord® SP. December was the only timing for Garlon® 3A that reduced privet cover to the same extent as found from Accord® SP; for all other timings Accord® SP was clearly the superior herbicide. Privet cover did not differ between the two formulations of either herbicide. Based on the observed responses to variation in herbicide rate, timing, and formulation, it can be inferred that glyphosate has greater overall phytotoxicity on privet than triclopyr.

[1]This research was made possible by financial and in-kind assistance from the Georgia Department of Transportation, Atlanta, GA. The authors thank Ms. Leigh Priestley for her assistance with site selection and maintenance and Dr. Jim Miller and Mr. Jimmie Cobb for their contributions to the study plan.

FOUR-YEAR KUDZU RESPONSES TO HERBICIDES, BURNING, AND COMPETING VEGETATION.
T.B. Harrington and L.T. Rader; University of Georgia, Athens, GA 30602 and International Paper Company, Wilmington, NC 28401.[1]

ABSTRACT

In July 1997, research was initiated to compare several herbicide treatments and three densities of loblolly pine (*Pinus taeda*) plantings for their combined abilities to control kudzu (*Pueraria montana*). At the Savannah River Site, a National Environmental Research Park near Aiken, SC, four study sites (blocks) were identified that were heavily infested with kudzu. Each 1-2 acre site was divided into six plots of equal area and one of the following treatments was randomly assigned to each plot in a randomized complete block design:

1. Untreated check
2. Transline® (clopyralid): 21 oz/acre
3. Garlon®4 (triclopyr ester): 3.1 qts./acre
4. Escort® (metsulfuron): 4 oz/acre
5. Tordon®101-M (picloram+2,4-D): 6 qts./acre
6. Spike®20P (tebuthiuron): 20 lbs./acre (granular)

In July 1997, herbicides were applied via backpack sprayers as broadcast treatments at 100 gallons of spray volume per acre. In December 1997, each site was broadcast burned, and within each treatment plot, loblolly pine seedlings were planted in split plots at densities of 0, 1, or 4 seedlings per m^2 to provide various levels of competitive pressure to potentially exclude or suppress the recovering kudzu. During the summers of 1997-2001, cover (%) values for kudzu, herbaceous species, blackberries (*Rubus* spp.), and pines were estimated visually within each of three 1-m^2 quadrats per split plot. An angular transformation was applied to homogenize the variance, and the data were subjected to analysis of variance. Multiple comparisons of means (α=0.05) were performed with Tukey's test.

Broadcast burning caused a temporary reduction in kudzu cover, but by the second year it had recovered to its pre-treatment abundance. The remaining discussion will focus on responses observed in the fourth year after treatment (2001). Four years after treatment, kudzu cover differed as follows: untreated check (71%) > Transline® (12%) > remaining treatments (0-2%). Kudzu cover also decreased to a moderate degree with increasing pine density. Forb cover was lowest in untreated check (2%) and Transline® (5%) plots versus 11-16% cover in the other treatments, and it also differed among pine densities of 0 seedlings/m^2 (21% cover), 1 seedling/m^2 (8% cover), and 4 seedlings/m^2 (3% cover). Grass cover also was lowest in untreated check and Transline® (<1%) plots and it was greatest in Spike®20P plots (13%), but it did not differ among pine densities. Blackberry cover differed only between pine densities of 0-1 seedlings/m^2 (16-17%) versus 4 seedlings/m^2 (6%), and not among herbicide treatments. Pine cover was lowest in untreated check (<1%) and Spike®20P plots (4%) versus 51-69% in the other treatments, and it differed between its densities of 1 seedling/m^2 (24% cover) versus 4 seedlings/m^2 (47% cover).

Results indicate that each of the herbicide treatments can be used to strongly reduce kudzu abundance. The only herbicide that had a significant detrimental influence on the planted pines was Spike®20P, killing the vast majority of the seedlings by the first year of the study. Competitive exclusion by kudzu strongly limited abundance of all other species, while competitive exclusion by pine limited abundance of forbs, blackberry, and to a lesser extent, kudzu. Although the herbicide treatments were highly effective at reducing kudzu abundance, some surviving kudzu is present in virtually all of the treatment replications. High-density pine plantings may be a viable alternative for limiting recovery of kudzu, but results indicate that maintenance treatments of herbicides, burning, or mechanical removal would be required to prevent this exotic pest plant from eventually overtopping the pines.

[1]This research was supported by financial and in-kind assistance from Forest Service Savannah River (FSSR), U.S. Department of Energy, and Forest Health Protection, USDA Forest Service. The authors are particularly grateful to Dr. John Taylor and FSSR staff for their assistance with plot installation and treatment application.

SECOND YEAR LOBLOLLY PINE RESPONSE TO HEXAZINONE PREADSORBED ON A CHARCOAL CARRIER. C.L. Ramsey*, University of Florida, Milton campus, Milton FL. 32583.

ABSTRACT

A field study was conducted 1999 in east central Alabama to evaluate weed efficacy and loblolly pine growth and survival when treated with hexazinone preadsorbed onto a range powdered charcoal carriers. The study was an augmented, complete factorial, RCB design with three replications that was remeasured in October, 2000 for two Growing Seasons After Treatment (2GSAT) responses. Hexazinone, with and without a charcoal carrier, was band applied postemergence (3 months after planting) at 1.12 and 2.24 kg ai/ha (broadcast rate). Gro-Safe™, powdered charcoal was preadsorbed with hexazinone and applied at 0, 5.6, 11.2, 16.8, and 22.4 kg/ha (broadcast rate). Treatments applied to tilled, mineral soil without organic debris or weed cover on an agricultural research field. Soil is classified as a Norfolk loamy sand with pH 6 and 0.8 % organic matter. Rainfall was average in 1999, while the summer of 2000 had an extreme, summer-long drought.

Weed control was not correlated to hexazinone or charcoal in October, 2000 (2 GSAT). Although there was a slight trend in increasing weed control with increasing levels of charcoal for both hexazinone rates. There were significant main effects and interactions for loblolly pine groundline diameter (GLD) growth and survival for both hexazinone and charcoal ($P>F = 0.0001$). Pine GLD growth and survival were estimated by quadratic models for hexazinone at 1.12 kg ai/ha, and by linear models for hexazinone at 2.24 kg ai/ha. GLD growth and survival increased 0.68 mm and 2.5 %, respectively, for every unit increase in charcoal rate (hexazinone at 2.24 kg ai/ha). There was a four fold increase in above ground, fresh weight pine biomass when the charcoal carrier (16.8 kg/ha) was compared to the standard, water carrier treatment (hexazinone at 1.12 kg ai/ha).

Study results show that powdered charcoal preadsorbed with hexazinone could improve the herbicide's selectivity toward loblolly pine seedlings. In general, as charcoal rates increased subtoxic injury (i.e. stunting) was reduced, as indicated by increasing GLD growth treatment means. Also, toxic injury (i.e. survival/mortality) was reduced with increasing charcoal rates. Powdered charcoal/hexazinone carriers were able to reduce loblolly pine injury/mortality, even though the degree and duration of herbaceous weed control was not significantly enhanced.

EVALUATION OF HERBICIDES FOR SERICEA LESPEDEZA (*Lespedeza cuneata* [Dumont] G. Don) CONTROL ALONG HIGHWAY RIGHTS-OF-WAY IN OKLAHOMA. L.M. Cargill, D.P. Montgomery, D.L. Martin and G.E. Bell; Department of Horticulture and Landscape Architecture, Oklahoma State University, Stillwater, OK 74078.

ABSTRACT

Duplicate field experiments were conducted at two locations in north central Oklahoma during 2001 to evaluate several postemergent herbicides for the selective control of sericea lespedeza and common bermudagrass tolerance along highway roadsides. Nine herbicide treatments were applied to sericea lespedeza plants ranging in height from 12 to 18 inches on 24 May 2001 and 1 June 2001 to plots 5 by 15 feet. Three Escort treatments were fall-applied to sericea lespedeza plants 6 to 12 inches tall on 12 September 2001 (no data available). The Escort treated plots had been previously mowed at an approximate height of six inches with a sicklebar mower on 24 July 2001 and 3 August 2001. Applications were made with a CO_2 pressurized R&D brand boom-type bicycle sprayer equipped with three TeeJet 8002 VS flat-fan spray tips and calibrated to deliver 20 gallons per acre at a pressure of 24 PSI. Herbicide treatments evaluated and expressed in product rates per acre, included Garlon 4 at 0.5, 1.0 and 1.5 pints, Vista at 0.5, 1.0 and 1.3 pints, Escort at 0.3, 0.5 and 1.0 ounces and Distinct at 4.0, 8.0 and l2.0 ounces. All herbicide treatments had a non-ionic surfactant and ammonium sulfate (AMS) added at a rate of 0.25% v/v and 3.4 lbs. product, respectively. Treatments were arranged in a randomized complete block design with three replications. Percent sericea lespedeza control and percent bermudagrass phytotoxicity were visually evaluated 1, 2 and 3 months-after-treatment (MAT). The sericea lespedeza control ratings ranged from 0 percent or no control to 100 percent or complete eradication. Percent bermudagrass phytotoxicity ratings were scaled from 0 to 100, where 0 equals no injury and 100 equals complete brownout or complete necrosis of the bermudagrass.

Throughout the 2001 growing season, no bermudagrass phytotoxicity (0% injury) was produced from any of the herbicide treatments tested in these experiments.

Excellent sericea lespedeza control was produced at 2 MAT with the two higher rates of both Garlon 4 at 1.0 and 1.5 pts./A (92% to 98%) and Vista at 1.0 and 1.3 pts./A (94% to 98%). The remaining treatments, including Distinct, produced significantly less and offered only moderate to good control (58% to 81%) of sericea lespedeza. When the final evaluations were recorded at 3 MAT, a similar trend was observed. The two highest rates of both Garlon 4 at 1.0 and 1.5 pts./A and Vista at 1.0 and 1.3 pts./A produced the best sericea lespedeza control (96% to 99%) followed by the low rate (0.5 pt.) of Vista (84%) and the highest rate (12.0 oz) of Distinct (82%). The lowest rate of Garlon 4 (0.5 pt.) and the two lowest rates (4.0 and 8.0 oz.) of Distinct did not provide an acceptable level of sericea lespedeza control throughout the 2001 growing season (58% to 72%).

BROADLEAF WEED CONTROL ALONG OKLAHOMA ROADSIDES USING DISTINCT. D.P. Montgomery*, L.M. Cargill, D.L. Martin, and G.E. Bell, Department of Horticulture and Landscape Architecture, Oklahoma State University, Stillwater, OK 74078.

ABSTRACT

Several studies were conducted during the spring and summer of 2001 in north central Oklahoma to evaluate the effects of Distinct herbicide for the control of various common roadside weeds and tolerance of common bermudagrass. Distinct rates evaluated were 2, 4, 6 (only 1 site) and 8 oz. product per acre for musk thistle (*Carduus nutans*), kochia (*Kochia scoparia*), and Illinois bundleflower (*Desmanthus illinoensis*) control. All Distinct treatments included a non-ionic surfactant at a rate of 0.25% volume per volume and ammonium sulfate at a rate of 3.4 lbs. of product per acre. Treatments were applied on 5 April (site 1) and 24 April (site 2) to musk thistles. Musk thistle rosettes were actively growing at the time of application and ranged in size from 5 to 16 inches in diameter. Treatments were applied on 8 May to actively growing kochia which ranged in size from 3 to 8 inches in height. Treatments were applied on 27 June to actively growing Illinois bundleflower which ranged in size from 3 to 12 inches in height. Treatments were applied to 5 by 15 foot plots using a CO_2-pressurized bicycle sprayer calibrated to deliver 20 gallons of water per acre. Treatments were arranged in a randomized complete block design with three replications. Evaluations on musk thistle and Illinois bundleflower control consisted of calculating percent weed control based on dividing the number of dead plants, at 1, 2 and 3 months-after-treatment (MAT), by initial plant counts. Percent kochia control was visually evaluated at 1, 2 and 3 MAT as compared to the untreated check. Percent common bermudagrass injury was also visually evaluated at each site at 1, 2 and 3 MAT.

At site 1, musk thistle control was significantly better using the 8 oz Distinct treatment (99%) versus the 2 oz. rate (85%) at 1 MAT. However, by 3 MAT all treatments of Distinct were producing 100% musk thistle control. At musk thistle site 2, applications were made to slightly more mature plants just prior to bolting. Both the 4 and 6 oz. product per acre rates of Distinct produced 100% control of musk thistle by 1 MAT.

Kochia control from Distinct was not quite as good when compared to musk thistle control. At 1 MAT kochia control ranged from 60 to 91% with significant variation in response between 2, 4 and 8 oz. rates. Kochia control at 3 MAT declined to 40 to 83% with similar differences in rate response. No treatment of Distinct was able to produce and maintain a satisfactory level of kochia control (90%) in this particular study.

Illinois bundleflower control using Distinct was slightly better when compared to that of kochia. Illinois bundleflower control using Distinct treatments was very slow. At 1 MAT, control from Distinct treatments ranged from 54 to 65%. However, by 2 MAT, control had increased to 67 to 85%. By 3 MAT Distinct at 8 oz was producing acceptable control of Illinois bundleflower (90%) while control from lower rates had increased to 75 to 83%.

COMPARISON OF GLYPHOSATE FORMULATIONS FOR ROADSIDE WEED CONTROL. R.S. Wright, G.E. Coats, and J.M. Taylor. Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS, 39762.

ABSTRACT

Two experiments were conducted to compare glyphosate formulations for winter and summer weed control. In the first experiment, treatments consisted of Roundup Pro, Roundup Pro Dry, Dupont Glyphosate, Glypro, Glypro Plus, or Touchdown Pro, which were applied at 0.5 or 1.0 lb ai/A on March 23, 2001. Dupont Glyphosate and Glypro were applied with and without the addition of Surf Aid, an 80/20 surfactant, at 0.25% v/v. Dupont Glyphosate or Glypro applied at 0.5 lb/A without additional surfactant provided 53 or 43% control of Italian Ryegrass (*Lolium multiflorum* Lam.), and when Surf aid was added at 0.25% v/v, control increased to 76 or 78% 54 DAT. All other treatments at the same rate provided 63 to 68% control of Italian ryegrass 54 DAT. Dupont Glyphosate or Glypro applied at 1.0 lb/A without additional surfactant provided 53 or 35% control of tall fescue (*Festuca arundinacea* Schreb.). When Surf Aid was added, control increased to 78 or 60%. Among all other treatments applied at 1.0 lb/A, control of tall fescue ranged from 75 to 80% 54 DAT. All treatments applied at 1.0 lb/A provided 78 to 88% control of Carolina geranium (*Geranium carolinianum* L.) 54 DAT.

In the second experiment, treatments consisted of Roundup Pro, Roundup Pro Dry, Touchdown Pro, Dupont Glyphosate, Glypro, or MON 78754 which were applied at 0.33 or 0.66 lb ai/A on June 18, 2001. All herbicides in this experiment were applied with or without Timberland 90, a 90/10 surfactant, at 0.25% v/v. Glypro applied at 0.66 lb/A provided 73% control of johnsongrass (*Sorghum halepense* L.); When additional surfactant was added, control increased to 90% 33 DAT. All other treatments provided 80 to 90% control at the same rating interval. At 58 DAT, johnsongrass control ranged from 70 to 80% with all herbicides applied at 0.66 lb/A with additional surfactant. Slender aster (*Aster exilis* Ell.) was controlled 80 to 90% when glyphosate was applied at 0.66 lb/A with an additional surfactant.

USING DIQUAT TO CONTROL TREE ROOTS IN SEWER LINES: EVALUATING DIQUAT COMPATIBILITY WITH LAND-APPLIED SLUDGE APPLICATION. J.W. Groninger, Department of Forestry, Southern Illinois University, Carbondale, IL 62901.

ABSTRACT

The contact herbicide active ingredient diquat dibromide (diquat) is efficacious in controlling tree roots invading sewer lines. In order to be operable, diquat based sewer root control treatments must be compatible with all aspects of sewage processing, including field disposal of sludge containing diquat residue. In this study, treated sludge from a wastewater treatment plant was dosed with diquat to determine whether phytotoxicity or decreased yields could be observed following application on a tall fescue-dominated field. Land application of treated sludge increased total yields of grass and clover without impacting relative dominance of either species. Addition of diquat to treated sludge did not measurably impact grass, clover or total plant biomass yield relative to sludge containing no diquat. These results suggest that the use of diquat to control tree roots in sewer lines is compatible with land-applied sludge disposal systems.

INTRODUCTION

As municipal sewer systems age, tree roots often crack and invade sewer lines, causing backups and service disruptions. Chemical herbicides have been used to control tree roots in sewer lines since the 1960's (1). Since the 1970's, a mixture of metham sodium and dichlobenil has represented the standard treatment in controlling roots in this environment (2). More recently, anticipated changes in environmental regulations, worker safety concerns, and toxicity to bacterial nitrifiers in sewage treatment plants have spurred the development of alternative treatments (3). Greenhouse studies indicated that diquat applied in a foam solution controlled exposed roots of black willow (*Salix nigra*)(4). Applications in tree root-occluded sewer lines indicated that diquat was efficacious in an operational environment as well which has led to the development of the commercially-available product (Razorooter™, Sewer Sciences Inc., Syracuse, NY).

The ultimate utility of a diquat-based root control treatment requires compatibility with all aspects of sewage treatment operations, including disposal of sludge containing diquat residue. A relatively long half-life and broad activity spectrum initially raised concerns that sewage sludge containing diquat residue could result in phytotoxicity when sludge is applied to hay fields (5). The purpose of this study was to determine the impacts of treated sludge on plant community growth following field application of sludge dosed with a range of diquat concentrations.

METHODS

Treated sludge, in liquid form, was obtained from the Mason Farm Wastewater Treatment Plant located in Carrboro, NC. Dry weight analysis of the Mason Farm treated sludge indicated that it consisted of 2.41% solids by weight, so diquat dosing for the sludge material used in this study was calculated accordingly. The treated sludge was then dosed with one of five rates of diquat: 0, 100, 200, 400 and 800 g diquat cation g^{-1} sludge solids. The 200 ppm rate represents the maximum concentration of diquat calculated to occur following an operational treatment of sewer lines (C. Randall, Department of Civil and Environmental Engineering,Virginia Tech, pers. comm.). The diquat dosing solution was prepared using Reward® (supplied by the manufacturer (Syngenta Crop Protection, Greensboro, NC) in a water stock solution. The batch of Reward used for this study contains 242 g diquat cation l^{-1} according to analysis provided by the manufacturer. The dosed sludge solution was maintained at ambient temperature in covered containers and thoroughly mixed by stirring for one minute once per day for four days.

The study was conducted at the Southern Illinois University Tree Improvement Center near Carbondale, IL on a silt-loam soil. Vegetation was dominated by tall fescue *(Festuca arundinacea*) and the site had been mowed at least once annually for the past 35 years. The study area was mowed and cuttings removed three days prior to sludge application. Treatments plots consisted of each of the aforementioned rates of diquat plus a no sludge blank. Each treatment plot covered an area of 0.1858 m^2 and was replicated four times.

All applications to the test plots occurred on September 5, 2001. The dosed sludge material was applied at a rate of 2.2 dry tons per acre, representing the maximum land application rate from the Mason Farm facility (W. Gottschalk, pers. comm.). On October 1, all vegetation on measurement plots were clipped at ground line, separated into grass and clover components and dried to constant weight for biomass determination at the conclusion of the study.

Data were analyzed as a completely randomized design using analysis of variance. All differences with α <0.05 were considered significant.

RESULTS

The diquat-dosed treated sludge applications did not affect total yield of grass or clover or total vegetation yield (grass + clover) at any of the rates tested (Table 1). Grass dominated clover in all treatments, averaging 94.2% of all vegetation observed. The only significant results observed were differences among yields between test plots not treated with sludge when compared with all sludge treatments combined.. Sludge application increased grass yields 62% and total vegetation yields 66%.

CONCLUSION

Treated wastewater sludge containing diquat at the concentrations tested should have no measurable impact on plant biomass yield or composition in a hay pasture setting relative to sludge containing no diquat. Sludge applications at all rates tested can be expected to increase total yields of grass and clover without impacting relative dominance of either species. These results suggest that the use of a product containing the active ingredient diquat, and approved for use to control tree roots in sewer lines, is compatible with field applied sludge disposal.

LITERATURE CITED

1. Rayner, G. Z. 1965. Soil fumigants control roots in sewers. American City 80:6, 135.

2. Ahrens J. F., Leonard O.A. Townley. (1970) Chemical control of tree roots in sewer lines. Journal of the Water Pollution Control Federation 42:1643-1655.

3. Groninger J. W., Zedaker S. M., Seiler J. R. (1997) Herbicides to control tree roots in sewer lines. Journal of Arboriculture 23:169-172.

4. Groninger, J. W. and J. R. Bohanek. 2000. Effects of diquat on exposed roots of black willow (*Salix nigra*). Journal of Plant Growth Regulation 19:453-456.

5. Ahrens, W. H. (1994) Herbicide handbook, 7th ed. Weed Science Society of America, Champaign, IL. 352 p.

Table 1 Effects of sludge and diquat concentration on above ground dry biomass three weeks following treatment of a mowed field near Carbondale, IL. Means within a row followed by the same letter are not significantly different (α<0.05).

	No sludge	Sludge				
		Diquat Concentration (g diquat dibromide g^{-1} sludge solids)				
	0	0	100	200	400	800
grass ($g\ m^{-2}$)	68.7 b	114.0 a	113.6 a	111.8 a	109.7 a	106.7 a
clover ($g\ m^{-2}$)	2.9 a	7.9 a	3.2 a	5.3 a	7.3 a	14.0 a
total biomass ($g\ m^{-2}$)	71.5 b	122.0 a	116.8 a	117.1 a	116.9 a	120.7 a

EFFECT OF METSULFURON-METHYL APPLICATION TIMING ON MULTIFLORA ROSE (ROSA MULTIFLORA) CONTROL. R.S. Chandran, West Virginia University, Morgantown, WV 26505; P.L. Hipkins, Virginia Tech, Blacksburg, VA 24061; D. Richmond, West Virginia University, Morgantown, WV 26505.

ABSTRACT

Multiflora rose (*Rosa multiflora* L.) is a widespread weed problem in pastures of West Virginia and Virginia. Past studies demonstrated that fertilizer-impregnated metsulfuron-methyl was effective in controlling this weed (1,2). Field studies, designed as a randomized complete block with four replications, were conducted in Virginia and West Virginia in 2000 and 2001 to determine the effect of applying fertilizer-impregnated metsulfuron-methyl in spring (May, 2000) or fall (October/November, 2000) for the control of multiflora rose. A suspension of metsulfuron-methyl, using the 60 DF formulation, was impregnated at 90, 45, 22.5 or 11.25 mg/50 g of a 19-19-19 fertilizer. Each multiflora rose plant, with a mean diameter of 2 ft and a mean height of 3 ft, was treated with a 50-g portion of the herbicide-fertilizer mixture at the base. Studies in Virginia showed that fertilizer impregnated metsulfuron-methyl applied at 90 mg/plant during both spring and fall of 2000, controlled multiflora rose >90% when evalutated in August, 2001. However, the herbicide-fertilizer mixture applied in fall at 45 mg/plant provided better weed control (85%) compared to that from a similar spring application (20%). Similarly, fall-applied herbicide at 22.5 mg/plant controlled the weed higher (78%) compared to the same dose applied in spring (30%). At the lowest rate tested, there was no difference in weed control due to application timings. Studies in West Virginia also exhibited better overall weed control from fall treatments compared to spring treatments. Actively growing untreated plants were compared to obtain visual ratings of weed control.

References

1. Hinz, John. 1998. Impregnating metsulfuron on dry fertilizer for multiflora rose control. Proc. Northeastern Weed Sci. Soc. 52:3.

2. Richmond, R., E. Smolder, M. B. Bennett, D. Davis, C. Hickman, J. Hileman, E. Rayburn, and R. Chandran. 2000. Multiflora rose (*Rosa multiflora*) control using fertilizer impregnated metsulfuron-methyl. Proc. Northeastern Weed Sci. Soc. 54:138.

ABSORPTION, TRANSLOCATION, AND METABOLISM OF POSTEMERGENCE-APPLIED CGA 362622 IN COTTON, PEANUT, SICKLEPOD, AND JIMSONWEED. S. D. Askew, John W. Wilcut, and Scott B. Clewis; Department of Crop Science, North Carolina State University, Raleigh, NC 27695-7620.

ABSTRACT

Experiments were conducted to evaluate absorption, translocation, and metabolism of ^{14}C-CGA 362622 when foliar applied to cotton (*Gossypium hirsutum*), peanut (*Arachis hypogaea*), jimsonweed (*Datura stramonium*), and sicklepod (*Senna obtusifolia*). Differential metabolism is the basis for tolerance in cotton and jimsonweed. In addition, cotton absorbs less herbicide than the other three species, thus aiding tolerance. Only jimsonweed translocated appreciable herbicide (25%) out of the treated leaf and acropetally to meristematic tissue where the herbicide was quickly metabolized. No plant species translocated over 2% of applied radioactivity below the treated leaves. Most of the metabolites formed by the four plant species were more polar than CGA 362622 and averaged 51, 48, 30, and 25% of the radioactivity detected in treated leaves of cotton, jimsonweed, peanut, and sicklepod, respectively. The half-life of CGA 362622 was estimated at 0.8, 1.9, 4, and 6 days in treated leaves of cotton, jimsonweed, sicklepod, and peanut, respectively. In addition to metabolism, jimsonweed tolerance is based on acropetal translocation of the herbicide to the apical meristem. This translocation concentrates the herbicide and kills the apical meristem. The death of the apical meristem serves to compartmentalize the herbicide and death of this region releases apical dominance. As a result, axillary bud formation lower on the jimsonweed plant allows regrowth.

BEHAVIOR AND CONTROL OF PURPLE AND YELLOW NUTSEDGE WITH CGA-362622. S.C. Troxler, I.C. Burke, W.A. Pline, J.W. Wilcut, and W.D. Smith. North Carolina State University, Raleigh, NC 27695.

ABSTRACT

In a field study in Lewiston, NC, CGA-362622 (proposed trifloxysulfuron sodium) postemergence (POST) controlled purple (*Cyperus rotundus*) and yellow nutsedge (*Cyperus esculentus*) as well as one application of glyphosate early postemergence (EPOST) and 40 percentage points more than pyrithiobac. Greenhouse studies observed that CGA-362622 EPOST fb MSMA LAYBY reduced purple and yellow nutsedge shoot and root dry weights equivalent to glyphosate EPOST fb MSMA LAYBY. Thus, CGA-362622 could be effective for reducing tuber viability and consequently, nutsedge populations over time. Therefore, laboratory studies were conducted to evaluate the absorption, translocation, and metabolism of ^{14}C-CGA-362622 in purple and yellow nutsedge. The study was conducted in a random complete block design with three replications of treatments and the experiment was repeated in time. Treatment structure consisted of a split-split plot design with five harvest timings [4, 24, 48, 72, or 96 h after treatment (HAT)] as the main plots, two nutsedge species (purple and yellow) served as subplots, and seven portions of quantified radioactivity (leaf wash, treated leaf, above treated leaf, below treated leaf, other leaves, tubers, and roots) were sub-subplots. CGA-362622 was applied POST at 5.3 g ai/acre to purple and yellow nutsedge at the six-leaf stage, (10 cm in height) immediately before spotting with radioactive herbicide. Five μL droplets consisting of ^{14}C-CGA-362622 dissolved in HPLC-grade water with 0.25% v/v nonionic surfactant and containing 2.0 and 5.1 kBq radioactivity were spotted on a 1-cm^2 area on the middle-adaxial surface of the third fully expanded leaf on both species for absorption/translocation and metabolism experiments, respectively. The treated leaves and shoots were used to assess the rate and degree of metabolism of ^{14}C CGA-362622 in purple and yellow nutsedge. Plant parts were filtrated, extracted, spotted onto thin layer chromatography plates and developed to a 16-cm solvent front according to a Syngenta protocol. Radioactive trace peaks were integrated with Win-Scan software, and data consisted of percentage of parent herbicide and sum percentage of all metabolites that were more or less polar than the parent herbicide.

Less than 48 and 52% of ^{14}C-CGA-362622 was absorbed after 96 HAT in purple and yellow nutsedge. Absorption of ^{14}C-CGA-362622 peaked between 4 and 24 HAT. Both nutsedge species translocated appreciable herbicide (30%) out of the treated leaves. Translocation was both acropetal and basipetal, with at least 25% transported basipetally. Neither nutsedge species translocated over 4% of applied radioactivity to the tubers and roots. Most of the metabolites found in the nutsedge species were more polar than CGA-362622 and averaged 69 and 61% of the absorbed radioactivity in purple and yellow nutsedge. The half-life of CGA-362622 was estimated at 4 h in both purple and yellow nutsedge. The basis of susceptibility of purple and yellow nutsedge to CGA-362622 does not appear to be solely related to metabolism. The rapid absorption and translocation of CGA-362622 out of the treated leaf to vegetative meristematic regions may help control the nutsedge species. However, further research is needed to ascertain the role of root absorbed CGA-362622 in control of these problematic weeds. The physiological behavior of root absorbed CGA-362622 in purple and yellow nutsedge also needs to be investigated.

ABSORPTION, TRANSLOCATION, AND METABOLISM OF CGA-362622 IN COTTON (GOSSYPIUM HIRSUTUM), SPURRED ANODA (ANODA CRISTATA), AND SMOOTH PIGWEED (AMARANTHUS HYBRIDUS). R.J. Richardson, K.K. Hatzios, and H.P. Wilson; Virginia Polytechnic Institute and State University, Blacksburg, VA 24060.

ABSTRACT

Absorption, translocation, and metabolism of CGA 362622 were studied in cotton, spurred anoda, and smooth pigweed. Cotton and weed seedlings were treated with foliar applied ^{14}C-labeled CGA 362622 at the following growth stages: cotton at the cotyledon to one-leaf stage; cotton at the 2- to 3-lf growth stage; spurred anoda and smooth pigweed at the 4- to 6-lf growth stage. Treated seedlings were harvested at 6, 24, 48, and 72 hours after treatment (HAT). Absorption of ^{14}C-CGA 362622 was lower in cotton at the two- to three-leaf growth stage than in cotton at the cotyledon- to one-leaf growth stage or in the weed species. Two- to three-leaf cotton absorbed 39% of ^{14}C-CGA 362622 at 42 HAT, while cotyledon- to one-leaf cotton, spurred anoda, and smooth pigweed absorbed 55 to 59% of CGA 362622. Most of the radioactivity absorbed by smooth pigweed was translocated to the stem, leaves above the treated leaf and leaves below the treated leaf, but not to the root. Translocation of absorbed ^{14}C out of the treated leaf was minimal in spurred anoda and in cotton at both growth stages. Metabolism of ^{14}C CGA 362622 was more rapid in cotton than in spurred anoda or smooth pigweed. At 6 HAT, 30 to 31% of the absorbed ^{14}C had been metabolized in cotton compared to 15 to 18% metabolized in spurred anoda and smooth pigweed. By 72 HAT, metabolism of ^{14}C was greatest in cotton at the cotyledon- to one-leaf stage of growth. According to results, differential absorption, translocation, and metabolism contribute to the differential tolerance of cotton, spurred anoda, and smooth pigweed to the herbicide CGA 362622. Rapid translocation and slow rate of metabolism appear to explain the susceptibility of smooth pigweed to this herbicide. Reduced absorption and translocation and rapid metabolism contribute to the CGA 362622 tolerance of cotton at the two growth stages. Limited translocation may explain the intermediate tolerance of spurred anoda to the herbicide CGA 362622.

THE USE OF IMAZAPYR AND IMAZAPIC FOR COGONGRASS (IMPERATA CYLINDRICA (L.) BEAUV.) CONTROL. G.E. MacDonald, E.R.R.L. Johnson, D.G. Shilling, D.L. Miller and B.J. Brecke; Depts. of Agronomy and Wildlife Ecology, Gainesville; West Florida REC Jay, and Mid Florida REC, Apopka.

ABSTRACT

Cogongrass (*Imperata cylindrica* L. Beauv.) continues to be one of the most serious threats in native and forested ecosystems in the southeastern U.S. This exotic, invasive species infests several thousand acres in Florida, Alabama and Mississippi. Cogongrass management has relied on chemical means but this must be coupled with revegetation schemes to provide long-term cogongrass control. To date glyphosate and imazapyr are the only compounds that provide acceptable control but the residual soil activity of imazapyr may limit re-vegetation species. Imazapic herbicide has been recently registered for use in natural areas but its effectiveness on cogongrass is unknown. Therefore several studies were established to evaluate: 1) the effectiveness of imazapyr and imazapic for cogongrass under greenhouse conditions, 2) the effectiveness of imazapyr and imazapic for cogongrass under field conditions, 3) the tolerance of three pine species to varying rates of imazapyr, imazapic and glyphosate, and 4) tolerance of re-vegetation species to varying rates of imazapyr (simulated carryover).

Greenhouse experiments were conducted at facilities in Gainesville. Cogongrass rhizome segments were planted in 10 cm pots and allowed to grow for 8 weeks. Treatments were applied in a spray chamber using 8002 even flat fan nozzle set to deliver a volume of 30.65 L ha-1 at 220 kPa. The experiment was designed as a 6 x 6 factorial with imazapyr and imazapic at rates of 0.0, 0.125, 0.25, 0.50, 0.75 and 1.0 lbs-ai/A each. All treatments contained non-ionic surfactant at 0.25%. Field evaluations were conducted at the State of Florida Fish Management Area in Tenorac. Four rates of imazapyr (0.0, 0.25, 0.5, and 1.0 lbs-ai/A) and four rate of imazapic (0.0, 0.25, 0.5 and 1.0 lbs-ai/A) were applied in a factorial design. Initial observations 3 months after treatment also indicate a lack of activity from imazapic with little to no enhancement of imazapyr activity from the addition of imazapic. Pine tolerance work was conducted under greenhouse conditions. Seedling pines were transplanted into 4 L nursery pots and allowed to establish for 4 weeks prior to treatment. Treatments included glyphosate at 0.0, 1.0, 2.0, and 4.0 lbs-ai/a, imazapyr at 0.0, 0.25, 0.5 and 1.0 lbs-ai/A and imazapic at 0.0, 0.125, 0.25 and 0.5 lbs-ai/A. These were applied to three pine species - slash pine, loblolly pine and long-leaf pine. Treatment application details were the same as those described above. Glyphosate showed the most damage to all pine species with long-leaf pine being the most injured. Loblolly showed the most tolerance of those species evaluated. Imazapyr and imazapic showed less to injury to both slash and loblolly pines compared to glyphosate and again long-leaf was the most susceptible and loblolly the most tolerant. Tolerance of several re-vegetation species was evaluated under field conditions to rates of imazapyr (0.0, 0.032, 0.125, 0.25 and 0.5 lbs-ai/A). Treatments were applied preemergence and species immediately seeded or transplanted into treated soil. Of those species evaluated, velvetbean (*Mucuna spp*.), *Myrica cerifera* and *Pityopsis gramnifolia* showed the most tolerance to imazapyr.

WEED CONTROL, TOLERANCE, AND PHYSIOLOGICAL BEHAVIOR OF FIRSTRATE POST AND POST-DIRECTED IN COTTON. J.W. Wilcut, I.C. Burke, A.J. Price, S.B. Clewis, and A.C. York; Department of Crop Science, North Carolina State University, Raleigh, NC 2695-7620; and A. S. Culpepper, Department of Crop and Soil Sciences, the University of Georgia, Tifton, GA 31794.

ABSTRACT

A series of experiments were conducted to evaluate weed control, cotton response to Firstrate applied postemergence-directed or postemergence (POST), and the physiological behavior of Firstrate in cotton. In the first study, cotton varietal tolerance to Firstrate applied POST in a weed free environment was evaluated in North Carolina in 1997 and 1998. Cotton varieties included Suregrow 125, Deltapine 90, Deltapine 51, Deltapine 33B, Paymaster 1330RR, Stoneville 474, and Stoneville BXN 47. Herbicide treatments included an untreated weed free check, Staple at 0.063 lb ai/ac, and Firstrate at 0.0156 or 0.0312 lb ai/ac. Firstrate and Staple were applied with a nonionic surfactant (NIS) at 0.25% (v/v). All cotton varieties were injured 11% or less with Staple, Firstrate at the low rate and high rate injured cotton 20% or less, and 40% or less, respectively, at 6 to 8 DAT. BXN was injured numerically more by Staple and either rate of Firstrate than other varieties. Injury from all herbicides in all varieties was transitory and was not apparent at harvest. Yields were not influenced by herbicide treatment. A weed-free study was conducted at Lewiston-Woodville, NC in 1997 and 1998. Firstrate was applied at 0.0156 or 0.0312 lb/ac alone or with MSMA on 6 inch or on 12 inch cotton. These treatments were compared with an untreated check and with Cotoran at 1.0 lb ai/ac plus MSMA at 2.0 lb/ac on 6 inch cotton and with Bladex at 0.8 lb ai/ac plus MSMA at the aforementioned rate on 12 inch tall cotton. The herbicides were kept within one inch of the soil surface (precise application). The cotton variety was Suregrow 125. Cotton was injured 3% or less with all treatments at all growth stages. Yields were not affected by Firstrate in a weed-free environment. A study at Moultrie, GA reported 16-25% injury when Firstrate at 0.0156 lb/ac plus 1.0% COC and was applied 3 to 4 inches up the stem of 6-8 inch tall cotton. Injury was transitory and was 2% or less at 23 DAT. Treatments made 4-6 inches up on the stem of 13-16 inch tall cotton injured cotton 4% or less early season. Yields of Deltapine 458RRBG were not negatively influenced by Firstrate treatment.

Experiments were conducted at 10 locations over a two year period to evaluate weed control with Firstrate at 0.0156 lb/ac, Roundup at 1.0 lb ai/ac, and a tank mixture of Firstrate plus Roundup. Emerged weeds at the time of application were evaluated 20-25 days after treatment. All weeds were present in two or more locations. Firstrate failed to control broadleaf signalgrass (*Bracharia platyphylla*), crowfootgrass (*Dactyloctenium aegyptium*), fall panicum (*Panicum dichotomiflorum*), goosegrass (*Eleusine indica*), large crabgrass (*Digitaria sanguinalis*), and Texas panicum (*Panicum texanum*). Roundup and a Roundup plus Firstrate tank mixture controlled these species at least 98% with no differences among treatments. Firstrate alone controlled Palmer amaranth (*Amaranthus palmerii*), redroot pigweed (*Amaranthus retroflexus*), and smooth pigweed (*Amaranthus hybridus*) less than 30% while all Roundup treatments controlled 100% of these populations. Firstrate and Firstrate plus Roundup controlled entireleaf (*Ipomoea hederacea* var. *integriuscula*), ivyleaf (*Ipomoea hederacea*), pitted (*Ipomoea lacunosa*), and tall (*Ipomoea purpurea*) morninglories in the cotyledon to 5L growth stage 100% while Roundup alone controlled less (90%). Firstrate controlled common lambsquarters (*Chenopodium album*), sicklepod (*Senna obtusifolia*), and prickly sida (*Sida spinosa*) 30% or less while all Roundup treatments controlled 100%. All herbicide treatments controlled cotyledon to 4L common ragweed 100%.

In laboratory studies, ^{14}C-Firstrate was rapidly absorbed by the leaves and stem of Deltapine 5415RR cotton. Over 40% of the herbicide was absorbed within 4 hours and absorption increased to approximately 90% at 48 HAT. The herbicide was translocated to an appreciable extent both acropetally and basipetally when foliar applied (POST) or when applied on the stem (PDS). When applied on 12L cotton PDS, Firstrate translocated to reproductive tissues. Very little metabolism (10% or less) was seen over a 48 hour period when applied on the 3rd leaf of a 4L cotton plant.

PHYSIOLOGICAL BASIS FOR THE INTERACTION OF CLORANSULAM WITH GRAMINICIDES, GLYPHOSATE, AND BROADLEAF HERBICIDES. J.W. Barnes and L.R. Oliver. Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72701.

ABSTRACT

A series of experiments were conducted in the field, greenhouse, and laboratory from 1997 to 2001 to determine if herbicide mixture of cloransulam (FirstRate) with graminicides, broadleaf herbicides, or glyphosate would provide effective weed control without antagonistic interactions. The experimental design for all experiments was a randomized complete block or a factorial arrangement of treaments. Field plots were evaluated for visual weed control 2, 3, and 4 weeks after treatment (WAT). In greenhouse trials, plant fresh weights were measured 2 WAT, and the data were converted to % growth reduction. Both greenhouse and field data were subjected to Colby's method to determine whether interactions were additive, antagonistic, or synergistic. The physiological basis for the herbicide interactions was examined by conducting herbicide absorption and translocation experiments. Plants were sprayed with herbicide solution and then spotted with 4 1-µl droplets of radiolabelled herbicide. The plants were harvested 0, 6, 24, and 72 hours after treatment (HAT) by washing the spotted leaf in 4 ml of DI water and dividing the rest of the plant into shoot tissue above and below the treated leaf and roots. Percent herbicide absorption and translocation were then calculated from the data. All data from all experiments were subjected to ANOVA and means were separated by Fisher's protected LSD at the 0.05 level of significance.

Graminicide combinations with cloransulam were concurrently examined in field and greenhouse studies in which fluazifop, quizalofop, sethoxydim, clethodim, or fluazifop + fenoxaprop were applied alone or with cloransulam at labeled rates of all herbicides. Control of broadleaf signalgrass (*Brachiaria platyphylla*), barnyardgrass (*Echinochloa crus-galli*), large crabgrass (*Digitaria sanguinalis*), and yellow foxtail (*Setaria glauca*) was antagonized whenever cloransulam was mixed with quizalofop, fluazifop, or fluazifop + fenoxaprop. Quizalofop absorption and translocation was not reduced by cloransulam. In contrast, mixtures of fluazifop with cloransulam did result in reduced fluazifop absorption and translocation from the leaf to shoot tissue. Cloransulam should only be mixed with sethoxydim or quizalofop for annual grass control because of the tendency for antagonism when cloransulam is mixed with the other graminicides.

Mixtures of the broadleaf herbicides acifluorfen, fomesafen, lactofen, chlorimuron, and imazethapyr with cloransulam were evaluated in field and greenhouse trials. Cloransulam was applied at rates of 9 and 18 g/ha while the broadleaf herbicides were applied at 0.25 and 0.5 of the labeled rates. Antagonism of entireleaf morningglory (*Ipomoea hederacea* var. *integriuscula*), velvetleaf (*Abutilon threophrasti*), and hemp sesbania (*Sesbania exaltata*) was predominately observed when cloransulam was mixed with acifluorfen, fomesafen, lactofen and chlorimuron. Control of Palmer amaranth (*Amaranthus palmeri*), pitted morningglory (*Ipomoea lacunose*), sicklepod (*Senna obtusifolia*), prickly sida (*Sida spinosa*), and smooth pigweed (*Amaranthus hybridus*) was rarely antagonized in field and greenhouse experiments. No herbicide combination resulted in a net reduction in control compared to the herbicide applied alone. Cloransulam absorption in entireleaf morningglory 24 HAT was reduced from 85 to 74% when combined with fomesafen. All herbicides except imazethapyr reduced cloransulam absorption in velvetleaf 24 HAT from 54% to less than 40%. Less than 5% of the ^{14}C-cloransulam was translocated and no herbicide combination increased or decreased cloransulam translocation. The combination of cloransulam with broadleaf herbicides will provide a broad weed control spectrum despite some concerns over herbicide antagonism.

Cloransulam was applied at three rates ranging from 4.5 to 18 g/ha either alone or with three rates of glyphosate (420 to 840 g/ha) in concurrent field and greenhouse trials. Velvetleaf, morningglory species, and sicklepod control was antagonized when glyphosate was mixed with cloransulam. In contrast to these species, Palmer amaranth, smooth pigweed, and prickly sida control was found to have an additive interaction. Even though antagonism was discovered there was not a subsequent reduction in weed control. In physiology studies, ^{14}C-glyphosate absorption and translocation was not affected by cloransulam in velvetleaf and entireleaf morningglory but was slightly lowered with pitted morningglory. Absorption of ^{14}C-cloransulam into velvetleaf and entireleaf morningglory increased by 10 to 20% when cloransulam and glyphosate were mixed. The effect of glyphosate on cloransulam absorption into pitted morningglory was quite the opposite from the other species with absorption being reduced by at least 10% by all cloransulam and glyphosate combinations. The increased absorption of cloransulam by velvetleaf in response to glyphosate was dependent upon glyphosate formulation as well as the addition of a crop oil concentrate to the spray solution. Despite the occurrence of antagonism, cloransulam + glyphosate did provide effective control of the all weed species and should be viewed as a valuable tool for morningglory management.

INFLUENCE OF WEED DENSITY, EMERGENCE DATE, HERBICIDE APPLICATION, AND TILLAGE LEVEL ON SICKLEPOD (*SENNA OBTUSIFOLIA*) SEEDBANK DYNAMICS. L.R. Oliver and J.W. Barnes, University of Arkansas, Fayetteville, AR 72701.

ABSTRACT

The sicklepod seedbank has increased dramatically the past 10 to 20 years and, because of its long seed dormancy and viability, sicklepod will continue to be a problem weed. The objective was to evaluate the influence of sicklepod emergence date and density, chlorimuron (Classic) application, and tillage level on the seedbank dynamics of sicklepod in a non-Roundup Ready production system. The experimental design was a split-split plot with four replications. The main plot was planting date (mid-April, mid-May, and mid-July), subplot was tillage level (till or no-till), and sub-subplots were three plant densities (4, 16, and 48 plants/m^2) with chlorimuron or no postemergence herbicide in a factorial arrangement. Plots were 1 m^2 with a 2-m alley around each plot. A single plant seed source was planted into peat pellets in the greenhouse on April 16, May 16, and July 17, 1996, and two weeks later the seedlings were transplanted at the proper equidistant spacing for each treatment. Chlorimuron at 0.009 kg ai/ha + 0.25% surfactant was applied over-the-top at 1- to 2-leaf sicklepod (May 17, June 7, and August 7) for each planting date. Morphological and reproductive development was recorded during the growing season. At maturity and before seed shed, legumes were removed from every plant in each plot. The legumes were threshed, and the number of seeds from each plot were classified by size (seed not passing through seed sieves 3.1, 2.3, 2.1, 1.8, and 1 mm) then counted and weighed. Seed germination and viability of 50 seeds were determined for each size classification within each plot. All seed from each plot were re-deposited onto the soil surface of the original plot on December 31, 1996, and designated plots were tilled. For the next 4 years, the tilled plots were field cultivated in the spring prior to sicklepod emergence and in the fall following the first hard frost. From 1997 through 2000 as sicklepod seedlings emerged, the seedlings were counted and cut at the soil line within 2 weeks of emergence throughout the growing season. All data were subjected to analysis of variance, and means were separated based on Fisher's Protected LSD at P = 0.05.

The application of chlorimuron caused the greatest height reduction in May-planted sicklepod by 6 weeks after emergence (WAE), and for the remainder of the growing season all chlorimuron-treated plants were approximately half the height, width, and branching of the non-treated plots. Chlorimuron reduced the population of total legume and seed production approximately 25% because of an 88% stand reduction in May-planted sicklepod, but the remaining plants had 50% greater pod and seed production. The effectiveness of chlorimuron was increased at lower sicklepod densities. Number of the larger seed sizes (for example size 2.3 mm) were reduced 45 and 75% by chlorimuron in May- and July-planted sicklepod, respectively. Total legume and seed production was greatest in May-planted (1,712, and 35,842/m^2, respectively) and least in July-planted (89 and 635/m^2, respectively), and as density increased from 4 to 48 plants/m^2, legume and seed number increased from 673 to 1,390/m^2 and 14,193 to 28,170/m^2, respectively. In a separate seed scarification trial, the original 2.3 and 1 mm seed sizes averaged 10 and 2% germination without scarification and 86 and 25% germination from scarified seed, respectively.

For the next 4 years, only 4.3% of the total seed produced emerged under non-irrigated conditions. A total of 948, 1,220, and 5 seedlings emerged over the 4 years from April, May, and July planting dates, respectively. Sicklepod seedlings emerged from early May through early September each year. Approximately 60% of the total emergence occurred in 1999 and declined dramatically in 2000. Tillage level influenced sicklepod emergence by the second year, with greater emergence from the seedbank under no-till conditions. In 1999 no-till increased emergence approximately 40%. Chlorimuron reduced total emergence from the seedbank 58% due to reduction in larger, higher-germinable seed the year of establishment.

In summary, date of sicklepod emergence influenced legume and seed production and chlorimuron effectiveness. Sicklepod plants emerging in mid to late July produce seed that do not add to the soil seedbank. Higher sicklepod densities and April emergence date reduces chlorimuron effectiveness. Chlorimuron reduced emergence from the soil seedbank 58%. However, low densities (4/m^2) emerging in April and May can add significantly to the soil seedbank. Sicklepod seed emerge equally well under no-till and tilled conditions.

THE ACTIVITY OF FLUAZIFOP HERBICIDE ON BRISTLY STARBUR (*ACANTHOSPERMUM HISPIDUM* DC). T.C. Teuton, G.E. MacDonald, and B.J. Brecke, Department of Agronomy, University of Florida, Gainesville 32611 and West Florida Research and Education Center, Jay, FL 32565.

ABSTRACT

Bristly starbur (*Acanthospermum hispidum* DC), a non-native weed from central/south America that continues to be a problem for row crop farmers in the southeast. In peanut, full season interference of bristly starbur from 8, 16, 32, and 64 plants per 7.5 feet of row reduced peanut yields by 14, 26, 43, and 50% respectively. Fluazifop-p-butyl is the active ingredient in Fusilade DX, a post graminicide herbicide that is registered for use in several agronomic and horticultural crops. Fluazifop inhibits the acetyl-CoA carboxylase (ACCase) enzyme in grasses, which is the initial step in fatty acid synthesis. This causes an immediate cessation in growth after application followed by leaf chlorosis and brown and necrotic tissue at the nodes. In broadleaves and sedges, the ACCase enzyme is not sensitive to fluazifop-p-butyl or other post graminicides.

During routine use of fluazifop for grass control, county agents in Georgia observed control of bristly starbur in grower fields. A preliminary study was conducted under field conditions and confirmed activity on this weedy species. It was also noted that the mode-of-action and symptomology associated with this activity was contact in nature; atypical of fluazifop. Therefore, the objectives of this research were to characterize the activity of fluazifop on bristly starbur and compare the activity of other post-graminicide compounds on bristly starbur.

To determine the effect of fluazifop formulation, technical grade fluazifop (99% active) was compared to commercial Fusilade DX at 3 stages of bristly starbur development (8, 20 and 38 cm height) and at 3 rates (0.14, 0.28 and 0.56 kg-ai/A). A rate titration was conducted with the commercial formulation to determine a dose response for bristly starbur. The activity of several post-graminicide herbicides (clethodim, quizalofop, diclofop, sethoxydim and haloxyfop) was also evaluated on bristly starbur at 15 and 50 cm heights to compare compounds of similar modes-of-action to fluazifop. Commercial formulations were used for each herbicide at a single standard field use rate with the appropriate surfactant or crop oil for each material. All experiments were conducted in 2001 under greenhouse conditions at the University of Florida in Gainesville. Seed were collected from the West Florida Research and Education Center in Jay, FL in 1999 and germinated in peat. Seedlings were then transplanted to 12 cm pots and allowed to grow to the desired stage. Treatments were applied in a spray chamber using 8002 even flat fan nozzle set to deliver a volume of 30.65 L ha^{-1} at 220 kPa. All fluazifop treatments contained non-ionic surfactant at 0.25%. Experiments were visually evaluated for percent injury 3, 6, 10, and 14 days after treatment. Treatments were arranged in a randomized complete block design with 4 replications. Data was analyzed using analysis of variance and data separated using LSD or regression analysis.

Visual injury symptoms from fluazifop on bristly starbur included rapid leaf chlorosis and necrosis within 3 to 6 days after treatment. Fluazifop was the only herbicide from the cyclohexanedione or aryl-oxy-phenoxy herbicides evaluated to show activity. Little difference in control with regard to height was observed between the technical grade material and the commercial formulation at those rates evaluated. Excellent activity was observed with commercial fluazifop at rates ≥ 0.14 kg ai/ha, with a calculated I_{50} value of 0.18 kg-ai/A. Collectively, these results suggest an alternative mode/mechanism-of-action for fluazifop-p-butyl herbicide on bristly.

EVALUATION OF PHYSIOLOGICAL RESPONSES IN QUINCLORAC-RESISTANT AND –SUSCEPTIBLE BARNYARDGRASS. M. L. Lovelace, R. E. Talbert, B. W. Skulman, and E. F. Scherder. Department of Crop. Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72701.

ABSTRACT

Continual use of quinclorac for control of propanil-resistant barnyardgrass has led the selection of a multiple resistant biotype to quinclorac and propanil. Studies have been initiated to evaluate mechanisms contributing to quinclorac resistance in barnyardgrass. First, an absorption and translocation study was conducted in order to evaluate differential responses between resistant- and susceptible-barnyardgrass biotypes. Plants were grown in full strength Hoagland's solution until the four-leaf stage. Plants were treated with quinclorac at 420 g ai/ha using a enclosed track sprayer calibrated to deliver 187 L/ha. The third leaf was then treated with radiolabeled quinclorac (four 1-μL droplets of formulated spray solution containing ring-labeled [^{14}C]-quinclorac; 25,000 disintegrations per minute (dpm)/μL). At 0, 3, 6, 12, 24, 48, and 72 h after application, radiolabeled quinclorac was washed from the treated leaves and plants were divided into treated leaf, leaves newer than the treated leaf, leaves older than the treated leaf, and roots at 0, 3, 6, 12, 24, 48, and 72 h after application. A sample of Hoagland's solution was extracted to determine root exudation of quinclorac. Plant tissue was oxidized and radiolabeled quinclorac was counted using a liquid scintillation counter.

Quinclorac absorption increased until 48 h after application. Maximum absorption of both biotypes was 98% and did not differ over time. At 3 h after appliction, quinclorac-resistant barnyardgrass contained 72% of the absorbed [^{14}C]-quinclorac in the treated leaf, which was greater than the quinclorac in the treated leaf of the quinclorac-susceptible barnyardgrass (42%). Maximum acropetal movement of [^{14}C]-quinclorac was achieved by 12 h after application (approximately 30% of the absorbed quinclorac) and did not differ between biotypes over timer. Basipetal movement of [^{14}C]-quinclorac increased until 24 h after application (30 to 35% of the absorbed quinclorac), and decreased until 72 h (20% of the absorbed quinclorac). Basipetal movement did not differ between biotypes. Less than 10% of the absorbed quinclorac tranlocated into the roots of the barnyardgrass plants. Root exudation of [^{14}C]-quinclorac increased with time in both quinclorac-resistant and –susceptible biotypes over time. By 72 h after application, exudation of quinclorac in the resistant biotype was 29%, compared to 20% exudation in the susceptible barnyardgrass biotype. Quinclorac exudation could be a mechanism in which resistant-quinclorac biotypes are detoxified.

Ethylene is a secondary mechanism in which quinclorac injures plants and differential production of ethylene may provide further insight to mechanisms in which quinclorac is influencing plant growth. An experiment was conducted to evaluate the production of ethylene in resistant- and susceptible-barnyardgrass biotypes. Plants were grown in full-strength Hoagland's solution until the three-leaf stage. Three plants were transferred to 50-ml glass cylinders with 5 ml of Hoagland's solution alone or in combination with quinclorac at 1 mM. Cylinders were capped with a septum and a 1-ml gas sample were withdrawn from the headspace with a syringe at 0, 3, 6, 12, 24, and h after treatment. Ethylene was identified and quantified using gas chromatography. After all gas samples have been taken, whole plant, root, and shoot fresh weights will be taken in order to determine ethylene production g^{-1} tissue.

Ethylene production increased rapidly through 6 h after application in the quinclorac-susceptible susceptible biotype. Ethylene production in the quinclorac-resistant biotype did not differ from untreated plants. Maximum ethylene production of the susceptible biotype was approximately ten times greater than the resistant biotype. Results from ethylene production indicate that quinclorac appears to be interfering with the induction process of the enzymes involved in quinclorac phytotoxicity. Currently, further research being conducted to elucidate other mechanisms that may be involved in quinclorac resistance in barnyardgrass.

COMPARATIVE PHYSIOLOGIES OF RICE AND RED RICE (*ORYZA SATIVA*). E.N. Cable-Stiers and N.R. Burgos,; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72701.

ABSTRACT

Rice and red rice are categorized under the same genus and species. They are similar in their morphological and molecular structures, yet red rice is more competitive than today's cultivated rice varieties. We hypothesize that the higher competitive nature of red rice can be attributed partly to higher photosynthetic efficiency. A field study was conducted at the Rice Research and Extension Center in Stuttgart, Arkansas in 2000 and 2001 to compare the photosynthetic response of rice and red rice to shading and nitrogen under noncompetitive conditions. The study utilized a split-split plot design. Main plot treatment was rice cultivar or red rice ecotype. Two rice cultivars, 'Wells' and 'Bengal,' and two red rice ecotypes, Stuttgart strawhull and Katy red rice (a putative cross between rice and red rice), were transplanted into each sub-subplot on June 15, 2000 and May 14, 2001. Sub-subplots were $1m^2$. Subplot treatment was shading . Sub-subplot treatment was nitrogen, which was applied one week after transplanting at 0, 100, and 200 kg/ha in the form of urea. Fifty days after planting, leaf samples were taken from the 100 kg N/ha unshaded plots for carbon discrimination determination to look at the possibility of red rice utilizing a modified carbon fixation pathway. Barnyardgrass (*Echinochloa crus-galli* L.) was used as a C_4 check. Analysis was done at the University of Arkansas Stable Isotope Laboratory. Rice and red rice were subjected to 50% light reduction for one week 10 days after anthesis. Photosynthesis readings were taken using a LiCor CO_2 gas analyzer 2 days after shade application. At harvest, the number of tillers, panicles, biomass, and grain count per plant were recorded. In 2001, prior to shade removal, leaf samples were taken to extract chlorophyll content using an acetone extraction method for rice (Krishnan 1996). Chlorophyll was quantified using calculations prescribed by Lictenthaler and Wellburn (1983).

'Wells' did not reach maturity in 2000, and therefore was not harvested. Stuttgart strawhull was the most competitive plant tested, producing more tillers, and panicles, and utilizing nitrogen more effectively than any other cultivar tested. Agronomically, Katy red rice was more similar to 'Bengal' than to Stuttgart strawhull. In 2001, 'Wells' produced more tillers, but less panicles than Katy red rice. Due to technical problems in 2000, photosynthesis readings were not useful for Stuttgart strawhull. In both years, 'Wells' had the highest photosynthetic rates when not shaded. In 2000, photosynthesis rates for Katy red rice and the rice cultivars were comparable when unshaded; however, Katy red rice photosynthesized at a higher rate than the rice cultivars in 50% shade. Photosynthetic rates were decreased 20% in Katy red rice, 35% in 'Bengal,' and 50% in 'Wells.' In 2001 under reduced light , Katy red rice photosynthesized at a higher rate than 'Bengal,' but not 'Wells' as was seen in the previous year. Under the shade, Stuttgart strawhull was less efficient than Katy red rice. Photosynthetic rates were decreased 14% for Katy red rice, 32% for Stuttgart strawhull, 55% for 'Bengal,' and 45% in 'Wells.' Total chlorophyll content in the rice varieties was higher than the red rice. Shade did not affect the chlorophyll a/b of rice cultivars or Katy red rice, but decreased it for Stuttgart strawhull. Increase in chlorophyll b is a shade-adaptation mechanism and could explain Stuttgart strawhull's increased photosynthetic ability when shade stressed as compared to the rice cultivars. Carbon isotope discrimination values for the rice and red rice were in the range of a typical C_3 plant. However, this does not rule out the possibility of a modified carbon fixation pathway.

GENETIC DIVERSITY IN RED RICE USING SSR MARKERS. S.N. Rajguru, N.R. Burgos, J.M. Stewart, and D. Gealy. University of Arkansas, Fayetteville, AR 72701

ABSTRACT

Rice is an important crop in the southeastern United States. In 2001, 1,631 acres of land in Arkansas was planted to rice. However, one of the major problems in rice production is red rice. Red rice belongs to the same genus and species *Oryza Sativa* and, therefore, is very similar to rice. Genetic introgression can occur between rice and red rice in nature, and this may contribute to the genetic diversity of red rice.

This study was conducted to analyze the genetic relationships between red rice populations and cultivated rice in Arkansas and to determine the number and distribution of red rice biotypes in Arkansas. One hundred seventy six red rice samples were collected from 11 rice dryers in Arkansas in 1999. Sample origins were Dixie Dryer, DeWitt, Eudora, Fair Oaks, Marianna, Pine Bluff, Stuttgart, Truman, Tyronza, Wilmot, and Wynne. These samples originated from fields planted to one of the following rice cultivars: Bengal, Cypress, Drew, Jefferson, Kaybonnet, LaGrue, Leah, and Lemont. Three red rice plants from five random samples obtained from each dryer were grown in the greenhouse, for a total of 165 plants. ‘Bengal’ rice was used as standard rice cultivar for these runs. DNA was extracted from young leaves using a modified CTAB protocol. Fingerprinting of red rice samples was done using simple sequence repeat (SSR) primers for rice. Twenty-four SSR primer pairs were used. DNA amplification was done by polymerase chain reaction (PCR), separated by polyacrylamide gel electrophoresis (PAGE) and visualized by staining with CYBR green. Individuals were evaluated for presence or absence of a genetic fragment. Data were used to generate similarity coefficients and genetic distances. Initial groupings of red rice samples were generated by cluster analysis of genetic distances.

Cluster analysis of 165 individuals from 55 samples showed that samples from some locations (Eudora, Pine Bluff, and Wilmot) were more genetically dispersed than those from other locations. Samples from other locations tended to segregate into two or three clusters. There was substantial genetic diversity among individuals tested. Five primers revealed distinct differences between ‘Bengal’ and red rice or between red rice samples. Of these, primer pair D63901 produced the most distinctive bands between rice and red rice. These primer pairs could potentially be used in identifying red rice hybrids. In order obtain robust information on red rice genotypes and their distribution more samples need to be analyzed.

BIOLOGY AND GEOGRAPHIC DISTRIBUTION OF RED RICE POPULATIONS SAMPLED FROM COMMERCIAL DRYERS. D.R. Gealy, N.R. Burgos, and L.E. Estorninos. USDA-ARS, Dale Bumpers National Rice Research Center, Stuttgart, AR 72160, University of Arkansas, Fayetteville, AR 72701, and University of Arkansas Rice Research and Extension Center, Stuttgart, AR 72160.

ABSTRACT

Red rice (*Oryza sativa* L.) is one of the most troublesome weeds of rice in the southern U.S., and Arkansas produces more than half of the rice in this region. In order to better understand the distribution and infestation levels of red rice throughout Arkansas, rough rice seed samples were obtained from grower seed lots that had been delivered to numerous dryers operated by commercial rice mills. Rice mills transferred all samples to central processing locations, which facilitated efficient collection of samples for these studies. Red rice infestation levels in ~30 counties were determined from commercial records or by sampling representative subgroups of the rice seed lots. Over several years of sampling, infestation levels in grower seed lots by county ranged from 0.01% to 2.9% red rice. Approximately 200 representative samples were selected from year 2000 seed lots and grown out from single seeds in a field nursery at Stuttgart in 2001. Statewide, 80% of red rice accessions were awnless strawhull and 20% were awned blackhull. Days to heading of individual lots ranged from 85 to 110 d. Heights ranged from 92 to 160 cm and leaf dimensions ranged by more than 100%. Sampling red rice from commercial dryers proved to be a highly efficient and low input method of evaluating statewide infestation levels, locations, and biological characteristics of this complex weed.

RESPONSE OF RICE VARIETIES TO BISPYRIBAC-SODIUM APPLICATIONS. W. Zhang, E.P. Webster, C.T. Leon, K.J. Pellerin, and S.D. Linscombe; AgCenter, Louisiana State University, Baton Rouge, LA 70803.

ABSTRACT

A greenhouse study was conducted to evaluate shoot and root growth of rice (*Oryza sativa* L.) varieties as affected by bispyribac-sodium rates and timings. Two rice varieties, ‘Cocodrie’ (long-grain) and ‘Bengal’ (short-grain), were evaluated. Bispyribac-sodium was applied at 0, 22, and 44 g ai/ha to one- to two-, two- to three-, and three- to four-leaf rice. The recommended rate for bispyribac-sodium is 22 g/ha. Propanil at 3.36 kg ai/ha was applied at the same application timings as bispyribac-sodium to each variety for comparison. Fresh weight of shoot and root was obtained at 1, 2, and 3 weeks after treatment (WAT) and shoot:root ratio was calculated based on the fresh weight of shoot and root.

Cocodrie was tolerant to bispyribac-sodium as no diference in shoot and root fresh weight or shoot:root ratio was observed for 22 g/ha bispyribac-sodium treated plants compared with the nontreated. Increasing the rate of bispyribac-sodium to 44 g/ha reduced shoot and root weight at 1 and 2 WAT, respectively, when treated at the one- to two-leaf stage. Cocodrie treated with bispyribac-sodium did not differ in shoot:root ratio compared with the nontreated. No difference in shoot and root fresh weight or shoot:root ratio occurred for propanil treated Cocodrie compared with the nontreated across all sampling dates.

Bengal was less tolerant to bispyribac-sodium compared with Cocodrie and tolerance was growth stage dependent. Bispyribac-sodium applied at the one- to two-leaf rice stage reduced shoot fresh weight but did not affect root fresh weight at 1 WAT, resulting in an lower shoot:root ratio compared with the nontreated. At 2 and 3 WAT, both shoot and root fresh weight were reduced by bispyribac-sodium at the one- to two-leaf timing with a shoot:root ratio greater than the nontreated. This higher shoot:root ratio indicates a greater inhibition of root development than shoot development. Bispyribac-sodium applied at the two- to three-leaf rice stage reduced shoot and root fresh weight of Bengal with a greater shoot:root ratio across all three sampling dates. Bispyribac-sodium applied at the three- to four-leaf rice stage did not affect shoot fresh weight but reduced overall root fresh weight at 2 and 3 WAT; however, no difference in shoot:root ratio occurred for the treated plants compared with the nontreated. No difference in shoot and root fresh weight or shoot:root ratio was detected with propanil treated Bengal compared with the nontreated.

These results indicate that rice varieties may differ in their tolerance to bispyribac-sodium when treated prior to the three- to four-leaf growth stage. Shoot:root ratio may be used as an indicator in rice variety trials for bispyribac-sodium tolerance.

GIBBERELLIC ACID AND CROP INJURY IN CLEARFIELD RICE. R.T. Dunand, E.P. Webster, and S.D. Linscombe; Louisiana State University Agricultural Center, Crowley and Baton Rouge, LA.

ABSTRACT

Clearfield (imazethapyr-tolerant) rice has exhibited injury symptoms following the application of Newpath. Gibberellic acid, a plant growth regulator, applied as a seed treatment and foliar spray can improve stand (especially at reduced seeding rates) and seedling vigor in semidwarf, long-grain rice, the germplasm base for Clearfield rice. The influence of gibberellic acid on seedling vigor in a Clearfield rice production system was evaluated to determine the effect on crop tolerance.

An early season Clearfield rice line, CL121, was drill-seeded on 7-inch rows at 75 lb/A. The recommended range in seeding rates for drill-seeded rice is 90 to 110 lb/A. Plot size was 9 x 25 ft. Soil type was Crowley silt loam. Agricultural chemicals were applied as recommended for pest control. Gibberellic acid (Release, Valent BioSciences Corp., Libertyville, IL) seed treatment was applied at 10 g oz/cwt. All imazethapyr treatments (Newpath, BASF Corp., Research Triangle Park, NC) included a preemergence and a postemergence application. On the second day after planting, Newpath was applied at 4 and 5 fl oz/A. At the 3- to 4-leaf stage (27 days after planting, DAP), the lower preemergence rate of Newpath was followed by the same rate. At the 4- to 5-leaf stages (31 DAP), the higher preemergence rate of Newpath was followed by 3 fl oz/A. Also, at 31 DAP, treatments including gibberellic acid (1.5 g/A, Valent BioSciences Corp.) and propanil (4 lb/A, Stam M4, Rohm and Haas Co., Philadelphia, PA) were applied. All foliar treatments were made with a CO_2 driven backpack sprayer using a delivery rate of 15 gal/A. Experimental design was a randomized complete block with four replications. There was a factorial arrangement of two seed treatments (plus and minus Release) and four herbicide/plant growth regulator treatments: 1-Stam M4 and RyzUp, 2-Newpath (4 followed by 4), 3-Newpath (5 followed by 3), 4-Newpath (5 followed by 3 + RyzUp).

Plant population and crop development were evaluated. Stand density was increased from 10 to 14 plants/ft^2 by Release and was unaffected by the preemergence Newpath treatments. Optimum stand in rice is 10 to 30 plants/ft^2. At 37 DAP, injury ratings ranged between 10 and 40%, and Release reduced crop injury by 15% on average across all herbicide treatments. The earlier Newpath treatment had the most injury. The later Newpath treatment with RyzUp had the least injury and was comparable with Stam M4 and RyzUp. At 38 DAP, plant height averaged 2 cm taller with Release (36 cm vs 38 cm), and Newpath decreased plant height up to 10 cm. The earlier Newpath timing had the greatest reduction in plant height. Similar trends in plant height were noted at maturity. At 43 DAP, crop vigor ratings (1=excellent and 10=poor) averaged 3 with Release and 8 without Release. Except for injury ratings, the effects of plant growth regulators and herbicides on crop growth were independent.

At harvest, crop maturity and production were affected by Release only. Grain moisture averaged 17.8% for treatments without Release compared with 18.2% with Release. Differences in grain moisture of 0.5% represent a change in maturity of one day. Grain yield was higher on average in treatments with Release (8675 lb/A) compared with treatments without Release (8062 lb/A). Although Newpath caused injury and reduced crop growth, there was no impact on grain yield. Grain yields averaged between 8190 and 8744 lb/A for the four herbicide treatments.

The cost of seed of Clearfield rice will cause producers to consider the use of lower than recommended seeding rates. Release can be an important part of a program that includes reduced seeding rates. Release can increase seedling population, thereby allowing reduced seeding rates in addition to reducing crop injury, increasing crop vigor, and maintaining yield potential. Clearfield rice has the greatest tolerance to Newpath when the preemergence application is followed by a postemergence application after the 3- to 4-leaf stage. Even though injury to Clearfield rice can occur with Newpath, the impact on grain production is minimal.

POTENTIAL IMPACT OF 'LIBERTY LINK' RICE ON RICE WATER WEEVIL. K.V. Tindall, E.P. Webster, and M.J. Stout; LSU AgCenter, Louisiana State University, Baton Rouge, LA, 70803.

ABSTRACT

Transgenic herbicide-resistant varieties are said to be "substantially equivalent" to varieties from which they are derived, with the exception of the inserted gene(s) and their products. This assumption may or may not be valid. In addition, although herbicide-resistant varieties are resistant to specific herbicides, slight injury to plants can occur from herbicide applications. Depending on the severity of injury, nutritive quality of plant tissue for insect pests may be altered. The BAR gene has been inserted into Liberty Link rice to confer resistance to glufosinate. Use of glufosinate causes inhibition of glutamine synthase and leads to rapid accumulation of ammonia, which is toxic to plants. If ammonia concentrations increase in resistant plants following glufosinate application, several possible outcomes could occur with respect to herbivores. Ammonia can be toxic to insects, can be used as source of nitrogen by insects, and can be an attractant for insects.

The rice water weevil (*Lissorhoptrus oryzophilus* Kuschel) is the most destructive insect pest of rice in the United States. Adult weevils feed on leaves and oviposit in the leaf sheath beneath the water surface. Larvae eclose, migrate to roots, and feed on root tissue. Larval feeding stunts plant growth and reduces grain yields. There have been no investigations concerning insect populations on Liberty Link rice. Experiments were designed to determine if the insertion of the BAR gene in Liberty Link rice influenced rice water weevil egg densities and/or larval densities compared to it parent line 'Bengal'; and if there were differences in egg densities and/or larval densities on glufosinate-treated and nontreated Liberty Link rice.

Experiments were performed in greenhouses located at Louisiana State University in Baton Rouge, La. The experimental design was a randomized block design with three replications for numbers of eggs and four replications for numbers of late instars and larval weights (for eggs, total n = 56; for larval density and weights, total n = 68). Treatments included Liberty Link rice treated with glufosinate at 0 and 400 g ai/ha at the two-to three-leaf stage (EPOST) followed by second application at the four-to five-leaf stage (LPOST). A nontreated Bengal was included for comparisons. Two days after LPOST, four pots per treatment were placed in infestation cages and flooded to a depth of 18 cm. After four days, adult rice water weevil infestations were terminated and one plant was taken to the laboratory to examine rice water weevil ovipositional preference by counting eggs laid in the leaf sheath. Roots of a second plant were washed 21 days after adult infestation and numbers of larvae present on each plant were recorded. Larvae were lyophilized and weighed to the nearest mg. Treatment effects for ovipositional preference, larval density, and mean weights of larvae were analyzed with *a priori* contrast statements.

Average weights of larvae feeding on treated Liberty Link rice were 2 times higher than weights of larvae feeding on Bengal rice. Larval weights did not differ when feeding on nontreated Liberty Link rice and treated Liberty Link rice. When insect densities are similar on different plants, average weights can provide information about host suitability. When insect densities are different, comparisons of host suitability are difficult. However, it is reasonable to assume that nontreated Liberty Link rice is a more suitable host than Bengal because larval weights on nontreated Liberty Link rice were two times that of larvae on Bengal and initial larval densities were likely higher than those found on Bengal because of higher oviposition.

Nontreated Liberty Link rice was 30% more preferred for rice water weevil oviposition over its parent line Bengal and treated Liberty Link rice. Treated Liberty Link rice had 20% fewer larvae present on roots after 21 days compared with the nontreated Liberty Link rice. Numbers of larvae on nontreated Liberty Link rice and Bengal did not differ. Nontreated Liberty Link rice was more susceptible to rice water weevil damage; this suggests that insertion of the BAR gene may have made the plant more susceptible to weevil infestation. Glufosinate applications appear to induce resistance to the rice water weevils at a level that resembles natural resistance of Bengal. Further experimentation is required to determine how the level of resistance in the treated Liberty Link rice compares with natural levels of resistance in the parent line.

GLYPHOSATE EFFECTS ON FRUIT RETENTION, 'CAVITATION', AND YIELD IN GLYPHOSATE-RESISTANT COTTON VARIETIES. J.W. Wilcut, W.A. Pline, K.L. Edmisten, and R. Wells; North Carolina State University, Raleigh, NC.

ABSTRACT

Despite the wide-spread acceptance and utilization of glyphosate-resistant (GR) cotton by growers in the Southeastern USA, there have been reports of fruit loss and 'cavitation' following glyphosate treatments. Several theories on the cause of 'cavitation', (where a boll which has died remains on the plant instead of abscising) have emerged. One theory claims that 'cavitation' is caused by the pathogenic organism *Phomopsis*, whereas another claims that 'cavitation' occurs due to a break in the vascular tissue transporting water to the growing boll. 'Cavitation' seems to be more prevalent in cotton varieties with an Acala background such as DP 90, DP 5690, etc. The objectives of these studies were first, to determine which glyphosate treatments correspond with increases in fruit abortion, 'cavitation,' and reduced yields; secondly, to determine whether varieties differ in their tolerance of post-directed (PD) glyphosate treatments compared with a conventional PD treatments; and finally, to determine the anatomical cause of 'cavitation' in 'cavitation'-prone varieties. Field studies were conducted in Greene County, NC in 2000 and 2001 in grower's fields that had a history of glyphosate-induced fruit loss in GR cotton. The variety DP 5415RR was used both years. Treatments included an untreated control; three labeled glyphosate treatments (a 4-leaf postemergence (POST) treatment, a 4-leaf POST treatment followed by (fb) an 8-leaf PD treatment, and an 8-leaf PD treatment alone), and three non-labeled glyphosate treatments (a 4-leaf POST fb 8-leaf POST treatment, an 8-leaf POST alone treatment, and an 8-leaf POST fb a 12-leaf PD treatment). All treatments consisted of glyphosate at 1.12 kg ai/ha applied using a backpack sprayer at the designated leaf stages. At the midbloom stage, plants treated with an 8-leaf POST fb 12-leaf PD treatment had 1.2 less first position bolls on nodes 1-10 than nontreated plants. At cutout, both the 8-leaf POST and the 4-leaf POST fb the 8-leaf POST treatments had fewer first position bolls on nodes 1-10 and more 'cavitations' than nontreated plants. Overall, plots treated with an 8-leaf POST treatment yielded 150 kg/ha less seed cotton than plots not receiving the 8-leaf POST treatment. In the variety study, conducted in 1999 and 2000 in Wayne County, NC, only one variety, DP 451RR had fewer first position bolls on nodes 1-10 with a glyphosate PD treatment compared to a conventional PD, however, yield was not affected. Studies investigating the anatomical cause of 'cavitation' compared longitudinal-sections of the abscission zones of squares and bolls from DP 90 ('cavitation-prone') and DP 50 (not 'cavitation-prone') from 3 days before anthesis to 21 days after anthesis. In the majority of the timings studied, particularly the early timings, (3 days before anthesis to 3 days after anthesis), DP 50 abscission zones contained numerous cells with a dense carbohydrate-like material, whereas these cells in DP 90 abscission zones contained far less dense carbohydrate-like material. The carbohydrate-like material may be produced by the activity of hydrolytic enzymes in the abscission zones which would promote proper abscission. The immaturity of these cells in DP 90 may suggest that the abscission zone is not prepared for abscission in the event that it may be necessary, thus causing the fruit to die but remain attached to the plant. Longitudinal sections of the peduncle and fruiting branch joint in cavitated bolls of DP 90 show that these carbohydrate-containing cells are prevalent in the distal side of the abscission zone (away from the main stem) and separation of the organ has occurred in this portion. However, the cells are lacking in the proximal side of the abscission zone (towards the main stem) causing the desiccated fruit to remain attached to the fruiting branch. Therefore, this research suggests that 'cavitation' of cotton bolls may be due to the inability of some bolls to form a proper abscission zone. Glyphosate treatments may increase the incidence of 'cavitation' by promoting increased boll shed. Therefore, in varieties prone to 'cavitation' these bolls would desiccate, but remain attached to the plant.

GLYPHOSATE INHIBITS POLLEN AND ANTHER DEVELOPMENT IN GLYPHOSATE RESISTANT COTTON. W.A. Pline, R. Viator, K.L. Edmisten, J.W. Wilcut, J. Thomas, and R. Wells; North Carolina State University, Raleigh, NC

ABSTRACT

Glyphosate treatments to glyphosate-resistant (GR) cotton have been associated with poor pollination and increased boll abortion. Anatomical studies were conducted to characterize the effect of glyphosate treatments on the development of male and female reproductive organs of cotton flowers at anthesis. In comparsion to non-treated plants, glyphosate applied at both the 4-leaf stage postemergence (POST) and at the 8-leaf stage postemergence-directed (PDIR) inhibited the elongation of the anther column and filament, which increased the distance from the anthers to the receptive stigma tip 4.9 to 5.7 mm during the first week of flowering. The increased distance from anthers to stigma resulted in 42% less pollen deposited on stigmas of glyphosate-treated plants than non-treated plants. Moreover, pollen from glyphosate-treated plants showed numerous morphological abnormalities. Transmission electron microscopy showed the presence of large vacuoles, numerous starch grains, and less organized pockets of endoplasmic reticulum (ER) containing fewer ribosomes in pollen from glyphosate-treated than non-treated plants. Pollen development in glyphosate-treated plants is likely inhibited or aborted at the vacuolate microspore and vacuolate microgamete stages of microgametogenesis resulting in immature pollen at anthesis. Although stigmas from glyphosate-treated plants were 1.2-1.4 mm longer than those from non-treated plants, no other anatomical differences in stigmas were visibly evident. The presence of the glyphosate resistant CP4-EPSPS enzyme was quantified in reproductive and vegetative tissues using ELISA. Content of CP4-EPSPS in the stigma, anther, pre-anthesis floral bud (square), and flower petals was significantly less than in vegetative leaf tissue. Glyphosate effects on male reproductive development resulting in poor pollen deposition on the stigma, as well as production of aborted pollen with reduced viability provide a likely explanation for reports of increased boll abortion and pollination problems in glyphosate-treated GR cotton.

GLYPHOSATE-RESISTANT HORSEWEED AND FACTORS INFLUENCING ITS CONTROL.
R. M. Hayes, T.C. Mueller, University of Tennessee, Knoxville and J.B. Willis, and R.F. Montgomery, Monsanto, Union City, TN

ABSTRACT

VanGessel reported a Glypohosate-resistant horseweed population in Delaware with 8- to 13-fold resistant to either the isopropylamine or diammonium salts of glyphosate (Weed Sci. 49:703-705). In 2000, a producer in Lauderdale County, TN contacted the local extension office and Monsanto and reported failure to control horseweed (*Conyza canadensis),* often called mare's tail, with 0.75 lb ae/ac glyphosate (Roundup Ultra®). Many plants were not killed after the field was retreated with 1.5 lb ae/ac glyphosate (Roundup Ultra®). Surviving plants were stunted and yellowish, but the apical meristem remained green. A field trial in 2001 confirmed the observation of the previous year. The producer treated part of the field with Roundup Ultra® at 0.75 lb ae/ac plus 2, 4-D in late February and achieved complete control. The balance of the field was treated with paraquat (Gramoxone Max®) 0.38 lb ai/ac plus chlorimuron-metribuzin (Canopy®) at 0.18 lb ai/ac plus 0.25% surfactant when horseweeds were ≤6 inches. Horseweed control in soybeans was nearly complete with this treatment. Neighboring producers reported similar performance issues with glyphosate (Roundup UltraMAX® and Touchdown IQ®) on horseweed. Other producers in Haywood, Crockett, and Gibson counties failed to achieve acceptable horseweed control with up to 1.5 lbs ae/ac as single or sequential application. Most of these fields had not been tilled and had a history of glyphosate use. In some cases glyphosate had been used exclusively for a number of years.

Initially, a comparison of glyphosate formulations was performed to rule out that recent formulation changes had not compromised efficacy on horseweed. Formulations included Roundup Original®, Roundup D-Pak®, Roundup Ultra®, Roundup UltraDry®, Roundup UltraMAX®, Touchdown 5® and Touchdown IQ® at 1.5 lbs ae/ac plus 0.25% surfactant. None of the formulations controlled horseweed more than 65% at 31 days after treatment (DAT).

Twenty treatments labeled for use in cotton were evaluated for control of the glyphosate-resistant horseweed. At 36 DAT, dicamba (Clarity®) at 0.25 lb ae/ac alone or with glyphosate (Roundup UltraMAX®) and MSMA plus diuron (Karmex® or Direx®) controlled horseweed ≥97%. Diuron, fluometuron (Cotoran, Meturon®), and prometryn (Caparol, CottonPro®) plus glyphosate (Roundup UltraMAX®) controlled horseweed from 80 to 92%. Carfentrazone-ethyl (Aim®), lactofen (Cobra®), flumioxazin (Valor®), metolachlor (Dual®), dimethpin (Harvade®), pyrithiobac (Staple®) and oxyflurfen (Goal®) alone or in mixtures with MSMA or glyphosate failed to control horseweed. Glufosinate (Liberty®) at 0.42 lb ai/ac applied to horseweed ≤12 inches that had been previously treated with glyphosate at 0.75 lb ae/ac did not provide more than 86% control.

Water volumes greater than 10 gallons per acre tended to decrease activity on horseweed. Surfactant rates of 0.25 to 2% did not improve horseweed control with Roundup UltraMAX®. There was no difference in horseweed control with glyphosate among four different surfactants (R-11, Silwet L-77®, LI-700® and Induce).

In greenhouse studies, 2.5 lb ae/ac glyphosate was required to control 2-inch rosette of the resistant biotype while the susceptible biotype was controlled with 0.38 lb ae/ac. Three-inch rosettes of the R-biotype required 5 lbs ae/ac and the S-biotype required 0.75 lb ae/ac. Both the R and S biotypes required higher glyphosate rates as the plants become larger. Thus the TN-R biotype horseweed exhibited at least a 6X tolerance to glyphosate.

Recommendation for managing fields of suspect resistant horseweed are: glyphosate 0.75 lb ae/ac + dicamba (Clarity®) at 0.25 lb ai/ac at least 21 days before planting; or glyphosate 0.75 lb ae/ac + 2,4-D at 0.475 lb ae/ac at least 90 days before planting; or glyphosate 0.75 lb ae/ac early spring followed by paraquat (Gramoxone Max®, Boa®) 0.38 lb ai/a plus diuron (Karmex® or Direx®) or fluometuron (Cotoran, Meturon®), (PRE labeled rate for soil type before cotton emergence) or MSMA preplant at 2 lbs ai/ac plus diuron (Karmex® or Direx®) or fluometuron (Cotoran, Meturon®) at PRE labeled rates. Early preplant control measures are most effective. Horseweed escaping PRE control should be post-directed as early as possible with MSMA + diuron (Karmex® or Direx®).

EFFICACY, ABSORPTION, AND TRANSLOCATION OF GLYPHOSATE FORMULATOINS. S. A. Payne, N. R. Burgos, L. R. Oliver, and R. B. Lassiter, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR, 72704, and Dow AgroSciences, Little Rock, AR, 72212.

ABSTRACT

Field studies were conducted in Keiser and Pine Tree, AR, in 2000 to evaluate weed control by glyphosate formulations in glyphosate-resistant soybeans. Studies were arranged as a randomized complete block with a factorial arrangement of treatments. Factors included glyphosate rate: 0.28, 0.56, 0.84, and 1.12 kg ai/ha; and glyphosate formulation: Glypro (DAS NAF-552), Glyphomax Plus (DAS NAF-545), Glyphomax (DAS GF-63), Vantage (DAS NAF-546), Roundup Ultra, and Touchdown 5. All formulations except Glypro were packaged with a surfactant. Pitted morningglory (*Ipomoea lacunosa*) and barnyardgrass (*Echinochloa crus-galli*) control were evaluated at 1, 2, and 4 weeks after treatment (WAT). Pooled over locations, pitted morningglory control at 1 WAT by Glyphomax Plus, Vantage, and Roundup Ultra was approximately 40% and was higher than that by Glypro (20%). By 2 WAT, control was similar for all formulations and ranged from 52 to 63%. Pitted morningglory control at Keiser at 4 WAT was approximately 50% and there were no differences among formulations. At Pine Tree, Glypro, Glyphomax, and Vantage provided 70% control while Roundup Ultra and Touchdown 5 provided 60% control by 4 WAT. Barnyardgrass control at Pine Tree was similar among formulations containing a surfactant and higher than that by Glypro at 1 , 2, and 4 WAT. By 4 WAT, all formulations with a surfactant provided at least 80% control, while Glypro controlled barnyardgrass 55%.

Laboratory studies were conducted to evaluate absorption and translocation of ^{14}C-glyphosate by the previously mentioned formulations in pitted morningglory and barnyardgrass. Studies were arranged as a randomized complete block with a factorial arrangement of treatments. Factors included glyphosate formulation, four glyphosate rates (100, 200, 400, and 800 g ai/ha), and four harvest times (2, 6, 24, and 72 h). Absorption was calculated as a percent of the amount of ^{14}C-glyphosate recovered and translocation was calculated as a percent of the amount absorbed. Absorption of ^{14}C-glyphosate by pitted morningglory was similar among all formulations at 2 h (10%). At 6 h and thereafter, all formulations with a surfactant were absorbed more than Glypro. By 72 h, absorption of Vantage and Roundup Ultra was among the highest at 58%. Translocation above pitted morningglory treated leaf was similar for all formulations at 2 and 6 h, but at 72 h, Touchdown 5 showed the most acropetal movement (33%), followed by Glypro, Glyphomax, and Roundup Ultra (27%). Glyphomax Plus and Vantage had the least acropetal translocation. There were no differences among formulations in translocation of ^{14}C-glyphosate to pitted morningglory roots. In barnyardgrass, Glyphomax Plus and Touchdown 5 were among the most absorbed formulations at 2 and 72 h. Glypro was generally the most mobile in barnyardgrass. Of the formulations with a surfactant, Roundup Ultra and Touchdown 5 provided among the greatest acropetal translocation at 24 and 72 h (12%). Glyphomax Plus and Vantage provided the most translocation to roots at 2 h at 10%. When examined collectively over pitted morningglory and barnyardgrass, absorption and translocation of formulations with a surfactant were similar. Efficacy was not always correlated with absorption and translocation. Factors other than absorption and translocation influence the efficacy of glyphosate on weed species.

INVESTIGATIONS INTO GLYPHOSATE RESISTANT HORSEWEED (CONYZA CANADENSIS): RESISTANCE MECHANISM STUDIES. J. Bourque, Y.C.S. Chen, G. Heck, C. Hubmeier, T. Reynolds, M. Tran, P. Ratliff and D. Sammons, Monsanto Co., St. Louis, MO.

ABSTRACT

Recent greenhouse studies have shown that a biotype of horseweed collected from fields in Delaware survived higher than labeled rates of glyphosate and higher rates than other biotypes collected from the area. Experiments have been initiated to determine the mechanism for the differential tolerance in these biotypes. Radiolabeled ^{14}C-glyphosate experiments were conducted to determine if differences in the uptake and translocation of glyphosate would be observed. Initial indications are that metabolism does not play a key role in the resistance mechanism. Changes in the level of shikimate (an indicator of glyphosate's inhibition of the shikimate pathway) will be analyzed at similar time points as the uptake/translocation experiments. Finally, progress on complete molecular analysis for both biotypes will be presented including the DNA coding sequence for EPSPS and expression levels within both biotypes of horseweed.

UTILIZATION OF AN ALTERNATIVE VECOTR SYSTEM FOR EXPRESSION OF CORN P450 PROTEIN. C.L. Brommer and M Barrett; Department of Agronomy, University of Kentucky, Lexington, KY 40546.

ABSTRACT

The cytochromes P450 are an important enzyme family for the detoxification of xenobiotics in plants. Our recent efforts to understand the capabilities of individual P450 enzymes to metabolize xenobiotics have used P450 genes cloned from corn heterologously expressed in yeast (*Saccharomyces cerevisiae*) strains. The yeast strains employed have been engineered to express cytochrome P450 reductase. The second enzyme required for P450 activity. However, several researchers have experienced difficulties in achieving consistent, high levels of monocot P450 gene expression in the yeast system. A number of limitations, including alternative codon usage between yeast and monocots, have been addressed. However, the expression of all the P450 monocot genes tested has not been achieved, at least to date. This led our group to explore and alternative expression system to yeast. We chose to explore the use of baculovirus as an alternative to yeast for the expression of catalytically active monocot P450.
For this study, corn P450 genes were cloned into a transfer vector (PBlueBac Vector®) from Intitrogen, Co. Cell-mediated double recombination between viral sequences flanking the heterologous protein gene (P450) and the corresponding sequences of the viral expression vector resulted in the incorporation of the heterologous protein gene into the viral genome. Hence, recombinant progeny viruses produced heterologous protein late in their life cycle. This mixture was added to the Sf9 cell line for infection. Following infection and production of the transformed virus particles, the virus mixture was collected and purified using cell plates and positive viral plaques were isolated. Final verification of viral purity was done using PCR analysis with primers designed on either side of P450 gene inserted into the baculovirus. Purified baculovirus was scaled up to high levels and then used to infect the Sf9 cells in a liquid shaker culture. 72 hours following infection, Sf9 cells are harvested from growth media and microsomes are made. These microsomes are tested for protein content, P450 levels, and P450 activity. Data are collected for the CYP81A3 gene, CYP72A5 gene, a wild type virus with no gene insertion, a virus that was transformed with B-galactosidase, and a control cell culture with no virus added.

In previous studies, Ralston and Barrett utilized a yeast vector for several P450s including corn CYP72A5, CYP81A2, and Jerusalem artichoke (*Helianthus tuberosus*) CYP73A1. P450 concentration was 39 and 89 pmol/mg of protein for CYP72A5 and CYP81A2, respectively. The dicot P450 (CYP73A1) produced 142 pmol/mg with no detectable P450 in the yeast blank. For our studies, baculovirus transformed with CYP72A5 produced 176 pmol/mg of degraded P450, at absorbance 420nm. The baculovirus with CYP81A3 yielded 433 pmol/mg, at 420nm as well as the non-transformed baculovirus, which produced 20 pmol/mg of the same degraded P450. These levels of degraded monocot (corn) P450 are considerably higher then any previously shown. The P450 from these studies was probably degraded due to problems with the microsome isolation protocol. Future research will entail optimization of the microsome preparations, P450 enzymatic activity studies using radiolabeled herbicides, cloning and insertion of other corn P450s into baculovirus, isolation of corn P450 reductase, and co-expression of the corn P450 reductase with already isolated corn P450s, using the baculovirus expression system.

INVESTIGATIONS ON THE ACTIVITY OF SULFOSATE HERBICIDE ON ROUNDUP-READY® COTTON.
G.E. MacDonald, S.N. McGraw and R. Querns. Agronomy Department, University of Florida, Gainesville, FL 32611.

ABSTRACT

Field and greenhouse studies were initiated to investigate the effects of glyphosate and sulfosate on Roundup-Ready (RR) cotton. Observations made during field studies in 1999 and 2001 showed severe damage with sulfosate treatments, but with dissimilar symptomology to glyphosate and sulfosate on non-transgenic crops. Sulfosate and glyphosate were applied at 0.0, 0.38, 0.75 and 1.5 lbs-ai/A to Roundup Ready (DeltaPine 655RR) and conventional (Stoneville 454) cotton in the 1^{st} true, 4^{th} true leaf and 1^{st} square stage of development. Sulfosate caused leaf chlorosis and necrosis and severe stunting within 5 to 7 days, while normal symptoms of glyphosate injury are not generally visible until 10 days after application. The commercial formulation of glyphosate (Roundup Ultra) did not cause visible injury to RR cotton at any rate or time of application. Rates of photosynthesis (µmoles/cm^2/min)were measured two days after herbicide application. The commercial formulation of sulfosate caused over an 80% reduction in the photosynthetic rates of both conventional (Stoneville 454) and RR cotton (DeltaPine 655) when applied at the 4^{th} leaf stage of cotton. Rates were also reduced from applications made on the 1^{st} square stage but to a lesser extent. Glyphosate reduced photosynthetic rates in conventional cotton but did not effect the RR variety. Analysis of shikimic acid content was also evaluated in 2001 using the procedure of Singh and Shanner, 1998. All treatments of sulfosate and glyphosate did not increase shikimic acid levels, regardless of time of application or rate. Although early and mid season injury was present from sulfosate treatments to RR cotton, there were no significant differences in yield. Further studies under greenhouse conditions investigated the effect of several formulations of glyphosate including isopropylamine salt, trimesium salt, sesquesodium salt, ammonium salt and technical acid applied at 0.0, 0.38, 0.75 and 1.5 lbs-ae/A to Roundup Ready cotton at the 4^{th} leaf stage. In addition, trimesium iodide alone and in combination with technical acid and ammonium sulfate were applied at the same rates found in the previously listed formulations. The commercial formulation of trimesium glyphosate, the trimesium iodide alone and in combination with technical glyphosate acid caused a significant reduction in the photosynthetic rates of RR cotton; and similar symptomology to that observed under field conditions. Shikimic acid analysis also showed no difference among treatments, suggesting the mode of action is not active on the shikimic acid pathway in cotton. These studies indicate there is an alternate mode of action of sulfosate in RR cotton and that the trimesium salt itself is phytotoxic to cotton. The symptomology and rapid reduction in photosynthesis rates further suggest that the salt may be a photosynthetically active compound.

REPRODUCTIVE RESPONSE OF TRANSGENIC COTTON TO A PREVIOUSLY NONSELECTIVE HERBICIDE. W.E. Thomas, W.A. Pline, R. Viator, J.W. Wilcut, K.L. Edmisten, R. Wells,[*] and M.D. Paulsgrove[†]. [*]North Carolina State University, Raleigh, NC 27695 and [†]Aventis Crop Protection, RTP, NC 27709.

ABSTRACT

Cotton engineered for resistance to glyphosate has been shown to have lower pollen viability, decreased seed set per boll, and altered floral morphology when treated with labeled glyphosate treatments. Therefore, studies were initiated to determine whether glufosinate applications to glufosinate-resistant cotton caused similar changes in floral morphology and seed set. Two runs of the experiment were conducted in a phytotron greenhouse with controlled environmental conditions. Glufosinate treatments were applied at 0.49 kg / ha. Treatments included an untreated check, 4-leaf stage foliar application (POST), 8-leaf stage foliar application (POST), 4-leaf foliar (POST) followed by 8-leaf foliar application (POST), and a 4-leaf foliar (POST) followed by 8-leaf stem application (PDS). To assess floral morphology, the anther to stigma distance, stigma height, and length of staminal column were measured. Pollen viability was also determined on the corresponding measured flowers using a Brewbaker and Kwack pollen tube formation media with 5% sucrose (w/v). All plants were mapped at the fifth week of flowering to evaluate numbers of bolls, number of bolls on the first ten nodes, first position bolls, vegetative squares, squares, and cavitated bolls. The first position bolls on the first six fruiting branches were removed and seeds per bolls counted. After statistical analysis, none of the treatments showed significant differences among the measured floral characteristics, or pollen viability, except for anther to stigma distances and seed set. The distance from the top anther to the tip of the stigma was statistically less in plants treated with an 8 leaf (POST) application than untreated plants. However, this difference is not likely to influence pollen deposition, because in both cases anthers reached above the stigma tip. This type of spatial orientation allows pollen to fall by gravity to the stigma surface. Seed set from a 4-leaf POST followed by 8-leaf PDS treated plant was significantly different than the other treatments and the untreated, but no logical explanation exists since it was not the most intense treatment.

DETECTION OF MOISTURE STRESS USING HYPERSPECTRAL REFLECTANCE DATA FROM COMMON COCKLEBUR, SICKLEPOD, AND SOYBEAN. W.B. Henry*, D.R. Shaw, K.R. Reddy, L.M. Bruce, H.D. Tamhankar, and T.H. Koger. Mississippi State University, Mississippi State, MS.

ABSTRACT

This research was conducted to determine if remote sensing could be used to detect the presence, and perhaps the degree, of moisture stress in common cocklebur (*Xanthium strumarium* L.), sicklepod [*Senna obtusifolia* (L.) Irwin and Barnaby], and soybean [*Glycine max* (L.) Merr.]. Another goal of this research was to determine if moisture stress impacts our ability to correctly classify species. Research was conducted during the summers of 2000 and 2001 outdoors at the Plant Science Research Center, Mississippi State University. All plants were grown in 12-L pots filled with sand. Each pot contained two plants. Plants were grown with optimal water and nutrient conditions for eight weeks prior to the imposition of moisture stress. Plants were fertigated with a nutrient medium containing 1/2X Hoagland's solution. Stress was generated by decreasing the time, and subsequently the amount, that the plants were watered. There were three moisture regimes. The plants receiving no moisture stress, (Moisture Level III, 100%) were watered three times daily for a total of 45 min and 2.25L. The plants in the second water stress treatment, (Moisture Level II, 60%), were watered a total of 27 min and 1.35L daily. The plants in the first water stress treatment (Moisture Level I, 40%) were watered a total of 18 minutes and 0.9L daily. After moisture stress treatments were imposed, reflectance data were generated between the hours of 11:00 a.m. and 2:00 p.m. at two-day intervals. These data were generated from individual leaves. Once the reflectance of the leaf was measured, this same leaf was removed from the plant and the leaf water potential (lwp) was determined. Leaf area, green weight, dry weight, and nutrient analysis were also measured several times throughout the experiment. Hyperspectral reflectance data were collected with a handheld spectroradiometer using an artificial light source. These hyperspectral data included bands of light between 300 and 2500 nm, at 1.4 nm increments. Hyperspectral responses potentially suggesting moisture stress were analyzed and pertinent features were extracted using indices, wavelet transforms and signature amplitudes.

Data suggest that, within a species, plants grown at 100% and 40% moisture could be correctly classified approximately 60 to 80% of the time, depending upon species and statistical analyses. Three ranges of leaf water potential were created, and common cocklebur was correctly classified into these ranges 58 to 68% of the time. Data were inconclusive with respect to correlating individual bands and lwp across species and moisture levels. Although moisture stress did influence the spectral response of these species, it did not decrease the ability to correctly classify between species. The trend was that as moisture stress increased, so too did the ability to distinguish between species.

MORNINGGLORY (*IPOMOEA* SPP.) RESPONSE TO NEIGHBORING CORN (*ZEA MAYS* L.) PLANTS AND DIFFERENT COLORED PHYSICAL STRUCTURES. A.J. Price and J.W. Wilcut, North Carolina State University, Raleigh.

ABSTRACT

Our field observation of *Ipomoea* spp. noted that many *Ipomoea* spp (*Ipomoea hederacea* var. *integriuscula* Grey, *Ipomoea hederacea* L. Jacq., *Ipomoea lacunose* L., and *Ipomoea purpurea* L. Roth.) grew out of places of comparable competitive advantage onto neighboring plants or structures that provided a climbing habitat. A total of 223 *Ipomoea* plants growing in rows and row middles in a 1300 ft^2 area within established corn research plots revealed that of the total *Ipomoea* plants surveyed, 68% that were large enough had grown up corn plants. More significant, of the 152 *Ipomoea* plants growing up corn, 96% had grown to the row closest in proximity instead of growing across the row middle. Greenhouse research was then initiated to determine if *Ipomoea* spp. grew preferentially toward certain colored structure or green corn plants. Black 9 L pots were filled with approximately 8 cm of metromix soil media. Ivyleaf morningglory (*Ipomoea hederacea*) were then seeded opposite a 31 cm stake painted black, blue, green, red, yellow, or white, or a 31 cm corn plant. The experimental design was a completely randomized design with three replications of treatments and the experiment was repeated three additional times. Reflected solar radiation spectral quality of each stakecolor was measured using a LICOR 1800 radiospectrometer measuring every 2 nm, from 200 nm to 1200 nm, and averaged over five measurements. Reflectance data is reported in µmol $m^{-2}s^{-2}$. Field research was also conducted in which *Ipomoea hederacea* plants were grown in a split-split plot experimental design with three replications of treatments and the experiment was conducted twice. The main plot factor was structure consisting of 4.5 by 9.5 by 244 cm lumber placed 61 cm in the ground after being painted black, green, or white, or 183 cm tall corn. One subplot factor was initial (plants) distance from either a corn plant or painted lumber within a plot. Planting distances were 15, 31, 61, 92, or 122 cm. The other subplot factor was east vs. west orientation of *Ipomoea hederacea* to the corn plant or lumber. Reflected solar radiation spectral quality of each lumber color was measured as previously described. Greenhouse grown *Ipomoea hederacea* displayed varying degrees of positive growth response toward black (2 of 12), blue (7 of 12), green (9 of 12), red (7 of 12), yellow (8 of 12), white (9 of 12) stakes, or corn (11 of 12). The treatment consisting of the black stake had significantly fewer *Ipomoea hederacea* recording a yes response to climbing habit. Figures 1 through 6 are spectral data collected from greenhouse experiments. In field study, the main plot factor structure was significant, with fewer *Ipomoea hederacea* climbing black lumber than other colored lumber or corn. The subplot factor initial distance was also significant for percentage of *Ipomoea hederacea* that climbed as well as their final weight. *Ipomoea hederacea* tend to respond to spatial distribution of surrounding objects and apparently used this reflectance to preferentially project their stems toward the most prospective structure for climbing. Figures 7 through 9 are spectral data collected from field studies.

Greenhouse reflectance data:

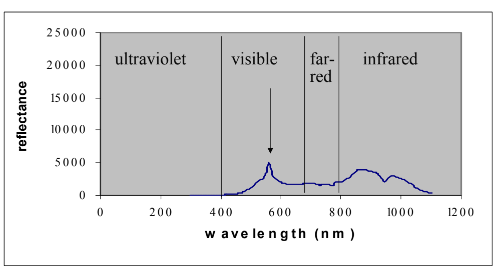


Figure 1. Green stake reflectance data.

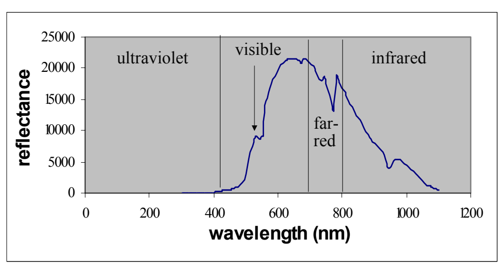


Figure 2. Yellow stake reflectance data.

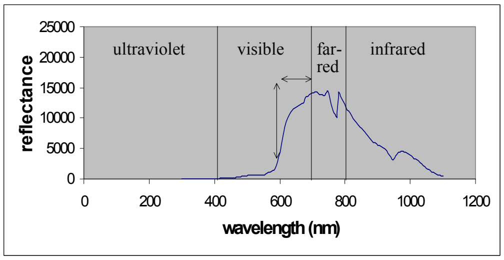


Figure 5. Red stake reflectance data.

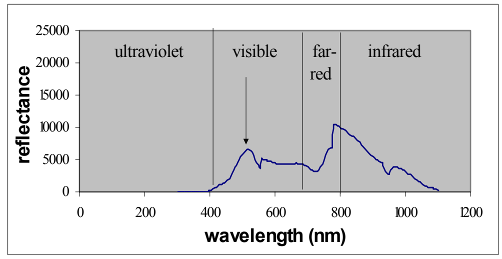


Figure 3. Blue stake reflectance data.

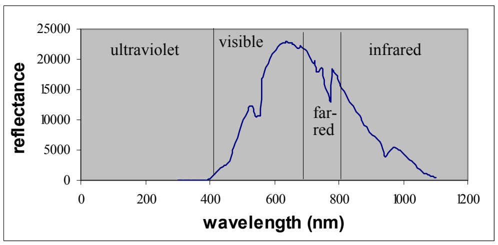


Figure 4. White stake reflectance data.

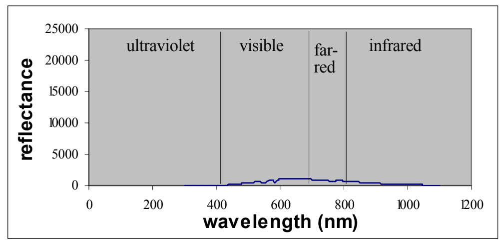


Figure 6. Black reflectance data.

Field reflectance data:

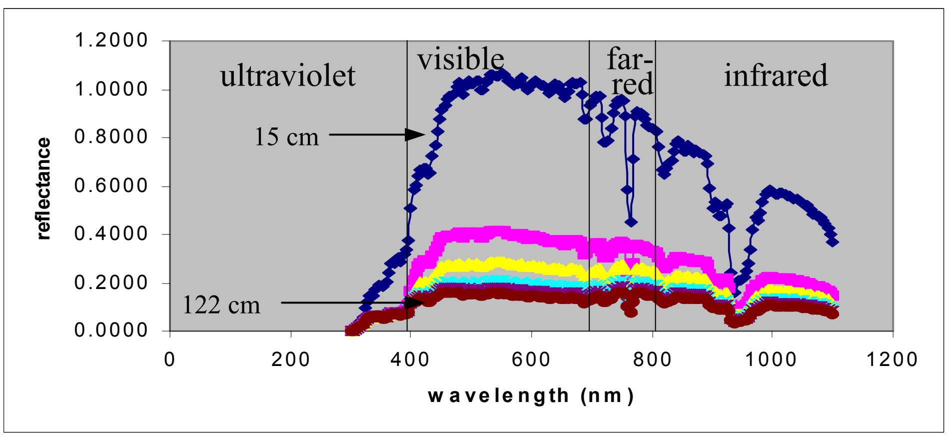


Figure 7. White painted lumber reflectance data from 5 initial distances: 15 (top line), 31, 61, 92, 122 cm.

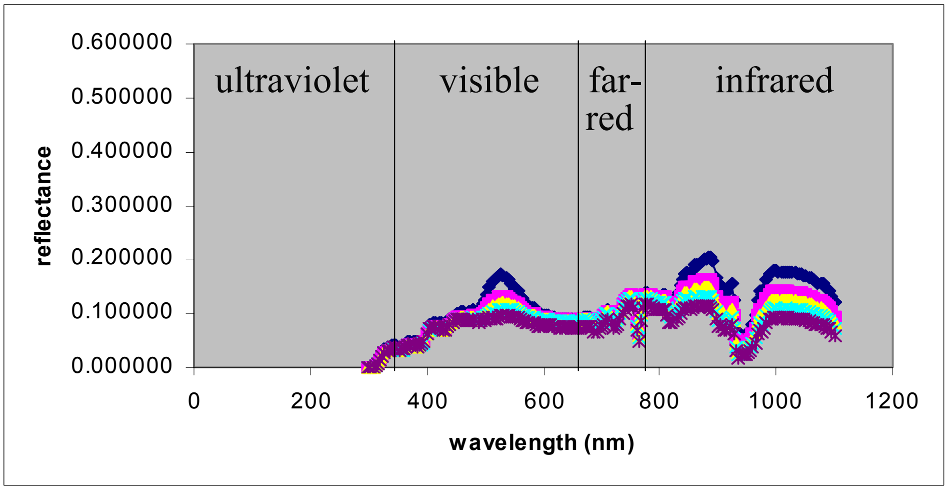


Figure 8. Green painted lumber reflectance data from 5 initial distances: 15 (top line), 31, 61, 92, 122 cm.

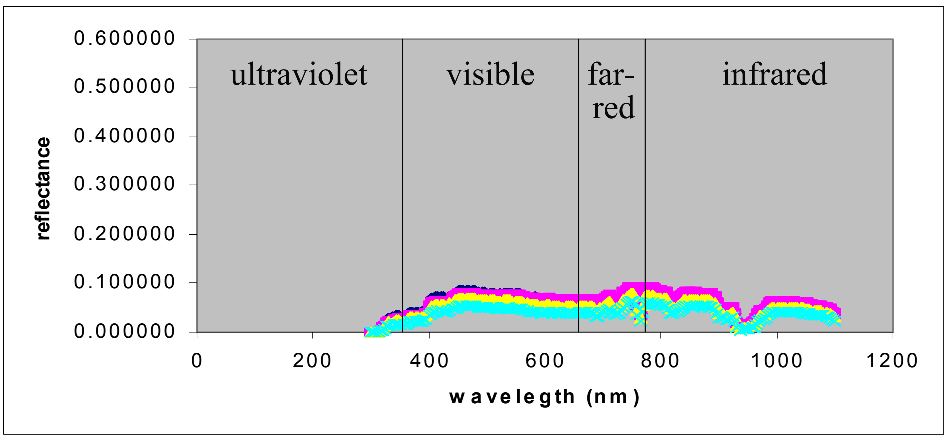


Figure 9. Black painted lumber reflectance data from 5 initial distances: 15 (top line), 31, 61, 92, 122 cm.

PHYSIOLOGICAL FACTORS INFLUENCING THE MANAGEMENT OF TORPEDOGRASS. R.M. Tenpenny, G.E. MacDonald, D.L. Sutton. Department of Agronomy, University of Florida, Gainesville, FL 32611.

ABSTRACT

Torpedograss (*Panicum repens* L.) is a perennial grass that was introduced into the United States in the early 1900's as a possible marshland forage. Introduction of such non-native species can harmfully impact agriculture and disrupt native wildlife habitats and recreational lands. Native aquatic and wetland plants are in constant competition with invasive species, such as torpedograss, which destroy established ecosystems. Weedy vegetation also plays a large role in economic losses of agriculture and industry by impeding irrigation and drainage canals and aggressively growing along littoral zones and ditch banks of other important land areas.

In Florida, vegetative reproduction via 'torpedo-like' rhizomes, stolons, and shoots are the main source of torpedograss spread and persistence. Glyphosate (N- [phosphonemethyl] glycine), a non-selective herbicide, is the only EPA approved herbicide for torpedograss control in standing water. Glyphosate treatments typically cause necrosis of foliage but control is short-term due to rapid regrowth from extensive under-ground rhizomes. This non-selective control method and the persistence of torpedograss has warranted the objectives of this research to 1) gain a better understanding of the vegetative reproduction and comparative growth mechanisms of torpedograss and the native plant species maidencane (*Panicum hemitomon*) and 2) evaluate the addition of 2,4-D (another herbicide registered for aquatic use) as a means to enhance the efficacy of glyphosate for torpedograss control.

Research to evaluate vegetative reproduction was conducted at the University of Florida's Ft. Lauderdale Research and Education Center. Vegetative growth of torpedograss was compared to maidencane and evaluated under various growing conditions. Torpedograss was able to out-compete maidencane at all growing conditions. Torpedograss was also found to actively grow throughout the year whereas maidencane became dormant under short day conditions.

Chemical control methods were tested and evaluated at the University of Florida, Gainesville during the summer of 2001. Plants were grown outdoors in 15 cm pots to uniform size and treated using a spray chamber. Four weeks after treatment above-ground biomass was collected and plants were allowed to regrow for 4 weeks. At this time whole plants were harvested and biomass was separated into roots (rhizomes) and shoots and dry weights (g) determined. Initial data suggested the addition of 2,4-D enhanced the activity of glyphosate but this was not evident from regrowth biomass.

THE INTERACTION OF IN-FURROW INSECTICIDE AND AT-CRACKING HERBICIDE PROGRAMS IN PEANUT (*ARACHIS HYPOGAEA*). N.P. Shaikh and G.E. MacDonald. Department of Agronomy, University of Florida, Gainesville, FL 32611.

ABSTRACT

Field studies were conducted to investigate the interactive effects of in-furrow insecticides and at-cracking herbicide programs in peanut. Studies were conducted at Tifton, GA in 1997 and 1998, and Gainesville and Marianna, FL in 1999 and 2001. All studies were planted within the first 2 weeks of May. The variety 'Georgia Green' was planted at 6 seed/foot of row in 36-inch rows. Plot size was 4 rows by 20 feet. Three in-furrow insecticides phorate, aldicarb and acephate and untreated were tested in combination with two at-cracking herbicides, paraquat and imazapic. Phorate, aldicarb, and acephate were applied in-furrow at planting at 1.0, 1.0, and 0.19 lbs-ai/A, respectively. Paraquat + bentazon was applied at 0.13 + 0.5 lbs-ai/A at 2 and 4 weeks after cracking (WAC) and imazapic applied at 0.063 lbs-ai/A at 4 WAC. Visual observations of percent injury were noted at mid-season and incidence of Tomato Spotted Wilt Virus (TSWV) was taken prior to harvest. Peanut yield (lbs/A) was also determined for all studies. Phorate treated peanut showed symptoms of foliar leaf necrosis in all studies but only within the first 5 weeks after emergence. Neither herbicide program, regardless of insecticide, caused significant peanut injury for all studies. There was also no statistical interaction between herbicides and insecticides on TSWV incidence or yield for all studies. Observations in 1997 and 1998 showed phorate to significantly suppress the incidence of TSWV compared to other insecticides but had no effect on yield. At Gainesville and Marianna in 1999 and 2001 phorate was at par with other insecticides for suppressing TSWV and no impact on peanut yield. In 1997 and in Marianna 2001, imazapic treated peanut had higher yields, was equal to paraquat + bentazon in 1998, both locations in 1999 and Gainesville in 2001. These studies also indicate that the herbicides used did not have any influence on the incidence of TSWV in peanut.

TIME OF REMOVAL OF CROWNBEARD FROM PEANUTS. R.L. Farris and D.S. Murray. Department of Plant and Soil Sciences. Oklahoma State University, Stillwater, OK 74078.

ABSTRACT

Crownbeard (*Verbesina encelioides*) is ranked as the third most common and the sixth most troublesome weed in Oklahoma peanuts. Crownbeard, also known as golden crownbeard, yellowtop, or cowpen daisy is a member of the sunflower family (Asteracaea/Compositae). This summer annual weed is native to America and is found in warmer regions of the United States. Crownbeard is propagated by seeds, winged achenes, abundantly produced on wide flower heads of yellow disk and ray florets in an open inflorescence and grows to a height of 1.5 m. The leaves are grayish green with ovate, alternate leaves, which are about 5-10 cm long and 1.25 cm wide. The weed has been shown to exhibit toxic effects to livestock due to the toxin galegine and may also have allelopathic properties, adding to its weed interference nature.

A field experiment was conducted at the Caddo Research Station near Ft. Cobb, OK to measure the effects of competitive duration of crownbeard with peanuts. Data collected consisted of weed counts and weed weights at eight weed removal times and peanut yields. The experimental design was a randomized complete block with four replications. The plot size was 3.7 m wide by 12 m long. The soil was a sandy loam with a pH of 6.8 and a 0.7% organic matter content. The Tamspan 90 peanut cultivar was planted at a rate of 90 kg/ha. Crownbeard was removed at 4, 6, 8, 10, 12, 14, and 16 weeks after emergence and there was a plot maintained weed-free for the entire season. The crownbeard plants were removed from all four rows; however, between rows 2 and 3 the crownbeard were counted, clipped off at soil level, dried, and dry weights recorded. After each crownbeard removal period, the plots were maintained weed free for the remainder of the growing season through herbicide use, hoeing, and hand pulling.

The center two rows of each plot were dug and inverted, field cured, combined, dried, and weighed. Correlation between weed numbers and duration of competition versus dry weed weight and weed numbers, dry weed weight, and duration of competition versus peanut yield were determined. For each week of crownbeard growth, a 500 kg/ha/week increase in dry weed weights occurred. Weed density, coupled with time of removal of crownbeard, was a poor predictor of dry weed weight and peanut yield; however, dry weed weight and competitive duration were good predictors of peanut yield. Results showed a linear decrease in peanut yield due to crownbeard competition. For each week of crownbeard competition, a 3% peanut yield reduction occurred. Full season interference resulted in approximately a 40% peanut yield reduction. Early season crownbeard control is needed to maximize predicted peanut yields in Oklahoma.

DETECTION OF PITTED MORNINGGLORY (*IPOMOEA LACUNOSA* L.) IN SOYBEAN WITH SUPERVISED DATA ANALYSIS TECNIQUES. T.H. Koger, D.R. Shaw, and F.S. Kelley, Department of Plant and Soil Sciences, Mississippi State University; L.M. Bruce, Department of Electrical and Computer Engineering, Mississippi State University, Mississippi State, MS 39762; and K.N. Reddy, USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS 38776.

ABSTRACT

Hyperspectral sensors are capable of collecting reflectance data in more than 1500 spectral bands that may span as many as five portions of the electromagnetic spectrum. However, most data analysis procedures utilized to identify pertinent classification features such as a series of spectral bands from hyperspectral data that can be used to discriminate weeds from crop are often overwhelmed due to the vast amount and high dimensionality of hyperspectral data. Thus, the objective of this research was to determine the potential for different supervised data analysis techniques of hyperspectral reflectance signals for discriminating pitted morningglory intermixed with soybean and weed-free soybean.

A field experiment was conducted in 2001 at the Plant Science Research Center near Starkville, MS. The experiment was arranged in a randomized complete block with each treatment replicated four times in 4.5 by 12 m plots. The treatments were presence or absence of pitted morningglory, with half of the plots containing pitted morningglory intermixed with soybean and the other half containing weed-free soybean. Existing vegetation in all plots were desiccated with 1.1 kg ai/ha paraquat in mid-April. Two days later, the entire experimental area was disked twice, and the glyphosate resistant soybean cultivar 'Asgrow 4702 RR' was planted in 57 cm rows in all plots on May 21. Pitted morningglory seed was planted in nine 1.0-m^2 quadrates in the center of each pitted morningglory plot. Once emerged, pitted morningglory populations were thinned so that each 1.0-m^2 quadrate contained 4 plants. This population was maintained throughout the duration of the experiment by hand-pulling excess pitted morningglory and other weeds as needed. All weeds in remaining area of pitted morningglory plots and entire weed-free soybean plots were controlled with glyphosate as needed. When pitted morningglory was in the cotyledon to 2-leaf, 2- to 4-leaf, and 4- to 6-leaf, and 6- to 9-leaf growth stages, eight hyperspectral reflectance measurements were collected from each pitted morningglory intermixed with soybean and weed-free soybean plot. Each reflectance measurement contained 2151 individual spectral bands with a bandwidth of 1.4 nm between 350 and 1050 nm and 1.0 nm between 1000 and 2500 nm. Spatial resolution for each reflectance measurement was 0.25 m. Three supervised analysis techniques were evaluated for their ability to select features that can be used as classification variables in Fisher's linear discriminant analysis to discriminate reflectance properties of pitted morningglory intermixed with soybean and weed-free soybean at each pitted morningglory growth stage. The three analysis techniques were: 1) selection of the ten individual (1.0 or 1.4 nm) spectral bands having the greatest discriminatory power according to stepwise discriminant analysis, 2) the ten principal components that accounted for the most variability within each reflectance measurement, and 3) selection of the bets ten HAAR based wavelet coefficients (coefficients of energy for each spectral band) having the greatest discriminatory power according to stepwise discriminant analysis.

Most of the selected features, for each data analysis technique, were derived from the near-infrared (700- to 1300-nm) portion of the electromagnetic spectrum for all pitted morningglory growth stages. Classification accuracy of the two-class system (pitted morningglory intermixed with soybean and weed-free soybean) was between 77 and 100% across all pitted morningglory growth stages for the spectral bands and wavelet coefficient data analysis techniques. The principal component analysis technique did not produce features useful for discriminating the two class systems, with 44 to 52% classification accuracy across all pitted morningglory growth stages. Principal component analysis is a useful tool for determining which variables account for the most variability in multivariate data. However, based on this research, principal components may not serve as good discriminators of classification systems. Classification accuracy with these two systems was greater as pitted morningglory growth stage increased, with 77 to 89% and 86 to 100% classification accuracy at the cotyledon to 4-leaf and 4- to 9-leaf pitted morningglory growth stages. Based on these results, the spectral band and wavelet based analysis techniques have potential for detecting weeds small enough to be controlled with most labeled postemergence herbicides.

OBTAINING WEED POPULATIONS FOR COMPUTERIZED DECISION SUPPORT SYSTEM (DSS) INPUTS: COUNTS VERSUS ESTIMATIONS. S.W. Murdock and D.S. Murray; Plant and Soil Sciences, Oklahoma State University, Stillwater, OK 74078.

ABSTRACT

There have been several computerized Decision Support Systems (DSS), for weed control, developed in the past decade. The DSS treatment recommendations are sometimes based on economics. When economics are used, generally, a weed density must be input by the user. There is a concern that the user will not properly scout a field for weeds but instead estimate the weed populations present in the field. The following research was performed to determine if estimated weed populations are as accurate as weed counts and if estimations result in different treatment recommendations from the DSS in small plot areas.

The research was performed in existing experiments, therefore, plots that had been chemically treated alike, up to the time estimations and counts were performed, were combined. This resulted in two treatments with 16 plots each, which were four rows wide by 50 feet long. Three estimators estimated the weed populations (#/100 sq. ft., the DSS format) for each plot. Then counts were made in each plot to determine the actual weed populations. Mean separation was performed between the actual and estimated weed populations with LSD analysis at the 0.05 significance level. The means for the actual weed populations were input into the DSS for treatment recommendations, the top three recommendations and net returns were recorded and then compared to the treatment recommendations from the DSS with each estimators weed populations. To obtain the treatment recommendations all inputs were held constant except for the different weed populations between the actual population and each estimators' population.

In the two experiments reported, there was a cotton experiment with five inch cotton in 40 inch bedded rows and a peanut experiment where the peanuts were seven inches tall in 36 inch bedded rows. The cotton experiment had an average weed height of 2 to 3 inches with two weeds species present Johnsongrass (*Sorghum halepense* (L.) Pers.) and pitted morningglory (*Ipomoea lacunosa* L.); while the peanut experiment included Texas panicum (*Panicum texanum* Buckl.), Johnsongrass (*Sorghum halepense* (L.) Pers.), crownbeard (*Verbesina encelioides* (Cav.) Benth. & Hook. f. e), and entireleaf mornngglory (*Ipomoea hederacea* var. *integriuscula* Gray) all averaging between 3 to 5 inches in height.

There were no differences between the estimators' populations and the actual populations in the cotton experiment and only three times did a estimators' population significantly differ from the actual population in the peanut experiment, with the four weed species. The estimators' populations were not different from the actual poulation 88% of the time, in the peanut experiment, and 92% of the time when averaging both locations. The DSS treatment recommendations and net returns were similar between the actual and the estimated populations in both experiments. The top three recommendations for the actual populations, if not the same, were always in the top five recommendations for the estimators' populations.

In small plot areas, weed population can be effectively estimated by the user and will result in minimal to no change in the output recommendations from the DSS. If using the DSS as a "decision aid" and considering the top several recommendations as viable options, the output from the estimators populations would be essentially the same as the actual populations output from the DSS.

HOW DO WE TEST FOR HERBICIDE RESISTANCE? N.R. Burgos and R.E. Talbert; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72701.

ABSTRACT

Confirmation of resistance is still a nebulous process to many, primarily because published articles on herbicide-resistant weeds describe different protocols for testing resistance. There are also varying degrees of uncertainty about discriminating between tolerant and resistant weed populations. The Weed Science Society of America (WSSA) adopts the following definition of these terminologies. Tolerance is the natural ability of a species to survive herbicide application that severely inhibits another species, without prior exposure to the herbicide. Resistance is the heritable ability of a species to survive herbicide application that normally controls the same species in the past. We also need to recognize that because of the genetic diversity of weeds, there is a difference in natural level of tolerance to a herbicide within a species. This should not be construed as resistance.

This paper discusses protocols used at the University of Arkansas for confirmation of herbicide resistance of barnyardgrass (*Echinochloa crus-galli*), common cocklebur (*Xanthium strumarium*), Palmer amaranth *(Amaranthus palmeri*), and ryegrass (*Lolium spp.*). The methods are discussed in relation to protocols used for other species. Protocols are developed to confirm resistance, levels of resistance, and cross-resistance of samples from farmers' fields that are suspected to be resistant. Protocols vary according to species and herbicides involved; however, there are general principles that apply to any situation. First, is proper seed collection. If possible, collect seed from at least 20 individual plants from one suspected resistant population. Part of the seed can be bulked for confirmation of resistance and the rest stored individually for information on homogeneity of the population. Second, is the use of appropriate susceptible standard. For weeds like ryegrass, which consist of several species, it is critical to use a susceptible standard that is of the same species as the suspected resistant sample. If possible, it is best to use a known susceptible sample from the same county or locality. Different ecotypes of the same species may have different levels of tolerance to the herbicide used. Third, is the use of historical data on herbicide use. This usually resolves the question of whether the population is just tolerant or has become resistant. Fourth, is the establishment of a herbicide response curve in a replicated trial. This allows for proper statistical comparison of various samples, gives information on the level of resistance, and provides baseline information on rates to use for quick confirmation of resistance for future samples. Fifth, is check for cross resistance. This need to be done on more than one resistant samples because cross- and multiple resistance patterns may differ between populations. Petri dish bioassays had been reported to effectively distinguish between resistant and susceptible samples of some species. This method is quick and cheap; however this technique produced misleading results for confirmation of diclofop-resistant ryegrass. Use of methods other than whole-plant assay needs to be carefully evaluated before being adopted as a regular protocol for resistance confirmation.

REGIONAL VALIDATION OF HADSS AND PROGRESS TOWARD REGIONAL ADAPTATION. A. J. Price*, G.G. Wilkerson, North Carolina State University, Raleigh and A.C. Bennett, The University of Florida, Belle Glade

ABSTRACT

HADSS (Herbicide Application Decision Support System), WebHADSS, and Pocket HERB are a family of decision aids based on an economic threshold model which utilizes weed populations, weed competitiveness, herbicide efficacy, herbicide cost, estimated crop yield, estimated selling price and other information to create a list of appropriate treatments that can then be ranked based on net economic return, maximum weed control obtained, herbicide cost, and several other factors. Databases used to develop the initial HADSS program were provided by Georgia (peanut), Mississippi (soybean) and North Carolina (corn, cotton, soybean). Cooperating weed scientists in Alabama, Arkansas, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas have been conducting validation research comparing HADSS recommendations to those of cooperating weed scientists, grower standards, or weed-free controls. Crops vary by state but include corn, cotton, peanut, and soybean. Although HADSS recommendations have generally provided consistently good weed control and protected yields effectively, many cooperators have made changes to the database so that the program mirrors their top treatment choices and reflects different ecological variables found within each region. Regional adaptation of the initial HADSS database includes Alabama (cotton, peanut), Arkansas (soybean), Georgia (cotton), Louisiana (cotton, soybean), Mississippi (cotton, soybean), North Carolina (corn, cotton, peanut, soybean), Oklahoma (cotton, peanut), Tennessee (corn, cotton), and Texas (cotton). Validation comparisons across the South have shown that weed control and net returns from HADSS recommendations are generally equivalent to or greater than those obtained from recommendations of weed scientists and grower standards. We expect these to continue to improve due to the programs' continual refinement and modification. Major regional changes include addition and deletion of weed species listed for individual crops, changes in POST rates for weed size and moisture conditions, adapting herbicide efficacies, as well as recommended treatments. Arising issues include generic formulations vs. trade names (e.g., glyphosate 4L vs. Roundup Ultra), grouping similar species within a genus (e.g., Amaranth, Polygonum, Sida), appropriate herbicide rates for weed size and soil moisture conditions, and efficacy values for herbicides that provide near complete control of a weed (100 vs. 98-99%).

POSTEMERGENCE HERBICIDE RECOMMENDATIONS BY HADSS IN PEANUT FIELDS BASED ON THE NUMBER OF SCOUTING STOPS. G.G Wilkerson, D.L. Jordan, and D. Krueger, Department of Crop Science, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

One of the perceived limitations to incorporating HADSS (Herbicide Application Decision Support System) into routine weed management decisions is ability to economically scout fields. A total of 52 peanut (*Arachis hypogaea* L.) fields were scouted from 1997 through 2001 in the peanut belt of North Carolina to investigate the value of scouting and to compare the currently recommended scouting strategy to alternatives requiring less time and effort. Weed species and density were recorded for each acre of the field. HADSS was used to determine the expected return for each treatment on each acre, and the treatment with the highest net return across all acres was considered to be the optimal "whole-field" treatment. The expected net return from the optimal treatment for each of the 52 fields was compared to that estimated by HADSS for the commercial standard Storm (acifluorfen, 0.28 kg a.i./ha plus bentazon, 0.56 kg a.i./ha) plus 2,4-DB (0.14 kg a.i./ha) followed by Select (clethodim, 0.14 kg a.i./ha) when grasses were present. For 17 fields that were 12 or more acres in size, a “3-stop” or “6-stop” approach was used to see if the recommendation based on fewer stops would be similar to the recommendation generated from the greater number of stops used in the whole-field approach. The 3-stop approach represented one pass through the middle of the field (front, middle, and back of field). The 6-stop approach represented two passes through the field with 3 stops made on the initial pass with an additional 3 included while returning to the initial starting point. Both methods are common among practitioners. Expected net returns were compared under the various weed size options and moisture conditions offered by HADSS. Peanut yield was set at 3500 pounds/acre with a range of market prices (350, 490, 575, 610 $/ton farmer stock peanut). These scenarios were also evaluated with or without paraquat as an option.

Using the whole field approach to scouting, which included sampling each acre, theoretical net return was $5 per acre greater than using the 3-stop approach and $1 per acre greater than using the 6-stop approach, when pooled over all conditions and 17 fields. The optimal whole-field treatment was the recommendation in 48% and 73% of fields using the 3-stop and 6-stop approaches, respectively. The standard program of Storm plus 2,4-DB followed by Select provided theoretical net returns $10 per acre lower than the HADSS whole-field recommendation for the 52 fields. The combination of Storm plus 2,4-DB followed by Select was the primary recommendation from HADSS in approximately 23% of fields when paraquat was not an option and in only 1% of fields when paraquat was allowed. Site-specific management (treating each acre with the most economical treatment recommended by HADSS for that acre) increased net returns from 0 to $10 per acre in approximately 68% of fields. In some fields site-specific weed management increased net returns substantially more than $10 per acre.

THE STORY BEHIND HERBICIDE LABEL STATEMENTS. L.L. Whatley, BASF Corporation, Research Triangle Park, NC 27709

ABSTRACT

The reason that certain statements appear on herbicide labels is not always obvious, but all statements are based on data or lack or data. For example, restricting herbicide applications from certain geographies may be due to a lack of efficacy or residue data in that area. Conversely, the restrictions could be due to data that show lack of efficacy, crop injury, or other unwanted effects when used outside the labeled area. If data are lacking and the costs of generating it are high, the use area may never be expanded. Restrictions on herbicide application method are often imposed to avoid target crop phytotoxicity, nontarget drift, or ensure efficacy. Grazing restrictions are required when residues may show up in livestock meat or milk; the residues must be allowed to dissipate before animals graze the treated forage. The specific time from application to grazing depends on data from residue and metabolism studies. Preharvest restrictions, those prohibiting harvest until a specific time after application, may be needed to allow crop residues to dissipate to a level at or below the tolerance expression. They may also be imposed because no residue data were generated to show that a preharvest restriction is unnecessary. Rotational crop restrictions come from field observations plus soil residue dissipation profiles and subsequent uptake patterns for root crops, cereal crops, and leafy vegetables. Although a rotational crop may not be visibly affected, it can contain residues from the herbicide application(s) in the previous crop. Rather than conduct studies to support a tolerance on the rotational crop, it may be more advantageous to restrict its planting until the second season after the original application or later. In developing data to support herbicide statements, manufacturers must strike a balance between the need and cost effectiveness. If cost effectiveness is low, label statements are likely to be triggered by lack of data.

WORKER PROTECTION SAFETY RULES ADJUSTED TO REFLECT RESEARCHERS TRAINING AND JOB TASKS. R.R. Hedberg WSSA, Washington, DC, E.J. Retzinger Jr., BASF, W. Des Moines, IA, H.P. Wilson, VPI and State University, Painter, VA and James V. Parochetti, CSREES/USDA, Washington, DC.

ABSTRACT

In 1996 the Environmental Protection Agency (EPA) finalized the Worker Protection Standard (WPS) guidelines to "reduce the risks of illness or injury resulting from workers and handlers occupational exposures to pesticides used in the production of agricultural plants on farms or in nurseries, greenhouses, and forests and also from the accidental exposure of workers and other persons to such pesticides." The WPS regulation was directed at farm workers whose primary job was the harvesting of fruits and vegetables. Although use of unregistered experimental pesticides was fully exempt from the WPS regulation no provisions were made to exempt research uses of registered pesticides.

In 1996 during the term of WSSA President Steve Duke a group was formed to petition the EPA for an exemption to some of the provisions of WPS. In 1997 Cal Messersmith officially commissioned this group as Special Committee S53: Worker Protection Standard Task Force. In 1998 Dan Hess contacted the Presidents of the Entomology Society of America, the American Phytopathological Society and the National Association of Independent Crop Consultants and thus formed the Consortium of Crop Research Workers. In 1999, with the appointment of Robert Hedberg, as Director of Science Policy for the National and Regional Weed Science Societies, this group gained a consistent presence in Washington D.C.

The WPS Task force met with EPA staff several times between 1996 and 1998 before submitting an official petition to EPA in October 1998 seeking the following four changes to the WPS regulation:

1. Exempt researchers who hold a Category 10 Research and Demonstration endorsement on their Pesticide applicator's license.
2. Eliminate the Posting of each registered compound for each experiment in research trials.
3. Allow the field notebook to be the Central Posting site for research areas.
4. Allow researchers early re-entry to plots and adjacent areas for data collection and other activities in both field and greenhouse settings.

After numerous conversations and meetings with EPA by Rob Hedberg and other Consortium members the agency sent the consortium a letter of clarification in July of 2001 that addressed the major concerns of WSSA members.

1. EPA acknowledged that under Experimental Use Permitting (EUP) regulations, WPS and other label requirements would not apply to certain uses of registered pesticides that are the subject of laboratory, greenhouse and limited replicated field trials. However, WPS requirements will still apply to use registered products for plot maintenance and such applications would still need to be posted.
2. The field notebook used by the researcher would be recognized as the central posting site if accessible to workers at that research site.
3. Researchers are allowed the same early re-entry access as pesticide handlers, and if qualified as a Certified Crop Advisor they will have further flexibility in their choice of personal protective equipment (PPE).

INTERFERENCE OF BROADLEAF SIGNALGRASS IN CORN AND CONTROL WITH NEW CHEMISTRIES. T.C. Mueller and R.M. Hayes, University of Tennessee, Knoxville, TN.

ABSTRACT

Broadleaf signalgrass (*Brachiaria platyphylla*) is a difficult-to-control grass weed that is prevalent in no-till corn fields in the mid-south area. It is a decumbent, spreading, branched, bent and rooting at the nodes, summer annual with a fibrous root system and is a prolific seed producer. This research focused on two questions. What effect does the presence of broadleaf signalgrass have (if any) on corn growth and yield? What are chemical control options for this weed?

Classical time-of-removal studies (interference) studies were conducted in two locations in both 2000 and 2001 at Jackson and Knoxville, TN. Small plot techniques were used at each location, including application of herbicides with backpack sprayers. Corn was planted into a no-till production system in either April (Jackson location) or May (Knoxville). All plots were sprayed with glyphosate as a burndown herbicide prior to planting. 'Asgrow 738RR' was the variety in all trials, and other weeds were removed by either hand removal (rhizome johnsongrass) or an overspray of bromoxynil or dicamba (miscellaneous broadleaf weeds). Environmental conditions each year were conducive to good herbicide activity. Herbicide treatments to remove broadleaf signalgrass included a weekly application of glyphosate at 3, 4, 5, 6, 7, 8, and 9 weeks after planting (WAP), weedfree and untreated weedy control plots. The authors note that there may be a lag time between herbicide application and complete death of the broadleaf signalgrass.

Broadleaf signalgrass emerged at the same time as the corn in Knoxville, and was more competitive. Broadleaf signalgrass competition from > 6 weeks after planting had lower yields than the other plots where broadleaf signalgrass had previously been controlled. Trends were less clear at Jackson, with less obvious effect of broadleaf signalgrass on corn yield. This may have been due to a period early in the year where the corn emerged and grew in the absence of broadleaf signalgrass. Another finding was that little broadleaf signalgrass emerged after a glyphosate application, which may have been due to depletion of the seed bank or a shading effect of the corn.

Broadleaf signalgrass control was examined in several studies in Knoxville using small plot techniques. For each study, an appropriate hybrid was used to minimize corn injury ('Clearfield' corn for the Lightning® treatments, RoundupReady® corn for the Roundup UltraMax® treatments). Appropriate industry standards were included in each test.

Aventis products AE130360 01 WG70 and AE130360 02 61WG both provided control equal to Basis Gold® when applied to small broadleaf signalgrass. Control with the Aventis compounds was more complete when applied with MSO compared to COC, and the addition of atrazine did not antagonize control. Lightning® provided control equal to Basis Gold either with or without the addition of 2 or 4 ounces per acre of Distinct®. The most complete control in non-transgenic corn was provided by a PRE application of Bicep II Magnum® followed by an early POST application of Accent®. Guardsman Max® followed by Celebrity Plus® also provided good control. In RoundupReady® corn, a sequential application of Roundup UltraMax® provided near complete broadleaf signalgrass control. A single application of Roundup UltraMax® did not provide complete control in this heavily infested site. A PRE-only broadleaf signalgrass treatment did not provide acceptable control, even when additional Dual® and Princep® were added to a full rate of Bicep II Magnum®. Mesotrione (Callisto®) demonstrated good broadleaf signalgrass activity when applied to small (< 6 inch) broadleaf signalgrass.

The most important time to remove broadleaf signalgrass competition from corn appeared to be 3 to 5 weeks after planting. Effective broadleaf signalgrass control was demonstrated by Accent®, Roundup UltraMax®, Lighting®, Basis Gold®, Aventis Experimentals, and mesotrione (Callisto®).

NEW MESOTRIONE PREMIXES FOR BROADSPECTRUM WEED CONTROL IN CORN. J. Lunsford*, W.W. Bachman, J. Tweedy; Syngenta Crop Protection, Greensboro, NC 27419.

ABSTRACT

Mesotrione (2-[4-methylsulfonyl-2-nitrobenzoyl]-1,3-cyclohexanedione) pre-packaged mixes with s-metolachlor and s-metolachlor plus atrazine are currently under development by Syngenta Crop Protection. These new mixtures are being developed for preplant, preemergence and early postemergence use in corn. Mesotrione provides excellent control of most important broadleaf weeds in corn including velvetleaf, pigweed species, waterhemp species, common lambsquarters, common ragweed, giant ragweed, jimsonweed, nightshade species, morningglory species, common sunflower and Pennsylvania smartweed. The addition of s-metolachlor or s-metolachlor plus atrazine to mesotrione in pre-packaged mixes results in the control of a broad spectrum of annual grass and broadleaf weeds. Corn shows excellent tolerance to mesotrione plus s-metolachlor or mesotrione plus s-metolachlor plus atrazine pre-packaged mixes.

FORAMSULFURON (AE F130360): A NEW POSTEMERGENT HERBICIDE IN SOUTHERN CORN. G.L. Schwarzlose, C.J. Effertz, S.B. Garris, J.W. Sanderson, S.S. Hand, W.R. Perkins, L.S. Hall, P.N. Odom, and W.F. Strachan; Aventis CropScience, 2 T.W. Alexander Drive, Research Triangle Park, NC 27709.

ABSTRACT

AE F130360 [N,N-dimethyl-2-[3-(4,6-dimethoxypyrimidin-2-yl)ureidosulfonyl]-4-formylaminobenzamide] is a novel sulfonylurea herbicide for postemergence use in corn. AE F130360 is formulated with a safener and can be applied safely across a wide number of corn (Zea mays L.) hybrids. It is formulated as a 35% water dispersible granule for North American use and requires the use of adjuvants for optimum activity. Esterified seed oils and 28% or 32% urea-ammonium nitrate is preferred. It is applied with the new Aventis CropScience safener, isoxadifen-ethyl (AE F122006; ethyl 5,5-diphenyl-2-isoxazoline-3-carboxylate).). Isoxadifen-ethyl is submitted for registration in rice in combination with fenoxaprop-p-ethyl. Foramsulfuron possess favorable toxicological properties, such as low mammalian and aquatic toxicity, typical of herbicides in this family. Foramsulfuron has a very positive fate in soil resulting in no limitations on normal rotational crop sequences. Foramsulfuron is effective against major grass weed species, as well as some broad-leaved weeds. AE F130360 35 WG (35% foramsulfuron + 35% isoxadifen) has a recommended use rate of 1.50 – 1.75 ounces product per acre and is applied with methylated seed oil and UAN or AMS. AE F130360 has the flexibility to be utilized in a wide variety of tankmixes. The trade name for AE F130360 is Optionä .

AE F130360 has been tested in over 400 development trials as well as numerous screening trials. In these trials excellent crop safety was exhibited. AE F130360 is an excellent grass herbicide controlling annuals such as foxtail species (Setaria sp.), barnyardgrass (Echinochloa crus-galli (L.) Beauv.), shattercane (Sorghum bicolor (L.) Moench) Panicum species (Panicum sp.), crabgrass species (Digitaria sp.), goosegrass (Eleusine indica (L.) Gaertn.), and Brachiaria species (Brachiaria sp.).

AE F130360 also controls a number of important broadleaf weed species like nightshade species (Solanum sp.), redroot pigweed (Amaranthus retroflexus L.), velvetleaf (Abutilon theophrasti Medicus), common lambsquarters (Chenopodium album L.), common cocklebur (Xanthium strumarium L.), common ragweed (Ambrosia artemisiifolia L.), morningglory species (Ipomoea sp.), and common chickweed (Stellaria media (L.) Vill.

AE F130360 also controls perennial grasses like johnsongrass (Sorghum halepense (L.) Pers.) as well as having activity on many perennial broadleaf weeds such as Canada thistle (Cirsium arvense (L.) Scop.). Foramsulfuron and isoxadifen-ethyl have been submitted to governmental agencies for use in corn. Registration is anticipated for the 2002 use season.

WEED CONTROL SYSTEMS IN ROUNDUP READY® CORN. C.B. Corkern, J.A. Mills, and A.L. Catchot; Monsanto Company. Leland, MS 38756.

ABSTRACT

Field trials were conducted in 2000 and 2001 to evaluate weed control systems in Roundup Ready® corn. In 2000, a trial was established at a producer location in Shelby, MS and in 2001, a trial was established at the same location in Shelby, MS and at the Monsanto, Leland Agronomy Center located near Stoneville, MS. Experimental design was a randomized complete block with 3 or 4 replications. At Shelby, plot sizes were 8 rows (38 inch) by 600' and 8 rows by 1300' in 2000 and 2001, respectively. At Leland, plot size was 4 rows (38 inch) by 80'. In 2000, treatments were Bicep II Magnum (2.5 lb ai/A) plus atrazine (0.5 lb ai/A) applied PRE, Bicep II Magnum (1.2 lb ai/A) plus atrazine (0.25 lb ai/A) applied PRE followed by Roundup Ultra (0.75 lb ae/A) applied POST to V7 corn, ReadyMaster ATZ (2.0 lb ai/A) applied at V3 corn, ReadyMaster ATZ (2.0 lb ai/A) plus atrazine (0.5 lb ai/A) applied at V3 corn, a single POST application of Roundup Ultra (0.75 lb ae/A) applied at V3 corn and Roundup Ultra (0.75 lb ae/A) applied at V3 corn followed by Roundup Ultra (0.56 lb ae/A) applied at V7 corn. In 2001, equivalent rates of Roundup UltraMax were used in place of Roundup Ultra. Also, the two ReadyMaster ATZ treatments were replaced with a Prowl (1.0 lb ai/A) plus atrazine (1.5 lb ai/A) treatment applied at corn spiking and a Roundup UltraMax (0.75 lb ae/A) plus atrazine (1.5 lb ai/A) treatment applied at V3 corn. Weed control data were recorded prior to corn harvest. Yield data were also recorded at all locations.

In 2000, morningglory (entireleaf and pitted) control ranged from 82 to 95%. Barnyardgrass control was at least 92% for all treatments containing a residual herbicide. Two applications of Roundup Ultra was necessary for control similar to treatments with residuals for morningglory and barnyardgrass. Corn yield ranged from 159 to 168 bu/A with significantly less corn yield for the single Roundup Ultra treatment as compared to the sequential Roundup Ultra treatments. At Shelby in 2001, johnsongrass control was at least 93% for all treatments containing Roundup UltraMax. Bicep II Magnum plus atrazine or Prowl plus atrazine controlled johnsongrass no more than 69%. Broadleaf signalgrass control ranged from 88 to 92% control for all treatments except the single application of Roundup UltraMax. Control with this treatment was no more than 80%. When a residual herbicide was used, barnyardgrass control was at least 98%. Single or sequential applications of Roundup UltraMax provided no more than 90% barnyardgrass control. No differences were observed for corn yield. At Leland, no differences were observed for redroot pigweed and barnyardgrass control regardless of treatment. Control ranged from 86 to 97% and 89 to 98%, respectively. For pitted morningglory, control was no more than 81%, regardless of treatment. A single application of Roundup UltraMax provided only 60% control and a sequential application of Roundup UltraMax was necessary for control similar to the other treatments. No differences were observed for corn yield, regardless of treatment.

In conclusion, a single application of Roundup UltraMax did not provide season long control in most cases. Control of annual grasses and broadleaves generally required two applications of Roundup UltraMax or Roundup UltraMax plus a residual herbicide for season long control. Good control of johnsongrass was obtained with Roundup UltraMax alone or in combination with a residual herbicide.

TANK MIXING CYHALOFOP-BUTYL WITH OTHER RICE HERBICIDES IN SOUTHERN U. S. D.M. Simpson, V.B. Langston, R.B. Lassiter and R.K. Mann. Dow AgroSciences, Indianapolis, IN; The Woodlands, TX; Little Rock, AR; and Indianapolis, IN.

ABSTRACT

Cyhalofop-butyl is being developed by Dow AgroSciences LLC for postemergence control of grass weeds in dry- and water-seeded rice in the southern U.S. Cyhalofop-butyl will be labeled for the control of 1-4 leaf grasses when applied Pre-Flood at 280 g ai/ha. Nine studies were conducted between 2000 and 2001 in dry-seeded rice to evaluate the effect of tank mixing cyhalofop-butyl with postemergence broadleaf herbicides. To increase potential for antagonism, a less than recommended rate (210 g ai/ha) of cyhalofop-butyl was used in the trials. Cyhalofop-butly was tank mixed with triclopyr (280 and 420 g ai/ha), carfentrazone (23 g ai/ha), bentazone (840 g ai/ha), halosulfuron (70 or 52 g ai/ha), bispyribac-sodium (22 g ai/ha), and bensulfuron-methyl (42 g ai/ha). Applications were made to grasses in the 1-4 leaf stage. Barnyardgrass (*Echinochloa crus-galli*) control was not affected by tank mixing with the low rate of triclopyr (280 g ai/ha), bentazon, or bispyribac-sodium. The frequency of barnyardgrass control being significantly reduced by tank mixing was 50% with bensulfuron-methyl, 55% with halosulfuron, 40% with triclopyr (420 g ai/ha), and 13% with carfentrazone. Amazon sprangletop (*Leptochloa panicoides*) control was not affected by tank mixing with triclopyr (280 g ai/ha), carfentrazone, or bentazon. The frequency of sprangletop control being significantly reduced by tank mixing was 40% with triclopyr (420 g ai/ha), 60% with halosulfuron, 60% with bispyribac-sodium, and 50% with bensulfuron-methyl. In 2000 and 2001 six studies were conducted to determine the interval required between cyhalofop-butyl and halosulfuron applications to avoid antagonism of grass control. Cyhalofop-butyl was applied at 210 g ai/ha to 1-4 leaf grasses. Halosulfuron at 70 g ai/ha in 2000 and 52 g ai/ha in 2001was applied 5, 3 and 1 days before cyhalofop-butyl application, tank mixed with cyhalofop-butyl, and 1, 3 and 5 days after cyhalofop-butyl application. Barnyardgrass and sprangletop control was reduced when halosulfuron was applied 1 or 3 days before cyhalofop-butyl, tank mixed with cyhalofop-butyl, or applied 1 day after cyhalofop-butyl.

WEED MANAGEMENT WITH CAPAROL IN ROUNDUP READY COTTON. D. Porterfield, W.W. Bachman, B.D. Black, G.L. Cloud, J.E. Driver, J.C. Holloway, Jr., J. Lundsford, S.H. Martin, B.W. Minton, and E. Rawls. Syngenta Crop Protection, Greensboro, North Carolina.

ABSTRACT

Field studies were conducted at twenty-one locations during 2001 to evaluate cotton and weed response to reduced rates of Caparol applied preemergence (PRE). Caparol was applied at 560, 1120, and 1680 g ai/ha. Comparisons were made to Caparol to PRE followed by Touchdown 3SL at 840 g ae/ha applied early postemergence (EPOST) to 3 to 4 leaf cotton or post-directed (PD) to 10 to 14 inch cotton.

Cotton tolerance to reduced rates of Caparol was acceptable. Early season response was symptomatic of triazine herbicides and transitory. No injury was observed mid to late season. Caparol at 1120 g ai/ha PRE gave 80% or greater control of redroot pigweed (*Amaranthus retroflexus*), entireleaf morningglory (*Ipomoea hederacea* var. *integriuscula*), pitted morningglory (*Ipomoea lacunosa*), and prickly sida (*Sida spinosa*) at 4 to 5 weeks after application. Caparol at 1680 g ai/ha gave control of the aforementioned weeds in addition to Palmer amaranth (*Amaranthus palmeri*) and large crabgrass (*Digitaria sanguinalis*). Caparol at 1120 g and higher followed by Touchdown EPOST gave greater than 89% control of all weeds season long and was comparable to Prowl PRE followed by Touchdown EPOST followed by Touchdown PD. Caparol PRE followed by Touchdown + Dual Magnum EPOST did not show an increase in control over Touchdown EPOST due to the high level of control and residual activity from the Caparol component. When used in programs with Touchdown, reduced rates of Caparol PRE provided broad spectrum season long weed control.

INSPIRE EC®, A NEW SYNGENTA COTTON HARVEST AID. J.E. Driver, W.W. Bachman, G.L. Cloud, J.C. Holloway, Jr., J. Lunsford, B.W. Minton, S. Martin, S.T. Moore, D. Porterfield, C.A. Pearson, C. Foresman, Syngenta Crop Protection, Inc., Greensboro, NC.

ABSTRACT

Inspire EC® is a new cotton harvest aid currently being developed by Syngenta Crop Protection, Inc. The active ingredient butafenacil is a member of the protoporphyrinogen oxidase (PPO) inhibitor class of chemistry. The product will be formulated as an emulsifiable concentrate containing 0.83 pounds of active ingredient per gallon. Leaf defoliation begins within 7 days after application. Inspire EC has proven to be an effective cotton harvest aid material in trials established by Syngenta and university researchers across the cotton belt. An added benefit of Inspire EC is its effectiveness in desiccating vines that may be present at harvest. Several objectives have been addressed in numerous field trials conducted from 1995 to 2001. Multiple trials conducted across the cotton belt were established to 1) define the most effective rate of butafenacil, 2) determine the optimum application timing, 3) evaluate the effect of various adjuvants, 4) determine tank mix options, and 5) evaluate efficacy of butafenacil when applied by air.

Results reported in this abstract represent a summary of data generated by Syngenta and university researchers. Trials were conducted on various cotton varieties utilizing either ground or aerial application equipment. Butafenacil was applied using either a CO_2 backpack sprayer, Hi-Cycle or tractor mounted sprayer, or a spray coupe, which delivered 10 to 20 gallons of water per acre. Plot size was 4 rows up to 30 feet in length. Aerial trials were conducted in 2000 and 2001 at two locations each year. In these trials butafenacil was applied using a carrier volume of 5 GPA on plots up to 1 acre in size. All plots were evaluated for percent defoliation, percent leaf desiccation, and percent green leaves at 7 and 14 days after application. Percent regrowth was evaluated at 14 and 21 days after application. All data were subjected to an analysis of variance at the 95% level of confidence.

Inspire EC was evaluated at rates ranging from 0.042 lb ai/A to 0.089 lb ai//A. Overall, a flat rate response in leaf defoliation and leaf desiccation was observed across butafenacil rates regardless of application timing (60 to 90% open bolls). However there was a trend towards increased defoliation as the percent open bolls increased. Several adjuvants classified as either a crop oil concentrate, non-ionic surfactant, or organosilicant were evaluated with Inspire EC to assess their effects on product performance. Overall, Inspire EC was effective in defoliating cotton regardless of adjuvant type used; however the addition of a crop oil concentrate or organosilicant tended to increase defoliation with only a minimal increase in leaf desiccation.

Several trials were conducted in 2000 and 2001 to evaluate the efficacy of Inspire EC versus other harvest aid materials. These trials also compared reduced rates of tank mixtures of Inspire EC with standard defoliants to the labeled rate of each. In direct comparison with standard harvest aid materials, Inspire EC, 0.069 lb ai/A at 11 to 15 days after application provided defoliation comparable to Ginstar® EC (thidiazuron + diuron), 0.094 lb ai/A, and Def® 6 (tribufos), 0.75 lb ai/A + Dropp® 50 WP (thidiazuron), 0.05 lb ai/A. Defoliation afforded by Inspire EC was superior to Dropp 50WP, 0.1 lb ai/A, Finish® brand 6 (ethephon), 1.125 lb ai/A, Def 6, 0.75 lb ai/A, and Def 6 + Prep™ both at 0.75 lb ai/A. Reduced rates (0.035 and 0.053 lb ai//A) of Inspire EC in tank mixture with either Finish brand 6 or Dropp at one-half the standard rate resulted in defoliation comparable to Inspire at 0.069 lb ai/A alone, but superior to either Dropp or Finish brand 6 at their normal use rate.

Sequential applications of Inspire EC, at 0.069 lb ai/A followed by either Inspire EC, 0.069 lb ai/A or Cyclone Max® (paraquat) 0.25 lb ai/A resulted in a 10% to 13% increase in cotton defoliation compared to Inspire EC in a single application. No significant increase in leaf desiccation was observed in a single versus sequential application. Results from aerial trials conducted in 2000 and 2001 confirmed Inspire EC as an effective cotton harvest aid when applied by air. Direct comparisons of Def 6 to Inspire EC revealed a trend for higher levels of cotton defoliation with Inspire EC.

Syngenta is pursuing registration of Inspire EC as a cotton harvest at 0.069 lb ai/A or 0.0834 lb ai/A if vine desiccation is desired.. Proposed labeling includes ground and aerial applications with options to tank mix with other registered boll openers, defoliants, and desiccants.

WEED MANAGEMENT PROGRAMS WITH TRIFLOXYSULFURON-SODIUM IN COTTON. J.C. Holloway, Jr.*, W.W. Bachman, D.D. Black, G.L. Cloud, J. Driver, J. Lunsford, S. Martin, B. Minton, D. Porterfield, E. Rawls, M. Johnson. Syngenta Crop Protection, Greensboro, NC

ABSTRACT

Trifloxysulfuron-sodium, (ISO proposed name), also known as CGA 362622, is a new sulfonylurea herbicide being developed by Syngenta for post-emergence and post-directed weed control in cotton. The current formulation is a 75 WDG and the mode of action is ALS inhibition. CGA 362622 controls a wide spectrum of broadleaf weeds, grasses, and sedges. The use rates of CGA 362622 are extremely low, between 0.1 – 0.25 oz/A in cotton. CGA 362622 can be applied over the top of cotton at the early post application timing, (maximum of 0.1 oz/A), as well as post directed at the post, late post, and lay by application timings, (maximum of 0.25 oz/A). No more than 0.4 oz/A may be applied per season. CGA-362622 will be approved for use on conventional, RR, and BXN cotton.

CGA 362622 applied alone controls many of the most troublesome weeds in cotton. Weeds controlled include redroot pigweed (*Amaranthus retroflexus*), common cocklebur (*Xanthium strumarium*), coffee senna (*Cassia occidentalis*), sicklepod (*Senna obtusifolia*), hemp sesbania (*Sesbania exaltata*), pitted morningglory (*Ipomoea lacunosa*), and ivyleaf morningglory (*Ipomoea hederacea*). Suppression of yellow nutsedge (*Cyperus esculentus*), purple nutsedge (*Cyperus rotundus*), and seedling johnsongrass (*Sorghum halepense*), is achieved with a single application.

A Syngenta solutions program allows for additional weed species to be controlled, as well as, season long control of this weeds. Weeds controlled in this program approach include yellow nutsedge (*Cyperus esculentus*), purple nutsedge (*Cyperus rotundus*), prickly sida (*Sida spinosus*), smallflower morningglory (*Jacquemontia tamnifolia*), Florida pusley (*Richardia scabra*), smooth crabgrass (*Digitaria sanguinalis*), goosegrass (*Eleusine indica*), and broadleaf signalgrass (*Brachiaria platyphylla*). A program such as Touchdown IQ® early post followed by CGA 362622 post or post-directed followed by CGA 362622 + prometryn late post-directed or at lay-by, gives season long control of these troublesome weeds.

COTTON RESPONSE TO CGA 362622: RATES, TIMINGS, AND TANK-MIXTURES. S.M. Schraer, G.L. Cloud, B.W. Minton, C.D. Porterfield, S.H. Martin, J.E. Driver, J. Lunsford, D. L. Black, and M. Johnson; Syngenta Crop Protection, Greensboro, NC.

ABSTRACT

In-house and university trials were conducted across the cotton belt to evaluate the performance of CGA 362622 (trifloxysulfuron, proposed common name). CGA 362622 75WG 0.1-0.25 oz/A was applied 1-13 leaf cotton alone or in tank-mixes with Touchdown, Touchdown + Dual Magnum, Roundup UltraMax, or Roundup Ultra.

In general, Post-emergence Over-the-Top (POT) applications of CGA 36262275 WG applied alone at 0.1 oz/A caused <15% cotton injury. However, greater injury resulted if applications were made when cotton was stressed. Injury from 0.2 oz/A applied POT was typically less than 20%, but persisted longer than injury from 0.1 oz/A. Initial injury at both rates was always <10% when applications were made to 5 leaf or larger cotton.

Averaged across 11 trials, CGA 362622 75 WG 0.1 oz/A a + glyphosate injured cotton 10-14% and was slightly more injurious than CGA 362622 alone (8%). When tank-mixed with Dual MAGNUM or Dual MAGNUM + glyphosate, applications of CGA 362622 resulted in 15-20% cotton injury. However, these tank-mixes also demonstrated the potential for higher levels of cotton injury at some sites.

Weed free yield trials showed no yield reduction with CGA 362622 75WG POT applied to 3-4 leaf cotton at rates up to 0.15 oz/A. Initial injury with 0.1-2.5 oz/A was 23-32% compared to 16% with Staple 1.2 oz/A. At 21 DAA, injury was 11% or less except for CGA 362622 2.5 oz/A which was 16%. Average seed cotton yield with CGA 362622 0.1-0.15 oz/A ranged from 2579-2587 lb/A compared to 2409 lb/A with Staple. At 0.25 oz/A, yield was comparable to Staple 1.2 oz/A. Injury with 1.5-2.5 oz/A applied L-POT to 12-13 lf cotton was less than 20% 5-7 DAA. L-POT applications resulted in higher cotton injury levels than PD applications (2-3%) of the same rate. Injury from 0.15-0.25 oz/A applied to 12-13 lf cotton was <10% by 23 DAA. Seed Cotton yields with 12-13 lf applications (2544-2606 lb/A), regardless of rate or application placement, were comparable to 0.1 oz/A E-POT and numerically higher than Staple E-POT.

POST-over-the-top label recommendations:

- Applications are not recommended for cotton that is under stress caused by drought, excessive soil moisture, heavy insect and/or disease pressure, low soil fertility, etc.
- Add a non-ionic 0.25% v/v, do not use a COC, MSO, or any fertilizer additives
- Cotton should have a minimum of 5 true leaves.
- Do not apply CGA 362622 at rates higher than 0.15 oz/A.
- Use a minimum of 10 gals water per acre.
- Do not tank-mix with any other herbicide or additives, or unacceptable injury may occur.
- Do not tank-mix with malathion, profenofos (Curacron®), or emamectin-benzoate containing insecticides (Proclaim ™) or unacceptable cotton injury can occur.
- Over-the-top applications can result in transient yellowing of cotton and occasional stunting. Symptoms can persist for a few days but have no effect on cotton yield.

In a total weed control program, CGA 362622 offers greater flexibility as a post-directed spray (PD) or layby treatment. CGA 362622 75WG rates for PD allow single applications of 0.15-0.25 oz/A. Do not exceed a total 0.4 oz/A per growing season of CGA 362622. As a PD application, CGA 362622 offers various options for tank-mix partners, which include Touchdown, Caparol, Dual Magnum, Staple, Cotoran, and MSMA.

WEED CONTROL WITH CGA-362622 IN ROUNDUP READY AND BXN COTTON SYSTEMS. L.T. Barber, D.B. Reynolds, J.C. Sanders, D.G. Wilson, N.W. Buehring and K.M. Bloodworth. Department of Plant & Soil Sciences, Mississippi State University, Mississippi State, MS.

ABSTRACT

CGA-362622 (trifloxysulfuron sodium) is a broad spectrum sufonylurea herbicide which controls cocklebur (*Xanthium strumarium* L.), morningglories (*Ipomoea* spp.), pigweeds (*Amaranthus* spp.), sicklepod [*Senna obtusifolia (* L.) Irwin and Barnaby], coffee senna (*Cassia occidentalis* L.) and yellow nutsedge (*Cyperus esculentus* L.). Roundup Ready cotton acreage in Mississippi increased from 50% of planted acres in 2000, to 88% in 2001. With the increase of transgenic cotton cultivars such as Roundup Ready and BXN systems, adequate control of most weeds is available. However, in these systems problem weeds such as pitted morningglory (*Ipomoea lacunosa* L.) in Roundup Ready cotton and sicklepod in BXN cotton systems may survive herbicide treatment. The purpose of this study was to evaluate CGA-362622 efficacy and determine if CGA-362622 applications would increase control of these problem weeds in Roundup Ready and a BXN transgenic systems.

Efficacy studies were conducted over two years (2000 and 2001) at the Black Belt Branch Experiment Station near Brooksville, MS on a silty clay loam. A preliminary study was conducted to evaluate cotton injury in regard to three rates of CGA-362622 (2.2, 3.2 and 5.3 g ai/A). These rates were topically applied postemergence at the 2-, 4- and 6- leaf cotton growth stages and at the 6-leaf growth stage some treatments were applied post direct. Roundup Ready and BXN cotton varieties were 'Stoneville 4892 BR' and 'Stoneville BXN 47' respectively. Plots were 12.7 by 40 feet and were arranged in a randomized complete block design with four replications. Herbicide applications were made with a tractor mounted boom at 15 gallons per acre. Weeds evaluated were pitted morningglory and sicklepod in the Roundup Ready system and pitted morningglory, entireleaf morningglory (*Ipomoea hederacea* var. *integriuscula Gray*) and sicklepod in the BXN system. Visual ratings for weed control and cotton injury were taken 8, 15 and 40 days after treatment (DAT). Data were subjected to analysis of variance and means were separated by least significant difference at the 0.05 level of significance. Weed control and cotton yield were pooled across years.

Eight days after treatment, CGA-362622 injured cotton 16% with rates of 2.2 and 3.2 g ai/A. However, injury decreased to less than 5% by 40 DAT and yield was unaffected. When the rate was increased to 5.3 g ai/A and applied over the top, 38% injury was observed 15 DAT and yield was lower than the untreated. When this rate was post-directed, no injury was observed and yield was unaffected. A blanket application of Cotoran (fluometuron) at 1.5 lb ai/A was applied preemergence to both Roundup Ready and BXN systems. In the Roundup Ready system pitted morningglory control 40 DAT, was maintained at 83 to 85% with two applications of Roundup UltraMax (glyphosate) at 0.75 lb ai/A. However, the 93% pitted morningglory control achieved with two applications of CGA-362622 at 2.2 g ai/A was better than that achieved with Roundup UltraMax and equal to CGA-362622 and Roundup UltraMax combinations. Sicklepod control in the Roundup Ready system was 90 to 92% with single or sequential applications of Roundup UltraMax and CGA-362622. Seed cotton yield did not differ among treatments; however, all treatments provided higher yield than the untreated check.

In the BXN system at least 90% control of pitted and entireleaf morningglory control was maintained 40 DAT with sequential and single applications of Buctril (bromoxynil) and CGA-362622. Control was increased to 97% with CGA-362622 (2.2 g ai/A) applied to 2-leaf cotton followed by Buctril (0.75 lb ai/A) at 4-leaf. Sicklepod control with Buctril was only 70% by 40 DAT. However, the addition of CGA-362622 increased sicklepod control to 95% by 40 DAT. The highest seed cotton yield of 1499 lb/A occurred with CGA-362622 followed by Buctril. These data suggest that CGA-362622 offers the potential to complement weaknesses such as morningglory control in Roundup Ready systems and sicklepod control in BXN systems, as well as providing effective control of problematic weeds in non-transgenic crop production systems.

WEED CONTROL IN PASTURES WITH FLUROXYPYR ADDED TO PICLORAM AND TRICLOPYR.

W.N. Kline, J.A. Nelson and P.L. Burch, Dow AgroSciences LLC, Indianapolis, IN 46268.

ABSTRACT

Dow AgroSciences (DAS) currently provides several highly effective herbicides for use on rangeland and pastures. Recently DAS announced plans to register and launch two new formulations which will be labeled for use in range & pasture. These two formulations contain fluroxypyr + triclopyr and fluroxypyr + picloram. The fluroxypyr + triclopyr formulation will carry the tradename Pasturegard* and will be a non-restricted use herbicide. The fluroxypyr + picloram formulation is currently designated as LAF-004 and will be given a trade name in the near future.

Pasturegard is an oil soluble, emulsifiable liquid product containing a 1:3 ratio of fluroxypyr plus triclopyr. It is labeled for the control of woody plants and broadleaf weeds on rangeland, permanent grass pastures, conservation reserve program (CRP) acres and non-cropland, including fence rows and non-irrigation ditch banks within these areas. Pasturegard may be applied to woody or herbaceous broadleaf plants as a foliar spray or as a basal bark or cut stump application to woody plants. As a foliar spray, Pasturegard will control herbaceous plants that have emerged from the soil or woody plants that are in full leaf at the time of application. Established grasses are tolerant to Pasturegard. The maximum use rate is 4 quarts per acre.

Field research trials established throughout the US during 2000 and 2001 have shown Pasturegard to be an effective broadleaf weed control herbicide on a wide range of troublesome pasture weeds. Key weeds that have proven to be particularly susceptible to Pasturegard herbicide are sericea lespedeza (LESCU) and ironweed (VENBA) and to a lesser degree, marshelder (IVAAN). Pasturegard at 1.5 pts/A provided superior control of sericea lespedeza and ironweed when compared to Grazon P+D or Weedmaster at 2.0 pts/A.

LAF-004 is a 1:1 ratio of fluroxypyr plus picloram. This product will be labeled for the control of broadleaf weeds and woody plants on rangelands, permanent grass pastures, and non-crop areas such as fencerows and non-irrigation ditch banks. This product is an emulsifiable liquid product that may also be mixed with oil. Established grasses are tolerant to this product. When registered, the maximum use rate will be 3 qts per acre and this product will be a restricted use herbicide.

Based upon field trials throughout the US, established in 2000 and 2001, LAF-004 at 1.5 pts/A provided similar control, compared to Grazon* P+D and Weedmaster at 2.0 pts/A of many key weed species including western ragweed (AMBPS) woolly croton (CVNCP), broomweed (GUEDR) and marshelder (IVAAN). LAF-004 at 1.5 pts/A provided superior control of sericea lespedeza and ironweed when compared to Grazon P+D or Weedmaster at 2.0 pts/A

LAF-004 at rates greater than 2.0 pts/A also provides suppression or control of many brush species, including locusts, pricklypear and blackberry.

*Trademark of Dow AgroSciences

RESULTS FROM FALL HERBICIDE TRIALS FOR PASTURE WEED CONTROL WITH REDEEM R&P, GRAZON P+D, WEEDMASTER, BANVEL, AND 2,4-D. W.N. Kline, P.L. Burch, J.A. Nelson, Dow AgroSciences LLC, Indianapolis, IN 46268 and P.L. Hipkins, VA Tech, Blacksburg, VA.

ABSTRACT

In recent years cattle producers in the South have expressed more interest in weed control strategies that can be implemented during the fall and winter months. This increased interest is due to time constraints during the early part of the growing season. This study was initiated during the fall of 2000 to evaluate several herbicides for control of troublesome cool season pasture weeds and to determine if these herbicides could provide residual activity on later germinating weeds during the following spring and early summer.

Redeem* R&P is a relatively new non-restricted use broadleaf weed management herbicide introduced by Dow AgroSciences in 2000 for use in range & pasture. Comparison treatments between Redeem R&P, Grazon* P+D, Weedmaster, Banvel, and 2,4-D were applied on December 11, 2000 in an actively grazed pasture near Athens, Ga. Four rates of Redeem R&P, 2 rates of Grazon P+D, one combination of Redeem + 2,4-D, and one rate each of Weedmaster, Banvel and 2,4-D were evaluated.

The dominant weed at this site was musk thistle (Carduus Nutans, CRUNU) during the winter months; shifting to a mixture of horsenettle (Solanum Carolinense, SOLCA) and musk thistle by the early summer.

All herbicide treatments provided good initial burn-down of musk thistle rosettes with control ratings between 80 and 95% (57 DAT, February 6). Evaluations made in March (100 DAT, March 6) and again in April (140 DAT, April 30) revealed significant differences between treatments. Ratings taken in March and April reflect pre-emergent herbicide activity. Musk thistle control on these rating dates averaged between 84 and 94% with Redeem treatments, 89 and 94% with Grazon treatments, and averaged between 60 and 68% with Weedmaster, Banvel, and 2,4-D treatments. On these ratings dates, Redeem, Redeem/2,4-D and Grazon treatments were not significantly different from each other at the 5% level. Weedmaster, Banvel, and 2,4-D treatments were not significantly different from each other; however Redeem, Redeem/2,4-D and Grazon treatment were significantly different from Weedmaster, Banvel, and 2,4-D treatments at the 5% level.

Final evaluations were made in June (189 DAT, June 18) and control ratings were taken for both musk thistle and horsenettle. Results on musk thistle at this rating date were highly variable and not conclusive; a weak trend suggests that the Grazon treatments were providing some residual control of emerging musk thistle seedlings. Results at this rating date on horsenettle demonstrated that Grazon P+D was the only treatment that was providing soil residual activity and suppression of horsenettle seedling emergence (69 to 74% control), approximately 6 months following the December application. Grazon treatments were significantly different from all other treatments at the 5% level on horsenettle at this rating date.

BEYOND™ HERBICIDE FOR CLEARFIELD* WHEAT. R.C. Scott and C. Fabrizius, BASF Corporation, Research Triangle Park, NC 27709.

ABSTRACT

Beyond™ is a new herbicide for use in Clearfield* Wheat, Canola and Sunflowers. In Clearfield* wheat, Beyond herbicide controls Italian ryegrass, cheat, jointed goatgrass and numerous other grass and broadleaf weeds. Beyond will control ryegrass that is resistant to herbicides that inhibit Acetyl-CoA Carboxylase. Beyond is for use on Clearfield* wheat varieties only. Clearfield* is the BASF registered trademark for crops tolerant to the imidazolinone family of herbicides. Clearfield* wheat is not considered a genetically modified organism. Adapted Clearfield* wheat varieties are currently being developed for all major wheat markets.

In the fall of 2000, two field trials were established to evaluate ryegrass control with several rates and timings of Beyond herbicide. Rates evaluated included 4, 5 and 6 fluid oz of product per acre. Applications were made to ryegrass in the 1-2lf, 3-4lf and 1-2 tiller growth stages. All treatments received 0.25% non-ionic surfactant. Results from the two locations were similar. All treatments except 4 oz/ac applied at the 1-2 lf ryegrass growth stage controlled Italian ryegrass 90% or more by the end of the season. The earliest application timing was applied prior to complete ryegrass emergence and controlled ryegrass only 80-85%. The optimum rate and timing for ryegrass control with the Clearfield* wheat production system appears to be 4 fluid oz per acre of Beyond herbicide applied to ryegrass that is in the 3 leaf to 2 tiller growth stage. Tank mixing Beyond herbicide with liquid fertilizer or Prowl herbicide did not improve ryegrass control in these studies.

AE F130060 - A NEW SELECTIVE HERBICIDE FOR GRASS CONTROL IN WHEAT. S.S. Hand, T.L. Smith, J. Sanderson, G. Barr, F. Strachan, M. Paulsgrove; Aventis CropScience RTP, NC 27709.

ABSTRACT

AE F130060 combined with mefenpyr-diethyl, a safener in a 1:2 ratio, is a new postemergence herbicide being developed by Aventis CropScience for weed control in winter wheat. AE F130060 is comprised of the active ingredient mesosulfuron-methyl. This herbicide acts as an inhibitor of acetolactate synthase (ALS). Mesosulfuron-methyl will control many important grass weeds in wheat and is highly active on wild oat, Bromus sp. and annual ryegrass as well as some broadleaf weeds such as wild mustard. Mefenpyr-diethyl is a postemergent safener registered for use on wheat and barley in the United States and Canada. AE F130060 plus mefenpyr-diethyl exhibit excellent wheat tolerance at 2.5 to 15 g ai /ha.

In field experiments in North America, mesosulfuron-methyl controlled annual ryegrass, annual bluegrass, wild oat, canarygrass, downy brome and Japanese brome as well as wild mustard, Tansy mustard and blue mustard. AE F130060 is applied to grass weeds up to 2 tiller in size and 1-2 leaf mustards. Best weed control is achieved when a NIS or MSO is added to the tankmixture.

AE F130060 has a very favorable ecological, ecotoxicological and environmental profile with low acute mammalian toxicity and no genotoxic, mutagenic or oncogenic properties noted. Microbial degradation is the primary degradation pathway of mesosulfuron-methyl in the environment. Mesosulfuron-methyl is rapidly degraded and unlikely to pose any risk to succeeding crops. Excellent control of ACC-ase resistant wild oat (*Avena fatua* L.) biotypes have been attained with AE F130060 in field trials. AE F130060 also controls diclofop-resistant annual ryegrass (*Lolium multiflorum* L.).

The low use-rate, excellent weed control and crop safety combined with very favorable toxicological, ecotoxicological and environmental properties will make this product a valuable tool for wheat farmers.

A NEW HERBICIDE FOR BROADLEAF WEED CONTROL IN PASTURES. J.A. Nelson, W.N. Kline, P.L. Burch and M.B. Halstvedt. Dow AgroSciences, LLC. Cedar Park, TX 78613.

ABSTRACT

Dow AgroSciences is currently pursuing registration of fluroxypyr for use in Range and Pasture. Fluroxypyr use in Range and Pasture will be promoted in two different formulated products, with triclopyr or picloram. Fluroxypyr plus triclopyr will be sold under the trade name Pasturegard* and fluroxypyr plus picloram will be discussed as LAF-004 until a trade name has been designated.

Pasturegard* is a 1:3 ratio of fluroxypyr and triclopyr esters formulated in a 2.0 lb ae per gallon product. This product is labeled for control of woody plants and broadleaf weeds on rangeland, permanent grass pastures, conservation reserve program (CRP) acres and non-cropland, including fence rows and non-irrigation ditch banks within these areas. For general weed and brush control apply Pasturegard at rates of 1-2 and 2-4 pints/A, respectively. Pasturegard can be applied as individual plant treatments such as high volume foliar and basal applications with appropriate carriers. The maximum use rate of Pasturegard is 4 quarts/A per annual growing season.

LAF-004 is a 1:3 ratio of fluroxypyr ester plus picloram amine formulated in a 1.3 lb ae per gallon product. This product is labeled for control of woody species and broadleaf annual and perennial weeds on rangeland and permanent grass pastures, and non-cropland areas in and around these sites. For general weed and brush control apply LAF-004 at 1.5-2.0 and 2-4 pt/A, respectively. LAF-004 can also be applied as the individual plant treatment-high volume foliar. The maximum use rate for LAF-004 in 3 quarts/A per annual growing season.

* Trademark of Dow AgroSciences

EVALUATION OF POINT-INJECTION SPRAYING SYSTEMS. N.W. Buehring, D.B. Reynolds, L.T. Barber, K.M. Bloodworth, J.C. Sanders and D.G. Wilson. Department of Plant & Soil Sciences, Mississippi State University, Mississippi State, MS.

ABSTRACT

Point-injection spraying systems have become an increasingly popular way to apply pesticides. A point-injection spraying system operates by directly injecting pesticide(s) from a chemical tank into the carrier hose. Using this system has many advantages, such as not requiring mixing of pesticides, pesticides can easily be changed from field to field, and no pesticide waste after the pesticide application.

A point-injection spraying system has five main components: console, chemical tank(s), chemical pump(s), ground-speed sensor, and flow meter. The console is typically mounted inside the cab of the applicator and it controls operations such as pesticide rate and GPA. The console displays features such as ground speed, total acres treated, total amount of pesticide applied, and total amount of carrier applied. Chemical tanks are where the undiluted pesticide is placed and they are available in 7.5 or 25 gallon sizes. Additionally, these tanks can be equipped with agitators to keep the pesticides in suspension during application. From the chemical tank the pump injects the pesticide(s) directly into the carrier hose. Pumps with varying flow capacities are available to accommodate a wide range of volumetric rates. However, it is difficult for the pumps to inject pesticides that have viscous formulations such as Harvade (dimethipin) and Finish (ethephon). The ground-speed sensor is used in conjunction with a flow meter to accurately apply pesticides at the proper GPA.

Future pesticide management programs could integrate Global Positioning Systems (GPS) and Geographical Information Systems (GIS) with point-injection spraying systems to apply pesticides on a site specific basis only where they are needed within a field. Also, it would allow for changing pesticides and pesticide rate "on the go" within a field. Additional hardware and software will be necessary to apply pesticides variably through a field. Hardware such as a computer and Differentially Corrected GPS (DGPS) unit will be required. Software such as SSToolbox® and Fieldware™ will also be required. For this technology to be economically feasible to farmers, it will need to be integrated with remote sensing. Remote sensing is the use of digital images to detect weeds, insects, and diseases along with crop vigor. However, many factors have yet to be determined in the spectral data analysis of digital images to accurately assess pest populations within a field. Currently, to develop application treatment maps for variable rate pesticide applications, ground-truthing data is used. Ground-truthing is collecting data across a field to determine pest populations, but this is a very laborious process that is not economical for farmers.

EFFECT OF 2,4-D FORMULATION ON SPRAY DROPLET SIZE. A.S. Sciumbato and S.A. Senseman, Texas Agricultural Experiment Station, College Station, TX 77843, J. Ross, Agricultural Experiment Station, Department of Entomology, Plant Pathology and Weed Science, Las Cruces, NM 88003, and T.C. Mueller, University of Tennessee, Department of Plant and Soil Sciences, Knoxville, TN 37901.

Abstract

Herbicide drift is an important consideration for economic, environmental and legal reasons. This study was performed to examine spray droplet size as affected by different herbicide formulations and spray nozzles. A Malvern laser droplet size analyzer was used to measure the droplet size spectra of various formulations of 2,4-D when applied with three different spray nozzles. Nozzles used were 8002, 8003 and 8004 and the 2,4-D formulations included dry, liquid and emulsion formulations. The emulsion contained the isoctyl (2-ethylhexyl) ester of 2,4-D while the dry and liquid formulations were the dimethylamine salt.

The results of this study suggest that emulsion formulations of 2,4-D tend to form larger droplets when compared to liquid or dry formulations. The general order of droplet size (largest to smallest) by formulation was emulsion > liquid > dry > water. This sequence was not maintained with the largest nozzle, however, where the dry formulation provided the smallest droplets as opposed to water. These data provide valuable insight to spray droplet - herbicide formulation relations that will be useful to applicators concerned with minimizing risks of drift during 2,4-D application.

SITE SPECIFIC WEED MANAGEMENT IN ROUNDUP READY COTTON. D.A. Peters, Texas Tech University, Lubbock, TX; P.A. Dotray, Texas Tech University and Texas Agricultural Experiment Station; J. W. Keeling, Texas Agricultural Experiment Station; T. A. Murphree, Texas Tech University and Texas Agricultural Experiment Station; and J.B. Wilkerson, Agricultural and Biosystems Engineering Department, University of Tennessee, Knoxville, TN.

ABSTRACT

Field experiments were conducted in 2000 and 2001 near New Deal, TX to compare weed control in a glyphosate-tolerant cotton production system using mechanical cultivation, a conventional hooded sprayer, and a light-activated hooded sprayer. Treatments included trifluralin at 0.75 lb/A applied preplant incorporated (PPI) followed by (fb) prometryn at 1.2 lb/A applied preemergence fb mechanical cultivation as needed; trifluralin PPI fb a postemergence over-the-top (POT) broadcast application of glyphosate at 1 lb/A at the four leaf growth stage, fb glyphosate at 1 lb/A with a conventional hooded sprayer (HS) as needed; trifluralin PPI fb glyphosate POT broadcast and glyphosate at 1 lb/A with a light-activated hooded sprayer (LAS) as needed; and trifluralin PPI fb a POT application of glyphosate at 1 lb/A on a 14-inch band over the row at the four leaf stage and glyphosate at 1 lb/A with LAS as needed. 'Paymaster 2326 RR' cotton was planted at a seeding rate of 15 lb/A on 40-inch rows on May 9, 2000 and May 10, 2001 and harvested November 20, 2000 and December 10, 2001. Experimental design was a randomized complete block with four replications. Plots were 8 rows by 600 feet. Preplant incorporated treatments were applied February 29, 2000 and March 2, 2001, and incorporated with a springtooth harrow. Preemergence applications were made on May 10 both years. Postemergence treatments were applied on June 9, July 3, and July 18 in 2000 and June 9 and July 5 in 2001. Weeds were 1 to 6 inches in height at the time of application. Control of Palmer amaranth (*Amaranthus palmeri* S. Wats), common cocklebur (*Xanthium strumarium* L.), and silverleaf nightshade (*Solanum elaeagnifolium* Cav.) was visually rated on June 17 (early season), July 28 (mid season), and August 14 (late season) in 2000 and June 23, July 19, and August 2 in 2001. The amount of spray solution used by the LAS was determined by subtracting the volume remaining after spraying a single plot from the initial volume in the tank. Percent herbicide savings was calculated based on the amount of solution required to apply a broadcast treatment.

In 2000, control of Palmer amaranth ranged from 83-88% for all treatments at the early rating. At the mid- and late-season rating, the LAS treatments provided at least 88% Palmer amaranth control and were similar to the HS and greater than cultivation. Common cocklebur control with the LAS was similar to HS and greater than cultivation at all rating dates. Silverleaf nightshade was controlled 31-40% by all treatments at the early season rating. At the mid- and late-season rating, the LAS provided control similar to HS and greater than cultivation.

In 2001, Palmer amaranth and common cocklebur control at all rating dates was similar to HS and ranged from 75-93% for both weeds when the LAS was used following a POT broadcast application of glyphosate. However, when the LAS was used following a banded application, Palmer amaranth control at the mid- and late-season rating was reduced when compared with the LAS following a broadcast application. At the early- and late-season rating, silverleaf nightshade control with the LAS was similar to the HS, but mid season control was greater for the HS (80% vs 68%).

Herbicide savings in 2000 were 85% for the June application when a banded glyphosate treatment at the four leaf stage was fb LAS, 63 and 67% on July 3, and 56 and 71% on July 18 for banded fb LAS and POT fb LAS, respectively. In 2001, observed herbicide saving was 73% for the banded fb LAS for the June application and 84 and 62% in July for banded fb LAS and POT fb LAS. Lint yields ranged from 380 to 430 lb/A in 2000 and 500 to 940 lb/A in 2001. No significant differences among treatments were observed in either year.

In July of 2001, the LAS was equipped with a data logger to monitor nozzle activation and record when and where in the field nozzles were operating. The goal was to map the location of weeds in the field and monitor weed population changes within the growing season. These studies indicate that weed control programs utilizing LAS may control weeds similar to a conventional hooded sprayer and significant herbicide savings were observed.

DEVELOPMENT OF SITE-SPECIFIC APPLICATION MAPS AND APPLICATION OF HARVEST-AIDS USING A GPS CONTROLLED POINT INJECTION SPRAYER. J.C. Sanders, D.B. Reynolds, N.W. Buehring, and L.M. Bruce. Department of Plant & Soil Sciences, Mississippi State University, Mississippi State, MS.

ABSTRACT

The type and rate of harvest-aids needed for specific areas within most cotton (*Gossypium hirsutum* L.) fields can vary due to a number of factors. Variation in cotton growth and maturity can be influenced by fertility, moisture, herbicides, insect pests, and various other adverse conditions. Harvest-aid type and rate depends on level of maturity, boll opening, regrowth potential, and weed pressure. Over-applying and under-applying a harvest-aid can adversely affect the performance of the application by reducing fiber quality, yield, harvestability, and profits. The ability to site-specifically apply a harvest-aid, based on a particular site's needs, would allow the producer to maximize the performance of the harvest-aid application along with potential profits. Unnecessary material application and costs can be jointly reduced, thus allowing the producer to be more profitable and environment friendly.

An experiment was conducted at the Black Belt Branch Experiment Station, Brooksville, MS to evaluate the possibilities of site-specifically applying harvest-aids in cotton using a differentially corrected global positioning system (DGPS) controlled point injection sprayer. There were approximately 20 acres in the field of interest, and the cotton variety was 'Deltapine 451 BG/RR'. Ground-truthed data which included percent open bolls, nodes above cracked boll (NACB), weed presence, and hyperspectral reflectance data (350 to 2500 nm) collected with a handheld spectrometer were collected on half-acre grids. Multispectral data were also collected with the use of a real time digital airborne camera system (RDACS) mounted in an airplane. For this portion of the experiment the ground truthing data were used to produce site-specific treatment maps. The Normalized Difference Vegetation Index (NDVI), was calculated from both spectral data sources. Due to several complications with the site-specific spray system, the harvest-aid applications could not be completed in a timely manner.

Had the point injection sprayer been functioning properly, we would have been able to successfully complete the site-specific harvest-aid application. There was a strong correlation between NDVI and the level of maturity which is best indicated by percent open bolls. It is hoped that NDVI and other vegetation indices calculated from spectral data can be incorporated into the development of treatment maps thus eliminating the time consuming and costly evaluation of crop maturity manually.

UTILIZING REMOTE SENSING TO DETERMINE CROP MATURITY. J.C. Sanders, D.B. Reynolds, D.G. Wilson, and L.M. Bruce. Department of Plant & Soil Sciences, Mississippi State University, Mississippi State, MS.

ABSTRACT

Determining crop maturity and when to harvest can be a complex process for indeterminate crops such as cotton (*Gossypium hirsutum* L.) and peanuts (*Arachis hypogaea* L.). Harvesting either crop too early or too late can decrease yield and lint or nut quality. Percent open bolls, nodes above cracked boll, and the computer aided expert system COTMAN are some of the techniques currently used to determine cotton maturity and optimal harvest-aid application timing. Peanut maturity can be determined by removing the outer pod layer using the hull-scrape method. The digging date is estimated by placing the exposed pods on the peanut maturity profile board and assessing their maturity based on color. Once maturity is determined and before the crop can be harvested, cotton must be defoliated and peanuts inverted in order to terminate crop growth and preserve optimal yield and yield quality. The determination of peanut maturity tends to be more strenuous than that of cotton due to the fruit of the peanut being underground, but neither crop's maturity can be determined as easily as other crops. The degree of crop maturity for cotton and peanuts can vary spatially across any given field due to a number of environmental factors. The ability to frequently assess both crops for maturity across an entire field would enhance the producer's capabilities for a precise harvest and maximum yield.

Experiments were conducted at the Plant Science Research Center, Starkville, MS to evaluate the possibility of correlating remotely sensed cotton and peanut data to crop maturity. The cotton variety planted in 2000 was 'Paymaster 1560 BG/RR' and in 2001 was 'Stoneville 4892 BR'. Two types of peanuts were planted in 2001, with 'Georgia Green' being the variety for the runner type and 'Borden Jentex' being the variety for the Valencia type. Using conventional production techniques for both crops, maturity was monitored and determined . In addition to conventional assessment variables, hyperspectral reflectance data (350 to 2500 nm) were taken using a handheld spectrometer throughout the growing season for both crops. Normalized difference vegetation index (NDVI) values were calculated from the spectral data and evaluated for changes temporally as a function of crop maturity. When days after planting (DAP) were polynomially regressed against NDVI in cotton, there was a high degree of correlation ($r^2 = 0.82$) and maturity was found to occur just after NDVI peaked. There was a slight correlation in a polynomial regression curve with DAP plotted against NDVI for both runner ($r^2 = 0.70$) and Valencia ($r^2 = 0.76$) type peanuts, but maturity for neither type could be clearly related to the regression curve. More vegetation indices, calculated from spectral data, will be evaluated for correlation to maturity for both cotton and peanut.

PEANUT PERFORMANCE AND WEED CONTROL AS INFLUENCED BY STAND-IMPROVEMENT PLANTING. W.A. Williams* and G.R. Wehtje. Agronomy and Soils Department; Auburn University, Auburn University, AL 36849-5412.

ABSTRACT

Peanut growers occasionally encounter deficient peanut stands due to various factors including poor seed quality and/or limited seedling survival due to seedling diseases or soil crusting. The ideal plant population is approximately 60,000 plant/A. A deficient stand could either be accepted or the area could be replanted entirely. An alternative would be to plant additional seed along side the existing rows in an attempt to bring the stand to the desired plant population. Arguments against this approach include 1) expense, 2) difficulty in determining a single appropriate harvest date since the crop has two planting dates, and 3) probable increased weed pressure since the integrity of soil-applied herbicides would be disrupted during the second planting.

Studies were conducted at the Wiregrass Experiment Station during 2000 and 2001 to address this practice in light of aforementioned concerns. Experimental variable included peanut variety (i.e. GK-7 and Southern runner), herbicide treatment (i.e. metolachlor applied PRE at 1.9 lb ai/A, pendimethalin applied PRE at 1.5 lb ai/A and 'none') and planting regime. Three planting regimes were included: 1) good seed (seed planted at 4 seed/row foot so as to ensure an acceptable stand), poor stand (seed planted at 2.6 seed/row foot so as to ensure a poor stand), and poor stand plus replanting. In this case plots were replanted 2-3 weeks after the first planting, i.e. when stand resulting from first planting was obviously deficient by visual inspection. Data collection included stand counts after both planting's (i.e. first planting and any replanting), visual weed control ratings and yield.

Only two instances occurred where additional seeding disrupted weed control. In 2000, additional seeding into pendimethalin treatment decreased yellow nutsedge (*Cyperus esculentus* L.) control. In 2001, additional seeding into pendimethalin treatment decreased florida beggarweed (*Desmodium tortuosum* DC.) control. This indicates that the integrity of the herbicide blanket was generally not disrupted by additional seeding. However, increasing a poor stand to a good stand by additional seeding did not increase yield. Therefore, additional seeding does not appear to be beneficial.

DICLOSULAM PERSISTENCE IN SOIL AND ITS EFFECT ON PEANUT ROTATIONAL CROPS. C.A. Gerngross, S.A. Senseman, Texas Agricultural Experiment Station, College Station, TX 77843 and W.J. Grichar, Texas Agricultural Experiment Station, Yoakum, TX 77995.

ABSTRACT

Diclosulam is used to control broadleaf weeds in peanut (Arachis hypogaea) production, but has rotation restrictions of 10 months for cotton and 18 months for corn and sorghum. Therefore, field studies were conducted at the Texas Agricultural Experiment Station in Yoakum and at a cooperator's field near De Leon, TX to evaluate the persistence of diclosulam and its potential injury to rotational crops. The peanut variety, 'GK-7', was planted in 2000. Rotational crops planted in 2001 included conventional corn ('Pioneer 32K61'), imidazolinone resistant corn ('Pioneer 32Z29'), grain sorghum ('Pioneer 8313') and cotton ('DeltaPine 436RR'). The diclosulam preemergence (PRE) treatments in 2000 simulated rotation carryover and consisted of 18 g a.i./ha, 27 g/ha, 53 g/ha and 81 g/ha. These rates represent 2/3X, 1X, 2X and 3X of the labeled rates, respectively. In 2001, five PRE treatments consisting of 13 g a.i./ha, 7 g/ha, 3 g/ha, 1.5 g/ha and 0.8 g/ha were applied to the rotation crops. The plots sprayed in 2000 were quantified by comparison with the 2001 plots, which represented a standard crop response curve from the known amount of applied diclosulam. Data taken from the rotation crops in 2001 included stand counts, height measurements, fresh biomass weights and dry weights. No adverse effect from diclosulam was detected in imidazolinone resistant corn. Furthermore, no differences existed in the fresh and dry weights of all crops. Sorghum heights were significantly reduced at the 3X rate in Yoakum, but sorghum heights remained constant at De Leon. Cotton heights were also affected at the 2X rate in De Leon, but the results were not consistent with treatments. Thus, it can be concluded for the given year and conditions, diclosulam did not cause injury to these specific rotational crops.

INTERRELATIONS OF ROW SPACING AND GLYPHOSATE APPLICATION TIMING IN ROUNDUP READY SOYBEANS PLANTED AT VARIOUS DATES IN THE MS DELTA. D. H. Poston*, R. M. Griffin, and R. T. Coleman. Delta Reserach and Extension Center. Mississippi State University. Stoneville, MS.

ABSTRACT

Mississippi soybean (*Glycine max* (L.) Merr.) producers have widely adopted the Early Soybean Production System (ESPS) in an effort to avoid drought. The ESPS has traditionally involved planting maturity group IV soybeans in April. In 2001, approximately 74% of the state's soybean crop was planted on or before May 7 with many of these acres planted in March and early-April because of limited opportunities to plant in April and planting conflicts with other crops. Unfortunately, weed control recommendations to date have been established using data gathered from soybeans planted in May or later.

Studies were conducted in 2001 at the Delta Research and Extension Center in Stoneville, Mississippi to determine optimum timings for postemergence (POST) glyphosate applications in Roundup Ready® soybeans planted late-March, mid-April, and early-May in 15- and 30-inch rows. Glyphosate (1.0 lb ai acre^{-1}) was applied in single applications 2, 3, 4, 5, and 6 wk after planting (WAP) or in sequential [1.0 followed by (fb) 0.75 lb ai acre$_{-1}$] applications 2 fb 4, 3 fb 5, 4 fb 6, and 5 fb 7 WAP. Weed control ratings for annual morningglories (*Ipomoea* spp.), hemp sesbania [*Sesbania exaltata* (Raf.) Rydb.], prickly sida (*Sida spinosa* L.) and barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.] were taken 9 WAP and soybean yield was determined.

Weed control averaged across all four weed species was 5 to 9% higher with 15-inch row spacings than with 30-inch row spacings. Weed control was 92% or greater with single glyphosate applications made 6, 5, and 5 WAP in soybeans planted in 15-inch rows on March 27, April 20, and May 3, respectively. With 30-inch row spacings, glyphosate applications made 6, 3 fb 5, and 3 fb 5 WAP were required to achieve 90% or greater weed control for March 27-, April 20-, and May 3-planted soybeans, respectively. For March 27-planted soybeans, maximum yield averaged across row spacings was achieved with a single glyphosate application 6 WAP. For April 20-planted soybeans, maximum yield occurred with single glyphosate applications 5 WAP in 15- and 30-inch rows. For May 3-planted soybeans, maximum yield was obtained with single glyphosate applications 4 and 5 WAP in 15- and 30-inch row spacings, respectively.

Sequential glyphosate applications have traditionally been recommended in the southern United States for optimum weed control and yield in Roundup Ready soybeans, but the need for sequential glyphosate applications may be reduced in soybean fields planted in narrow rows prior to May 1 in the Mississippi delta. Therefore, weed management costs could be considerably less in early-planted soybean systems compared to more traditional systems. However, rainfall during the summer of 2001 was above normal in the Mississippi delta and yield losses due to weed competition in non-irrigated soybeans were less noticeable in 2001 than in more normal years where soil moisture becomes extremely limited in mid-July. Therefore, slight increases in weed control with sequential glyphosate applications compared to single applications may result in higher soybean yields in years where moisture is more limited. Future studies will investigate this possibility.

WEED CONTROL IN MATURITY GROUP IV SOYBEAN GROWN IN MS AT VARIOUS ROW SPACINGS AND PLANTING DATES. R.M. Griffin, D.H. Poston, D.R. Shaw, and F.S. Kelley; Mississippi State University, MSU 39762, MS and Delta Research and Extension Center, Stoneville, MS 38776.

ABSTRACT

Soybean [*Glycine max* (L.) Merr.] traditionally has been grown in 91 - 102 cm row spacing because equipment for corn (*Zea mays* L.) and cotton (*Gossypium hirsutum* L.) production has been adopted for use on soybean, and because of the need to cultivate for weed control. When weeds are present, the earlier shading of weeds by soybean planted in narrow rows (19 – 51 cm) results in equal or greater yields and improved weed control compared to wide rows (76 – 102 cm). Early-planted maturity Group IV soybeans have proven more profitable than later-maturing cultivars in some areas of the southern US. Group IV cultivars have been bred specifically for the southern US thus shifting a competitive advantage to the crop and reduced-tillage systems that have been developed for row-crop production on Southern soils.

Non-irrigated field trials were conducted at the Black Belt Branch Experiment Station near Brooksville, MS on a Brooksville silty clay loam, and at the Delta Research and Extension Center near Stoneville, MS on a Sharkey silty clay loam to evaluate soybean production under different environmental, soil, and weed interference conditions. A glyphosate-tolerant medium maturity Group IV soybean was planted in early-April, mid-April, and early-May at each location in 19 and 76 cm rows. Before planting, hemp sesbania [*Sesbania exaltata* (Raf.) Rydb. Ex A.W. Hill], pitted morningglory (*Ipomoea lacunosa* L.), sicklepod (*Cassia obtusifolia* L.), and barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.] seed were broadcast over the experimental areas and incorporated to enhance weed pressure. The study was composed of multiple 12 treatment (trt.), 4 rep trials that included a full range of chemical weed control alternatives available to producers. Postemergence treatments were applied to weeds 5 – 10 cm in height. Weed control ratings were taken 2 and 5 weeks after final postemergence herbicide applications.

Postemergence treatments were required 35 days after planting (DAP) for the early-April plantings, 24 DAP for the mid-April plantings, and 14 DAP for the early-May plantings. Ratings were similar for the same treatment in different row spacing and planting dates. Several treatments, including sequential postemergence treatments and preemergence fb postemergence treatments effectively controlled pitted morningglory, hemp sesbania, sicklepod, barnyardgrass, and johnsongrass [*Sorghum halepense* (L.) Pers.]. In Brooksville, because of extreme late-season drought stress in the 2000 season and excessive late-season rainfall in the 2001 season, plots that were harvestable in both years had extremely low yields (1 – 6 bu/A) and poor seed quality; consequently, yield data was inconclusive. In Stoneville, early-season drought limited yields to 1 – 9 bu/A over the trials in the 2000 season.

Utilizing an earlier planting date allowed postponement of postemergence herbicide treatments. Excessive rainfall or drought late in the season dramatically affected crop yield and quality.

INFLUENCE OF ROW SPACING, SEEDING RATE AND TIMING OF ROUNDUP APPLICATIONS ON SICKLEPOD CONTROL IN SOYBEANS. M.P. Harrison, N.W. Buehring and R.R. Dobbs; Mississippi State University, Verona, MS 38879.

ABSTRACT

Vacuum planters provide more uniform seed spacing than conventional or air planters. Soybean growers are interested in knowing whether vacuum planters offer an advantage over conventional or air planters. A study was conducted during 2000 and 2001 to evaluate the influence of planters, seeding rates and row spacings under two Roundup (glyphosate) weed management systems on sicklepod (*Senna obtusifolia*) control and soybean (*Glycine max*) yield. The experimental design was a split plot with weed management systems as main plots and planter type, seeding rate, and row spacing combinations as subplots. Treatments in both Roundup weed management systems were: non-uniform seed spacing with two seeding rates (140,000 and 210,000 seed/ac) planted in 7.5 or 15 inch rows using an air planter and uniform seed spacing with three seeding rates (105,000, 140,000 or 210,000 seed/ac) planted in 9.5, 19 or 28.5 inch rows using a vacuum planter. Yield, but not sicklepod control, was affected by planter treatments each year. The two-year results indicated that with either two Roundup applications in 2001 or three Roundup applications in 2000, the vacuum planter at 9.5 or 19 inch rows with the 0.75 recommended seeding rate (105,000 seed/ac) produced yield equal to the recommended seeding rate (140,000 seed/ac) with either the vacuum planter at 9.5 or 19 inch rows or the air planter with 7.5 or 15 inch rows. Both years, the vacuum planter at 9.5 or 19 inch rows with the 0.75 recommended seeding rate produced 11 to 24% more yield, and greater late-season sicklepod control than the recommended seeding rate (140,000 seed/ac) with the vacuum planter at 28.5 inch rows. Two applications of Roundup (averaged over planter treatments) provided 95% late season sicklepod control compared to 67% for one Roundup application in 2001. Three applications of Roundup (averaged over planter treatments) provided 95% control compared to 84% for two applications in 2000. Except for the 28.5 inch row, all treatments with two applications of Roundup in 2001 or three applications in 2000, provided greater than 90% late-season sicklepod control. With one Roundup application in 2001 and two applications in 2000, however, narrow rows (9.5 or 7.5 inch) at 1.5 times the recommended seeding rate showed greater late-season sicklepod control and yield than 28.5 inch rows. Planter type did not affect sicklepod control in 2000 or 2001 in narrow rows (≤ 19 rows). However, averaged over years and narrow rows, the vacuum planter (9.5 and 19 inch rows) at $^{3}/_{4}$ the recommended seeding rate provided 5% higher yield than the air planter (7.5 and 15 inch rows) at the recommended seeding rate. At the recommended seeding rate, the vacuum planter (9.5 or 19 inch rows) also provided 13% higher yield than the air planter (7.5 or 15 inch rows).

ROW SPACING AND SEEDING RATE EFFECT ON LATE-SEASON SICKLEPOD CONTROL AND SOYBEAN YIELD. N.W. Buehring, G.R.W. Nice, and R.R. Dobbs; Mississippi State University, Verona, MS.

ABSTRACT

A two-year study (1997-1998) was conducted with three conventional soybean (*Glycine max*) cultivars (Delta and Pineland DP3588, Hutcheson, and Riverside 499) to determine the effect of reducing row spacing from 30 to 15 and 7.5 inches in combination with soybean seeding rates [120,000 (1-X), 240,000 (2-X), and 360,000 (3-X) seeds/A] and herbicide applications (untreated-check, single, and sequential) on sicklepod (*Senna obtusifolia*) control and soybean yield. Environmental growing conditions were optimum in 1997 and adverse in 1998 (no rainfall in early to mid growing season). Except for sicklepod control with Hutcheson in 1998, all cultivars provided similar sicklepod control and yield. Hutcheson (a medium-short stature cultivar) with both single application [flumetsulam + metolachlor applied preemergence (PRE)] and sequential applications [PRE plus chlorimuron applied postemergence (POT)] at the 2-X seeding rate, indicated 7.5 inch rows provided greater late season sicklepod control than 15 inch rows. Although the untreated-check with the 3-X seeding rate in narrow rows under optimum conditions (1997) provided > 90% late-season sicklepod control, it was lower in yield than the 1-X or 2-X seeding rates with sequential herbicide applications. In the 15 inch rows in 1997 and in the 7.5 and 15 inch rows in 1998, the 3-X seeding rate with the single application provided late season sicklepod control and yield equivalent to the 2-X seeding rate with sequential applications. Both years, with sequential applications, the 2-X seeding rate with 7.5 and 15 inch rows also provided greater late season sicklepod control than the 1-X seeding rate with 7.5, 15, and 30 inch rows. With the sequential applications, yields for 1-X seeding rate in 7.5 and 15 inch rows were equal to 30 inch in 1998, and 31% greater than 30 inch in 1997. However, with the 2-X seeding rate and sequential applications, under optimum conditions in 1997, the 7.5 inch rows had the highest yield of 50 bu/A and was 21% greater than 15 inch rows. In 1998, the same treatment showed good late-season sicklepod control (> 80%) but had a lower yield of 28 bu/A, with no difference between 7.5 and 15 inch rows.

GRAIN SORGHUM RESPONSE TO PREEMERGENCE HERBICIDES WHEN PLANTED IN A CONVENTIONAL VS TWIN ROW CONFIGURATION. B. A. Besler, W. J. Grichar, and K. D. Brewer. Texas Agricultural Experiment Station, Yoakum.

ABSTRACT

Field studies were established in 2000 and 2001 at the Texas Agricultural Experiment Station in Yoakum to evaluate grain sorghum [*Sorghum bicolor* (L.)] response to applications of Outlook and Aatrex when applied preemerge. Other objectives included comparing the effectiveness of these two herbicides at full and reduced rates for weed control and yield response on grain sorghum when planted in a twin row or conventional row spacing configuration. The experimental design was a factorial arrangement with herbicide treatments and row spacing included as factors. Herbicide treatments included Aatrex 4L at 0.5 lbai/A (1/2X rate) and 1.0 lbai/A (1X rate) and Outlook 6E at 0.5 lbai/A (1/2X rate) and 1.0 lbai/A (1X rate). Row spacing for the conventional planting was 36". Twin rows were spaced 9" apart on 36" rows. Parameters measured were weed control, crop injury and yield.

Both Outlook and Aatrex applied alone or in combination controlled tall waterhemp [*Amaranthus tuberculatus* (Moq.) J. D. Sauer] season long in 2000 and 2001. Outlook at 1.0 lbai/A and all Outlook + Aatrex tank-mixes provided good control of Texas panicum (*Panicum texanum* Buckl) both in 2000 and 2001. All herbicide treatments, when applied to grain sorghum planted in a twin row configuration, controlled purple nutsedge (*Cyperus rotundus* L.) > 80%. Only in 2001, did row spacing significantly affect the level of weed control for all three weed species evaluated. Weed suppression in the twin row configuration in 2001 was evident in the untreated check for all three weed species mid to late season. Significant yield increases over the untreated check occurred only in 2000 with the tank mixes of Outlook + Aatrex at full and reduced rates. Conventional row spacing out yielded twin row spacing both years.

WEED MANAGEMENT IN NO-TILLAGE CORN PLANTED INTO FESCUE AND BERMUDAGRASS SOD. M.W. Shankle, A. Rankins, Jr., G.B. Triplett, Jr. Pontotoc Ridge-Flatwoods Branch Experiment Station, Pontotoc, MS and Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS.

ABSTRACT

Current recommendations for pasture renovation to non-toxic endophyte tall fescue (*Festuca arundinacea*) will cost producers' $200/ac, and three years improved animal productivity are necessary to defray expenses. Herbicide resistant corn allows the integration of no-tillage corn (*Zea mays*) production as a component in the no-tillage pasture renovation system. This will minimize renovation costs if economically positive grain yield is obtained. Herbicide control of winter and early spring vegetation is essential for stand establishment and plant vigor in no-tillage systems. In addition, warm season perennial grasses must be controlled to promote maximum grain yield. Field research was conducted at the Pontotoc Ridge-Flatwoods Branch Experiment Station, Pontotoc, MS in 2001 to evaluate weed management in no-tillage corn as a no-tillage pasture renovation system component. Preemergence burndown treatments included 1 lb/A glyphosate or 0.625 lb/A paraquat applied alone and tank-mixed with 1.2 lb/A metolachlor plus 2.0 lb/A atrazine and 0.6 lb/A metolachlor plus 1.0 lb/A atrazine. At 3 WAP (weeks after planting), postemergent treatments included at least 0.75 lb/A glyphosate alone and tank-mixed with either 3.0 lb/A simazine, 0.5 lb/A 2,4-D amine, or 0.02 lb/A primisulfuron + 0.02 lb/A prosulfuron.

At 2 WAP, tall fescue control was at least 92% with all preemergence burndown treatments. Glyphosate alone or tank-mixed controlled dallisgrass (*Paspalum dilatatum*) at least 98% and bermudagrass (*Cynodon dactylon*) at least 85%, but control with paraquat alone or tank-mixed was less than 36%. At 7 WAP, all treatments controlled tall fescue at least 98%. Dallisgrass control was at least 92% with all treatments that included postemergence glyphosate alone and tank-mixed, except for paraquat followed by glyphosate + primisulfuron + prosulfuron. Bermudagrass control was at least 90% with treatments that included postemergence glyphosate, except for paraquat followed by glyphosate + primisulfuron + prosulfuron, glyphosate + 2,4-D amine, and glyphosate + simazine. Treatments that did not include postemergence glyphosate controlled dallisgrass and bermudagrass less than 38%. The highest grain yield was 134 bu/A with sequential glyphosate applications, suggesting the addition of a tank-mix partner is not necessary if postemergence application timing corresponds to appropriate weed species and size.

COVER CROP USE IN ROUNDUP READY CORN. J.K. Norsworthy; Clemson University, Blackville, SC 29817.

ABSTRACT

Atrazine, a mainstay in US corn production for over 30 years, is frequently found in ground and surface water resources throughout the Southeastern Coastal Plains. A field trial was initiated in the fall of 2000 to assess the potential for using cover crops, conservation tillage, and glyphosate as alternatives to atrazine in Southeastern corn production. The cover crops rye, wheat, and oats were drill seeded in mid-November at the Edisto Research and Education Center near Blackville, SC, and then subsequently desiccated in late March, two weeks prior to planting corn. 'Dekalb 662 RR' corn was strip-till planted in early April and irrigated as needed throughout the growing season. The three cover crops were compared to a non-cover crop system. Herbicide programs evaluated within each system included: no herbicide, 1.5 lb ai/A atrazine + 0.96 lb ai/A *S*-metolachlor at planting followed by 1 lb ai/A glyphosate at 30-inch corn, and 1 lb/A glyphosate at 22-inch corn followed by 1 lb/A glyphosate at 30-inch corn. A standard weed management program involving no cover crop, disking prior to planting, and 1.5 lb/A atrazine + 0.96 lb/A *S*-metolachlor at planting followed by 1 lb/A atrazine + 1% v/v crop oil concentrate at 12-inch corn was included for comparative purposes. Cover crop aboveground biomass was quantified prior to corn planting. Pitted morningglory, entireleaf morningglory, Palmer amaranth, Florida pusley, large crabgrass, and common bermudagrass were the predominant weeds infesting the test area. Weed control was visually rated at 3 and 12 weeks after corn emergence, and corn height and biomass production assessed periodically throughout the growing season.

Rye produced the most vegetative aboveground biomass prior to desiccation, whereas oats and wheat produced statistically similar amounts of biomass. At 40 days after emergence, corn height and biomass in the oat cover crop were reduced 12 and 26% compared to the non-cover treatments. Averaged over herbicide programs, corn grain yield was 17.2 bu/A less in the oat cover crop than in non-cover treatments, whereas corn yields in rye and wheat were similar to the non-cover. At 3 and 12 weeks after corn emergence, weed suppression in the absence of a herbicide varied by species, indicating that some weeds were more sensitive to cover crops than others. At 12 weeks after emergence, the standard treatment of atrazine + metolachlor followed by atrazine provided >90% control of all weeds, except common bermudagrass, whereas all species were adequately controlled following sequential glyphosate applications or the soil-applied program followed by glyphosate. In turn, corn grain yields for the experimental treatments involving rye in combination with atrazine + metolachlor followed by glyphosate or sequential applications of glyphosate alone yielded greater than the standard program. When using soil-applied atrazine programs, there appeared to be no benefit from a cover crop for further improvements in early-season weed control. Conversely, there was some benefit in the use of a cover crop in a glyphosate-only system because of the early-season weed suppression prior to the use of glyphosate. Glyphosate-only systems that utilized cover crops provided weed control and corn grain yield equivalent or superior to the standard weed management system that relied intensively on atrazine.

EFFECTIVENESS OF BUFFALOGRASS [*Buchloe dactyloides* (Nutt. Engelm)] FILTER STRIPS IN REMOVING DISSOLVED METOLACHLOR AND METABOLITES FROM SURFACE RUNOFF. L.J. Krutz[1], S.A. Senseman[1], M.C. Dozier[2], D.W. Hoffman[3], and D.P. Tierney[4]. (1) Department of Soil and Crop Sciences, Texas Agricultural Experiment Station, Texas A&M University System, 2474 TAMU, College Station, TX, (2) Department of Soil and Crop Sciences, Texas Cooperative Extension, Texas A&M University System, College Station, TX, (3) Blackland Research Center, Texas Agricultural Experiment Station, Texas A&M University System, Temple TX, (4) Human & Environmental Safety Department, Syngenta Crop Protection, Greensboro, NC.

ABSTRACT

Metolachlor and metolachlor metabolites differ substantially in adsorption and desorption behavior suggesting that retention differences among compounds within vegetative filter strips is likely. A micro-watershed runoff study was conducted to compare the simultaneous partitioning of metolachlor, metolachlor OA, and metolachlor ESA in a buffalograss filter strip. Runoff was introduced up slope of a 1 X 3 m watershed for 1 hr at a rate of 12.5 L min^{-1} and a concentration of 0.12 µg mL^{-1}. After crossing the length of the plot, the runoff rate was determined and water samples collected at pre-determined-time intervals. Water samples were subjected to solid phase extraction, and the compounds were analyzed by high performance liquid chromatography-photodiode array detection. The total mass retained by the filter strip was determined for each compound and partitioned between infiltration and adsorption. The total metolachlor mass retained within the filter strip (26 %) was significantly greater than the metabolite mass retained (13 %). The mean infiltration mass retained for all compounds was approximately 9 % and was not significantly different among compounds. Metolachlor mass retained by adsorption to the grass thatch/soil surface (18 %) was significantly greater than the metabolite mass adsorbed (4 %). Buffalograss filter strips appear to preferentially retain metolachlor as compared to the metolachlor metabolites due to differences in the partitioning of the compounds among the solution, soil, and thatch.

USING DUAL RADIOLABELED THIN-DISC FLOW EXPERIMENT AND BATCH KINETIC STUDIES TO BETTER UNDERSTAND HERBICIDE-SOIL INTERACTIONS. M.C. Smith, D.R. Shaw, J.H. Massey, M. Boyette, and C.J. Gray, Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Batch kinetic and equilibrium experiments and dual-label thin-disc flow experiments were conducted with atrazine and imazaquin to better understand nonequilibrium herbicide-soil interactions. All experiments were conducted using 5.0 mM $CaCl_2$ solution and the upper 8 cm of a Demopolis silt loam (loamy-skeletal, carbonatic, thermic, shallow Typic Udorthent), 8% clay, 6.2% organic matter, well drained, and pH of 7.6. The soil was collected, air-dried, and sieved through a 1.7 mm sieve. Traditional batch kinetic and equilibrium studies used a 2:1 solution to soil ratio. In all batch studies, the soil slurry was shaken for 24 hr; however, spiked herbicide solutions were added at different time intervals. This was done to minimize the effects of physical changes in soil aggregates over the first 2 hr of shaking.

Batch kinetic studies with both herbicides suggested a bi-phasic reaction, with an almost instantaneous rapid component and a much slower gradual component. When soil herbicide concentration versus the square root of time was graphed, both herbicides expressed a linear relationship. This suggests that diffusion into 3-demensional soil and organic matter complexes likely accounts for the gradual phase. The rapid phase was defined as complete after 5 min, and equilibrium was reached at 24 hr. After 5 min, 45% of the atrazine initially in solution was sorbed, compared to 4.5% with imazaquin. After 24 hr, 55% of the atrazine initially in solution was sorbed, compared to 12.5% with imazaquin. Thus, the rapid phase accounted for 82% and 36% of the total sorption for atrazine and imazaquin, respectively.

Partitioning coefficients for both herbicides was determined using batch techniques for the rapid and gradual phases, with initial solution concentrations ranging from 0.05 µM to 7.0 µM. The isotherms of both the rapid and gradual phases for each herbicide best fit the Freundlich equation. With atrazine, the rapid phase and gradual phase K_f values were 1.38 and 2.41, respectively. The N-value of both phases equaled 0.93. With imazaquin, the rapid phase and gradual phase K_f values were 0.35 and 0.056, respectively. The N-value for the rapid phase of imazaquin was 0.71, compared to 0.86 for the gradual phase.

In the dual-label thin-disc flow experiments, 3.0 g soil was placed on a 0.45 µm filter sealed in a 47 mm Nalgene® In-Line Filter Holder. Soil was rinsed with 500 ml 5.0 mM $CaCl_2$. A pulse of 100 µl ^{14}C-labeled herbicide with ^{3}H-labeled water in 5.0 mM $CaCl_2$ was injected. The pulse was then rinsed through the soil-disc with 5.0 mM $CaCl_2$ at a flow rate of 1.0 ml min^{-1}. A total of 0.05 µCi ^{14}C-herbicide and 0.5 µCi ^{3}H-water was injected. The effluent was collected as 1.0 ml fractions. The amount of ^{14}C-herbicide and ^{3}H-water in each fraction was determined by full spectrum dual label DPM counting. The soil and effluent solution concentration of each herbicide was calculated using ^{3}H-water as a conservative tracer.

Control experimental runs without soil demonstrated the apparatus did not sorb significant amounts of either atrazine or imazaquin. The peak soil retention of atrazine was observed after 12 ml of effluent was collected, and accounted for 20% of the total pulsed herbicide. Over the entire thin-disc experimental process, the average partition coefficient for atrazine was 1.55. This value closely agrees with the observed rapid-phase K_f value. The thin-disc flow experiments failed to detect any imazaquin retention. In the future, data generated with the batch kinetic and isotherm experiments will be used in a two-component nonequilibrium sorption model to describe atrazine retention seen in the thin-disc flow experiments.

ENVIRONMENTAL FATE AND SAFETY OF ROADSIDE HERBICIDES AND TRANSGENIC CROP TOXINS. J.B. Weber and Fred H. Yelverton. Crop Science Department, North Carolina State University, Raleigh, NC 27695[1]

ABSTRACT

Once pesticides and transgenic crop toxins are introduced into the environment, physical, chemical, and biological processes cause the chemicals to be transferred from place to place and transformed to reaction products. Five transfer processes are normally involved: 1) Absorption, exudation and retention by plants and plant residues; 2) Adsorption and desorption by colloidal soil surfaces; 3) Movement over the soil surface in runoff water in the dissolved or bound state; 4) Vapor-phase diffusion through soil pores and the atmosphere; and 5) Hydrodynamic transport through the aqueous phase of the soil media. Three transformation processes may be involved: 1) Photochemical degradation by sunlight; 2) Chemical degradation such as hydrolysis; and 3) Biological degradation by plants and microorganisms. Dissipation of herbicides and toxins is governed by four major elements, namely, 1) Physicochemical properties of the compound; 2) Soil properties; 3) Application conditions and time of application; and 4) Climatic and hydrogeologic conditions. Herbicides and transgenic crop toxins should persist and be mobile enough to control the target pest but not other species and not contaminate the air, water or soil. A ranking of 15 herbicide products used by the North Carolina Department of Transportation for environmental and toxicological safety is included.

INTRODUCTION

The fate and behavior of herbicides and other man-made organic toxicants in the environment has been of concern for at least three decades. Although biologists and wildlife scientists had long complained of adverse environmental effects from pesticides and other industrial pollutants, it was an article in the *Police Gazette* by Laura Tallian in 1960 and a book entitled *Silent Spring* by Rachel Carson (1962) which brought the matter to public attention. Tallian was critical of pesticide recommendations made by the University of California and Carson was critical of the effects of pesticides on wildlife. Both writers attributed many human ailments and diseases to man-made chemicals and established in the public mind the notion that all man-made chemicals are injurious to human and animal health, a perception that still exists today. Over the past 39 years more than 40 books and thousands of articles have been published which imputate or exonerate man-made chemicals in human and animal health and the deteriorating environment (19, 21, 22).

With respect to herbicides, the increased public awareness has had both good and bad effects. The good news is that there has been a broadening of interests and responsiblities for the discipline of zizaniology (weed science) and the development of transgenic crops that are resistant to environmentally safe herbicides, and crops that produce their own insecticides. The bad news is that financial support for basic studies on the fate and behavior of pesticides and transgenic crop toxins in the environment is extremely limited while support for applied use of the products is abundant. The result is that the public is again becoming very concerned about the fate and behavior of new pesticide products and toxins in genetically engineered crops that industry has developed and for which little basic knowledge of environmental fate is available. The objectives of this paper are to discuss the processes involved in the dissipation of pesticides and crop toxins in the environment and the factors that govern them, and to rank the environmental and toxicological safety of 15 commonly used herbicides.

DISSIPATION PROCESSES

Many chemical, physical, and biological processes are involved in the dissipation of organic chemicals in the environment (3, 5, 6, 14). Dissipation has been defined as "the act of separating into parts and scattering or passing completely from existence". The definition infers that the pesticide or crop toxin is transformed into by-products, which are further transformed, and that the parent compounds and their byproducts are also transferred to other places and transformed until none exists, or in most cases none is detectable. Many pesticides may now be detected in pg/L amounts and this amounts to one drop of organic chemical dissolved in 485,000 railroad tankers of water. Figure 1 illustrates the many processes involved in the dissipation of chemicals (CS), in this case herbicides or crop toxins, in the environment. The transfer processes are characterized by the CS molecules remaining intact. They include absorption, exudation, and

[1]We acknowledge the North Carolina State Agricultural Service for financial support.

retention by weeds and crop plants, adsorption and desorption to soil colloids, movement over the soil in runoff water and eroding sediment, volatilization losses through soil pores and into the atmosphere, and leaching or capillary transport through aqueous media, in the soil. Transformation processes are characterized by the splitting of the chemical molecule (C/S). They include degradation by chemical, photochemical, or biological processes. Transformation of a parent compound or its by-products can occur in any of the transfer modes.

TRANSFER PROCESSES

Absorption, Exudation and Retention. Absorption, exudation and retention of a pesticide or crop toxin by weeds and crop plants is dependent on the properties of the compound (2,4). Hormone-type herbicides, for example, 2,4-D, are moderate to high in water solubility and are very mobile in and out of plants while dinitroaniline herbicides, for example, trifluralin, are very insoluble and very immobile in plants. Toxic proteins that are produced by transgenic crops (*Bacillus thuringiensis*, Bt crops) are mobile in plants and are also exuded into the soil (13, 15, 17). High plant populations may result in much higher amounts of a plant-mobile pesticide being removed from the soil but amounts rarely exceed 10% of that applied, and that which is taken up by crop plants is normally detoxified (Figure 1). Little is known about the concentrations of plant toxins that are produced by transgenic plants and which are found widely distributed in plants and in soil in which the plants grow. The amount of pesticides and metabolites removed by crop plants is normally extremely low (< 5 mg/kg) and the amount deposited in crop seeds is generally nondetectable (< 1 pg/kg).

Adsorption and Desorption. From the early studies of Thompson (16) soils have been known to possess highly sorptive properties. Soil has the ability to adsorb, exchange, oxidize, reduce, catalyze, and precipitate chemicals and matter. The tilled surface soil, normally the 0 to 15 cm depth, is a relatively uniform mixture of heterogeneous materials, including an active fraction composed of organic matter, clay minerals and sesquioxides, and an inert fraction composed of silt and sand (Figure 1). The organic matter (OM) fraction in surface soils may range from <0.1% in desert soils to 100% in organic soils. The active fraction is referred to as humus and normally ranges from <1% to 10% in agricultural soils. It is the soil constituent that is most effective in binding most organic pesticides and regulating their mobility and availability (11, 22). Clay minerals, in particular 2:1 type clays such as montmorillonite, and metallic hydrous oxides that are present in tropical and subtropical soils are also effective in binding selected pesticides and toxins and influencing their fate and behavior.

Movement Over the Soil. Runoff water from agricultural lands carries with it small amounts of agricultural chemicals in the dissolved state and bound to eroding soil particles as depicted in Figure 1. Wauchope (18) reported that pesticide losses from farm fields ranged from 2 to 17% 0of the total applied in "catastrophic" rainfall situations and from 0 to 10% in "seasonal" or "long-term" runoff studies. In the majority of cases, losses were less than 1 to 2%. The amount of pesticide that ran off farm fields depended primarily on the intensity and duration of the rainfall, and the length of time between pesticide application and rainfall occurrence and was generally not related to the chemical properties of the compounds (27). Detectable quantities of widely used pesticides are occasionally found in rivers in the spring of the year when large quantities are being applied to large areas over a short period of time and heavy rains follow application.

Volatilization. Vapor movement of pesticides from soil is a significant phenomenon, as evidenced by crop injury in the field resulting from herbicides applied to soils long distances away from the treated area. Dissipation of pesticide vapors from soils involves vapor diffusion through soil pores, diffusion from the soil into the atmosphere, evaporation from the dissolved state in soil solution and evaporation of sorbed molecules from soil surfaces, as depicted in Figure 1. The vapor pressure (VP) of a pesticide is the key property regulating its vapor loss from the soil (22). Vapor pressures of pesticides range from $< 10^{-10}$ mm Hg at 25°C for compounds that are nearly nonvolatile to $> 10^{3}$ mm Hg at 25°C for highly volatile fumigants. In mass balance studies using soil column lysimeters, losses of metolachlor, a herbicide with VP of 2×10^{-5} mm Hg at 25°C, amounted to 26 to 46% of the amount applied over a 30 day period (10). Greatest vapor losses of pesticides occur from warm, moist soils and lowest losses from cool, dry soils. Volatilization is to a great extent regulated by the adsorption of pesticides by soils constituents, as depicted in Figure 1.

Leaching and Capillary Flow. Chemicals dissolved in soil solution are leached downward through the soil by gravitational forces and upward through the soil by capillary action, sometimes referred to as "wicking", as depicted in Figure 1. Advection (mass movement) and diffusion process are involved in both cases (26, 28). The movement of a slug of an organic chemical in an aqueous mobile phase through a homogeneous solid sorbent (sand) stationary phase normally follows classical chromatographic principles (12). Relative movement of a chemical in the mobile aqueous phase through a porous complex media such as soil is complicated by the presence of lipophilic and hydrophilic surfaces, micro and macro pores, and soil pans all of which influence retention and movement of water and chemicals alike. Highly leachable chemicals that have been carried downward in the soil can return to the surface by capillary flow under conditions of high water tables and high evaporation (25).

TRANSFORMATION PROCESSES

Transformation of pesticides and toxins infers the disassembling of the parent compound, as shown in the splitting of the molecule (C/S) in the chemical, biological, and photochemical decomposition processes depicted in Figure 1.

Chemical Decomposition. Degradation of pesticides in soils by purely chemical reactions has been discussed by Kearney and Kaufman (9). The major processes included hydrolysis, oxidation, and reduction.

Photochemical Degradation. Nonbiological chemical degradation of organic chemicals involving sunlight is termed photodecomposition. The subject has been reviewed by Crosby (3). The energy of photochemical decomposition is inversely related to the wavelength of radiant energy. The shorter the wavelength, the greater the energy available for photodegradation. Ultraviolet radiation with wavelengths of from 200 to 420 nm are responsible for the photodegradation of most pesticides. Ultraviolet light energizes a variety of reactions such as oxidation, reduction, hydrolysis and isomerization of many compounds. The amount of pesticide photochemically degraded depends on the susceptibility of the chemical, its exposure to sunlight depending on the method of application, and its length of exposure. It may range from a few per cent for a soil incorporated chemical to more than 90% for an aquatic or foliage-applied chemical.

Biological Degradation. Degradation of pesticides and toxins can occur through the action of many biological organisms, including soil microorganisms, plants, and animals. (1, 8, 9). Many different biological degradation processes have been identified for many pesticides. They include oxidation of phenoxyalkanoic acid herbicides, such as 2,4-D, reduction of dinitroaniline herbicides, such as trifluralin, hydrolysis of phosphate insecticides, such as malathion, dehalogenation of chlorinated hydrocarbon insecticides, such as DDT, dealkylation of phenylurea herbicides, such as diuron, and decarboxylation of many acid herbicides, such as chloramben, dicamba, and dalapon. Many compounds are degraded by several processes. Degradation studies of all pesticides and crop toxins should be carried out. The type of degradation that occurs and a measured half-life value for each compound must be determined. Half-life values for currently used pesticides range from < 1 day to > 365 days, but most have values ranging from <1 to <90 days.

PESTICIDE SAFETY

For a pesticide to be registered for use in the U.S., the compound must: 1) Be effective on the target pest, 2) be economical, 3) have met toxicological requirements, and 4) have met environmental safety requirements. The latter two requirements concern pesticide safety to people, wildlife, and the environment. All pesticides must undergo toxicological testing for acute toxicity, subchronic toxicity, chronic toxicity, teratogenicity, reproduction toxicity, mutagenicity, and endocrine disruption toxicity. Environmental safety tests include wildlife toxicity and ground water contamination (leaching) potential. Pesticides should be selected for use with all of the above factors in mind. I have, therefore, compared eight toxicological properties and eight environmental properties of the 18 major pesticides (17 herbicides and 1 growth regulator making up 15 products) used by the North Carolina Department of Transportation, and ranked the chemicals in order of toxicological safety and soil leaching potential. This is only one possible rating based on information presently available. The ratings range from 0 to 100, where the lower rating signifies safer material. Common and Trade names of the 15 products, along with a numerical and descriptive rating of this toxicological safety and leaching potential are shown in Table 1. The safest of the 15 compounds are two phosphonic acid herbicides, fosamine and glyphosate. The next three safest chemicals are dinitroaniline herbicides, pendimethalin, prodiamine, and oryzalin. The least safest compound of the group is the phenoxyacid mixture of 2,4-D, dichloroprop, and mecoprop. The 15 pesticides listed in Table 1 are very seldom detected in drinking water wells, although certain pesticides have been found. The major causes of pesticides being detected in well water include the following: 1) Chemicals used around wells, 2) the absence of an anti back-siphon valve on the well faucet, 3) defective well casing or casing not caulked, 4) very shallow or open wells, 5) pesticides applied in karst (limestone subsoil) regions, and 6) pesticides with high pesticide leaching potentials (PLPs) used on soils with high soil leaching potentials (SLP) (20, 24).

TRANSGENIC CROP TOXINS

The development of transgenic crops that carry a gene transferred from a soil bacteria (Bacillus *thuringiensis)* that imparts in the plant the ability to produce toxic insecticidal crystal proteins (ICPs) has caused considerable concern in the scientific community (7). The toxic proteins (toxins) have been reported to persist in the soil for long periods of time to affect the microbial populations (13,15, 17). The toxins have also been reported to be injurious to non-target insects, such as butterflies. Bt toxin insecticidal crystal proteins (ICPs) are produced continuously in plants and eventually end up in the soil. They readily bind to clay minerals and organic matter, which reduces their bioavailability (17). More research is needed on the fate of these compounds in the environment. Genes have also been transferred to crop plants from soil bacteria that are able to decompose the herbicide glyphosate. These genetically engineered (Roundup-Ready) crops have also caused concern among people in many parts of the world (7). Transgenic crop products cause realistic concerns about the effects of transgenic crops on human health (foreign proteins may cause allergenic reactions), the ecology of native plants (movement of transgenes via pollen may create "superweeds" that are resistant to Roundup), and the livelihood of the world's poorest farmers (a terminal gene imported in a crop plant causes them to produce sterile seed). More research is needed to produce answers to these concerns.

LITERATURE CITED

1. Alexander, M. 1994. Biodegradation and Bioremediation. Academic Press, Inc., NY.
2. Corbett, JR., K. Wright, and A.C. Baillie. 1984. The Biochemical Mode of Action of Pesticides. 2nd Ed., Academic Press, Inc., NY.
3. Crosby, D.G. 1998. Environmental Toxicology and Chemistry. Oxford University Press, NY.
4. Fedtke, C. 1982. Biochemistry and Physiology of Herbicide Action. Springer-Verlag, Berlin.
5. Gould, R.F. (Ed.). 1972. Fate of Organic Pesticides in the Aquatic Environment. American Chemical Society, Washington, DC.
6. Guenzi, W.D. (Ed.). 1974. Pesticides in Soil and Water. Soil Science Society of America, Inc., Madison, WI.
7. Hileman, B. 1999. Perscription for a Global Biotechnology Dialogue. Chem. and Chem. Engr. News 77(29):44.
8. Hill, J.R. and S.J.L. Wright, (Eds.). 1978. Pesticide Microbiology. Academic Press, London.
9. Kearney, P.C. and D.D. Kaufman, (Eds.). 1975 (Vol I), 1976 (Vol. 2), 1988 (Vol. 3). Herbicides: Chemistry, Degradation, and Mode of Action. Marcel Dekker, Inc., NY.
10. Keller, K.E. and J.B. Weber. 1997. Soybean *(Glycine max)* influences metolachlor mobility in soil. Weed Sci. 45:833-841.
11. Mickelson, S.H. (Ed.). 1993. Sorption and Degradation of Pesticides and Organic Chemicals in Soil. Special Publ. No. 32. Soil Science Society of America, Inc., Madison, WI.
12. Miller, J.M. 1975. Separation Methods in Chemical Analysis. John Wiley and Sons, Inc., NY.
13. Palm, C.J., D.L. Schaller, K.K. Donegan, and R.J. Seidler. 1996. Persistence in soil of transgenic plant produced *Bacillus Thuringiensis* var. *Kurstaki* δ-endotoxin. Can. J. Microbiol. 42:1258-1262.
14. Saltzman, S. and B. Yaron. 1986. Pesticides in Soil. Van Nostrand Reinhold Co, NY.
15. Tapp, H. and G. Stotzky. 1995. Dot blot enzyme-linked immunosorbent assay for monitoring the fate of insecticidal toxins from *Bacillus Thuringiensis* in soil. Appl. Environ. Microbial. 61:602-609.
16. Thompson, H.S. 1850. On the adsorbent power of soils. J. Royal Agric. Soc. Engl. 11:68-74.
17. Venkateswerlu, G. and G. Stotzky. 1992. Binding of the protein and toxin proteins of *Bacillus thuringiensis* subsp. *kurstaki* on clay minerals. Current Microbiol. 25:225-233.
18. Wauchope, R.D. 1978. The pesticide content of surface water draining from agricultural fields - A review. J. Environ. Qual. 7:459-472.
19. Weber, J.B. 1988. Pesticide dissipation in soils as a model for xenobiotic behaviour. Pages 4560. *In,* Pesticides: Food and Environmental Implications. Proc. Intern. Atomic Energy Agency, Vienna. IAEA-SM-297/45.
20. Weber, J.B. 1990. Potential problems for North Carolina ground water from herbicides: A ranking index. Proc. Weed Sci. Soc. North Carolina 8:30-46.
21. Weber, J.B. 1991. Fate and behavior of herbicides in soils. Applied Plant Sci. 5(1): 29-41.
22. Weber, J.B. 1994. Properties and behavior of pesticides in soil. Pages 15-41. In R.C. Honeycutt and D.J. Schabacker, (Eds.), Mechanisms of Pesticide Movement Into Ground Water. Lewis Publ./CRC Press, Inc., Boca Raton, FL.23. Weber, J.B. 1995. Physicochemical and mobility studies with pesticides. Pages

99-115. In M.L. Leng, E.M.K. Leovey, and P.I. Zubkoff (Eds.), Agrochemical Environmental Fate: State of the Art. Lewis Publ./CRC Press, Inc., Boca Raton, FL.

24. Weber, J.B. 2000. Relative pesticide leaching potentials (PLP), soil leaching potentials (SLP), and groundwater contamination potentials (GWCP). Pages 21-26. In North Carolina Agricultural Chemicals Manual, North Carolina State University, Raleigh, NC.

25. Weber, J.B., G.E. Mahnken, and L.R. Swain. 1999. Evaporative effects on mobility of 14C- labeled triasulfuron and chlorsulfuron in soils. Soil Sci. 164:1-11.

26. Weber, J.B. and C.T. Miller 1989. Organic chemical movement over and through soil. *In* B.L. Sawhney and K. Brown (Eds.), Reactions and Movement of Organic Chemicals in Soils. Soil Science Society of America, Inc., Madison, WI.

27. Weber, J.B., P.J. Shea, and A.J. Strek. 1980. An evaluation of nonpoint sources of pesticide pollution in runoff. *In* M.R. Overcash and J.M. Davidson (Eds.), Environmental Impact of Nonpoint Source Pollution. Ann Arbor Science Pub., Inc., Ann Arbor, MI.

28. Weber, J.B. and D.M. Whitacre. 1982. Mobility of herbicides in soil columns under saturated- and unsaturated-flow conditions. Weed Sci. 30:579-584.

Table 1. An empirical ranking of the toxicological and environmental safety of 15 herbicide products used by the North Carolina Department of Transportation.

Common name	Trade name	Rating*
Fosamine	Krenite	8 very low
Glyphosate	Roundup	15 very low
Pendimethalin	Pendulum	15 very low
Prodiamine	Endurance	15 very low
Oryzalin	Surflan	37 low
Asulam	Asulox	37 low
Sulfometuron	Oust	40 low
Mefluidide + Chlorsulfuron	Embark + Telar	43 low
MSMA	Acme	43 low
Fluaifop-p	Fusilade	47 low
Imazameth	Cadre	55 medium
Triclopyr	Garlon	58 medium
Isoxaben	Gallery	60 medium
Clopyralid	Transline	60 medium
2,4-D + dichlorprop + mecoprop	Triamine	65 medium

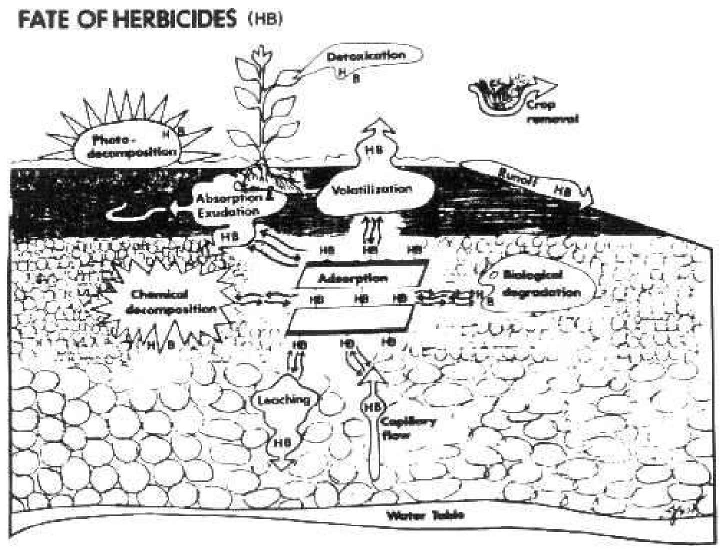


Figure 1. Processes affecting the dissipation of chemicals (CS) in the environment. Transformation processes are characterized by the splitting of the C/S molecule. Transfer processes are characterized by the (CS) molecules remaining intact (21).

DEVELOPMENT OF IMAZETHAPYR AND GLYPHOSATE RATE RESPONSES FOR WILD RADISH, SUSCEBTIBLE AND HERBICIDE TOLERANT CANOLA VARIETIES. T.L. Grey, P.L. Raymer, D.B. Evans, D.C. Bridges, and J.W. Davis. Department of Crop and Soil Science, University of Georgia, Griffin, GA 30223.

ABSTRACT

Several marketing and production problems have slowed the adoption of canola (*Brassica napus* L.) in the southeastern United States. One major deterrent to canola production is the difficulty of controlling cruciferous weeds like wild radish (*raphanus raphanistrum* L.) in the crop. Wild radish is the most common and troublesome winter annual weed in small grain production in Georgia. Cruciferous weeds, especially wild radish, compete vigorously with canola for light, nutrients, and water, but the seeds of the species also pose a quality problem in harvested canola seed. Seed of wild radish are high in erucic acid and glucosinolates and when present in harvested grain may result in outright rejection of canola or significant price dockage at the elevator. Research that screened a number of herbicides failed to demonstrate any naturally occurring differential tolerance between canola and wild radish with a single herbicide.

The introduction of herbicide-tolerant crops provides an alternative mechanism for achieving differential herbicidal selectivity between canola and wild radish. To date, enhanced tolerance of four groups of herbicides has been achieved with canola. Deployment of cultivars tolerant to either glyphosate or to imdazolinone herbicides offers great promise for wild radish control in canola production systems of the Southeast. However, an understanding of crop tolerance and weed control efficacy are needed in order to develop reliable rate recommendations before deploying these two herbicide-tolerant systems in this region.

Experiments were conducted to determine dose response to imazethapry and glyphosate, on susceptible and tolerant canola cultivars and wild radish. Two wk old seedlings were uniformly treated with their respective herbicide. Two wks after treatment, plants were visually rated for injury and above-ground portions harvested and dried to determine plant dry matter. Treatments consisted of imazethapyr at 0.0 to 0.55 g a.i./L (10 treatments) and glyphosate at 0.0 to 4.8 g a.e./L (10 treatments). Herbicide tolerant cultivars were ‘Pioneer 47A51’ for imazethapyr and ‘Quest’ for glyphosate. For both herbicides, wild radish and the herbicide susceptible culitvar ‘Oscar’ were evaluated and all experiments were repeated. Non-linear regression procedures using a modified Mitscherlich plant growth model [$y = \beta_0[(1\text{-}p)e^{-\beta_1(x-\beta_2)}]$] for the visual injury data and the negative exponential growth function [$y = \beta_0 e^{(-\beta_1 x)}$] was applied to plant dry weight and dry weight based on the non-treated control.

Increased injury from herbicide treatment resulted in significantly different asympotic maximum injury (β_0) for all plant types. Injury increased with herbicide rate and ranged from 0 to 100%. Oscar and wild radish were very sensitive to imazathapyr and glyphosate. Pioneer 45A71 was very tolerant to imazethapyr at all concentrations. Quest was tolerant of glyphosate at low concentrations of glyphosate but injury increased with increasing concentration. An indication to the fit of these data to the modified Mitscherlich is indicated by the R^2. Dry weight response curves for Oscar and wild radish indicated a decrease in dry matter production as compared to Quest and Pioneer 45A71 for glyphosate and imazethpyr, respectively. Analysis of the negative exponential model β_0 parameters indicated the dry weight of each plant type for non-treated control was 1.0 and 0.8 g/plant for Quest and Pioneed 45A71, respectively. β_1 parameters indicated significant differences between the herbicide tolerant canola, wild radish, and Oscar dry weights.

These data indicate that Pioneer 45A71 and Quest can tolerate herbicide concentrations that can cause death to wild radish and susceptible canola cultivars such as Oscar. For Pioneer 45A71 visual injury, plant dry weight, and % dry weight based on the check tolerance to imazethapyr was excellent to 0.55 g/L while wild radish and Oscar were very sensitive to rates > 0.2 g/L. Quest visual injury, plant dry weight, and % dry weight based on the check indicated tolerance to glyphosate at 0.4 g/L. However, glyphosate at >2.5 g/L injured Quest >50% indicating it is not totally resistant to glyphosate. In contrast, wild radish and Oscar were injured 77 and 80% respectively with glyphosate at 0.15 g/L and killed at doses of 1.2 g/L or greater.

EVALUATION OF VALOR FOR PREPLANT WEED CONTROL IN CORN AND GRAIN SORGHUM.
B.J. Williams, A.B. Burns and D.B. Copes; Northeast Research Station, St. Joseph, LA, Louisiana State University Agricultural Center, Baton Rouge, LA 70803.

ABSTRACT

Corn and grain sorghum tolerance to preplant applications of Valor (flumioxazin) was evaluated in 2001 at the Northeast Research Station near St. Joseph, LA, on a Commerce Silt Loam. Valor at 1 and 2 oz/A was applied 30, 21, 14 and 7 days before planting. Plots were kept weed free with glyphosate plus 2,4 - D before planting and metolachlor plus atrazine after planting. A non-treated check was included for each application timing. Valor efficacy for controlling several common winter weeds was evaluated in separate studies. Herbicide treatments were applied using a CO_2 pressurized backpack sprayer calibrated to deliver 15 GPA. The experimental design for corn and grain sorghum tolerance trials was an RCB with a factorial treatment arrangement. The experimental design for the efficacy trial was an RCB. All data were subjected to analysis of variance. Means were separated using Fisher's Protected LSD at the 5% level.

Valor did not effect corn or grain sorghum emergence at any rate or timing. Furthermore, injury to corn and grain sorghum was only observed following heavy rainfall after emergence. Corn was at the V1 to V2 growth stage before the first rainfall. Following the first rainfall Valor at 2 oz/A caused 10, 14, 15, and 35% injury when applied 30, 21, 14, and 7 days before planting, respectively. Within 10 days most of the injury to corn had decreased to non-detectable levels. Similar injury was observed following heavy rainfall 12 days later. Grain sorghum was at the spike to V1 growth stage when the first rainfall occurred after emergence. Valor at 2 oz/A caused 15, 25, 36, and 40% injury 30, 21, 14, and 7 days before planting, respectively. As with corn, grain sorghum injury was short lived. Valor at 1oz/A caused about half as much injury to corn and grain sorghum as 2 oz/A Valor. Valor did not affect corn or grain sorghum height, stand, or yield. Valor 0.5 and 1 oz/A improved *Oenothera laciniata*, *Lamium amplexicaule*, *Stellaria* Spp., *Rumex crispus*, *Coronopus didymus* and *Polygonum pensylvanicum* control 10 to 40% when tank mixed with paraquat or glyphosate. Valor had the broadest spectrum and best residual control compared to linuron, diuron, carfentrazone, dicamba, thifensulfuron plus tribenuron and oxyfluorfen.

These data suggest that Valor at 0.5 to 1 oz/A could potentially be used in corn and grain sorghum 14 to 21 days before planting to improve preplant weed control systems for these crops. However, more research is needed to identify appropriate Valor rates and timings for improved crop tolerance.

EVALUATION OF DIREX AND LINEX FOR PREPLANT WEED CONTROL IN CORN AND GRAIN SORGHUM. D.B. Copes, B.J. Williams and A.B. Burns; Northeast Research Station, St. Joseph, LA, Louisiana State University Agricultural Center, Baton Rouge, LA 70803.

ABSTRACT

Corn and grain sorghum tolerance to preplant applications of Direx (diuron) and Linex (linuron) was evaluated in 2001 at the Northeast Research Station near St. Joseph, LA, on a Commerce Silt Loam. Direx and Linex at 1 to 2 lb ai/A were applied 30, 21, 14 and 7 days before planting. Plots were kept weed free with glyphosate plus 2,4 - D before planting and metolachlor plus atrazine after planting. A non-treated check was included for each application timing. Direx and Linex efficacy for controlling several common winter weeds was evaluated in separate studies. Herbicide treatments were applied using a CO_2 pressurized backpack sprayer calibrated to deliver 15 GPA. The experimental design for corn and grain sorghum tolerance trials was an RCB with a factorial treatment arrangement. The experimental design for the efficacy trial was an RCB. All data were subjected to analysis of variance. Means were separated using Fisher's Protected LSD at the 5% level.

Injury to corn and grain sorghum from preplant applications of Linex or Direx was not observed until 6 WAE in corn and 2 WAE in grain sorghum. Injury was more severe in corn than grain sorghum from preplant applications of Linex and increased as applications were made closer to planting. Corn and grain sorghum injury was not as severe from preplant applications of Direx as from Linex. Application timing had very little influence on corn and sorghum injury, with the exception of 2 lb ai/A Direx applied 7 DPP prior to planting grain sorghum. Corn and grain sorghum height was also reduced 6 and 2 WAE, respectively. Reductions in height were not observed before or after the initial observations. Corn yield was not reduced by 1 lb ai/A Linex, but 2 lb ai/A Linex reduced corn yield 20 and 10% when applied 21 and 7 DPP, respectively. Grain sorghum yield was reduced about 10% from both 1 and 2 lb ai/A Linex applied 7 DPP. Corn and grain sorghum yield was not reduced by 1 lb ai/A Direx applied 30, 21, 14 or 7 DPP. However, both corn and grain sorghum yield was reduced 10 to 20% by 2 lb ai/A Direx applied 21 DPP or later. Tank-mixing glyphosate with Linex, Direx or Bladex (cyanazine) improved cultleaf eveningprimrose control 35, 15 and 30% 2, 4 and 8 weeks after treatment, respectively. There were no differences between Linex, Direx and Bladex. Swinecress control was improved when glyphosate was tank-mixed with Linex, Direx or Bladex 2 WAT. Direx was about 10% better than Linex and Bladex at improving swinecress control when tank-mixed with glyphosate 4 WAT. By 8 WAT only slight improvements in swinecress control were observed when glyphosate was tank-mixed Linex, Direx or Bladex. Ryegrass control was reduced 10 to 20% when glyphosate was tank-mixed with Linex, Direx or Bladex 1 WAT. Direx also reduced ryegrass control 20% when tank-mixed with glyphosate 4 WAT. Annual bluegrass control was reduced 5 to 10% when glyphosate was tank-mixed with Linex or Direx 2 WAT. Direx also reduced annual bluegrass control about 20% when tank-mixed with glyphosate 4 WAT. By 8WAT both ryegrass and annual bluegrass control was at least 90% from glyphosate alone and tank-mixed with Linex, Direx or Bladex.

These data suggest that Linex or Direx at 1 lb ai/A or less could potentially be used in corn and grain sorghum 21 days before planting or earlier to improve preplant weed control systems for these crops. More research is needed to identify appropriate Linex and Direx rates and timings for improved crop tolerance.

DIFFERENTIAL TOLERANCE OF BROADLEAF WEEDS TO FIRSTRATE. J.W. Barnes and L.R. Oliver. Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72701.

ABSTRACT

Experiments were conducted in Fayetteville, AR from 1997 to 1999 to determine the optimum growth stage and application rate of FirstRate (cloransulam) for POST control of broadleaf weeds in soybean. Laboratory experiments were conducted in 2000 and 2001 to determine if differential tolerance to FirstRate is due to herbicide absorption and translocation. The experiments were conducted in a factorial design with plots arranged in a randomized complete block (RCB) with four replications. The factors were six FirstRate application rates (0, 4.5, 9, 18, and 36 g ai/ha) applied at three application timings (1, 2, and 3 weeks after emergence)and the seven weed species. The weed species evaluated were entireleaf morningglory (*Ipomoea hederacea* var. *integriuscula*), pitted morningglory (*Ipomoea lacunose*), prickly sida (*Ipomoea lacunose*), hemp sesbania (*Sesbania exaltata*), sicklepod (*Senna obtusifolia*), Palmer amaranth (*Amaranthus palmeri*), and velvetleaf (*Abutilon theophrasti*). Visual weed control will be rated at 2, 3, and 4 weeks after treatment (WAT). FirstRate applications were made in a spray volume of 187 L/ha and included a crop oil concentrate at 1.0 v/v. Prior to spotting leaves with ^{14}C-herbicide solution, plants were treated with non-labeled FirstRate applied at 18 g ai/ha. The final spotting solution will contain ^{14}C-herbicide and enough spray solution to reach the final volume of the spotting solution. The ^{14}C-herbicide solution will be applied to the second true leaf in 4 1-*u*l droplets. The plants were harvested 0, 6, 24, and 72 hours after treatment (HAT). Plant harvest began with the removal of the treated leaves which were placed in a vial with 4-ml of acetonitrile. The vial was shaken for 30 seconds before removal from the vial. Following the removal of the treated leaf the remaining plant structure will be partitioned into sections of the roots, shoot tissue below the treated leaf, and area above the treated leaf. Plant sections were oxidized in a biological sample oxidizer using a mixture of CO_2 cocktail trap which trapped the evolved CO_2. All samples from leaf washes and oxidation were subjected to radioassay by liquid scintillation spectrophotometry (LSS). Herbicide absorption was calculated as the total ^{14}C recovered in the plant divided by the ^{14}C applied. Quantification of ^{14}C translocation out of the treated leaf will be calculated by summing the ^{14}C recovered in plant parts except the treated leaf divided by the amount of ^{14}C recovered from the plant. The data from both field and laboratory experiments were subjected to ANOVA and means separated by Fisher's Protected Least Significance Difference at the 0.05 level of significance. The data from the field experiment were pooled together over years as there was no year interactions with any factor considered in the experiment. Data from the field experiments was also subjected to nonlinear regression to develop control prediction models based on weed size and application rates.

In the field weed control with FirstRate was dependent upon application rate and timing for all weed species. Control of velvetleaf gradually declined over time but the labeled rate (18g ai/ha) of FirstRate maintained at least 50 % control of large (48 cm) plants. Palmer amaranth control was poor (<30 %) at all FirstRate rates and timings. The most susceptible weed species to FirstRate were entireleaf and pitted morningglory. The 18 g ai/ha rate of FirstRate maintained at least 80% control of both morningglory species throughout the duration of the experiment. Hemp sesbania and sicklepod and were initially suppressed by FirstRate at higher application rates (>60%). By three weeks after emergence FirstRate failed to achieve effective control of either species. As with Palmer amaranth, prickly sida control was poor regardless of application timing. The ranking of the susceptibility of the weed species to FirstRate is pitted morningglory = entireleaf morningglory > velvetleaf > hemp sesbania > sicklepod > Palmer amaranth = prickly sida.

FirstRate was rapidly absorbed into all weed species with only a 10 to 20% increase in absorption from 6 to 72 HAT. The only weed species that did not have an increase of absorption over time was prickly sida and hemp sesbania. The highly susceptible entireleaf morningglory had a maximum absorption of 62% at 72 HAT. Velvetleaf absorption of FirstRate was initially slower than several other weed species but by 72 HAT velvetleaf had absorbed 48% of the applied herbicide. Even though sicklepod and hemp sesbania are highly tolerant of FirstRate, absorption of the herbicide was rapid and was greater than 90% 72 HAT. Prickly sida absorption of FirstRate was never greater than 30% which was far less than any other weed species. FirstRate translocation was less than 3% at 6 HAT for all weed species. Translocation in prickly sida, sicklepod, and velvetleaf remained less than 3% at 72 DAT. Translocation in entireleaf morningglory, hemp sesbania, and Palmer amaranth did improve to 5 to 8% by 72 HAT. The absorption and translocation of cloransulam does not explain differences in tolerance to FirstRate.

RESPONSE OF CLEARFIELD CORN HYBRIDS TO A PREMIX OF IMAZETHAPYR PLUS IMAZAPYR APPLIED AT DIFFERENT GROWTH STAGES. M.W. Marshall, J.D. Green, and J.R. Martin; Department of Agronomy, University of Kentucky, Lexington, KY 40546.

ABSTRACT

Kernel set is a complex process which relies on coordinated timing of pollen shed and the extrusion of receptive silk. Any number of factors can interfere with silk and pollen nicking including fertility, environmental stress, and management. Stress, including drought, high temperature, and insect feeding, have the greatest impact of yield potential because silk emergence is delayed until pollen shed is nearly or completely finished. In addition, application of certain postemergence herbicides can impact ear development when applied at the later stages of corn development. The objective of this study was to evaluate corn hybrid response to various rates of imazethapyr plus imazapyr premix at three corn growth stages. Field experiments were conducted at the University of Kentucky Research and Education Center and Spindletop Research Farm in Princeton and Lexington, Kentucky, respectively. Experimental design was a split-split plot with the main plot being corn hybrid and subplot being corn growth stage and sub-subplot being herbicide application rate. Individual subplots were 2.3 by 9m in Lexington and 3 by 9 m in Princeton. Corn hybrids planted at both locations were Garst 8222, Garst 8541, Pioneer 34B92, and Southern States 849CL with a population of 74,000 seeds ha^{-1}. Herbicide treatments included no herbicide [0], imazethapyr (47 g ha^{-1}) plus imazapyr (15.7 g ha^{-1}) [X], and imazethapyr (94 g ha^{-1}) plus imazapyr (31.4 g ha^{-1}) [2X]. Herbicide treatments were applied at the V3, V6, and V9 growth stages with crop oil concentrate (2.3 L ha^{-1}) plus 28% liquid nitrogen fertilizer solution (4.7 L ha^{-1}). At physiological maturity, 10 consecutive ears were hand harvested from the right row of the plot center to determine percent damaged ears and shelled weight per ear. Percent damaged ears were visually evaluated as the number of damaged ears out of 10 ears harvested. Data were analyzed using ANOVA and means were separated using t-test and pair-wise comparisons. Yield data for both locations correlated with weight per ear data. Princeton ear weights were only significant across hybrids. Yields for the corn hybrids at Princeton were 183.4 g ear^{-1}, 161.5 g ear^{-1}, 154.1 g ear^{-1}, and 146.4 g ear^{-1} for Pioneer 34B92, Southern States 849CL, Garst 8541, and Garst 8222, respectively. No visual differences observed at the Princeton location in percent ear damage. The Lexington location showed a growth stage by herbicide treatment interaction; therefore, data were analyzed by hybrid for each growth stage within herbicide treatment rate combination. Individual ear weights were lower for control plots than herbicide treated ear weights due to mid- to late-season giant foxtail and velvetleaf interference. Garst 8222 and Garst 8541 showed a decrease in weight per ear at the V9 growth stage within 2X herbicide rate. In addition, Southern States 849CL showed a decrease in weight per ear at the V6 growth stage and X herbicide rate. The 2X and X treatments did not have any significant effect on kernel weight per ear or percent damage with Pioneer 34B92 when applied at the V3, V6, or V9 growth stages. Garst 8222 showed an increase in percent ear damage at the V9 growth stage and 2X herbicide rate and Southern States 849CL showed an increase in percent ear damage at the V9 growth stage at both herbicide rates. In conclusion, Princeton location only showed corn yield and individual ear weight differences among hybrids. At Lexington, weight per ear significantly decreased for two of the four hybrids when herbicide was applied at the highest rate and the later growth stages. Visual ear ratings did not correspond to weight per ear data which implies other confounding factors maybe involved in kernel set. The environment or other stress factors at the time of imazethapyr plus imazapyr application may also be impacting the potential for poor ear development because of the different responses observed between locations.

REDVINE CONTROL IN TRANSGENIC COTTON. H.R. Hurst, Delta Research and Extension Center, Stoneville, MS 38776.

ABSTRACT

Cotton (PM 1244RR in 1997, PM 1220RR/BG in 1998 and 1999, PM 1218B/R in 2000, and DP 422 B/R in 2001) was planted without preplant tillage on a clay soil infested with redvine [*Brunnichia ovata* (Walt.) Shinners]. Winter weeds were controlled with a preplant foliar application of Roundup Ultra® (glyphosate) at 1.0 lb active ingredient (ai) per acre applied in March each year. The experiment was established as a randomized complete block utilizing 8 rows by 100 ft plots of cotton planted on 40-inch centers with 4 replications. All planting, spraying, and cultivating was done with 4-row equipment. Treatments were (1) Roundup at 1.0 lb ai/acre over-the-top followed by two directed applications of 1.0 lb ai/acre in 1997 or one application at 2.0 lb in 1998 to the drill area with cultivation between rows, (2) Roundup as in treatment 1 plus Cy-Pro® (cyanazine) at 1.0 lb ai/acre plus surfactant applied as a broadcast lay-by application, (3) Roundup as in treatment 1 without cultivation and applied broadcast, (4) Roundup as in treatment 3 plus Cy-Pro lay-by as with treatment 2, and (5) a control. Treatment 5 consisted of a standard program of Cotoran® (fluometuron) at 1.75 lb ai/acre preemergence followed by post-directed applications with Cotoran at 1.0 lb ai/acre plus MSMA at 1.5 lb to 6-inch cotton and broadcast Cy-Pro plus surfactant lay-by as with treatments 2 and 4. Treatments 1, 2, and 5 were cultivated 3 times in 1997 and 4 times in 1998. In 1997 the post-directed Roundup treatments were applied in early June followed by an additional application in early July. In 1998 Roundup was post-directed mid-June only one time. Visual ratings on redvine control and foliage injury and counts of redvine were made at various times during each growing season. In mid-July 1997 visual injury to redvine was 85% and 90% with treatments 3 and 4, respectively. These values were significantly higher than other treatments. Redvine injury was also greater in mid-July 1998 with 91% and 94% for treatments 3 and 4, respectively. Broadcast treatments were more effective because greater redvine foliage was contacted with the spray. The redvine count with the commercial standard indicated redvine plant numbers increased 49% from October 1997 to mid-September 1998. Based on a comparison with the standard program, the use of Roundup reduced redvine stem counts 18%, 26%, 51%, and 48%, respectively for treatments 1, 2, 3, and 4 in early October 1997. Reductions from the commercial standard in mid September 1998 for year two were 18%, +7%, 61%, and 56%, respectively, for the same treatments. Cotton stand and seed cotton yield were determined each year. Cotton stand was not affected with any treatments in 1997. In 1998, the cotton stand was lower with the commercial program. All treatments had a lower stand than normally considered acceptable for optimum yield. Some plants may not have been counted as the count was taken late in the season. Cotton yield in 1997 was less for all Roundup treatments (a range of 1084 lb to 1290 lb/acre) when compared with the commercial standard (1598 lb). The variety used in 1997 experienced fruiting problems in some instances in the Mississippi Delta where Roundup was used. Perhaps this accounted for the reduction in yield in this experiment. This variety was not offered for sale in 1998. In 1998, all treatments produced greater numerical yield than the commercial standard. Treatment 3 produced significantly more seed cotton (1611 lb/acre) than the commercial standard (1373 lb), but yield was not different from treatments 1, 2, and 4.

In year 3, (1999) one-half (4 rows) of each of the original plots had only the standard herbicide program applied resulting in 10 treatments. This allowed the opportunity to evaluate residual control from the 1997 and 1998 in-season Roundup applications. The other one-half had Roundup applied in-season as described above.

Plots without Roundup in 1999 were treated September 27 with either Clarity® (dicamba) at 1.5 lb ai/A or Roundup at 1.0 lb ai/acre followed with Roundup in-season during 2000 and 2001 as described above. Plots receiving Roundup in-season in 1999 were not treated in September but received the same in-season treatment as the others during 2000 and 2001. One standard control received the fall treatments and both standard controls received the same herbicide program described above. All plots were treated lay-by with Cy-Pro in 1999-2001.

A visual estimate of redvine “leaf-out” (an estimate of the development of redvine plants recovering from dormancy) was made in April and again in May 1999-2001. In 1999, Roundup applied broadcast (treatments 4-8) in 1997 and 1998 without cultivation resulted in greater delay in redvine leaf development than the band application plus cultivation (treatments 1-4). All treatments delayed redvine in April 2000 when compared with the non-Clarity control. By May 2000, the fall 1999 treatments with either Clarity or Roundup provided greater delay in redvine recovery when compared with treatments that were not fall applied. The control treatment with fall-applied Clarity delayed redvine similar to treatments receiving 1999 in-season Roundup. This was also true with both rating dates in 2001. In May 2000, the average “leaf-out” for the broadcast and band Roundup treatments were similar (54 vs.

58%). This was not true with both rating dates in 2001 when broadcast Roundup in-season 2000 provided an average of 11% “leaf-out” vs. band applied Roundup provided 39% on April 16 and 16% vs. 48%, respectively on April 30.

Early season redvine plant injury ratings resulted in an average 28%, 12%, and 15% better control in 1999, 2000, and 2001, respectively for treatments with in-season Roundup applied broadcast compared with band applications plus cultivation. Early-season redvine plant injury with fall-applied Clarity without in-season Roundup was equal to any other treatment in 2000 and 2001.

Late-season average redvine control ratings for broadcast in-season Roundup applications were greater than those for band applications with cultivation each year. The ratings in 1999, 2000, and 2001 were 70 vs. 36%, 85 vs. 45%, and 89 vs. 51% for broadcast vs. band, respectively each year. Where Roundup was used in-season, fall-applied Clarity and Roundup treatments resulted in an average 25% and 15% greater redvine control rating in July 2000 and 2001, respectively.

Redvine plant counts in August 1999 and 2000 were not different between treatments except the 1999 control count with 1998 fall-applied Clarity was greater than the no fall-applied control treatments. In August 2001, average fall-applied Clarity treatment redvine plant counts were 48% lower when compared with fall-applied Roundup treatments.

Cotton stand was adequate for maximum yield in 1999 and 2000 but was low in 2001 due to a late count resulting in many plants being missed when counting. In all years cotton stand was similar between treatments.

Seed cotton yields were similar between treatments in 1999 and 2000. In 2001, the lowest yield was obtained from the control treatment without previous fall-applied Clarity. All other treatments resulted in greater yield than in-season band-applied Roundup treatments. The in-season broadcast-applied Roundup treatments resulted in greater yields (26%) than when in-season Roundup was applied on a band to 50% of the row area with cultivation. The very low yields in 2001 (847 to 1488 lb/acre) resulted from excessive rainfall at harvest causing an extended harvest delay with increased field loss.

EFFECT OF SELECTED GLYPHOSATE TREATMENTS AND IRRIGATION ON ROUNDUP READY™ COTTON. G.R. Wehtje, C.D. Monks, W.H. Faircloth, M.R. Woods, C.H. Burmester, H.D. Harkins, D.P. Delaney, L.M. Curtis, M.G. Patterson, and W.R. Goodman. Department of Agronomy and Soils, Auburn University, and Alabama Cooperative Extension System, Auburn, AL.

ABSTRACT

Ability to apply glyphosate over-the-top of cotton for controlling weeds has been realized on a commercial level with Monsanto's development of Roundup Readyä technology. The objective of this study was to compare the effects of glyphosate on irrigated and dryland cotton when applied according to the manufacturer's label directions. It has been speculated that the genetically-engineered glyphosate tolerance in the Roundup Ready cotton varieties is reduced under drought stress. This study was conducted in 1999 and 2000 at the Tennessee Valley Research and Extension Center in north central Alabama on a Decatur silt loam (1% organic matter and pH = 6.1). A stacked gene cotton variety (DPL 458 BR) was planted in late April each year using conventional procedures. Plots were kept weed-free with trifluralin (0.5 lb ai/acre, preplant incorporated), fluometuron plus pyrithiobac (2.0 lb ai/acre plus 0.0625 lb ai/acre, preemergence), and cultivation. Main plots were sprinkler irrigated individually for maximum yield based on previous research or were left dryland. Glyphosate subplots included four treatments: untreated, 1.0 quart/acre formulated material applied postemergence over-the-top at the 4-leaf stage (POST), 1.0 quart/acre post-directed to pre-bloom cotton (DIR), and 1.0 quart/acre applied both POST and DIR. Data collection included seed and lint cotton yield, plant mapping (10 plants/plot), first and second position boll harvest from 30 plants in each plot (15 consecutive plants from 2 adjacent rows), and fiber quality using HVI techniques. Regardless of irrigation, glyphosate applications had no effect on overall yield, growth parameters, number of total bolls by node, number of reproductive nodes, or fiber quality (except for micronaire on node 14 in 2000). Irrigation increased yield, reproductive nodes/plant, and the total number of bolls at each node. Irrigation had a positive effect on plant growth and fiber quality compared to cotton produced under dryland conditions.

GLYPHOSATE TOLERANCE AND SHIKIMIC ACID ACCUMULATION IN CONVENTIONAL AND GLYPHOSATE-RESISTANT COTTON SEEDLINGS. W.A. Pline, J.W. Wilcut, K.L. Edmisten, and R. Wells; North Carolina State University, Raleigh, NC.

ABSTRACT

The level of tolerance in herbicide resistant plants may vary among different tissues or growth stages. Studies were conducted to determine relative tissue sensitivity in glyphosate-resistant (GR) and non-glyphosate resistant cotton seedlings to the herbicide glyphosate. Glyphosate is often applied as a pre-plant treatment (burndown) in minimal tillage cotton production systems to remove any unwanted, emerged vegetation. Timing of these glyphosate applications is in close proximity to the time of planting and seedling emergence. As glyphosate leaches from roots of nearby senescing weeds, it may be absorbed into the roots of cotton seedlings. Therefore, cotton seedlings were grown in hydroponic solutions containing technical grade glyphosate to insure constant exposure to glyphosate. Glyphosate inhibited the growth of non-glyphosate resistant cotton cotyledons, hypocotyls, and roots 50% at concentrations of 23, 69, and 27 μM glyphosate, respectively. In contrast, growth of glyphosate-resistant cotton cotyledons, hypocotyls, and roots was inhibited by 50% at 3.5, 8, and 5 fold greater glyphosate concentrations, respectively, than non-glyphosate resistant cotton tissues. These data would suggest that cotyledons in both glyphosate-resistant and non-glyphosate resistant seedlings are more sensitive to glyphosate-induced fresh weight reduction than are hypocotyls and roots. However, reductions in cotyledon fresh weight were likely due to dehydration after glyphosate injury rendered roots and hypocotyls unable to absorb and transport water, because chlorosis in cotyledons was not evident. Correspondingly, shikimic acid, an intermediate in the shikimic acid pathway, which accumulates upon 5-enolpyruvyl 3-shikimate phosphate synthase (EPSP synthase) inhibition, reached levels of 17.3, 21.6, and 8.8 $\mu M\ g^{-1}$ fresh weight at 1 mM of glyphosate in non-glyphosate resistant cotyledons, hypocotyls, and roots respectively. In contrast, shikimic acid levels in glyphosate-resistant cotton were 4.2, 14.0, and 8.2 $\mu M\ g^{-1}$ fresh weight at 1 mM of glyphosate for cotyledons, hypocotyls, and roots respectively, suggesting that roots of glyphosate-resistant and non-glyphosate resistant cotton accumulate similar amounts of shikimic acid in response to glyphosate treatments. In addition, glyphosate inhibited the development of lateral roots in both glyphosate-resistant and non-glyphosate resistant cotton. Lateral roots of glyphosate-resistant and non-glyphosate resistant cotton treated with inhibitory doses of glyphosate appeared shorter and were surrounded by a thick layer of necrotic cells or root exudate which was not present in roots from plants grown in media not containing glyphosate. The quantity of glyphosate-resistant CP4-EPSP synthase was 4.7 and 6.6 times greater in cotyledons than in hypocotyls and roots, respectively. Tissues from dark grown glyphosate-resistant cotton seedlings contained 1.2 to 2.1 times less CP4-EPSP synthase than their light grown counterparts. Because lateral root development was inhibited, fresh weight was reduced, and shikimic acid accumulated following treatment with glyphosate in both glyphosate-resistant and non-glyphosate resistant cotton, the potential exists for glyphosate to negatively affect cotton seedling establishment.

COTTON AND WEED RESPONSE TO GLYPHOSATE APPLIED WITH SULFUR-CONTAINING ADDITIVES. W.H. Faircloth, C.D. Monks, M.G. Patterson, Auburn University, Auburn AL 36849; and J.C. Sanders, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

It has been speculated that the addition of sulfur-containing additives increases glyphosate efficacy on several problem weeds, thereby allowing lower rates (0.5-0.75 lb ai/acre) to be used. Ammonium thiosulfate (ATS) $[(NH_4)_2S_2O_3]$ and ammonium sulfate (AMS) $[(NH_4)_2SO_4]$ are marketed as herbicide activators in addition to having foliar fertilizer value. Mixed reviews of sulfur-containing additives exist in the literature with some researchers finding increased efficacy and others detecting no differences. A field study was begun in 1999 at the E.V. Smith Research Center, Shorter, AL to address this issue. Objectives of this research were twofold: 1) determine if these sulfur additions to glyphosate increase the control of yellow nutsedge (*Cyperus esculentus* L.) and sicklepod [*Senna obtusifolia* (L.) Irwin & Barneby], and 2) determine if sulfur additions to glyphosate had any effect on cotton injury, fruiting, maturity, and seed cotton yield. A five x three factorial arrangement of treatments in a randomized complete block design with four replications was carried out over three years. Factors were glyphosate rate (0, 0.5, 1.0, 1.5, and 2.0 lb ai/A) and sulfur addition (no sulfur, AMS-2.01 lb/A, and ATS-2.58 pt pr/A). Field plots consisted of four 30 ft. rows spaced 40 in. apart. Postemergence applications were made in 15 gallons of water per acre to young (6-leaf) cotton (Paymaster® 1218 BR). Visual weed control and crop injury ratings, plant mapping, and yields were taken from plots and analyzed (α=0.05).

The following response variables consistently showed no significant differences among factors and will not be presented: visible crop injury ratings, plant heights, number of fruiting nodes, and boll retention-position 1. Visible weed control ratings, seed cotton yield, total bolls-fruiting nodes 1-5, and total bolls- fruiting nodes 6-10 showed significant differences among glyphosate rates and years, but not among sulfur treatments. Though yellow nutsedge and sicklepod control increased with glyphosate rate, the 2.0 lb ai/A rate provided the greatest level of weed control for both species. Yellow nutsedge control was minimal even with the high rate. All plots that received glyphosate yielded similarly in 1999 and 2000. Higher rates of glyphosate (1.5 and 2.0 lb ai/A) had the highest yields in 2001. All treatments that received glyphosate yielded higher than the untreated in all years. Total bolls fruiting nodes 1-5 showed no recognizable trend with a glyphosate rate of 1.5 lb ai/A having the greatest number in 1999 and 2000. Total bolls fruiting nodes 6-10 also revealed that 1.5 lb ai/A glyphosate had the greatest number of bolls in 1999 and was equivalent to the highest in 2001.

Several variables showed significant differences only among glyphosate rate: total bolls, abcsised bolls, total bolls-fruiting nodes 11-15, total bolls-position 1, total bolls-position 2, boll retention- fruiting nodes 6-10, and boll retention- fruiting nodes 11-15. Total bolls per plant were higher for those plots receiving glyphosate than the untreated plots. However, the number of abscised bolls per plant was generally higher for those treated with glyphosate. Total bolls fruiting nodes 11-15 also revealed that glyphosate-treated plots had more bolls. Total bolls at positions 1 & 2 conformed to the same trends above with plots receiving glyphosate having more bolls. Boll retention at fruiting nodes 6-10 showed only untreated plots had less retention than the treated plots.

The remaining response variables showed significance by year only and will not be presented at this time: internode length, number vegetative nodes, total nodes, boll retention- fruiting nodes 1-5, boll retention-position 2, and maturity. In summary, high rates of glyphosate were needed to give acceptable weed control for both species. Though glyphosate applications generally increased the number of abscised bolls per plant, the ensuing weed control allowed the plant to compensate with more total bolls and thus higher yields. Sulfur-containing additives made no difference in weed control or glyphosate's effect on cotton fruiting. Thus, glyphosate rate and weather conditions (cause for such large differences between years) were found to have the greatest influence on cotton fruiting patterns and seed cotton yield.

YELLOW AND PURPLE NUTSEDGE CONTROL IN COTTON. S.C. Troxler, W.D. Smith, W.E. Thomas, and J.W. Wilcut. North Carolina State University, Raleigh, NC 27695.

ABSTRACT

A field study was conducted at Lewiston-Woodville, NC to evaluate nutsedge (*Cyperus spp.*) management and cotton yield in herbicide programs utilizing glyphosate, CGA-362622 (proposed trifloxysulfuron sodium), or pyrithiobac early postemergence (EPOST) in combination with post-directed (PDS) or late post-directed (LAYBY) herbicides in glyphosate-tolerant cotton. Field studies consisted of a randomized complete block design with three replications of treatments. All field plots received pendimethalin at 1120 g ai/acre plus fluometuron at 1120 g ai/acre preemergence (PRE). POST treatment options consisted of glyphosate at 1120 g ai/acre EPOST followed by (fb): 1) prometryn at 1120 g ai/ha LAYBY, 2) glyphosate at 1120 g ai/ha PDS fb prometryn at 1120 g/ha LAYBY, 3) prometryn at 1120 g/ha plus MSMA at 2240 g ai/acre LAYBY, 4) glyphosate at 1120 g/ha plus MSMA at 2240 g ai/ha PDS fb prometryn at 1120 g/ha LAYBY, 5) glyphosate at 1120 g/ha PDS fb prometryn at 1120 g/ha plus MSMA at 2240 g/ha LAYBY, or 6) MSMA PDS at 2240 g/ha fb prometryn at 1120 g/ha plus MSMA at 2240 g/ha LAYBY. Additional POST systems evaluated included an embedded POST by PDS by LAYBY factorial. POST options included CGA-362622 at 5.0 g ai/ha or pyrithiobac at 71 g ai/ha. PDS options consisted of no PDS or MSMA at 2240 g ai/ha. LAYBY options included prometryn at 1120 g ai/ha or prometryn at 1120 g/ha plus MSMA at 2240 g ai/ha.

In the field experiment, an EPOST treatment of CGA-362622 controlled purple and yellow nutsedge 85 and 80%, respectively. Equivalent control was observed with glyphosate EPOST. Pyrithiobac controlled both nutsedge species less ($\leq$ 50%). The addition of MSMA to LAYBY treatments increased purple and yellow nutsedge control in CGA-362622 and pyrithiobac POST systems. MSMA PDS increased nutsedge control for pyrithiobac systems. Glyphosate applied as an EPOST and PDS treatment controlled purple and yellow nutsedge greater than 94%. The addition of MSMA LAYBY did not increase nutsedge control in systems that used glyphosate EPOST plus PDS. No significant differences in cotton lint yield were observed from purple and yellow nutsedge POST herbicide management programs.

Greenhouse studies were conducted at the Weed Science Research Unit in Raleigh, NC to evaluate and characterize the nature of CGA-362622, glyphosate, glufosinate, MSMA, pyrithiobac, and their interactions for reduction of yellow and purple nutsedge foliage and root/tubers. Greenhouse experiments were conducted during the fall of 2000 and spring of 2001. The experiments consisted of a randomized complete block design with four replications of treatments and the experiments were repeated in time. Separate studies were conducted for yellow and purple nutsedge. POST herbicide treatments included: no POST herbicide, CGA-362622 at 3.6 or 5.3 g ai/ha, glyphosate at 1120 g ai/ha, glufosinate at 400 g ai/ha, pyrithiobac at 36 g ai/ha, MSMA at 1120 and 2240 g ai/ha, and all possible tank mixtures thereof. A nontreated control was included for comparison. All treatments received MSMA at 2240 g ai/acre LAYBY 30 DAT to simulate the LAYBY application that cotton growers typically employ for late season weed control. Plants were harvested 60 DAT, partitioned into roots and shoots, and dried for 72 h at 35 C. Percent reduction was measured relative to the nontreated control.

In greenhouse experiments, the MSMA LAYBY treatment alone reduced purple and yellow nutsedge shoot dry weights by 32 and 44%, respectively. CGA-362622 POST fb MSMA LAYBY treatements reduced purple and yellow shoots at least 73%. Rate of CGA-362622 influenced yellow nutsedge shoot dry weight reduction. Shoot dry weight reduction of purple and yellow nutsedge by CGA-362622 fb MSMA LAYBY was equivalent to glyphosate POST fb MSMA LAYBY. Glufosinate POST fb MSMA LAYBY reduced yellow nutsedge shoot dry weights 79%, but was less effective on purple nutsedge (45%). MSMA applied POST plus LAYBY decreased nutsedge shoot dry weights a minimum of 53%. The addition of MSMA in a tank mixture with pyrithiobac POST fb MSMA LAYBY increased reduction in yellow nutsedge shoot dry weight compared to the same system without MSMA POST.

COTTON RESPONSE TO IMAZAPIC AND IMAZETHAPYR. P. A. Dotray, J. W. Keeling, W. J. Grichar, T. A. Baughman, R. G. Lemon, and Scott A. Senseman. Texas Tech University, Lubbock; Texas Agricultural Experiment Station, College Station, Lubbock and Yoakum; and Texas Cooperative Extension, Lubbock, College Station, and Vernon.

ABSTRACT

Cotton and peanut harvested in Texas in 2001 totaled approximately 4,200,000 and 330,000 acres, respectively. Cotton is commonly rotated with peanut in Texas and across other peanut production regions. Peanut growers have a variety of selective herbicides to choose from, but must be aware of their rotational restrictions. Imazapic and imazethapyr control a broad spectrum of broadleaf weeds and have activity on yellow and purple nutsedge. These imidazolinone herbicides have significant soil residual activity to injure rotational crops. Cotton is susceptible to residues of imazapic and imazethapyr,. The objective of this experiment was to examine cotton response (stand, visual injury, yield) relative to soil residual concentrations of imazapic and imazethapyr using chemical extraction.

Field experiments were established in 2001 at three Texas locations: Denver City (Southern High Plains), Munday (Rolling Plains), and Yoakum (South Central Texas). Imazapic and imazethapyr were soil applied at six rates: 0.032 (1/2X), 0.016 (1/4X), 0.008 (1/8X), 0.004 (1/16X), 0.002 (1/32X), and 0.001 (1/64X) lb ai/A. Herbicides were applied to flat ground, incorporated twice 4 to 5 inches using a tandem disc, and bedded (Denver City); applied to flat ground and incorporated 2 to 2.5 inches using a power tiller (Yoakum); and applied to listed ground and incorporated 1 to 2 inches using a rolling cultivator (Munday). Applications were made immediately before planting (Munday and Yoakum) or three weeks before planting (Denver City). Paymaster 2326 RR was planted on May 18 at Denver City, Paymaster 1218 BG/RR was planted on May 11at Munday, and Stoneville 4793R was planted on Apr 27 at Yoakum. Soil samples, 0 to 3 inches in depth, were collected at planting to determine parts per million (ppm) concentration of each imidazolinone herbicide. Cotton stand and visual injury were evaluated during the growing season and lint and fiber quality were determined at the end of the growing season. At the Denver City location, 3.5 inches of rainfall was received between application and planting and 18 inches of rainfall/irrigation was received during the growing season.

No reduction in cotton stand was observed on Jun 1 (2 weeks after planting (WAP)) at Denver City; however, on Nov 1 (24 WAP) cotton stand was reduced when rates were averaged across herbicides. No reduction in cotton stand was observed at Munday or Yoakum. At Denver City, cotton injury by imazapic and imazethapyr at 0.008 to 0.032 lb ai/A was >50% Jun 1 (2 WAP). Imazapic was more injurious than imazethapyr at the 0.002 to 0.016 lb/A rates. On Jun 29 (6 WAP), imazapic and imazethapyr at 0.004 to 0.032 lb/A injured cotton >60%. Imazapic was more injurious than imazethapyr at the 0.001 to 0.016 lb/A rates. On Aug 9 (12 WAP) and Sep 28 (19 WAP), imazapic injured cotton greater than imazethapyr when averaged across rates. At Munday, imazapic injured cotton 33% at 2 WAP, which was greater than the injury caused by imazethapyr (23%) when averaged across rates. When averaged across herbicides, cotton injury was at least 50% at the 0.016 and 0.032 lb/A rates. On Jul 6 (8 WAP), imazapic was more injurious than imazethapyr at the 0.008 to 0.032 lb/A rates. At Yoakum, imazapic was more injurious than imazethapyr at the 0.016 and 0.032 lb/A rates 2 WAP. At these rates, imazapic injured cotton 50 to 69%, while imazethapyr injured cotton 19 to 35%. On Jun 18 (7 WAP), imazapic injured cotton 27% and imazethapyr injured cotton 17% when averaged across rates. When averaged across herbicides, only the 0.016 and 0.032 lb/A rates injured cotton >50%.

Lint yield at Denver City was reduced with the 0.008 to 0.032 lb/A rates when averaged across herbicides; however, at Munday and Yoakum, lint yield was reduced following the 0.016 and 0.032 lb/A rates when averaged across herbicides. At Denver City, lint yield from imazapic-treated plots was less than imazethapyr-treated plots when averaged across rates. No imazapic and imazethapyr levels were detected at Denver City; however, imazethapyr was detected in some replications at Yoakum following the 0.032 and 0.016 lb ai/A rates. Therefore, it is not possible to use herbicide concentrations in the soil from chemical extraction to predict cotton injury using our current analytical methods and technology.

PURPLE NUTSEDGE POPULATION DYNAMICS IN NARROW ROW TRANSGENIC COTTON AND SOYBEAN ROTATION. C.T. Bryson*, K.N. Reddy, and W.T. Molin, USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS 38776.

ABSTRACT

Purple nutsedge (*Cyperus rotundus* L.) is considered the world's worst weed. In the southern United States, purple nutsedge is a major weed in several row crops including cotton (*Gossypium hirsutum* L.). With the commercialization of glyphosate-tolerant crops, glyphosate offers another alternative to manage purple nutsedge. Recently, there has been renewed interest in cotton production in a rotation with other crops, using narrow row and transgenic weed control technology to reduce production costs. The objectives of this research were to study the effects of narrow row transgenic cotton and soybean [*Glycine max* (L.) Merr.] rotation systems on purple nutsedge population and control, and on crop yield. Our hypothesis was that a combination of transgenic technologies, crop rotation, and narrow row production systems would reduce purple nutsedge populations.

A field experiment was conducted in 1998-2001 at the USDA-ARS Southern Weed Science Research Farm, Stoneville, MS on a Dundee silt loam soil (pH 6.7 and 1.0% organic matter). The experiment was conducted as a split plot design with crop rotation [cotton (C) and soybean (S); CCCC, CCSS, CSCS, SCSC, SSCC, or SSSS] as main plots, and herbicide treatments as subplots. Herbicide treatments in cotton included: 1) CONV - metolachlor (1.1 kg ai/ha), fluometuron (1.1 kg ai/ha), and pyrithiobac (0.04 kg ai/ha) PRE and pyrithiobac (0.08 kg ai/ha) POST; 2) GLYPH - glyphosate (1.1 kg ai/ha) POST at 1-leaf and again at 4-leaf; and 3) No herbicide with purple nutsedge activity NO). Herbicide treatments in soybean included: 1) CONV - metolachlor (2.8 kg ai/ha) PRE and chlorimuron-ethyl (13g ai/ha) POST; 2) GLYPH - glyphosate (1.1 kg ai/ha) POST at 2 wk and again at 4 wk after emergence; and 3) NO. A dinitroaniline at 1.1 kg/ha (pendimethalin or trifluralin) was applied PPI to the entire experimental area. Tillage included disking, bedding, and flatten beds. Plots were 4 by 12.2 m. Cotton cultivar 'DP 436RR' and soybean cultivar 'DP 5806RR' were planted in rows 25 cm and 19 cm apart, respectively. The experiment was irrigated as needed (Aug. 8, 1998; July 8 & 24, 1999; July 14 & Aug. 4, 2000; none in 2001). Data collected included purple nutsedge counts (plants/m^2) at 3 randomly selected sites within each plot; purple nutsedge dry weights (g/m^2) within each site previously mentioned (except 1999); and seed cotton and soybean yields (kg/ha) each year (except seed cotton in 1998).

Purple nutsedge populations increased in CONV (74, 139, 358, and 254 plants/ha) and decreased in GLYPH (39, 9, 4, and 9 plants/ha) compared to the NO herbicide check (302, 254, 576, and 425 kg/ha) in continuous cotton for 1998, 1999, 2000, and 2001, respectively. For the continuous soybean system, purple nutsedge populations decreased over the same four-year period in CONV (83, 18, 6, and 2 plants/ha) and GLYPH (82, 0, 3, and 2 plants/ha) compared to NO herbicide check (362, 195, 306, and 144 plants/ha). In years that included soybean rotation (CCSS, CSCS, and SSCC), purple nutsedge populations decreased regardless of the herbicide treatment regime, but were lower in the CONV and GLYPH treatments when compared to NO. Similar trends were observed in plant dry weights over the four-year period. In 2001, after 4 years of crop rotation, seed cotton yields were 1501, 1861, and 1439 kg/ha for CCCC, SCSC, and SSCC rotations, respectively and soybean yields were 2850, 2773, and 2858 for SSSS, CSCS, and CCSS rotations, respectively. Among herbicide treatments, seed cotton yields were 2282, 2186, and 333 kg/ha, and soybean yields were 3169, 2806, and 2506 for CONV, GLYPH, and NO treatments, respectively.

After 4 years in continuous cotton or soybean, purple nutsedge density and biomass were significantly reduced with glyphosate-based weed control programs compared to non-glyphosate based programs. Purple nutsedge density and biomass decreased in cotton rotated with soybean compared to continual cotton, even with the conventional herbicide program. Purple nutsedge density and biomass were similar in soybean rotated with cotton and continual soybean regardless of herbicide program. Soybean yields were unaffected by crop rotation. Soybean yields did not differ between glyphosate and conventional herbicide program, but were higher than in herbicide systems that did not have activity on purple nutsedge.

COTTON RESPONSE TO APPLICATIONS OF TOUCHDOWN IQ AND CGA 362622. G.L. Steele and J.M. Chandler; Texas Agricultural Experiment Station, College Station, TX 77843-2474.

ABSTRACT

Touchdown with IQ technology has recently been registered for application to glyphosate tolerant cotton. Cotton tolerance questions have been raised since Touchdown IQ contains a different salt formulation of glyphosate than that found in Roundup products. Another cotton herbicide which is currently under development for potential use in combination with Touchdown is CGA 362622. This compound is in the sulfonylurea herbicide family, and has been shown to cause cotton injury when applied postemergence. Field experiments were conducted in 2000 and 2001 to compare cotton tolerance with Roundup Ultra or UltraMax and Touchdown. Both herbicides were applied at 0.75 lb a.e./A at the 2-leaf cotton stage, 4-leaf stage, and sequentially. In 2001 experiments evaluating cotton tolerance to CGA 362622 were performed. CGA 362622 was applied alone and in combination with Touchdown at the 4-leaf stage and post-directed to 16" cotton. Rates of CGA 362622 used were 0.0048 lb a.i./A at the 4-leaf stage and 0.0118 lb/A post-directed. Data collection included visual estimations of percent crop injury in the form of chlorosis, plant height, seed cotton yield, and total number of bolls/plant.

In 2000 and 2001 cotton plant heights did not significantly differ between treatments, indicating that neither Touchdown nor Roundup applications resulted in crop stunting. In 2000 cotton yield among all treatments were statistically similar. A comparable trend was observed with yields in 2001. In both years, number of bolls/plant were not different between treatments. This indicates that Touchdown and Roundup applications had no effect on boll abscission or retention, irrespective of boll position.

At 7 days after treatment (DAT) CGA 362622 applied at the 4 lf postemergence timing, significantly injured cotton. There was no difference in visual injury with CGA 362622, regardless of combination with Touchdown. By 28 DAT there were no significant differences in cotton injury, regardless of rate, timing, or herbicide combination. Cotton plant heights indicated that significant crop stunting did not result from any herbicide treatment. Cotton yield or number of bolls/plant did not differ between treatments. In conclusion, the different formulations of glyphosate had no effect on cotton tolerance. Visual cotton injury with CGA 362622 dissipated by 28 DAT, and did not translate into yield, height, or boll reductions.

REASSESSMENT OF 2,4-D PREPLANT INTERVALS IN COTTON. P.R. Vidrine, S.T. Kelly, D.K. Miller, E.P. Millhollon, and A.M. Stewart, LSU Agricultural Center, Baton Rouge, LA; P.A. Dotray, Texas Tech University, Lubbock, TX; C.B. Guy, G&H Associates, Tillar, AR; R.M. Hayes, University of Tennessee, Jackson, TN; J.A. Kendig, University of Missouri, Portageville, Mo; C.E. Snipes, Mississippi State University, Stoneville, MS; C.H. Tingle, University of Arkansas, Keiser, AR; M.M. Kenty and J.Thomas, Helena Chemical Company, Collierville and Memphis, TN.

ABSTRACT

The objective of this study was to determine if the preplant period prior to planting cotton could be safely shortened following the application of two formulations of 2,4-D applied at 2 rates and at 3 timings.

Acreage devoted to reduced tillage systems is increasing across the Southeast. The use of burndown herbicides to remove cover crops and/or winter weeds is necessary in a preplant management program (York et al., 2001). The use of 2,4-D formulations in the past required usage of at least 30 days prior to planting from some manufacturers while other companies were vague in preplant interval applications. To safely shorten the interval of time when applying herbicides prior to planting cotton could save time and allow decision to be made closer to planting time, especially if managing multiple crops. The use of 2,4-D in a short preplant interval to burn down broadleaf weeds would provide an economical and effective component in a stale seedbed management program.

Field studies were conducted in 2001 at 10 locations, which included Alexandria, St. Joseph, Winnsboro, and Shreveport, LA; Keiser and Tiller, AR; Jackson, TN; Portageville, MO; Stoneville, MS, and Lubbock, TX. Treatments consisted of HM9625-B (an ester of 2,4-D) and HM9720 (an amine of 2,4-D). HM9625 was applied at 13 and 26 oz/a whereas HM9720 was applied at 12 and 24 oz/a. Both herbicides were applied at 21, 14, and 7 days prior to planting. Data recorded included the node of the first fruiting branch, total bolls on the first four fruiting branches, injury, and yield. Data were analyzed as a factorial using SAS Proc GLM procedures. Results from the ANOVA for the full factorial as well as appropriate randomized complete block ANOVAs are reported in Tables 1 and 2. A square root transformation of means was performed, but showed no differences from original means in the analyses. Therefore, analyses and means reflect non-transformed data. Where possible data are pooled over locations and main effect means are reported. Where interactions prevent pooling of data, simple effect means are reported by location. Mean separation was achieved using the Waller-Duncan k-ratio test at the 0.05 level of probability.

Results from individual and combined location ANOVA for seedcotton yield, node of first boll, and total bolls on the first four fruiting branches is shown in Tables 1 and 2. Main effect means of seedcotton yield, node of first boll, and total bolls on first four fruiting branches for herbicide formulation, rate, and days applied prior to planting is shown in Table 3. No significant differences were noted on data collected. Also, no differences were noted between tillage and no till. Cotton injury evaluations were collected at approximately 3 to 4 weeks after planting. At Jackson, TN, cotton injury ranged from 3 to 35%. Minor cotton injury existed at Portageville, MO, with no more than 1% injury observed. At St. Joseph, LA, injury was as high as 77% following treatment with HM9625-B at 26 oz/a 7 days prior to planting. The general trend at this location showed increasing injury nearing planting time. Later ratings at these 3 locations indicated the cotton had recovered from the early-season injury (data not shown). Cotton recovery was similar to research conducted by York et al., 2001. Limited rainfall at these locations may account for this injury. No differences in yield data indicated the cotton overcame the injury. Other locations not included in Table 4 showed no cotton injury from treatments.

LITERATURE CITATIONS

York, A. C., A. S. Culpepper, R. B. Batts, and J. D. Hinton. 2001. Strip-til cotton response to 2,4-D and Dicamba applied at burndown. 2001 Proceedings Beltwide Cotton Conferences, Jan. 9-13, Anaheim, CA. Vol. 2, Pages 1214-1215.

EVALUATION OF FLUMIOXAZIN FOR COTTON WEED CONTROL. T.B. McKnight, S.T. Kelly, D.K. Miller and D.R. Lee. LSU Agricultural Center, Scott Research, Extension and Education Center, Winnsboro, LA, 71295 and Northeast Research Station, St. Joseph, LA, 71366.

ABSTRACT

Valor™ (flumioxazin) is a new herbicide being developed by Valent USA Corporation for broadleaf weed control in numerous crops. Flumioxazin is an N-phenylphthalimide derivative. The mode of action of flumioxazin is inhibition of protoporphrinogen oxidase (PPO) which leads to a disruption of the cell membranes. Previous research in Louisiana has shown that flumioxazin as a layby herbicide performed equivalently to currently used layby herbicides in cotton when applied to annual weeds. However, flumioxazin did not provide good control of perennial weeds compared to currently used herbicides applied at layby. Flumioxazin was applied as a preplant, at the Northeast Research Staion near St. Joseph, Louisiana on a silty loam soil, to evaluate potential effects on cotton when applied 30, 21, 14, or seven days before planting (DBP). Two rates of flumioxazin were evaluated (0.063 and 0.125 lb ai/A). Cotton was evaluated for injury, plant population, plant height, and lint yield. Flumioxazin applied at 0.063 lb/A injured cotton if planted 14 or seven days after application. When applied at 0.125 lb/A, cotton was injured 40% or greater regardless of application timing. Flumioxazin at 0.063 lb/A did not appear to impact plant populations at any of the application timings. However, 0.125 lb/A decreased cotton stand counts 33 days after planting (DAP) compared to the untreated when applied 21 DBP or earlier. Cotton plant height 34 DAP indicated that when planted 14 or seven days after flumioxazin was applied, cotton height was reduced by either rate of flumioxazin. Further, when compared to the untreated, flumioxazin at 0.125 lb/A reduced plant height at this evaluation date regardless of application timing. When observed 60 DAP, cotton height was reduced only by 0.125 lb/A flumioxazin applied 7 DBP. Cotton lint yield was not reduced with 0.063 lb/A flumioxazin at any of the application timings. Cotton lint yield was reduced with 0.125 lb/A applied 14 or 7 DBP.

Flumioxazin was also evaluated as a layby treatment, at the Macon Ridge Research Station near Winnsboro, Louisiana on a gigger silt loam. Flumioxazin did not provide acceptable woolly croton *(Croton capitatus*) control applied alone or tank-mixed with MSMA (2.0 lb ai/A). Flumioxazin tank-mixed with glyphosate (0.75 lb ai/A) increased control of woolly croton compared to glyphosate (0.75 lb ai/A) alone. A pre-pack of flumioxazin + glyphosate (V-10080) was comparable to a glyphosate + flumioxazin tank-mix, regardless of the surfactant in controlling woolly croton.

These data suggest that flumioxazin can be applied preplant in cotton, provided application is not made too close to planting. However, further investigation needs to be conducted to further refine planting intervals behind flumioxazin applications.

GLYPHOSATE AND PYRITHIOBAC COMBINATIONS IN COTTON. M.R. McClelland, J.L. Barrentine, and O.C. Sparks. Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72701.

ABSTRACT

Selective postemergence programs for broadleaf weed control in cotton provide producers versatility in their weed management programs. The Roundup Ready (glyphosate-tolerant) system has allowed the reduction of soil-applied herbicides in some situations. Although glyphosate programs without residual, soil-applied herbicides can be used effectively, application timing is important, and some weeds, such as morningglory species, are difficult to control with glyphosate alone. Some studies have shown that pyrithiobac (Staple) plus glyphosate increases weed control over that with either herbicide alone, although even when control was increased, cotton yield was not always affected. A combination package of pyrithiobac and glyphosate (Staple Plus) was introduced commercially by Dupont in 2000. The objective of the studies reported here was to evaluate the potential benefits of applying pyrithiobac with glyphosate in Roundup Ready cotton.

Two sets of experiments were conducted. Glyphosate formulations experiments were conducted in 2001at Marianna and Fayetteville, AR, (silt loam soils) to evaluate single applications of Staple with four glyphosate formulations. The experiment at Marianna was an RCB with 13- by 40-ft plots and four replications. Cotton (Paymaster 1218BR) was planted May 14, and POST treatments were applied June 6 (2-lf cotton, ~1-leaf weeds) at 20 gpA output. At Fayetteville, fourteen species [cotton (Paymaster 1218BR), soybean (RR), barnyardgrass, seedling johnsongrass, large crabgrass, sunflower, velvetleaf, sicklepod, hemp sesbania, prickly sida, entireleaf and pitted morningglory, smooth pigweed, and Palmer amaranth] were planted in a multispecies design. Each plot was 6.5 ft wide. Treatments were applied July 6 (1-lf cotton) at 15 gpA. Glyphosate formulations were Roundup (no surfactant), Roundup Ultra and UltraMax at 0.75 lb ai/A, and Touchdown IQ at 0.56 lb ae/A. Each formulation was applied alone and with Staple (0.031 lb/A). The second set of experiments (Staple Plus experiments) were conducted in 2000 and 2001 at Marianna and Fayetteville to evaluate Staple + glyphosate (Staple Plus) programs. Roundup Ready cotton was planted mid-May. Each experiment was an RCB design with four replications. Plots at Marianna were 13 by 40 ft., and plots at Fayetteville were 3 by 27 ft. Treatments included Staple + fluometuron PRE followed by (fb) Staple plus quizalofop (Assure) applied late over-the-top (LOT) when cotton was at the 4-leaf stage; Staple PRE alone or with fluometuron fb Staple Plus (Staple at 0.031 + glyphosate at 0.75 lb ai/A + surfactant) applied LOT; Staple Plus applied EOT (cotyledon to 3-lf cotton) or LOT or EOT fb LOT; and Roundup Ultra applied EOT fb LOT. Visual weed control and cotton injury ratings and cotton yield at Marianna (2001) were analyzed by ANOVA, and means were separated with LSD at the 0.05 probability level.

Glyphosate formulations generally did not differ in activity in the formulations experiments. The benefits of adding Staple to glyphosate were evident with these single-application treatments. Control of prickly sida (*Sida spinosa*), morningglory (*Ipomoea*) species, pigweed (*Amaranthus*) species, and annual grasses (*Digitaria sanguinalis*, *Eleusine indica*, and *Brachiaria platyphylla)* at 4 wk after treatment (WAT) at Marianna was 89 to 100% with all treatments. By 13 WAT, however, control with glyphosate alone was significantly lower for all species. Control with glyphosate alone also declined at Fayetteville for most species as weed regrowth and late emergence occurred. In the Staple Plus experiments, pigweed species (*A. palmeri and A. hybridus*) were generally controlled as well with two applications of Roundup Ultra alone as with Staple Plus. Control of annual grasses and prickly sida decreased later in the season with Roundup Ultra alone at Marianna, but there were no differences in control at Fayetteville when averaged over years. Staple Plus applied alone LOT gave the poorest morningglory control initially at both Fayetteville and Marianna (76% average). By 7 WAT, control had increased with single LOT applications and decreased with EOT applications. Morningglories treated at EOT apparently had sufficient regrowth to avoid complete shading from the growing cotton, whereas those treated at LOT were further shaded by the cotton. Control also declined with Roundup Ultra applications and was lower than treatments in which Staple or Staple Plus was applied LOT. For this difficult-to-control species, the residual activity of Staple helped maintain control later into the season. Cotton yield (Marianna only), however, did not differ among treatments. In summary, adding Staple to glyphosate was an advantage for difficult-to-control species, such as morningglory, but glyphosate applied twice was sufficient to control pigweed species and grasses and prickly sida at the Fayetteville location.

ALLELOPATHIC EFFECT OF SUNFLOWER RESIDUE ON COTTON AND CORN. M.T. Bararpour, S. Ziahosseini, A. Mansoji, I. Amini and S. Aghajani; Faculty of Agricultural Sciences, Department of Agronomy and Plant Breeding, University of Mazandaran, Sari, Iran.

ABSTRACT

A field study was conducted at the Agricultural Experiment Station in Sari, Mazandaran, Iran to determine the effect of sunflower (*Helianthus annus*) fresh residue on cotton (*Gossypium hirsutum*)and corn (*Zea mays*) emergence and growth parameters. Sunflower (record variety) was planted in the field at three planting times (2 weeks apart). Ten weeks after emergence of the first set of sunflower, all three planting sets were harvested and were chopped into small pieces. At the time of harvest, the first set of sunflower had 30 leaves and was 125 cm tall, the second set had 18 leaves and was 95 cm tall, and the third set had 10 leaves and was 70 cm tall. The experimental design was two species (cotton and corn), three ages of sunflower fresh residue, and three rates of residue in a factorial arrangement on a randomized complete block design. Fresh sunflower residue at the rate of 0, 80, and 160 g was incorporated into 1000 g of soil in a perforated plastic bag, which was placed at 15 cm depth in the field extending to ground level. One week after incorporation of residue, cotton (Sahel) and corn (Tricle Cross) seed were planted 3 cm deep in the center of each bag.

There were no significant differences between the rates of sunflower residue (80 and 160 g) on cotton and corn emergence and growth parameters. Cotton emergence decreased 25, 47, and 63% from 80 g of 6, 8, and 10 week old sunflower residue (WOSR) and 31, 51, and 62% from 160 g of the sunflower residue, respectively. For 80 g of sunflower residue, cotton height, number of leaves, and dry weight were reduced 12, 11, and 16% for 6 WOSR; 28, 29, and 39% for 8 WOSR; and 44, 39, and 67% for 10 WOSR, respectively. The higher rate of sunflower residue (160 g) reduced cotton height, number of leaves, and dry weight 18, 15, and 22% for 6 WOSR; 38, 30, and 44% for 8 WOSR; and 47, 47, and 69% for 10 WOSR, respectively. Sunflower residue significantly reduced corn emergence and growth parameters. Corn emergence was reduced 20, 21, and 37%; height was reduced 13, 14, and 34%; number of leaves was reduced 4, 4, and 21%; and dry weight was reduced 21, 25, and 42% from 80 g of 6, 8, and 10 WOSR, respectively. Six, eight, and ten WOSR at the rate of 160 g/1000 g of soil reduced corn emergence 20, 22, and 43%; height was reduced 15, 18, and 37%; number of leaves 8, 8, and 26%; and dry weight 29, 37, and 51%, respectively. The results indicated that the age of sunflower residue has greater negative impact on cotton and corn emergence and growth parameters than the rate of residue.

RESPONSE OF ROUNDUP READY COTTON TO PREHARVEST GLYPHOSATE APPLICATION. A.M. Stewart, A.S. Culpepper, A.C. York, and P.R. Vidrine; Dean Lee Research Station Louisiana State University AgCenter, Alexandria, LA 71302, Department of Crop and Soil Sciences, University of Georgia, Tifton, GA 31793, Department of Crop Science, Raleigh, NC 27695-7620.

ABSTRACT

In situations where late-season weed control is less than adequate, cotton growers may wish to make an over-the-top glyphosate application to glyphosate-tolerant cotton prior to harvest to increase picker efficiency. The specimen label for glyphosate currently does not permit a late-season application over-the-top until the 20% cracked boll stage. An experiment was conducted in 2000 and 2001 to determine the effect of glyphosate applications made prior to the 20% cracked boll stage on fruit set and retention of glyphosate-tolerant cotton. The trial was conducted a total of ten times in five locations. In 2000, locations included Clayton, Rocky Mount, and Lewsiton, NC, Tifton, GA, and Alexandria, LA. In 2001, locations were Clayton, and Lewsiton, NC, Tifton, GA, and ealry and late planted trials in Alexandria, LA. Glyphosate was applied over-the-top of glyphosate-tolerant cotton (vars. Stoneville ST 4892 BR and Paymaster PM 1218 BR) at 1.0 lb ai acre^{-1} 7 days prior to an arbitrarily determined last effective bloom date, on the last effective bloom date, and 7, 14 and 21 days after the last effective bloom date. The final treatment roughly corresponded to the 20% cracked boll stage. A non-treated control was included at all locations. Cotton was mapped for fruit distribution at the time of the initial treatment and harvested by position prior to final machine harvest according to box mapping procedures. Applications of glyphosate 7 days before the last effective bloom date significantly lowered seedcotton yield by 5% compared with the non-treated control. All other treatments yielded similarly to the control. Application at 14 days prior to the last effective bloom date was the only glyphosate treatment similar in yield to application at 21 days, which roughly corresponded to 20% cracked boll However, plant mapping data contained no significant differences among treatments. Therefore, plant mapping data was not able to fully explain observed differences in yield, possibly due to inherent variation in the procedure. Yield data do suggest that over-the-top applications of glyphosate prior to the last effective bloom date can reduce yield. Glyphosate application 14 days after the last effective bloom date resulted in similar yield compared to application at the 20% cracked boll stage. However, due to trends for yields to increase as applications are delayed, growers should be cautioned to follow label restrictions and delay application as long as possible.

EVALUATION OF STAPLE PLUS AND ROUNDUP ULTRA MAX WEED CONTROL PROGRAMS. D.K. Miller, P.R. Vidrine, S.T. Kelly, and D.R. Lee; Louisiana State University AgCenter, Baton Rouge, LA 70803.

ABSTRACT

Research was conducted in 2001 at the Northeast Research Station in St. Joseph, La on a silt loam soil (pH 6.8, OM 0.5%) to evaluate weed control programs with Staple Plus (pyrithiobac plus glyphosate) and Roundup Ultra Max (glyphosate). EPOST, MPOST, or LPOST application was to cotyledon to one, two to three, or three to four-leaf cotton, respectively. Staple Plus treatments were applied as Staple (pyrithiobac) plus glyphosate (Roundup Original). Treatments evaluated included Staple Plus (0.5 oz ai/A + 0.75 lb ai/A or 0.7 oz ai/A + 1.0 lb ai/A) applied MPOST; Staple Plus (0.3 oz ai/A + 0.5 lb ai/A) applied EPOST followed by Staple Plus (0.3 oz ai/A + 0.5 lb ai/A or 0.5 oz ai/A + 0.75 lb ai/A) applied LPOST; Staple Plus applied EPOST followed by LPOST (0.5 oz ai/A + 0.75 lb ai/A); glyphosate (Roundup Ultra Max) (0.75 or 1.0 lb ai/A) applied MPOST; glyphosate applied EPOST followed by LPOST (0.75 or 1.0 lb ai/A); and Staple plus Cotoran (fluometuron) (0.5 oz ai/A + 0.9 lb ai/A) applied PRE followed by Staple Plus (0.5 oz ai/A + 0.75 lb ai/A) applied LPOST. A nontreated control was included for comparison. Nonionic surfactant was included with all Staple Plus treatments at 0.25% v/v. Herbicides were applied broadcast to all rows of each 4 x 12 m, four row plot. Weeds evaluated included barnyardgrass (*Echinochloa crus-galli* L.), goosegrass (*Eleusine indica*), hemp sesbania (*Sesbania exaltata*), sicklepod (*Senna obtusifolia*), smooth pigweed (*Amaranthus hybridus* L.), pitted morningglory (*Ipomoea lacunosa*), and entireleaf morningglory (*Ipomoea hederacea*). Multiple weed flushes were observed due to above average rainfall season long. Efficacy of treatments was determined with a visual rating 21, 35, and 67 d after EPOST application. Late season rainfall resulted in heavy weed infestation and disease, therefore yield could not be determined.

At 21 DAT, Staple Plus programs resulted in hemp sesbania, smooth pigweed, sicklepod, and pitted and entireleaf morningglory control ranging from 88 to 95, 95, 81 to 94, 85 to 93, and 91 to 95%, respectively. Single application at the high rate MPOST provided control equal to lower rate sequential applications. Sequential applications or the high rate were needed for good grass control. Control of these weeds was not increased with addition of Staple plus Cotoran PRE to Staple Plus programs. Roundup Ultra Max programs resulted in hemp sesbania and smooth pigweed control ranging from 91 to 93 and 81 to 91%, respectively. Control of barnyardgrass, goosegrass, and pitted and entireleaf morningglory ranged from 54 to 73, 55 to 73, 66 to 75, and 66 to 76%, respectively.

At 35 DAT, results were similar with Staple Plus providing good to excellent control of broadleaf weeds and fair to good control of grasses. Roundup Ultra Max programs provided good control of hemp sesbania and smooth pigweed and fair to poor control of grasses and fair to good control of other broadleaves evaluated.

At 67 DAT, Staple Plus at the highest rate applied MPOST resulted in at least 85% control of all weeds except sicklepod (80%). Control was equal to sequential applications. Roundup Ultra Max at the highest rate sequential application resulted in 81, 83, and 80% control of barnyardgrass, hemp sesbania, and goosegrass, respectively, which was equal to control with Staple Plus. Morningglory control ranged from 75 to 88%.

TOUCHDOWN® WITH IQ TECHNOLOGY™ VS. ROUNDUP™ ULTRAMAX: TOLERANCE AND YIELD OF ROUNDUP READY COTTON. S.M. Schraer, G.L. Cloud, B.W. Minton, C.D. Porterfield, S.H. Martin, J.E. Driver, J. Lunsford, D.L. Black, and C. Foresman; Syngenta Crop Protection, Greensboro, NC.

ABSTRACT

Cotton trials conducted in 2000 (data not shown) concluded that when observed cotton response was similar between Touchdown® with IQ Technology™ (TD) and Roundup Ultra® (RU). Injury symptoms included general chlorosis and stunting. Symptoms were maximized under cool, damp, cloudy conditions at and following application. Crop response did not result in yield reductions. Cotton yields were similar between TD & RU. However, comparisons were not made with Monsanto's newest glyphosate formulation Roundup™ UltraMax (RUMAX). This comparison was the focus of Syngenta's 2001 glyphosate program.

Numerous trials were conducted across the cotton belt. Excellent cotton tolerance was observed with all applications TD and RUMAX. Averaged across trials, injury was less than 3% at 5-7 days after application (DAA). No significant differences were observed between TD and RUMAX. Seed cotton yield from glyphosate treated plots were not reduced compared to the untreated check. There were no significant seed cotton yield differences between TD and RUMAX. Average seed cotton yields from glyphosate programs ranged from 2022 to 2230 lb/acre.

ECONOMIC ASSESSMENT OF WEED MANAGEMENT FOR TRANSGENIC AND NON-TRANSGENIC COTTON IN STRIP- AND CONVENTIONAL-TILLAGE COTTON. S.B. Clewis, S.D. Askew, W.E. Thomas, and J.W. Wilcut, North Carolina State University, Raleigh, NC 27695-7620.

ABSTRACT

Studies were conducted to evaluate weed management systems in non-transgenic, transgenic bromoxynil-resistant, and transgenic glyphosate-resistant cotton (*Gossypium hirsutum* L.) in strip- and conventional-tillage environments. Field studies were established at the Central Crops Research Station located near Clayton in 1999; the Cherry Farm Unit near Goldsboro in 1999 and 2000; the Peanut Belt Research Station near Lewiston-Woodville in 1999; and the Upper Coastal Plain Research Station near Rocky Mount, NC in 1999 and 2000. Cotton cultivars, 'Paymaster 1220RR' (glyphosate-resistant), 'Stoneville BXN 47' (bromoxynil-resistant), and 'Stoneville 474' (non-transgenic), were planted on May 13, 1999 at Clayton, May 17, 1999 and May 25, 2000 at Goldsboro; May 10, 1999 at Lewiston; and May 11, 1999 and May 9, 2000 at Rocky Mount. Cotton was seeded at 15 seed m^{-1} of row. Plots were 7.6 m long and four 96-cm rows wide at Clayton and Goldsboro and 7.6 m long and four 91-cm wide at Rocky Mount and Lewiston. The experimental design was a randomized complete block with treatments replicated three times. A split-plot treatment arrangement with main plot tillage and subplot herbicide system was utilized to facilitate tillage and planting. Fifteen herbicide systems were evaluated in each main plot and differed between the tillage regimes. The difference between the tillage regimes was due to the additional paraquat preemergence (PRE) treatment in strip-tilled cotton for control of emerged weed vegetation at planting.

Five herbicide systems were evaluated in each cotton cultivar and three cultivars were grown in each tillage regime for a total of 15 herbicide systems in each tillage regime. The five herbicide systems in non-transgenic cotton included: 1) no herbicide treatment, 2) pendimethalin at 0.75 lb ai/A PRE + fluometuron at 1.0 lb ai/A PRE followed by (fb) pyrithiobac at 0.03 lb ai/A plus MSMA at 1.0 lb ai/A early-postemergence (EPOST) fb prometryn at 1.2 lb ai/A plus MSMA at 2.0 lb ai/A at late post-directed (LAYBY), 3) the aforementioned system with hand weeding as needed (ASN) to keep plot weed-free, 4) pendimethalin at 0.75 lb/A pre-banded (PREBAN) (46 cm wide) on the seed drill fb pyrithiobac at 0.03 lb/A plus MSMA at 1.0 lb/A EPOST fb pyrithiobac at 0.03 lb/A plus clethodim at 0.13 lb ai/A POST fb prometryn at 1.2 lb/A plus MSMA at 2.0 lb/A at LAYBY, and 5) pyrithiobac at 0.03 lb/A plus MSMA at 1.0 lb/A EPOST fb pyrithiobac at 0.03 lb/A plus clethodim at 0.13 lb/A POST fb prometryn at 1.2 lb/A plus MSMA at 2.0 lb/A at LAYBY. Herbicide programs for bromoxynil-resistant cotton included: 1) no herbicide treatment, 2) pendimethalin at 0.75 lb/A PRE + fluometuron at 1.0 lb/A PRE fb bromoxynil at 0.38 lb ai/A plus MSMA at 1.0 lb/A EPOST fb prometryn at 1.2 lb/A plus MSMA at 2.0 lb/A at LAYBY, 3) the aforementioned system with hand weeding ASN to keep plots weed-free, 4) pendimethalin at 0.75 lb/A fb bromoxynil at 0.38 lb/A plus MSMA at 1.0 lb/A EPOST fb bromoxynil at 0.38 lb/A plus clethodim at 0.13 lb/A POST fb prometryn at 1.2 lb/A plus MSMA at 2.0 lb/A at LAYBY, and 5) bromoxynil at 0.38 lb/A plus MSMA at 1.0 lb/A EPOST fb bromoxynil at 0.38 lb/A plus clethodim at 0.13 lb/A POST fb prometryn at 1.2 lb/A plus MSMA at 2.0 lb/A at LAYBY. Herbicide programs for glyphosate-resistant cotton included: 1) no herbicide treatment, 2) pendimethalin at 0.75 lb/A PRE + fluometuron at 1.0 lb/A PRE fb glyphosate at 1.0 lb/A EPOST fb prometryn at 1.2 lb/A plus MSMA at 2.0 lb/A at LAYBY, 3) the aforementioned system with hand weeding ASN to keep plots weed-free, 4) pendimethalin at 0.75 lb/A PREBAN fb glyphosate at 1.0 lb/A ANS fb prometryn at 1.2 lb/A plus MSMA at 2.0 lb/A at LAYBY, and 5) glyphosate at 1.0 lb/A ANS fb prometryn at 1.2 lb/A plus MSMA at 2.0 lb/A at LAYBY.

Tillage did not affect the level of weed control provided by the herbicide systems evaluated. Early-season stunting in strip-tillage cotton was 5% or less, regardless of herbicide system or cultivar and was transient. Excellent (>90%) control of common lambsquarters (*Chenopodium album* L.), *Ipomoea* species including entireleaf (*Ipomoea hederacea* var. *integriuscula*), ivyleaf (*Ipomoea hederacea* L. Jacq.), pitted (*Ipomoea lacunosa* L.), and tall (*Ipomoea purpurea* L. Roth) morningglories; jimsonweed (*Datura stramonium* L.), prickly sida (*Sida spinosa* L.), and velvetleaf (*Abutilon theophrasti* Medicus) was achieved with programs containing bromoxynil, glyphosate, and pyrithiobac EPOST. Glyphosate systems provided better and more consistent control of fall panicum (*Panicum dichotomiflorum* Michx.), goosegrass (*Eleusine indica* L. Gaertn.), and large crabgrass (*Digitaria sanguinalis* L. Scop.) than bromoxynil and pyrithiobac systems. Bromoxynil and pyrithiobac EPOST did not control sicklepod (*Senna obtusifolia* L.) unless applied in mixture with MSMA and fb a LAYBY treatment of prometryn plus MSMA. Herbicide systems that included glyphosate EPOST controlled sicklepod with or without a soil-applied herbicide

treatment. The highest yielding systems included all the glyphosate systems and bromoxynil systems that included a soil-applied herbicide treatment. Non-transgenic systems that included a soil-applied herbicide treatment yielded less than soil-applied treatment plus glyphosate EPOST system. Net returns from glyphosate systems were generally higher than net returns from bromoxynil or pyrithiobac systems.

PHYSIOLOGICAL BASIS FOR COTTON (*GOSSYPIUM HIRSUTUM* L.) TOLERANCE TO VALOR (FLUMIOXAZIN) APPLIED POSTEMERGENCE-DIRECTED. A.J. Price, W.A. Pline, D.A. Danehower, J. W. Wilcut, North Carolina State University, Raleigh and J. R. Cranmer, Valent USA Corporation, Cary, NC

ABSTRACT

Previous research has shown that flumioxazin, a herbicide being developed as a postemergence-directed spray (PDS) treatment in cotton, has the potential to injure cotton that is less than 30 cm tall if it contacts green stem material due to rain splash or misapplication of a PDS treatment. In response to this concern, the influence of plant growth stage and harvest time on the absorption, translocation, and metabolism of ^{14}C-flumioxazin PDS in cotton was investigated. To gain a visual perspective of cotton injury, young cotton plants (5-leaf) with chlorophyllous stems as well as older cotton plants (16-leaf) with mature bark were treated with 0.071 kg ai/ha flumioxazin plus 1.0% (v/v) crop oil concentrate or 0.25% (v/v) non-ionic surfactant. Treated plants and untreated plants at the respective growth stage were cross-sectioned at 5 cm above the soil surface nine days after treatment. Stem sections were magnified and photographed using bright-field microscopy techniques. To evaluate whether growth stage influenced absorption and translocation, cotton plants at 4, 8 or 12-leaf growth stages were treated with ^{14}C-flumioxazin on a 5-cm^2 section of stem simulating a PDS application. Plants were harvested 4, 24, 48, or 72 h after treatment (HAT) and divided into the treated stem, mature leaves, immature leaves and buds, remainder of the untreated stem, roots, and when applicable, fruiting branches (including the leaves on the fruiting branch), squares, and bolls. Plant parts were dried, ground, and combusted in a biological oxidizer to recover absorbed ^{14}C. Samples were then quantified utilizing liquid scintillation spectroscopy (LSS). To evaluate whether growth stage influenced metabolism, two separate studies were conducted in which cotton plants were grown and treated with ^{14}C-flumioxazin on the treated stem or spotted on the youngest fully expanded leaf and harvested as previously described. At harvest, partitioned plant parts were immediately placed in a freezer at –30 C until further analysis. Plant parts were then ground into a fine powder and 5 ml of acetone was added to extract ^{14}C-flumioxazin and possible metabolites. The remaining extracted stem and leaf material was oxidized and non-extracted ^{14}C quantified as previously described. The supernatant was analyzed utilizing Waters high performance liquid chromatography instrumentation (HPLC) to separate the parent herbicide from possible metabolites, which were identified and quantified using a Waters UV-spectrophotometer and a Packard in-line radioactive-detector. Comparing retention times from a ^{14}C-flumioxazin standard and the retention times within samples identified the parent herbicide. Total ^{14}C absorbed at 72 HAT was 77, 76, and 95% of applied at the 4, 8, and 12-leaf growth stages, respectively. Cotton at the 12-leaf stage absorbed more^{14}C within 48 HAT than was absorbed by 4 or 8-leaf cotton at 72 HAT. A majority (31-57%) of applied ^{14}C remained in the treated stem for all growth stages and harvest times. Treated cotton stems at all growth stages and harvest times contained higher concentrations (Bq/gram tissue dry wt.) of ^{14}C than any other tissue except at the 12-leaf stage 4 HAT which had less. Flumioxazin metabolites made up less than 0.05% of the applied ^{14}C and less than 5% of the absorbed ^{14}C found in the treated stem. Accumulation of metabolites in 4, 8, and 12-leaf cotton stems at 4, 24, 48, and 72 HAT was not significantly different. Flumioxazin metabolites in the treated leaf of 4-leaf cotton totaled 4% of the recovered ^{14}C 72 HAT. Flumioxazin metabolites in treated leaf of 12-leaf cotton totaled 35% of the recovered ^{14}C 72 HAT. These data suggest that differential absorption, translocation, and metabolism at various growth stages are the basis for differential tolerances of cotton to flumioxazin applied PDS. In cases where injury is observed on chlorophyllous cotton stems cotton after flumioxazin PDS treatments, injury results from localized high concentrations of flumioxazin on the treated stem area due to lower absorption into the stem (because of localized tissue damage from the herbicide) and the resulting lower levels of translocation throughout the plant compared to older cotton. In older cotton plants with a bark layer on the lower stem, less localized injury was observed due to woody (nonliving) outer layers of bark tissue and more rapid translocation of herbicide out of the treated stem area to areas where it may be metabolized. Also, lower concentrations in the treated stem despite continued flumioxazin absorption occur because of continued translocation, which serves to dilute the concentrations in the application zone. Application to older plants (more biomass) also dilutes flumioxazin concentrations as does metabolism in mature leaves.

DEVELOPING AN INTEGRATED MANAGEMENT PROGRAM FOR KUDZU. D.K. Jewett, K.O. Britton US Forest Service, Southern Research Station, Athens, GA, and J. Sun , Chinese Academy of Sciences, Beijing

ABSTRACT

Kudzu is a perennial, semi-woody, climbing legume; since the late 1800's, it has been introduced to North America as an ornamental, as forage for livestock, for improving soil and for preventing its erosion. By 1946, over 300,000 acres of kudzu had been planted throughout the United States. Although material planted here is from Japan, kudzu is native to southeast Asia. In China, an abundance of natural enemies and its cultivation prevent kudzu from becoming either an important economic or environmental liability (although it is not cultivated and is responsible for the death of small trees in Tai Bai Mountain Nat'l Forest Park, Shaanxi). In the United States, a variety of ways for managing populations of kudzu exist, including herbicides (like clopyralid), mechanical removal, and intensive livestock grazing. No method, however, yields convenient and economical suppression over large areas. Furthermore, use of many herbicides is or has been restricted near aquatic habitats and protected areas, including national parks and wildlife refuges. Because kudzu occupies land of varying habitats and propriety, relief often is significant and application of herbicides can be inconvenient, dangerous or both. For areas in which herbicide use is ill advised, alternate strategies for managing kudzu are being considered, including biological control. Briefly, the goal of biological control is balance between an invasive, exotic plant and its new habitat achieved with natural enemies. In China, an abundance of natural enemies, including sawflies, woodborers, and weevils has been documented in association with kudzu, and preparation for selecting potential biological control agents for release against populations in the United States has begun. Before selection can proceed, identity of populations in the United States must be verified, and their distribution and abundance must be documented. Incomplete systematic resolution is one obstacle to developing an integrated management program for kudzu because identity of populations in China and in the United States have not been reconciled, and potential biological control agents cannot be matched with their targets. Systematic resolution has been an obstacle to developing integrated management programs for other invasive, exotic plants, including leafy spurge, hoary cress, and spotted knapweed. Nine different species of kudzu are native to China, and distinction among three of them using morphological criteria is inconvenient and unreliable. Recent advancements concerning genetic distinction among specimens rely upon randomly amplified polymorphic DNA's (RFLP's) or amplified fragment length polymorphism (AFLP's). By differentiating amplification capacity of random primers, genetic profiles concerning specimens from thirteen geographically independent populations of kudzu and related taxa in China and in the United States have been generated and compared. Characterizing the limited number of specimens in this study using RFLP's supports varietal treatment of two species (*Pueraria montana* var. *lobata* and *P. chinensis*), but suggests a third plant (*P. montana* var. *montana*) should be treated as a separate species. A comprehensive scientific survey of populations in the United States has never been completed, but results of these molecular studies suggest its necessity. In response to this need, information concerning distribution and abundance of kudzu has been requested from extension agents in counties throughout the United States. They report more than one-million acres are occupied by kudzu in 2,300 counties, including ones in Oregon and Washington. This information is expected to help professionals survey populations of kudzu, verify their composition, identify their economic impact, document progress of their invasion, select sites for release of biological control agents, and measure success or failure of an integrated management program. Management of wild-land fires and invasive plants frequently are compared; general philosophy concerning both is the containment and eradication of small, sparsely distributed populations before they grow, combine and become unmanageable. As development of an integrated management program for kudzu proceeds, it is anticipated that herbicides will be applied to accomplish the former and biological control will be applied for the latter.

ACKNOWLEDGEMENTS We are grateful for the efforts of J.H. Miller (U.S. Forest Service, Auburn, AL), M.G. Cody, A.T. Dharman (U.S. Forest Service, Athens, GA), J. Tang (Anhui Agricultural University, Hefei, CN), T. Wu (South China Institute of Botanty, Guangzhou), and S. Kichman (Great Smoky Mountains Nat'l Park, Gatlinburg, TN).

SECOND-YEAR RESULTS FOR TANK MIXES OF OUST, ESCORT, AND ARSENAL APPLIED TO ABANDONED FIELDS BEING PLANTED IN LOBLOLLY PINES. J.A. Earl and R.A. Williams, Arkansas Agricultural Experiment Station and School of Forest Resources, University of Arkansas at Monticello, 71656.

ABSTRACT

Pine release from herbaceous competition has been a common practice to enhance plantation establishment. This is particularly important when converting an old field back into forest production, as the competition may have had several seasons to establish itself. This study looks at eight post-emergent herbicide applications using combinations of Oust, Escort, and Arsenal. Herbicide efficacy was measured approximately every 30 days in the first growing season, while also noting herbaceous competitors. Heights and diameters were measured initially, and at the end of the first two growing seasons. Results show that the industry standard rate of 2oz Oust+4oz Arsenal had significantly better growth by the end of year two. All herbicide treatments were still significantly different from the untreated checks for all growth data. Overall survival rate was around 79 percent. Year two's growth could have been impacted by an infestation of Nantucket tip moth.

INTRODUCTION

Pine release from herbaceous competition has been a common practice to enhance plantation establishment. This is particularly important when converting an old field back into forest production, as the competition may have had several seasons to establish itself. Herbicide applications for first-year plantations are usually most effective on seedlings planted at least one month prior to spraying; this gives the planting hole time to seal itself and keep the herbicide off the root tips (1). Treatments can be made either pre- or post-emergent, but studies have shown that application in late spring or summer have little or no effect (1,2). Studies have also shown improvement in height and diameter after some form of early-season herbaceous weed control (1,2,3).

In this study, we look at eight different tank mixes of Oust (sulfometuron methyl), Escort (metsulfuron methyl), and Arsenal (imazapyr) sprayed on first-year loblolly pine (*Pinus taeda* L.) seedlings planted in an abandoned field. Some treatments make use of a surfactant as well. Previous attempts to plant similar sites at the station (without the use of herbicides) failed due to high mortality caused by intense herbaceous competition. The objective here is to observe herbicide efficacy and potential crop tree injury, while also seeing if weed control improves survival to an acceptable level. Seedling performance will also be measured in an effort to see which herbicide, if any, significantly improves growth.

MATERIALS AND METHODS

The study was laid out on a 27-ac tract at the Pine Tree Research Station near Forrest City, AR (St. Francis Co). Soils are either a Calloway or Loring silt loam and are moderately well drained with a fragipan at a depth of 20 to 28 inches (4). For the previous two decades, the site had been in either dry-land soybeans (*Glycine max)* or grain sorghum (*Sorghum bicolor*) until it was machine-planted on 10 x 10 spacing with improved loblolly pine seedlings in late January 2000. The seedlings were purchased from Weyerhaeuser's Magnolia, AR nursery, and are from a first-generation North Louisiana seed source.

Four replications were established for the nine treatments, meaning that 36 plots were laid out. Each plot was set up so that there were 5 rows containing 5 trees each for a total of 25 measurement seedlings. Surrounding that 5x5 area were buffer rows at least two trees wide. All 36 plots were placed in a contiguous old field. After the plots were established and before spraying, treatments were assigned randomly to all 36 plots, giving the experiment a Completely Randomized Design (CRD) with 9 treatments and 4 replications.

Eight herbicide treatments were selected for comparison. There were four rates that used one ounce (a.i./ac) each of Escort and Oust with either four or six ounces of Arsenal AC and with or without a surfactant. Two rates used one ounce Escort with either four or six ounces of Arsenal AC and with or without a surfactant. There was one industry standard with two ounces Oust plus four ounces Arsenal AC, and finally a treatment with one ounce Escort plus two ounces Oust plus surfactant. There was one untreated control. All herbicides were mixed with water and sprayed at a volume of 10 gallons per acre. Seedlings were sprayed over-the-top using a twin nozzle spray rig attached to a four wheeler in mid-May of 2000. This was definitely a post-emergent application as the herbaceous competition was fully sprouted.

Heights (ft) and groundline diameters (in) were measured before treatment and after the first & second growing seasons. Initial measurements were evaluated using the Shapiro-Wilkes test to make sure the data were normal before analysis. Volume growth was computed using this formula: (current height – previous height) x (current diameter – previous diameter)^2. The incremental growth was analyzed with Proc GLM (5) as a CRD using increment as the dependent variable and treatment as the independent variable. Means were separated using Duncan's at an alpha level of 0.05. All 36 plots were tallied for initial survival, as well as at the end of the first and second growing seasons. The percentages were transformed using the Arcsin Squareroot technique to take them to an approximately normal distribution, then taken into SAS for analysis of variance.

For herbicide efficacy, two plots per treatment were evaluated every 30 days after treatment (DAT) through 150 DAT, and then again at the end of the first growing season (approximately 270 DAT). At each evaluation, a one square meter frame was placed over a randomly-chosen treatment tree, and percent bare ground and percent brownout were estimated ocularly. From these two measures, a percent green was calculated. Around July 1st of the first growing season, biomass samples were taken from the 4 control plots using a square frame one meter long on each side. Major herbaceous competitor species were identified, and then the samples were oven-dried and weighed. Projections for biomass per unit area were calculated.

RESULTS AND DISCUSSION

Herbicide efficacy and herbaceous competition

No new measurements for herbicide efficacy or herbaceous competitors were taken in the second year. From the first year results (6), it appears that the drought conditions created severe mortality among herbaceous competitors caused all treatments to be statistically the same. In terms of competition, Bermuda grass (*Cynodon dactylon* L. Pers.) was the toughest to control.

Height, diameter and volume growth

While 2001 had more favorable tree growing conditions than the year 2000, it also proved to be more favorable for the Nantucket pine tip moth (*Rhyacionia frustrana* Comstock). Visual estimates suggest that 98 percent or more of the seedlings in the study were affected. As the survival data suggests, it did not remove many trees from the study; however, it may have reduced both height and diameter growth.

Just as in year one, the seedlings still responded best to the industry-standard treatment of 2oz Oust+4oz Arsenal. Tables 1 and 2 show this treatment was clearly the top performer for height, diameter, and volume growth. Treatment 6 had nearly 2.2 feet of height growth in year two, while the next best treatments were in the range of 1.8-1.9 feet. The worst herbicides only averaged about 1.5-1.6 feet. All herbicides were significantly different from the untreated control. The best treatments averaged nearly 2/3 of an inch in diameter growth for the second year, while other treated plots ranged between 0.5 and 0.6 inches. By comparison, the untreated check only managed 0.35 inches of growth for 2001. Volume growth varied significantly among herbicides, but all were statistically greater than the control.

Survival

Survival in the second year was very similar to year one. Overall, the trees survived at a rate of 79 percent – losing only one percent for year two (Table 2). Most of the mortality was a direct result of drought conditions in the summer of 2000. With more even rainfall in 2001, only seven study trees were lost in the second season. While most trees did survive the summer, they did so in spite of a particularly bad infestation of tip moth. It still appears that the higher rates of Arsenal, plus the industry standard of Oust+Arsenal survived slightly better than the other treatments.

CONCLUSIONS

With drought conditions in the first year and tip moth in year two, these seedlings may have had factors other than herbicides to cause differences among treatments. Yet, just as in year one, the industry-standard rate of 2oz Oust+4oz Arsenal yielded the best results for height, diameter and volume growth. The other herbicide treatments (except treatments 2, 3 & 7) showed nearly similar results. All herbicide treatments were still significantly different from the untreated checks for all growth data. Given the more favorable climatic conditions, the gains realized in year one were continued through year two – in spite of the tip moth.

LITERATURE CITED

1. Haywood, J.D. 1988. Loblolly pine and herbaceous plant response to agricultural herbicides. P. 335-340 *in* Proc. of the Fifth Bienn. South. Silvic. Res. Conf. USDA For. Serv. Gen. Tech. Rep. SRS-1. 618p.

2. Shoenholtz, S.H. and B.L. Barber. 1988. The impact of herbicides on loblolly pine plantation establishment in east Texas. P. 341-348 *in* Proc. of the Fifth Bienn. South. Silvic. Res. Conf. USDA For. Serv. Gen. Tech. Rep. SRS-1. 618p.

3. Yeiser, J.L. 1998. Post-emergent control and pine seedling performance for Arsenal plus Escort or Oust treatments in SE Arkansas. P. 143-148 *in* Proc. South. Weed Sci. Soc., Birmingham, AL 423 p.

4. Gray, J.L. and V.R. Catlett. 1966. Soil survey of St. Francis County, Arkansas. USDA Soil Conservation Service in cooperation with the Arkansas Agricultural Experiment Station. Washington, DC: U.S. Government Printing Office. 81 p. and maps..

5. SAS Institute Inc. 1988. SAS/STAT user's guide. SAS Institute Inc., Cary, NC. 1028 p.

6. Williams, R.A and J.A. Earl. 2001. Efficacy of tank mixes of Oust, Escort, and Arsenal applied to abandoned fields being planted in loblolly pine. P. 114-117 *in* Proc. South. Weed Sci. Soc., Biloxi, MS 332 p.

Table 1. Comparison of height growth (ft) and groundline diameter growth (in) after two growing seasons

	2nd Season Growth [1]		Total Growth [1]	
Treatment[2]	Ht	GLD	Ht	GLD
1. 1oz Escort+1oz Oust+4oz Arsenal	1.89 b	0.62 ab	2.79 bc	0.77 b
2. 1oz Escort+1oz Oust+4oz Arsenal+3.2oz Entry II	1.60 c	0.55 cd	2.51 d	0.69 c
3. 1oz Escort+1oz Oust+6oz Arsenal	1.74 bc	0.50 d	2.58 cd	0.61 d
4. 1oz Escort+1oz Oust+6oz Arsenal+3.2oz Entry II	1.92 b	0.59 bc	2.82 b	0.75 b
5. 1oz Escort+6oz Arsenal	1.87 b	0.65 a	2.84 b	0.82 ab
6. 2oz Oust+4oz Arsenal	2.19 a	0.67 a	3.29 a	0.87 a
7. 1oz Escort+4oz Arsenal+3.2oz Entry II	1.59 c	0.50 d	2.44 d	0.61 d
8. 1oz Escort+2oz Oust +3.2oz Entry II	1.82 b	0.64 ab	2.83 b	0.79 b
9. Untreated control	1.09 d	0.35 e	2.13 e	0.41 e

[1]Means within a column sharing the same letter are not significantly different (Duncan's Multiple Range test, p=0.05)

[2]Product per acre

Table 2. Comparison of volume growth (in^3) and survival (%) after two growing seasons

Treatment[2]	Volume Growth[1] 2nd year	Volume Growth[1] Total	Survival[1] 1st year	Survival[1] 2nd year
1. 1oz Escort+1oz Oust+4oz Arsenal	10.2 b	23.0 bc	78 a	77 a
2. 1oz Escort+1oz Oust+4oz Arsenal+3.2oz Entry II	6.8 d	16.2 d	76 a	74 a
3. 1oz Escort+1oz Oust+6oz Arsenal	7.1 cd	15.2 d	87 a	86 a
4. 1oz Escort+1oz Oust+6oz Arsenal+3.2oz Entry II	9.0 bc	21.7 c	86 a	85 a
5. 1oz Escort+6oz Arsenal	11.2 b	26.9 b	87 a	85 a
6. 2oz Oust+4oz Arsenal	13.9 a	34.5 a	88 a	88 a
7. 1oz Escort+4oz Arsenal+3.2oz Entry II	5.4 d	12.1 d	71 a	71 a
8. 1oz Escort+2oz Oust +3.2oz Entry II	10.9 b	25.5 bc	76 a	76 a
9. Untreated control	2.5 e	6.6 e	68 a	68 a

[1]Means within a column sharing the same letter are not significantly different (Duncan's Multiple Range test, p=0.05)

[2]Product per acre

TOXICITY, ABSORPTION, TRANSLOCATION, AND RAINFASTNESS OF GLYPHOSATE IN TRUMPETCREEPER (*Campsis radicans*). D. Chachalis, Greek National Research Foundation, Institute of Plant Protection of Volos, Volos, Greece; and K.N. Reddy, USDA-ARS-Southern Weed Science Research Unit, Stoneville, MS 38776.

ABSTRACT

Trumpetcreeper is a perennial, deep rooted, difficult-to-control weed found in row crops of the Mississippi Delta. Although trumpetcreeper produces numerous seeds in noncultivated areas, propagation is mostly vegetative under normal agronomic practices. Trumpetcreeper has an extensive deep root system with numerous adventitious root buds that are underground regenerative organs capable of producing shoots. Although greenhouse studies have shown good control with glyphosate at 1.1 kg/ha, under field conditions trumpetcreeper control is only temporary and plants recover even with higher rates (3.36 kg/ha) of glyphosate. To obtain effective control in perennial weeds such as trumpetcreeper, sufficient glyphosate must be absorbed and translocated to meristematic regions (buds) of rootstock. Use of glyphosate mixtures with other herbicides often produces synergistic interactions. Pelargonic acid has previously been shown to increase glyphosate activity in other species. Greenhouse and laboratory experiments were conducted to study the effect of rainfall on glyphosate activity; to characterize absorption, translocation, and distribution of ^{14}C-glyphosate in trumpetcreeper; and study the effect of pelargonic acid on activity, absorption, and translocation of ^{14}C-glyphosate in trumpetcreeper.

Trumpetcreeper rootstocks were collected in 2000 from field-grown plants near the Southern Weed Science Research Unit Farm, Stoneville, MS. Rootstock segments (6-cm) were planted in soil in pots and were grown in greenhouse. Greenhouse conditions were maintained at 30/25 C (± 3 C) day/night temperature with a 14-h photoperiod. Herbicide solutions were applied to plants at the four- to six-leaf stage (about 20-cm tall) using an indoor spray chamber. Roundup Ultra formulation of glyphosate was used in the study. Simulated rainfall of 2.5 cm water was applied at 6, 24, 48, 96, and 192 h after treatment (HAT) using a rainfall simulator. Percent shoot dry weight reduction (i.e., control) was recorded at 3 wk after treatment. Absorption and translocation of ^{14}C-glyphosate was measured using standard techniques. The effect of pelargonic acid (0.5, 1.5, and 3.0%; v/v) on glyphosate (0.56 and 1.12 kg/ha) activity was determined as percent shoot dry weight reduction. The effect of 3% pelargonic acid on absorption and translocation of ^{14}C-glyphosate was measured using standard techniques. All experiments were conducted in a randomized complete block design with four replications and repeated.

A simulated rainfall of 2.5 cm (7.5 cm/h intensity) after 48 HAT had no effect on glyphosate activity, but within 24 HAT reduced efficacy by 19% compared with no simulated rainfall in trumpetcreeper. Absorption of ^{14}C-glyphosate increased from 2.3% to 20.2% and translocation from 0.4% to 10.5% from 6 to 192 h after application. At 192 HAT, radioactivity was distributed throughout the plant with ^{14}C accumulation decreasing in the order of: treated leaf > rootstock > roots > below treated leaf = above treated leaf > opposite leaf to treated leaf. The addition of pelargonic acid to glyphosate did not improve glyphosate activity or affect the pattern of absorption and translocation of ^{14}C-glyphosate. These results suggest that a longer period of leaf exposure to herbicide is critical for adequate glyphosate absorption and translocation to rootstocks to prevent production of new sprouts from underground rootstocks.

ISOLATION OF DISTINGUISHABLE CLASSIFICATION FEATURES FOR PITTED MORNINGGLORY (*IPOMOEA LACUNOSA* L.) FROM HYPERSPECTRAL REMOTE SENSING DATA. T.H. Koger, D.R. Shaw, W.B. Henry, and F.S. Kelley, Department of Plant and Soil Sciences, Mississippi State University; L.M. Bruce, Department of Electrical and Computer Engineering, Mississippi State University, Mississippi State, MS 39762; and K.N. Reddy, USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS 38776.

ABSTRACT

Hyperspectral sensors are capable of collecting reflectance data in more than 1500 spectral bands that may span as many as five portions (ultraviolet to mid-infrared) of the electromagnetic spectrum. However, little research has been conducted concerning weed detection capabilities with hyperspectral data, and most data analysis techniques are often overwhelmed due to the vast amount and high dimensionality of data collected with hyperspectral sensors. Thus the objective of this research was to identify a select number of bands derived over a wide range of the spectrum (350- to 2500-nm) from hyperspectral data that can be used to accurately detect pitted morningglory in soybean across a wide range of weed growth stages and background soil reflectance environments.

Experiments were conducted in 2001 at the USDA-ARS Southern Weed Science Research Unit, Stoneville, MS, and the Plant Science Research Center, Starkville, MS. Each experiment was arranged in a randomized complete block with a split-split plot factorial arrangement of treatments. Each treatment was replicated four times and the sub-sub plot size was 4.5 by 12.0 m. The main plot factor was cover crop residue. Residues of native vegetation, 'Maton' rye (*Secale cereale* L.), and hairy vetch (*Trifolium incarnatum* L.) were evaluated in till and no-till subplots. Rye (90 kg/ha) and hairy vetch (45 kg/ha) was drilled in 19 cm rows in mid-October 2000. In mid-April 2001, all plots were desiccated with 1.1 kg ai/ha paraquat, and tilled plots were disked twice two days following paraquat application. Glyphosate resistant soybean cultivar 'Asgrow 4702 RR' was planted in 57 cm rows in all plots in early May. The absence of presence of pitted morningglory was the sub-subplot factor, and was evaluated in each residue by tillage combination. Pitted morningglory seed was planted in nine 1.0-m^2 quadrates in the center of each pitted morningglory plot. Once emerged, pitted morningglory populations were thinned so that each 1.0-m^2 quadrate contained 4 plants. This population was maintained throughout the duration of the experiment by hand-pulling excess pitted morningglory and other weeds as needed. All weeds in remaining area of pitted morningglory plots and entire weed-free soybean plots were controlled with glyphosate as needed. When pitted morningglory was in the cotyledon to 3-leaf, 2- to 5-leaf, and 4- to 8-leaf growth stages, eight hyperspectral reflectance measurements were collected from each pitted morningglory intermixed with soybean and weed-free soybean plot. Each reflectance measurement contained 2151 individual spectral bands with a bandwidth of 1.4 nm between 350 and 1050 nm and 1.0 nm between 1000 and 2500 nm. Spatial resolution for each reflectance measurement was 0.25 m. The ten individual (1.0 or 1.4 nm) bands having the highest power to discriminate pitted morningglory intermixed with soybean and weed-free soybean across the tillage and residue systems, pitted morningglory growth stages, and for each location were selected using stepwise discriminant analysis. All bands were selected at the $P<0.15$ significance level. Each hyperspectral reflectance curve was dissected into forty-three 50-nm bands, and each selected individual band (1.0 or 1.4 nm) was allocated accordingly. Based on where the most selected 1.0 or 1.4 nm bands occurred in the spectrum, eight 50-nm bands (centered on 375-, 425-, 575-, 725-, 925-, 975-, 1125-, and 1375-nm) were selected and used as classification variables in Fisher's linear discriminant analysis to discriminate pitted morningglory intermixed with soybean and weed-free soybean within and across tillage and residue systems. To test the versatility of the 50-nm bands, linear discriminant functions developed for one location were utilized to discriminate reflectance data for pitted morningglory intermixed with soybean and weed-free soybean collected from the opposite location.

Tillage and residue systems had less impact than pitted morningglory growth stage on the ability to discriminate pitted morningglory intermixed with soybean and weed-free soybean. Discrimination accuracy was between 71 and 77% at the cotyledon to 3-leaf and 90 to 95% at the 4- to 8-leaf pitted morningglory growth stages within and across all tillage and residue systems. Using the discriminant function developed for one location to test data from the opposite location also resulted in better discrimination capabilities within and across all tillage and residue systems, with 68 to 89% and 50 to 60% correct discrimination at the 4- to 8-leaf and cotyledon to 3-leaf pitted morningglory growth stages. This research reveals potential for identifying certain spectral bands, from a larger hyperspectral data set, that can be used for accurate detection of small weeds (2- to 5-leaf pitted morningglory) across a variety of tillage and residue systems. The ability to detect small early season weeds is also very promising, as this is the time frame in which most weed control is most crucial for minimizing impact on crop yield.

CHEVROLET, FORD OR DODGE GLYPHOSATE. B.A. Hinklin, J.A. Kendig, P.M. Ezell and G.A. Ohmes, University of Missouri Delta Center, Portageville, MO 63873

ABSTRACT

Since the public release in 1996, glyphosate-tolerant soybeans acreage has continued to increase. It is estimated that 80% of Missouri acres were planted in Roundup Ready this past season. An increase in acreage means an increasing market share for Monsanto's Roundup herbicides and a decrease in market share for more conventional herbicides. This shift has prompted many companies to begin marketing their own glyphosate compounds. This will likely result in intense marketing efforts, along with implied advantages to one version of glyphosate over another. So is there a difference between a Chevy, Ford or Dodge glyphosate or do we buy one over the other because of cost, rebates, friendliness, or because we have always driven a Chevy?

Growers are interested in unbiased comparisons of the various products. With this in mind, we compared 15 glyphosate products for efficacy in glyphosate-tolerant soybean. The study was established June 11 of 2001 at the University of Missouri Delta Center Lee Farm located outside of Portageville, Missouri. The soil was a Tiptonville fine sandy loam with 1.5% organic matter and pH of 6.1. Soybean 'Pioneer 95B32RR' was planted on 30 inch rows and the study utilized a randomized block design with 4 replications. Treatments are listed in Table 1. Glyphosate was applied at 0.75 lb ae/A and surfactant (AG-98) was added as recommended to formulations that did not have a full surfactant load. Standard weed science methods were used to apply treatments. Treatments were applied early-post (4- to 6-inch weeds) 15 days after planting and then retreated early-post 17 days later. Rates are given in fluid ounces (weight ounces for Roundup Ultra Dry) per acre as formulation details were not completely clear.

Weed control ratings were taken 14 days after the first application and 13 days after the second application. Weeds evaluated in the test included ivy/entireleaf morningglory (Ipomoea hederaceae, IPOHE), common cocklebur (Xanthium strumarium, XANST), Palmer amaranth (Amaranthus palmeri, AMAPA), and large crabgrass (Digitaria sanguinalis, DIGSA). Data were subjected to analysis of variance and means were separated using Fisher's Protected LSD.

Two weed control ratings were taken. The first rating had the most variance, while the second ratings, taken after the second application, were always close to 100%. Fourteen days after the first application, weed control was generally between 85 and 95% with no statistical difference between treatments. Thirteen days after the second application all glyphosate treatments provided 100% control of crabgrass and common cocklebur, 95% control of Palmer amaranth, and 90% control of ivyleaf morningglory. There was no difference in weed control among herbicide treatments after the second application. These plots remained weed free through harvest. No crop injury was observed at any rating. There was no difference in soybean yields for all glyphosate treatments.

This study supports previous research which indicates that two applications of glyphosate provides good broad-spectrum weed control. Growers must consider business factors such as price, guarantees, replant programs and customer service; however efficacy does not appear to be an issue. Producers choice of glyphosate may mirror how they choose pickup trucks.

USE OF GLYPHOSATE-SUSCEPTIBILITY TO IDENTIFY PITTED MORNINGGLORY (*IPOMOEA LACUNOSA*) ECOTYPES. D.O. Stephenson, IV, L.R. Oliver, J.W. Barnes, J.A. Bond and E.R. Walker; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72701

ABSTRACT

Experiments were conducted in 2000 and 2001 at the Arkansas Agricultural Research and Extension Center in Fayetteville to investigate the possible existence of pitted morningglory ecotypes based on their susceptibility to glyphosate. Seed samples (accessions) were collected from areas in the United States where pitted morningglory grows indigenously. Prior research on pitted morningglory morphology has provided evidence that ecotypes exist with differing leaf size and shape, vine length, and date of first flower initiation that were latitude dependent.

A randomized complete block experimental design with four replications was utilized. Each accession was planted in individual plots, which consisted of a treated and a nontreated row. Plants were thinned to six per meter one week after emergence. Glyphosate at 0.84 kg ae ha^{-1} was applied when each individual accession reached a total plant length of 10 to 20 cm. Control ratings (0 = no control; 100 = death) were recorded 7, 14, and 21 days after treatment (DAT) along with treated and nontreated plant biomass that was collected 2 days after the 21 DAT rating. Statistical analysis was conducted through the use of analysis of variance and means were separated by Fisher's Protected Least Significant Difference test at the 0.05 significance level. Only 21 DAT control ratings are presented. Biomass weights for all accessions were not different, so data are not presented.

Data were combined due to a lack of an accession by year interaction. Accessions presented include northeast Missouri (MO), northeast North Carolina (NC), west Tennessee (TN), northeast South Carolina (SC), east and west-central Mississippi (MS), northeast and southeast Louisiana (LA), south-central Georgia (GA), and northeast, east and west-central, southwest, and southeast Arkansas (AR). In 2000 and 2001, all accessions reached the application window simultaneously; therefore glyphosate was applied to all accessions on the same day. Furthermore, all accessions had 2 to 3 leaves and were 11 to 14 cm in length at glyphosate application in both years. Consequently, differences in control did not result from differing growth habits or environmental conditions. A trend in decreasing control was noticed that corresponds with decreasing latitude. The only exception to the trend was the east-central MS accession, which was controlled 87%. Northeast NC, west TN, and east-central MS obtained higher control ratings than both Louisiana accessions and the south-central GA accession with average controls of 87 and 75%, respectively. There was no difference in accessions collected from the central area of pitted morningglory's native range. Accessions differed in their susceptibility to glyphosate even though the environmental conditions and plant size were similar at glyphosate application. Due to the differing susceptibilities to glyphosate that were observed, the existence of pitted morningglory ecotypes are probable.

EFFECTS OF COMMERCIAL DRIFT CONTROL ADJUVANTS ON DROPLET SIZE, EFFICACY AND SPRAY PATTERN WITH ROUNDUP ULTRA®. J.A. Garr, J.E. Hanks and G.D. Wills. Garrco Products, Inc., Converse, IN; USDA-ARS, Stoneville, MS; and Delta Research and Extension Center, Stoneville, MS.

ABSTRACT

Studies were conducted at Stoneville, MS to investigate the effects of one experimental and six commercially available drift control polymers on spray droplet size, spray pattern and efficacy of velvetleaf (*theophrasti* Medicus) when applied with Roundup Ultra®. Solutions were mixed in large enough quantities to allow the field, patternator and droplet analyses to be conducted without having to re-mix solutions. The same nozzles were used for all three studies. A Malvern laser particle analyzer was used to determine the volume median diameter and percent spray volume in droplets less than 144 microns. The Malvern instrument was in an enclosed chamber with the nozzle installed on a mechanical traversing system. The nozzles were positioned at a height above the laser beam to allow the entire width of the spray pattern to be traversed through the laser beam. Droplet analyses were repeated three times for each solution. The patternator consisted of corrugated metal with corrugations spaced 5 cm apart and slightly sloped to allow sprayed solution to collect in test tubes placed at the end of each corrugation. Spray solution collected in the test tubes provided a visual characterization of the spray pattern and the amount of solution collected in each test tube was recorded. The patternator was setup in an enclosed spray chamber to provide minimal air disturbance to the spray pattern. Nozzles removed from the field spray boom were used in the patternator test and calibrated to supply the same output as the field sprayer. Three replications were made with each solution with the amount of collected solution in each test tube being averaged to generate a representative graph of the spray pattern. Plots consisted of four rows spaced 1-m apart by 12-m long planted with conventional soybeans and eight rows of velvetleaf (*theophrasti* Medicus) planted perpendicular to the soybeans in rows spaced 1-m apart. Applications were made with a 4-row boom mounted on a John Deere 2355 tractor equipped with an air compressor to pressurize the spray system. Spraying Systems Turbo TeeJet® 110015vs nozzles were used and calibrated to apply 94 L/ha at 7.4 km/hr. Array, Spray Start, 41-A, Pointblank, Placement and Control were the six commercially available adjuvants and GP D1 was the one experimental product. Each product was applied at two rates with Roundup Ultra® at 0.6 kg ai/ha. All solutions contained an equal amount of ammonium sulfate. Roundup Ultra was applied with and without ammonium sulfate. Visual ratings (0-100) were recorded 3 WAT.

Volume median diameter and percent spray volume in droplets less than 144 microns was basically the same for solutions without drift control polymer added, but volume median diameter was increased and percent spray volume in droplets less than 144 microns was decreased with all polymers. Volume median diameter ranged from 205 microns without polymer to 487 microns with polymer and the percent spray volume in droplets less than 144 microns ranged from 29.4 percent without polymer to 7.0 percent with polymer. This indicated a significant reduction in the drift potential when drift control polymers are used. The spray pattern was distorted for two of the solutions with drift control polymers, but efficacy was unaffected with these two polymers. Efficacy was very good ($\geq$ 80%) for all treatments and ranged to 96%. Roundup Ultra without any additive resulted in the lowest control and was significantly lower than Roundup Ultra with ammonium sulfate only, indicating the ammonium sulfate was providing the additional control rather than the addition of drift control polymers. The addition of drift control polymers did significantly reduce the potential for drift.

ADSORPTION OF ATRAZINE FROM VARIOUS LAKE SEDIMENTS IN TEXAS. J.A. Vader, S.A. Senseman, Department of Soil and Crop Sciences, Texas Agricultural Experiment Station, College Station, TX 77843-2474; M.C. Dozier, Department of Soil and Crop Sciences, Texas Cooperative Extension, College Station, TX 77840.

ABSTRACT

Atrazine, a widely used herbicide in corn and sorghum, has been detected in various surface water sources in Texas. Detection of atrazine in surface water has been well documented, but it's partitioning onto sediment has received little attention. This study was conducted to determine the relative adsorption of atrazine to various lake sediments in Texas. Results from this study will help determine if sediment is a significant reservoir for atrazine and a periodic source of atrazine lake contamination. Sediment from eight Texas lakes was collected using an Eckman dredge. The samples were placed in a sealed plastic bag and placed on ice until they were returned to the laboratory. Upon arrival, the samples were dried and sieved through a 2-mm sieve. A portion of the sediment (100 g) was used for characterization. Sub samples of 2-g were placed in 35-ml centrifuge tubes. Initial standard solutions were made using a radiolabeled atrazine standard combined with analytical grade atrazine in methanol. One hundred uL of the initial standard solution was placed in a centrifuge tube for each sample along with 5 mL of 0.01M $CaCl_2$ solution. Radiolabeled atrazine was added such that each sample contained approximately 2000 disintegrations per minute (dpms). The samples were then placed on a table shaker and shaken for 24 h. Tubes were then removed and centrifuged for 10 min at a speed of 3.2 x g relative centrifugal force (RCF). A 2-mL aliquot was then removed from the supernant of each sample and placed in glass scintillation vial along with 10 mL of scintillation fluid. The samples were then placed on a Beckman LS6500 Multipurpose scintillation counter. Each sample was counted in counter for 20 min. This experiment was replicated four times. Values for K_d were determined by the Freundlich equation. Values for K_d ranged from 0.23 to 2.14. The differences were assumed to be due to characteristic differences of the sediment samples. Therefore, the potential exists for varying contamination based on sediment characteristics.

WEED SPECIES AND HERBICIDE APPLICATION EFFECTS ON CROP CANOPY REFLECTANCE.
C.R. Medlin, W.J. Everman, and L.B. Johnston; Department of Plant and Soil Sciences, Oklahoma State University, Stillwater, OK 74078; and Department of Botany and Plant Pathology, Purdue University, West Lafayette, IN 47907.

ABSTRACT

Experiments were conducted to evaluate the accuracy of remote sensing technology for detecting species-specific weed infestations and canopy reflectance changes due to postemergence herbicide applications. Velvetleaf, giant ragweed, common lambsquarters, giant foxtail and weed-free plots were established with and without drilled soybeans in May of 2001. Separate experiments were also established to determine the reflectance response patterns of corn when treated with postemergence herbicides. Ground-based reflectance measurements were collected approximately ten weeks after planting with a field spectrometer. Using the reflectance readings, models were formed to differentiate among the weed species or herbicide treatments. Weed differentiation models were nearly 100% accurate when models were created and used to classify data from the same site. Classification accuracy dropped to near 0%, when models were used to classify data collected from other locations. However, both models distinguished weedy from weed-free plots with at least 80% accuracy regardless of the source of the test data set. Ground-based reflectance measurements of herbicide treated corn plots were collected six weeks after planting. One to one comparisons of the untreated plots vs. each treatment were used to determine canopy reflectance changes due to the herbicide treatment. Atrazine and primisulfuron-methyl treated plots were indistinguishable from the untreated check, while all other herbicide treatments altered the reflectance of the crop canopy.

INTERACTIONS OF SELECTED FUNGICIDES AND HERBICIDES APPLIED POSTEMERGENCE TO PEANUT (*ARACHIS HYPOGAEA* L.). J.E. Lanier, D.L. Jordan, A.S. Culpepper, W.J. Grichar, J.E. Tredaway-Ducar, and B.J. Brecke, Department of Crop Science, North Carolina State University, Raleigh, NC 27695, Department of Crop and Soil Science, University of Georgia, Tifton, GA 31793, Texas Agricultural Experiment Station, Yoakum, TX 77995, Department of Agronomy, University of Florida, Gainesville, FL, and University of Florida Agricultural Research Center, Jay, FL 32565.

ABSTRACT

Timing of application of herbicides, fungicides, and foliar fertilizers applied to peanut often coincide. Determining if these agrichemicals are compatible is important when developing pest management strategies for peanut. Experiments were conducted from 1997 through 2001 in Georgia, Florida, North Carolina, and Texas to evaluate compatibility of selected postemergence herbicides applied in mixtures with fungicides or foliar fertilizers. Treatments were applied to weeds 5 to 15 inches tall using standard small-plot equipment. Weed Control was estimated visually approximately 2 weeks after application.

Annual grass control, consisting of large crabgrass (*Digitaria sanguinalis*), Texas panicum (*Panicum texanum*), broadleaf signalgrass (*Brachiaria platyphylla*), and goosegrass (*Eleusine indica*), by clethodim was reduced in 82, 63, 60, and 42% of the experiments when applied with copper-based fungicides (Kocide, Mankocide, Tenn-cop), fungicides containing chlorothalonil (Bravo Weather Stik, Bravo Ultrex, Echo, Bravo Weather Stik plus propiconazole), azoxtstrobin (Abound), and iprodione (Rovral), respectively. Fluazinam (Omega 500), tebuconazole (Folicur), and propiconazole (Tilt) did not reduce efficacy of clethodim. Efficacy was reduced more when clethodim and fungicides were applied in a spray volume of 25 gallons/acre compared with 10 gallons per acre. Efficacy of acifluorfen, imazethapyr, and 2,4-DB applied with fungicides was also compared. Smooth pigweed (*Amaranthus hybridus*) control by 2,4-DB was reduced in at least 2 of 3 experiments when applied with chlorothalonil (Bravo Weather Stik, Bravo Ultrex, Bravo Weather Stik plus Tilt), copper-based fungicides (Kocide, Mankocide), tebuconazole, azoxystrobin, or fluazinam. Iprodione did not affect efficacy of 2,4-DB. Copper-based fungicides reduced smooth pigweed control by imazethapyr. However, chlorothalonil, propiconazole, tebuconazole, fluazinam, fluotolanil plus propiconazole, and propiconazole plus trifloxystrobin did not reduce efficacy of imazethapyr. Smooth pigweed control by acifluorfen was reduced in 1 of 3 experiments when applied with tebuconazole. However, chlorothalonil, azoxystrobin, propiconazole, or fluazinam did not affect efficacy. While most fungicides did not affect efficacy of acifluorfen and imazethapyr, growers should avoid applications of 2,4-DB with fungicides when controlling smooth pigweed. These data suggest that growers should avoid applying all postemergence herbicides with copper-based fungicides.

Commercially available formulations of manganese and boron had no effect on clethodim and sethoxydim control of corn (*Zea mays* L.). Sicklepod (*Senna obtusifolia*) suppression by imazethapyr and 2,4-DB was reduced by both manganese and boron formulations in some but not all instances.

BIOCHEMICAL INTERACTIONS OF *MYROTHECIUM VERRUCARIA* ON WEEDS. R.E. Hoagland* and C.D. Boyette. USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS.

ABSTRACT

Bioherbicides are phytopathogenic micro-organisms or microbial compounds that possess phytotoxic properties that can be utilized for weed control. *Myrothecium verrucaria* (Alb. & Schwein.) Ditmar: Fr. is a fungal bioherbicide that can cause substantial injury and/or mortality to various weed species. Compounds including certain herbicides have been shown to interact with various pathogens resulting in antagonism or synergism of the corresponding injury to plants. Most of these herbicide:pathogen interactions have been reported for pathogens that affect crop plants, whereas this phenomenon has received only sparse attention for pathogens that infect weeds as their primary hosts. There is also a similar lack of information on the biochemical responses of weeds to such pathogens, and nearly all literature available on this subject has focused on cultivated crops. Thus, our objectives were to further examine the effects of *Myrothecium verrucaria* alone, and in combination with the herbicide glyphosate [*N*-(phosphonomethyl)glycine], on injury to kudzu [*Pueraria lobata* (Willd.) Ohwi], and to examine the effects of this bioherbicide on injury and marker enzymes in hemp sesbania (*Sesbania exaltata*) and sicklepod (*Senna obtusifolia*).

Fungal disease development in kudzu caused by *M. verrucaria,* increased at temperatures above 20^{o}C. The herbicide glyphosate exhibited synergistic interactions with *M. verrucaria* on kudzu. Dehydrogenase and general hydrolytic enzyme activities using the substrates triphenyltetrazolium chloride and fluorescein diacetate respectively, were significantly higher in bioherbicide-treated sicklepod and hemp sesbania tissues compared to untreated tissues. The bioherbicide at 3.5 x 10^6 spores per ml killed 4-day-old sicklepod and hemp sesbania seedlings, 96 h after application. Results showed that combinations of glyphosate can act additively or synergistically to improve the bioherbicidal potential of *M. verrucaria* for kudzu control and that general enzyme activities in two weeds were altered after pathogen infectivity.

EFFECT OF GLYPHOSATE ON POLLEN DEVELOPMENT OF GLYPHOSATE-RESISTANT CROPS AND SELCETED WEED SPECIES. W.E. Thomas, W.A. Pline, R. Viator, J.W. Wilcut, K.L. Edmisten, and R. Wells. North Carolina State University, Raleigh, NC 27695.

ABSTRACT

Recent research has shown that registered glyphosate treatments to glyphosate-resistant cotton negatively affect floral morphology and pollen viability. Even though yield reductions have not been reported with glyphosate-resistant corn, experiments similar to the cotton studies were designed to evaluate corn pollen production and viability. Two runs of the experiment were conducted in the North Carolina State University Phytotron greenhouse with controlled environmental conditions. Glyphosate treatments were applied at 1.12 kg ae/ha. Treatments included an untreated check, a 6-leaf stage foliar application, a 10-leaf foliar application, and a 6-leaf foliar application followed by a 10-leaf foliar application. According to the glyphosate supplemental label, it can be applied up to the 8-leaf stage or 30 inches in height. When the tassels emerged, they were immediately covered with a paper bag to capture released pollen. Anthers and pollen in the sample were collected on the first day of anthesis, 2 d after anthesiss (DAA), 4 DAA, and 11 DAA. All samples were weighed and a subsample was used for pollen viability assessment. With respect to pollen viability, two techniques were used. The fluorochromatic reaction, a histochemical technique, examines the integrity of the plasma membrane and the presence of esterase activity in pollen cytoplasm. The other stain called Alexander's stain estimates pollen wall integrity and cytoplasm differentiation. On the first day of analysis, the two methods provided similar estimates of pollen viability. Thus, Alexander's stain was used for the remainder of the test. All glyphosate treatments negatively influenced total pollen production. The 6-leaf stage, 10-leaf stage, and 6-leaf stage followed by 10-leaf stage treatments caused 21, 51, and 52% reduction in anther and pollen production compared to the untreated check, respectively. Pollen viability also has shown a similar response to these treatments. Glyphosate as a 10-leaf foliar treatment and 6-leaf plus 10-leaf foliar treatment reduced pollen viability to 60 and 57% respectively, compared to 99 and 98% viability in the untreated and 6-leaf foliar treatments.

Since some weed species have shown tolerance to glyphosate, similar experiments were designed to evaluate their floral structure and pollen viability. Sicklepod (*Senna obtusifolia*) and ivyleaf morningglory (*Ipomoea hederacea*) were subjected to various sublethal rates at different growth stages to estimate total shoot biomass, floral morphology, pollen viability, and seed set. Previous research has shown that late season applications of glyphosate reduced seed quality and quantity. These preliminary studies were done to find the most optimal rate of application and the most appropriate staining techniques. Preliminary data indicates that glyphosate alters pollen viability in sicklepod and possibly floral structure in ivyleaf morningglory similar to what has been reported in glyphosate-resistant corn and cotton.

CONTRIBUTION OF SEED RE-DISPERSAL IN *HELIANTHUS ANNUUS* L. PATCH PERSISTENCE.
M.G. Burton* and D.A. Mortensen. Department of Crop Science, North Carolina State University, Raleigh, NC 27695; and Department of Crop and Soil Sciences, The Pennsylvania State University, University Park, PA 16802.

ABSTRACT

Successional annuals are often observed to occur and persist in depressions and low-laying landscape positions. Multivariate and multiple regression analyses of the distribution of some large-seeded forbs (*Abutilon theophrasti* Medic., *Helianthus annuus* L.) confirm an inverse association of these species with elevation. Seed dispersal has been previously described for many plant species (plumed, non-plumed and explosively dehiscent). Likewise, a growing body of literature discusses the anthropogenic sources of propagule re-dispersal for successional annuals. No known studies have been conducted to confirm and quantify post-dispersal movement of seeds by erosive forces of wind and water in agroecosystems (except, for example, plants with obvious mechanism for dispersal such as the "tumbleweeds" (i.e., *Kochia scoparia* and *Salsola iberica*) or seeds with a pappus (e.g., *Taraxacum officinale* and *Asclepias syriaca*).

Two dispersal tracts were established seven days after crop planting in 1999. The tracts were separated by >200 m but were similar in terms of length, slope, and orientation. Each tract was 105 m long and 7.6 m wide (10 crop rows). Five-thousand seeds were mixed into the top 5 cm of soil in each of the middle four crop interrow spaces (i.e., 20,000 seeds in each dispersal "band") at 0, 35, 70, and 105 m from the tract low point. Seeds dispersed to each band were painted a different color. Two weeks after dispersal, seeds were mapped to 1.00 X 0.76 m (crop row width) grid cells. Only intact seeds were counted. Two irrigation and one rainfall event occurred during the experiment.

Except as a consequence of rodent activity, *Helianthus annuus* seeds were almost always observed re-dispersed to downslope locations. Winds, which were predominantly orthogonal to the transect length, did not move seeds more than a few meters. At most, 1.4% of seeds dispersed at a band were recovered on the soil surface. Seeds dispersed to band A were not observed in other locations and appeared to have been buried by eroded silts, clay and residues. On the contrary, seeds dispersed to higher landscape positions (e.g., band D) were predominantly moved to lower slope positions, sometimes long distances (up to 105 m) in only two weeks. Seed re-dispersal is believed to be an important factor in both moving seeds to favorable areas in arable land (areas with higher SOC and herbicide sorption) and in constraining seed dispersal and re-dispersal out of such areas). Immigration appears to contribute to patch seed density in low landscape positions without losses due to emigration.

PHYSIOLOGICAL BASIS FOR CGA 362622 ANTAGONISM OF CLETHODIM FOR GOOSEGRASS CONTROL. I.C. Burke, S.C. Troxler, W.E. Thomas, and J.W. Wilcut. Department of Crop Science, North Carolina State Univeristy, Raleigh, NC 27612.

ABSTRACT

Laboratory and greenhouse studies were conducted to determine the effect of CGA 362622 on absorption, translocation, and metabolism of clethodim in goosegrass [*Eleusine indica* (L.) Gaertn.], and to examine the effect of CGA 362622 on fresh weight accumulation and photosynthetic rate of actively growing goosegrass. For the absorption and translocation study, herbicide treatments were main plots, harvest timings were subplots, and plant portions were subsubplots in a split plot treatment arrangement. The metabolism study had an identical treatment arrangement. All studies were repeated in time. When plants reached the four leaf stage, the second fully expanded leaf was covered. The plants were sprayed with two non-radiolabeled mixtures, either clethodim (140 g ai/ha) alone or a mixture of clethodim and CGA 362622 (5 g ai/ha). Immediately after application, 5 1-μL droplets of ^{14}C-clethodim solution containing ^{14}C-clethodim (1.7 kBq of radioactivity), Selectä 2EC, deionized water, crop oil concentrate, and/or CGA 362622 were placed on the adaxial surface of the second fully expanded leaf. Plants were harvested at 0.5, 1, 4, 8, 24, or 96 h after treatment (HAT) and then divided into the treated leaf, roots, shoot above and shoot below the treated leaf. For absorption and translocation, plant parts were oxidized to recover ^{14}C. For metabolism, plants were harvested at 4, 8, 24, or 96 HAT, and only the treated leaf contained sufficient ^{14}C for detection. The ^{14}C was extracted, concentrated, and fractionated using high performance liquid chromatography. For the growth analysis and photosynthetic rate experiments, treatments were non-treated and CGA 362622 (5 g ai/ha) treated plants. Treatments were replicated four times and the experiments were repeated in time. For growth analysis, plants were harvested immediately and at 2, 4, 6, or 8 days after treatment (DAT) and above ground fresh weights were recorded. For photosynthetic rate measurements, single leaf photosynthetic rates were measured with a portable photosynthesis system, which included a 0.25 L chamber used to enclose the middle portion of the second uppermost fully expanded leaf. To ensure light saturation, measurements were made between 1100 and 1300 EST. Measurements were made just before herbicide treatment and 1, 2, 6, and 8 DAT.

Absorption was 28% of applied ^{14}C-clethodim at 0.5 h, and 87% of applied ^{14}C-clethodim at 96 h, regardless of the presence of CGA 362622. Clethodim exhibited a biphasic mode of absorption, with 60% of the ^{14}C-clethodim absorbed in the first 8 h. Absorption was improved a further 20 percentage points over the remaining 88 h of the study. Translocation of clethodim was similar when clethodim was applied alone or in the presence of CGA 362622. While absorption increased over time, little herbicide moved from the treated leaf to other plant portions at any harvest interval. By 96 h after treatment, only 0.8 % of applied ^{14}C had moved into the portion of the shoot below the treated leaf, the location of the intercalary meristem (active site). These data suggest that CGA 362622 does not affect translocation of clethodim out of the treated leaf. Metabolism of clethodim was similar when clethodim was applied alone or in the presence of CGA 362622. Three major metabolites of clethodim were detected in treated tissue at all harvest intervals, while no ^{14}C-clethodim (retention time of 35.5 min) was recovered at any harvest interval. Over time, ^{14}C extracted from treated leaves became relatively more polar than clethodim. CGA 362622 reduced goosegrass biomass accumulation compared to non-treated goosegrass from 0 to 4 DAT. Thereafter, the increase of biomass was similar for both CGA 362622 treated and non-treated goosegrass. Immediately before an application of CGA 362622, rates of photosynthesis were similar for all plants in the experiments. One day after treatment (DAT), the photosynthetic rate in plants treated with CGA 362622 had decreased, and remained lower at the 2, 6 and 8 d sampling times. CGA 362622 appears to affect overall growth rate of goosegrass, reducing it considerably. The reduction in growth caused by CGA 362622 could have implications for ACCase activity, perhaps causing negative feedback inhibition or reduced expression of the enzyme complex.

Graminicides evidently require actively growing meristematic regions for inhibition of ACCase. The data presented herein show that the growth and photosynthetic rate of goosegrass is reduced with CGA 362622 treatment. Clethodim was absorbed and translocated similarly to other graminicides, and absorption, translocation, and metabolism of clethodim was not affected by the presence of CGA 362622. The rapid metabolism of clethodim, which was unaffected by the presence of CGA 362622, resulted in detoxification of clethodim to nontoxic metabolites. By the time goosegrass resumed growth and photosynthesis, clethodim was no longer present to inhibit reactivated ACCase. Together, these data suggest that the antagonism of clethodim by CGA 362622 may be influenced by CGA 362622 altering the growth and photosynthetic rate of goosegrass and therefore the sensitivity of the plant to ACCase inhibition.

HERBICIDE LEACHING IN FLORIDA CANDLER SOIL. M. Singh and S.D. Sharma; University of Florida, Institute of Food and Agricultural Sciences, Citrus Research and Education Center, 700 Experiment Station Road, Lake Alfred, FL 33850

ABSTRACT

Leaching of herbicides in the lower layers may cause damage to the citrus tree due to greater root contact, poor weed control, groundwater contamination and economic losses due reduced herbicide efficiency. The environmental contamination risk from higher rates and repeated application of herbicides could possibly be reduced from the low rate technology herbicides having effective and long duration of weed control. Azafenidin is a new and low rate pre-emergence herbicide. Limited information is available on leaching aspect of Milestone. Therefore, this study was conducted to evaluate leaching potential of azafenidin and compared with other pre-emergence herbicides under variable rainfall in a Florida Candler fine sand soil. The data indicated that movement of herbicides in soil is governed largely by the amount and frequency of water applied. Herbicides had different leaching potential: diuron showed low mobility, norflurazon and azafenidin showed high mobility. Diuron is taken up by the established root system and therefore, its phytotoxic symptoms appeared a week later than the other herbicides. Azafenidin has soil-organic carbon sorption coefficient (K_{oc}) of 298, which indicate that it does not bind strongly to soil particles. After application, susceptible bio-indicator rye grass quickly exhibited necrotic symptoms and died within days of emergence. Further, when the effects of rates of water applied were averaged for individual herbicide, there was no significant difference in the distance moved by azafenidin and norflurazon herbicides. From the results, it appeared that leaching of azafenidin herbicide increased with the amount of water. The estimation of leaching as compared to the prevailing herbicides will provide important information about azafenidin.

CHARACTERIZATION AND CONTROL OF CHINESE YAM (DIOSCOREA BATATAS). C.L. Main, J.E. Beeler, D. K. Robinson, T. C. Mueller, University of Tennessee, Knoxville; K. Johnson, National Park Service, Gatlinburg, TN.

ABSTRACT

Chinese yam (*Dioscorea batatas* Dcne.) is an aggressive, exotic perennial vine that has severe detrimental impact on herbaceous and sapling forest under-story. A native of East Asia, Chinese yam has escaped ornamental cultivation and is found throughout the eastern half of the United States. Control of Chinese yam in the Great Smoky Mountains National Park is problematic. Rapid spread of this plant leads to domination of naturally occurring vegetation, diminished utility of natural areas, loss of native vegetation and diversity, and altered visitor perception of natural and historic scenery in the park.

Four preliminary studies were conducted in 2000 and 2001 to determine growth habit and control options for Chinese yam. A study was conducted at six locations to determine growth habit and tuber production through-out the growing season. Data collected included plant shoot height, primary and secondary tuber length and weight. A second study compared mechanical and herbicidal control strategies and the time needed to complete each treatment. Treatments included hand pulling, clipping, and glyphosate application at yam emergence and flowering. Data collected included stem counts, percent control and time to complete treatment. A second herbicide study focused on using glyphosate applied at two different timings under *in situ* conditions to determine the optimum timing for treatment. Glyphosate was applied with surfactant to Chinese yam plants at yam emergence and flowering. Due to lack of residual and poor initial control by glyphosate under *in situ* conditions, a greenhouse study was conducted in 2001. Treatments evaluated included clopyralid (0.197 kg ai /ha), triclopyr + clopyralid (0.631 kg ai/ha), triclopyr (2.53 kg ai/ha), glyphosate (1.12 kg ai/ha), metsulfuron (0.140 kg ai/ha) + non-ionic surfactant (NIS) (0.25 % v/v), sulfometuron (0.280 kg ai/ha) + NIS, imazapic (0.071 kg ai/ha) + NIS, mesotrione (0.225 kg ai/ha) + NIS, halosulfuron (0.070 kg ai/ha) + NIS, and an untreated check. Treatments were applied using a CO_2 pressurized sprayer, calibrated to deliver 336 L/ha. Visual evaluations of yam efficacy were recorded 7, 14, 28, and 35 days after treatment.

Chinese yam displayed shoot heights of 79, 201, and 370 cm in May, June and August 2000, respectively. Primary tuber formation occurred at a rate of 0.22 cm per day while increasing from 4.9 to 22 cm during the May to August sample period. Secondary tubers were smaller, however growth continued after primary tuber growth stopped. Comparison of yam control option under field conditions indicated the difficulty of mechanical control. No treatment reduced yam cover, stem count, stem height, or leaf number as compared to the untreated plot. Additionally, hand weeding took >50 minutes per three by three meter plot, clipping took 24-36 minutes, while herbicide application took only 8 minutes. The glyphosate timing study initiated in 2000 was examined for Chinese yam reduction in 2001. Results indicate that there was increased reduction of Chinese yam with glyphosate applications at flowering. Greenhouse studies in 2001found triclopyr provided 99% control of Chinese yam in both studies. No other herbicides provided adequate control.

IS PALMER AMARANTH RESISTANT (AMARANTHUS PALMERI) RESISTANT TO ALS AND DINITROANILINE HERBICIDES? W.K. Vencill, E. Prostko, Crop and Soil Sciences, University of Georgia, Athens and Tifton; and T. E. Webster, USDA-ARS, Tifton, GA.

ABSTRACT

Greenhouse studies were conducted to determine if suspected fields of Palmer amaranth were resistant to imazapic as well as other ALS-inhibiting herbicides and to the dinitroaniline herbicide, pendimethalin. Seeds were collected in the fall of 2000 from two fields in Jefferson Co., Georgia. Palmer amaranth seeds from a population that had never been treated with ALS-inhibiting herbicides was used for the control. Seeds were planted in sand and grown to 2-leaf stage before treatment. Plants were treated with 0, 10, 100, and 1000 g a.i./ha of imazapic, pyrithiobac, diclosulam, and chlorimuron. Plants were also treated with 0, 1, 5, 10, and 100 g a.i./ha of CGA 362622 (trifloxysulfuron). Visual injury symptoms and shoot fresh weight data were collected 14 days after treatment. Imazapic had a fresh weight ED_{50} of 7, 15, and 490 g/ha on Palmer amaranth from the known susceptible population, Flake, and Mobley field, respectively. CGA 362,622 had a fresh weight ED_{50} of 1.5, 5, and 20 g/ha on Palmer amaranth from the susceptible, Flake, and Mobley fields, respectively. Palmer amaranth from the Mobley field also was shown to be resistant to pyrithiobac, chlorimuron, and diclosulam. Sand was treated with 0, 100, 1000, 5000, and 10,000 g a.i./ha of pendimethalin before being planted with Palmer amaranth. There were no differences in the susceptible population and the Flake population in response to pendimethalin. The Mobley population exhibited an approximate two-fold increase in tolerance to pendimethalin.

EFFECTIVENESS OF BUFFALOGRASS [*Buchloe dactyloides* (Nutt. Engelm)] FILTER STRIPS IN REMOVING DISSOLVED ATRAZINE AND METABOLITES FROM SURFACE RUNOFF. L.J. Krutz[1], S.A. Senseman[1], M.C. Dozier[2], D.W. Hoffman[3], and D.P. Tierney[4]. (1) Department of Soil and Crop Sciences, Texas Agricultural Experiment Station, Texas A&M University System, 2474 TAMU, College Station, TX, (2) Department of Soil and Crop Sciences, Texas Cooperative Extension, Texas A&M University System, College Station, TX, (3) Blackland Research Center, Texas Agricultural Experiment Station, Texas A&M University System, Temple TX, (4) Human & Environmental Safety Department, Syngenta Crop Protection, Greensboro, NC.

ABSTRACT

Atrazine and atrazine metabolites differ substantially in adsorption and desorption behavior suggesting that retention differences among compounds within vegetative filter strips is likely. A micro-watershed runoff study was conducted to compare the simultaneous partitioning of atrazine, deethylatrazine, deisopropylatrazine, diamioatrazine, and hydroxyatrazine within a buffalograss filter strip. Runoff was introduced up slope of a 1 X 3 m watershed for 1 hr at a rate of 12.5 L min^{-1} and a concentration of 0.1 $\mu g\ mL^{-1}$. After crossing the length of the plot, the runoff rate was determined, and water samples were collected at pre-determined-time intervals. Water samples were subjected to solid phase extraction, and the compounds were analyzed by high performance liquid chromatography-photodiode array detection. The total mass retained by the filter strip was determined for each compound and partitioned between infiltration and adsorption. The total atrazine mass retained within the filter strip (35 %) was significantly greater than the metabolite mass retained (32 %). The mean infiltration mass retained for all compounds was approximately 23 % and was not significantly different among compounds. Atrazine mass retained by adsorption to the grass thatch/soil surface (13 %) was significantly greater than the metabolite mass adsorbed (9 %). Buffalograss filter strips appear to preferentially retain atrazine as compared to the atrazine metabolites due to differences in the partitioning of the compounds among the solution, soil, and thatch.

EFFECTS OF NOZZLE TYPES AND GLYHOSATE FORMULATION ON SPRAY DROPLET SIZE AND PATTERNS. J.E. Hanks, E.J. Jones, G.D. Wills and R.E. Mack. USDA-ARS, Stoneville, MS, Delta Research and Extension Center, Stoneville, MS and Helena Chemical Company, Memphis, TN.

ABSTRACT

Preliminary studies were conducted at Stoneville, MS with two nozzle types and three glyphosate formulations to evaluate the effects on spray droplet size and spray patterns. The nozzles used were a TeeJet® 110015vs air induction (AI) and a TeeJet® 110015vs extended range (XR); glyphosate formulations included Roundup UltraMax®, Roundup Custom® and Roundup Original®. Spray solutions were mixed to provide an application rate of 0.6 kg ai/ha when applied at a spray volume of 94 L/ha at a ground speed of 7.4 km/hr. Solutions were mixed in large enough quantities to allow the droplet analyses and patternator studies to be conducted without having to re-mix solutions. A Malvern laser particle analyzer was used to determine the volume median diameter and percent spray volume in droplets less than 144 microns over a range of pressures. The Malvern instrument was in an enclosed chamber with the nozzle installed on a mechanical traversing system. The nozzles were positioned at a height above the laser beam to allow the entire width of the spray pattern to be traversed through the laser beam. Droplet analyses were repeated three times for each solution, over a range of pressures from 140 kPa to 480 kPa. The patternator consisted of corrugated metal with corrugations spaced 5 cm apart and slightly sloped to allow sprayed solution to collect in test tubes placed at the end of each corrugation. Spray solution collected in the test tubes provided a visual characterization of the spray pattern and the amount of solution collected in each test tube was recorded. The patternator was setup in an enclosed spray chamber to provide minimal air disturbance to the spray pattern. Spray patterns were conducted at a pressure to provide an application rate of 0.6 kg ai/ha when applied at a spray volume of 94 L/ha at a ground speed of 7.4 km/hr.

The volume median diameter and percent spray volume in droplets less than 144 microns was significantly different for the two nozzle types. The air induction produced significantly higher volume median diameters than the extended range nozzle and significantly lower percentage of spray volume in droplets less than 144 microns. The volume median diameter ranged from 532 microns to 422 microns, respectively for spray pressures of 205 kPa to 480 kPa with the air induction nozzle applying water. The extended range nozzle produced a range of volume median diameters from 164 microns to 117 microns, respectively for spray pressures of 140 kPa to 415 kPa with water. At a spray pressure of 275 kPa, the air induction nozzle produced 6% spray volume in droplets less than 144 microns compared to 56% for the extended range nozzle. Glyphosate formulation had little effect on the volume median diameter or percent spray volume in droplets less than 144 microns compared to water. Spray patterns were slightly different with the two nozzle types, with the air induction concentrating more volume in the center portion of the spray pattern compared to the extended range that provided a smoother, slightly more uniform pattern. These results indicate significant reduction in the potential for drift can be achieved with air induction type nozzles compared to conventional nozzles typically used by applicators.

DETERMINING THE OPTIMAL SAMPLING DENSITY FOR SCOUTING AND MAPPPING WEED POPULATIONS. F.S. Kelley, D.R. Shaw, T.H. Koger, and F.E. LaMastus. Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Research was conducted on two fields in Brooksville, MS to evaluate the optimal sampling density required to accurately scout and map weed populations. In 2001, 50-m grids were imposed on two soybean fields, East field (15 ha) and South field (16 ha). Weed species were counted using a 4-m^2 sample size at each grid point. Using the data collected on a 10-m grid system, the variance was analyzed between the two sample sizes. The five most prevalent weeds in these two fields were used in this analysis.

Results varied by location. East field detection capabilities with 50 and 10-m grid sizes indicate sicklepod, pitted morningglory, and purple nutsedge were not significantly different with respect to grid sizes. The use of 50-m grids tended to overestimate entireleaf morningglory populations and underestimate horsenettle populations. South field detection capabilities with 50 and 10-m grid sizes also differed with respect to weed species. Entireleaf morningglory populations were overestimated with the 50-m grid. In addition, entireleaf morningglory was the only weed species that differed with the two grid sizes at both locations. Based on this research, the weed spectrum within a field would dictate the sample grid size.

EFFECTS OF DRIFT CONTROL ADJUVANTS ON SPRAY APPLICATION PARAMETERS WITH CONVENTIONAL AND AIR INDUCTION NOZZLES. E.J. Jones[1], J.E. Hanks[2], G.D. Wills[1], and R.E. Mack[3], Delta Research and Extension Center[1] and USDA-ARS[2], Stoneville, MS, and Helena Chemical Co.[3], Memphis, TN.

ABSTRACT

Laboratory studies were conducted to determine the effect of four drift reducing adjuvants on the spray pattern and droplet size of glyphosate herbicide. The drift reducing adjuvants and the rates used are shown in Table 1. Glyphosate was applied as both Rodeo® and Roundup Ultra Max® at 0.4 lb ai in 10 gallons per acre with both the TeeJet Extended Range 110015VS nozzle and the TeeJet Air Induction 110015VS nozzle.

Spray droplet size was determined for both types of nozzles using an Insitec Measurement Systems laser particle analyzer at 40 psi. Droplet size was determined as both the volume median diameter (Dv. 5) in microns and as the percentage of the fine spray volume less than 144 microns (<144μ) in diameter. Spray patterns were determined for both types of nozzles by using a single nozzle in a stationary position at 13 inches above a slanted sheet of corrugated metal. Spray mixtures were applied in 600-ml volumes at 41 to 48 psi to the sheet of corrugated metal with troughs spaced 2.5 inches apart with the discharge collected in 100-ml graduated cylinders. The average milliliter volumes of 3 replications as collected at each position from left to right were reversed right to left; added together and averaged again to show a symmetrical spray pattern for each mixture.

When using the TeeJet Extended Range 110015VS spray nozzle, glyphosate as both Rodeo and Roundup Ultra Max alone and with the drift reducing adjuvants HM 9911 and HM 9911A each at 0.5 and 1% v/v resulted in 49.7 to 58% fine spray droplets <144μ. The addition of HM 9950 at 0.5 and 1% v/v reduced the fine droplets to 38.4 and 26.3% and to 34.2 and 17.3% for Rodeo and Roundup Ultra Max, respectively. The addition of HM 9752 reduced the fine droplets to 33.1 and 27.8% for Rodeo and Roundup Ultra Max, respectively, with this same nozzle type. The volume median diameter (Dv. 5) with Rodeo and Roundup Ultra Max both alone and with HM 9911 and HM 9911A was 128 to 145μ. Using HM 9950 at 0.5 and 1% and HM 9752 the Dv. 5 was increased to 178, 241, and 205 and to 202, 351, and 234 with Rodeo and Roundup Ultra Max, respectively.

With the TeeJet Air Induction 110015VS nozzle, the overall percent of fine droplets was less and the Dv. 5 droplet size was greater than with the Extended Range nozzle. Glyphosate as Rodeo and Roundup Ultra Max both alone and with HM 9911 and HM 9911A each at 0.5 and 1% resulted in percent fine droplets <144μ from 3.1 to 8.5. The percent of fine droplets <144μ using HM 9950 at 0.5 and 1% and HM 9752 was reduced to 1.8 to 2.8. The Dv. 5 for Rodeo and Roundup Ultra Max with the combinations of HM 9911 and HM 9911A was 466 to 576 μ. The Dv. 5 of these glyphosate formulations was increased to 631 to 717 μ in combinations with HM 9950 and HM 9752.

The width of the spray patterns using the Extended Range Nozzle was similar for Rodeo and Roundup Ultra Max. The spray widths with each formulation alone and with HM 9911 at 0.5 and 1% and HM 9911A at 0.5% was approximately 50 inches. The spray widths with HM 9911A at 1% and HM 9950 at 0.5% was 45 inches and HM 9950 at 1% and HM 9752 was 35 to 40 inches.

The spray widths for the Air Induction nozzle with each Rodeo and Roundup Ultra Max alone and with HM 9911 at 0.5 and 1% and HM 9911A at 0.5% were approximately 40 inches. With HM 9911A at 1% and HM 9950 at 0.5% the spray widths were 35 and 25 inches, respectively. The addition of HM 9950 at 1% and HM 9752 reduced the spray widths to 15 to 20 inches.

Table 1. Drift reducing adjuvants and rates applied.

HM-9752	Proprietary blend of polymeric viscosity modifiers and ammonium sulfate (9 lb/100 gal.)
HM-9911	Proprietary blend of ammonia salts, potassium phosphate, surfactants, polyacrylamide polymers, and formulation aids (0.5% and 1.0% v/v)
HM-9911A	Proprietary blend of ammonia salts, potassium phosphate, surfactants, polyacrylamide polymers, and formulation aids (0.5% and 1.0% v/v)
HM-9950	Proprietary blend of ammonium polyacrylates, hydroxy carboxylates, sulfates, and polymeric deposition aids (0.5% and 1.0% v/v)

EFFICACY OF ROUNDUP ULTRA MAX® AND RODEO® WITH VARIOUS DRIFT REDUCING ADJUVANTS. G.D. Wills[1], J.E. Hanks[2], E.J. Jones[1], and R.E. Mack[3], Miss. Agric. and Forest. Exp. Stn.[1], USDA-ARS[2], Stoneville, MS, and Helena Chemical Co., Memphis, TN[2]

ABSTRACT

Two field studies were conducted to determine the effect of eight drift reducing adjuvants at rates as shown in Table 1 on the efficacy of glyphosate herbicide spray solutions. The glyphosate was applied in each of the two studies at 0.4 lb ai in 10 gallons of water per acre at 43 psi using a tractor-mounted sprayer with eight TeeJet® Extended Range 110015VS nozzles spaced 19 inches apart along the boom. Field-plot applications were over-the-top to four rows of three trifoliolate stage soybeans (*Glycine max* L. Merr.) 'Delta Pine 3478' spaced 38 inches apart, 40 feet long and interspaced with 5- to 8-inch-tall barnyardgrass [*Echinochloa crus-galli* (L.) Beauv], 5- to 7-inch-tall pitted morningglory (*Ipomoea lacunosa* Lag.), 4-to 8-inch-tall velvetleaf (*Abutilon theophrasti* Medik.), 3- to 5-inch-tall prickly sida (*Sida spinosa* L.), and 4- to 8-inch-tall smooth pigweed (*Amaranthus hybridus* L.) replicated four times in a randomized complete block design. Efficacy was determined by visual ratings at 2 weeks after treatment (WAT) whereby, 0 = no control and 100% = complete kill of shoots. Data were subjected to analysis of variance. Means were separated using Fisher's Protected Least Significant Difference (LSD) at P = 0.05.

In Field Study No. 1, glyphosate was applied as both Roundup Ultra Max and Rodeo, each alone and with the drift reducing adjuvants, HM-9911, HM-9911A, HM-9950, and HM-9752. In Field Study No. 2, glyphosate was applied as Rodeo alone and with the drift reducing adjuvants, HM-2005, HM-2005A, HM-2005B, and HM-2006.

At 2 WAT, smooth pigweed was controlled 98 to 100% in every treatment in each of the two studies. Control of the remaining five species was variously affected by the two glyphosate formulations alone and in combination with the different drift reducing adjuvants. In Field Study No. 1, control with Roundup Ultra Max alone was 86 to 96%. Control with this formulation was increased to 90 to 97% with HM-9950 at 1% v/v and to 95 to 100% with HM-9752, decreased to 81 to 94% with HM-9911 at 0.5% v/v, and not affected by the remaining drift reducing adjuvants. Further in Field Study No. 1, control with Rodeo alone was 69 to 88%. Control with this formulation was increased to 81 to 97% with HM-9911 at 1% v/v, to 90 to 98% with HM-9952, and was not altered by addition of the remaining drift reducing adjuvants.

In Field Study No. 2, control of the remaining five species was 68 to 85% with Rodeo alone. Control with Rodeo was increased to 75 to 95% with the addition of HM-2005, HM-2005A, HM-2205B, and HM-2006 and further increased to 91 to 97% with the addition of HM-9752.

Table 1. Drift reducing adjuvants and rates applied.

HM-9752	Proprietary blend of polymeric viscosity modifiers and ammonium sulfate (9 lb/100 gal.)
HM-9911	Proprietary blend of ammonia salts, potassium phosphate, surfactants, polyacrylamide polymers, and formulation aids (0.5% and 1.0% v/v)
HM-9911A	Proprietary blend of ammonia salts, potassium phosphate, surfactants, polyacrylamide polymers, and formulation aids (0.5% and 1.0% v/v)
HM-9950	Proprietary blend of ammonium polyacrylates, hydroxy carboxylates, sulfates, and polymeric deposition aids (0.5% and 1.0% v/v)
HM-2005	Proprietary blend of nonionic water soluble organic polymers and ammonium salts (5, 7, and 9 lb/100 gal)
HM-2005A	Proprietary blend of plant nutrients and water soluble organic polymers (5, 7, and 9 lb/100 gal)
HM-2005B	Proprietary blend of plant nutrients and water soluble organic polymers (5, 7, and 9 lb/100 gal)
HM-2006	Proprietary blend of nonionic water soluble organic polymers and ammonia salts (9 lb/100 gal)

REVIEW OF THE IR-4 BIOPESTICIDE PROGRAM. M.P. Braverman, W.L. Biehn, R.E. Holm , J.J. Baron and G.M. Markle; IR-4 Project, Rutgers University, North Brunswick, NJ 08902

ABSTRACT

The IR-4 Project was established in 1963 to provide pest management solutions to growers of fruits, vegetables, and other minor crops. IR-4 became involved in the registration of Bt products in 1970 and in 1982, a biological control program was established . The primary functions of the Biopesticide Program are to assist registrants with the regulatory process and to promote the development of new products by funding research through a competitive grants program. The registration assistance involves consulting and petition preparation for submission to the Biopesticides and Pollution Prevention Division (BPPD) of EPA. The IR-4 Project also is involved in the submission of Experimental Use Permits(EUP's) for products prior to complete registration. IR-4 has worked with 45 different companies and industry organizations (such as the Biopesticide Industry Alliance or BPIA) and is involved in partnerships with EPA, the Pest Management Regulatory Agency(PMRA Canada) and the California Department of Pesticide Regulation (CDPR). One of the major regulatory partnerships was the Biopesticide Registration Workshop held in November 2001. Since 1995, the IR-4 Project has funded over 1.8 million dollars in biopesticide research. In 2001, The IR-4 Project received 65 grant proposals and funded 43. Out of the projects funded, 27 were biofungicides, 9 were bioinsecticides or pheromones, 4 were bioherbicides and 3 were plant growth regulators. Twenty eight were food use projects and 15 were non-food use (turf, ornamentals, greenhouse, etc.).

CHARACTERIZATION AND INHIBITION OF CHLOROPLAST-LOCALIZED PEPTIDE DEFORMYLASES FROM *ARABIDOPSIS THALIANA*. M.A. Williams, L.M.A. Dirk, and R.L. Houtz, Plant Physiology/ Biochemistry/ Molecular Biology Program, Department of Horticulture, University of Kentucky, N-323 Ag Sci Center North Lexington, KY 40546-0091

ABSTRACT

Although peptide deformylase (DEF) has been studied extensively in bacterial systems, the role of such an enzyme in chloroplasts has been largely ignored despite reports that protein initiation in chloroplasts starts with n-formyl Methionine, as in bacteria. The *Arabidopsis thaliana* genome sequencing project has revealed two genes, *AtDEF1* and *AtDEF2* that are eukaryotic homologs of the essential prokaryotic gene encoding peptide deformylase. CLUSTAL W alignment between the *E. coli* and *Arabidopsis thaliana* predicted protein sequences revealed that the *Arabidopsis thaliana* peptide deformylases contain the three conserved protein motifs that have been characterized as essential for activity in bacterial DEF. The cDNAs for the *Arabidopsis thaliana* DEFs were cloned from total RNA, and the predicted protein sequences were analyzed using the Chloro P program, which revealed that both proteins contain putative chloroplast targeting sequences. *In vitro* chloroplast import experiments were conducted using bacterially expressed DEF and isolated chloroplasts. The *At*DEF1 protein was imported into isolated pea chloroplast under standard import conditions and processed to a mature form once inside the plastid. Experiments were conducted to analyze the effects of a known peptide deformylase inhibitor-actinonin on several plant species. These studies indicate that inhibitors of peptide deformylase have dramatic inhibitory effects on plant growth and development. Furthermore, actinonin elicited potent herbicidal activity applied either before or after seed germination. Therefore, peptide deformylase represents a novel target for the design of broad-spectrum herbicides with little or no mammalian toxicity.

EFFECT OF CLOMAZONE AT DRIFT RATES ON SEEDLING PECANS. M.S. Malik, R.E. Talbert, E.F. Scherder, M.L.Lovelace. Department of Crop, Soil and Environmental Sciences, University Of Arkansas, Fayetteville, AR 72701

ABSTRACT

Clomazone, (Command 4 EC) was extensively used in cotton some years ago. However off-target drift to pecans frequently occurred thus, growers were reluctant to use this formulation. Changing to the less volatile Command 3 ME markedly reduce reports of off-target spray drift.

To address this issue and with the potential of aerial application, an experiment was conducted to evaluate the potential hazard of Command movement to off-target vegetation. The experiment was conducted at University Of Arkansas Agricultural Experiment Station, Fayetteville, AR to determine the potential damage off-target vegetation. Command 3 ME, Command 4 EC and propanil (Stam M4) tank mixed with Command 3 ME were compared by direct application to seedling pecans. The labeled rate of clomazone for this soil type was 0.4 lb/A, which is 1X rate. Command was also used at 0.1X, and 0.01X rate. Propanil was applied at a 3lb ai/A rate. Two-seedling pecan trees 2- to 3- feet were utilized in each plot. Seedling pecans were transplanted on April 2, 2001. Pecan trees with 2 to 9 leaves were sprayed on July 18, 2001. One plant was covered and other plant was sprayed in order to differentiate foliar from soil uptake of clomazone. The experimental design was 4x3 factorial with five replications. An untreated check was also included. The data was analyzed using Analysis of Variance with mean separation based on 5% level of significance (LSD 0.05). The plants were rated weekly for bleaching and overall injury symptoms.

Slight bleaching in form of whitening of leaf veins and some leaf necrosis was observed (maximum of 8%) from 1X rate of each clomazone formulation. Injury in the form of complete necrosis of leaves to the maximum of 62% was observed in plants sprayed with a tank mix of propanil and clomazone at a 1X rate. Minor bleaching occurred with little or no injury at 0.1 X and 0.01 X rates with either formulation applied alone or in a tank-mix with propanil. The untreated check plots as well as the protected plants had no visual symptoms of soil uptake or volatility. New leaf development was not affected by any treatment.

CONTROL OF BROADLEAF MARSHELDER IN PASTURES. J.D. Nerada, W.J. Grichar, and A.J. Netardus. Texas Agricultural Experiment Station, Yoakum, TX, and Texas Cooperative Extension Service, Cuero, TX.

ABSTRACT

Marshelder, *Iva annua* L. is a common broadleaf weed found in all the regions of Texas, except for the Trans Pecos. It tends to grow in pastureland and other low lying fields where the ground is not disturbed and tends to stay moist. Recent years have shown Marshelder populations becoming more and more of a problem. A river bottom pasture was selected for a study site in which multiple herbicides were tested for control. Applications were made using a back-pack CO_2 sprayer, Roto-Wiper, and a Rope Wick. Marshelder plants were 10-12 in. In height when sprayed with the CO_2 sprayer and 18-24 in. when treated with the ATV equipped Rope Wick and Roto-Wiper. All herbicides tested exhibited some degree of control. Spray treatments of Tordon 22K controlled greater than 67% of Marshelder. Reclaim and Reclaim/Tordon 22K mix controlled 100%. The Roto-Wiper treatment of 10% Roundup solution controlled 80% Marshelder. The 10% Roundup solution in the Rope Wick controlled 50%. Marshelder can be controlled using various herbicides. Not only can it be sprayed, it can be Rope Wicked and Roto-Wiped also.

OASIS FOR PASTURE WEED CONTROL AND BERMUDAGRASS TOLERANCE. W.J. Grichar, J.D. Nerada, A.J. Jaks, and A. . Netardus. Texas Agricultural Experiment Station and Texas Cooperative Extension, Cuero, Tx.

ABSTRACT

Field studies were conducted during the 2000-2001 growing season to evaluate Oasis (imazapic + 2,4-D) for broadleaf weed control and bermudagrass [*Cynodon dactylon* (L.) Pers.] tolerance. Field studies were set up on plots 1.9 m wide by 8.1 m long. Each study was replicated 3-4 times. Herbicides were applied with a CO_2 backpack sprayer equipped with three SS-11002 flat fan nozzles spaced 50 cm apart and calibrated to deliver 140 L/ha at 160 kPa. Weed control and grass stunting were visually estimated using a scale of 0 (no control or bermudagrass stunting) to 100 (complete control or bermudagrass death) 4 wk after herbicide applications and on 4 wk intervals thereafter. In a 'Tifton 85' bermudagrass study, Oasis at 292 to 877 ml/ha resulted in 53 to 87% bermudagrass stunt when rated 4 wk after herbicide application. When rated 20 wk after herbicide application, bermudagrass stunt ranged from 28 to 72%. Bermudagrass stunt increased as herbicide rate increased in both instances. When 'Tifton 85' was initially harvested 6 wk after application none of the Oasis treated plots produced any yield while the untreated yielded over 12, 500 kg/ha. Subsequent 'Tifton 85' harvests taken 19 wk after herbicide application showed that Oasis at 730 and 877 ml/ha reduced bermudagrass but no yield reduction was noted when harvested 28 wk after application.

In 4 of 6 other studies on 'Coastal' bermudagrass, stunting was noted with all Oasis rates. Weed control using Oasis was variable and depended on the weed species. Oasis at 292 to 584 ml/ha controlled 68 to 90% Johnsongrass [*Sorghum halepense* (L.) Pers.] but controlled < 29% rain lilly (*Cosperia traubii* Hayward). Oasis at 292 ml/ha or greater applied to horsemint [*Blephilia ciliata* (L.) Benth] less than 15 cm tall provided > 95% control while Oasis at 146 ml/ha controlled < 85% horsemint. Brownseed paspalum (*Paspalum plicatulum*) control increased as the rate of Oasis increased.

YIELD AND PHYSIOLOGICAL RESPONSE OF PEANUT (*ARACHIS HYPOGAEA*) TO GLYPHOSATE DRIFT

B.L. Robinson, W.E. Thomas, W.A. Pline, I.C. Burke, D.L. Jordan and J.W. Wilcut, Department of Crop Science, North Carolina State University, Raleigh, NC

ABSTRACT

The increase in Roundup Ready corn, soybeans and cotton acreage has introduced potential problems for growers. Approximately 70-80% of the cotton and soybean acreages, and 7% of the corn acreages are planted to Roundup Ready varieties in North Carolina. Peanuts are often grown in areas that are situated near corn, soybean and cotton fields, and are sensitive to Roundup UltraMax (glyphosate) drift. Accumulation of shikimic acid in nontransgenic crops may be used to determine glyphosate drift. Field trials were conducted in 2001 at the Peanut Belt Research Station at Lewiston-Woodville, NC to determine yield, crop damage and shikimic acid accumulation. Roundup UltraMax was applied EPOST at 0.0078, 0.0156, 0.03125, 0.0625, 0.125, 0.25, 0.5, and 1.0 lb ai /ac to peanut plants 4-6 inches in diameter. Crop stunting, discoloration and stand reduction were visually rated 34, 41 and 47 d after the EPOST treatment. Samples for shikimic acid accumulation were taken 7, 14, 21, and 28 d after Roundup UltraMax treatments. Shikimic acid accumulation was determined by the methods developed by Singh and Shaner (1998).

Shikimic acid accumulation was found to be an effective diagnostic tool to determine drift rates in peanuts at 7 DAT, but not 14, 21 or 28 DAT. Shikimic acid accumulation increased as Roundup UltraMax rates increased. Roundup UltraMax rates of 0.25, 0.5 and 1.0 lb ai/acre resulted in significant economic loss, crop injury and reduced peanut yield. Crop injury was evaluated as a summation of crop discoloration, crop stunting and stand reduction. Shikimic acid accumulation was not significantly different at 14, 22, or 31 d after EPOST treatment (DAT). Injury, stunting, and plant discoloration values also increased as Roundup UltraMax rates of 0.063 lb ai/ac or higher. Shikimic acid accumulation also was detected at those rates. As shikimic acid accumulation increased, peanut yield and quality decreased.

DICLOSULAM APPLIED PRE-EMERGENCE IN PEANUT PRODUCTION. C.S. Bray, J. Tredaway Ducar and L.B. Braxton. University of Florida, Gainesville; Dow Agrosciences, Tallahassee, FL.

ABSTRACT

Diclosulam (Strongarm) is a new triazolopyrimidine sulfonanilide herbicide used in peanut (*Arachis hypogaea*) and soybean (*Glycine max*) to control several broadleaf weeds and suppress nutsedge in peanut. Diclosulam can be applied pre-emergence (PRE), pre-plant incorporated (PPI), or at true cracking (AC).

A study was conducted at the North Florida Research and Education Center in Marianna, Florida in 2001. C-99R peanuts were planted in 36 in rows. Treatments included Diclosulam PRE (0.023 lb ai/A), Diclosulam PRE (0.023 lb A/A) fb Regional Standard POST, Diclosulam AC (0.023 lb A/A), Diclosulam AC (0.023 lb A/A) tank-mixed with Regional Standard, Diclosulam AC (0.023 lb A/A) fb Regional Standard POST, Imazapic POST (0.063 lb A/A), Regional Standard POST and UTC. The regional standard consisted of paraquat (0.258 lb A/A) plus bentazon (0.25 lb A/A). All POST treatments included a non-ionic surfactant (NIS) at 0.25% V/V. Treatments were applied using a CO_2 backpack sprayer at 3 mph delivering 20 gpa. Four row plots with a length of 25 feet were utilized in a Randomized Complete Block design with three replications. Visual evaluations were made early and mid season which consisted of injury, purple nutsedge (*Cyperus rotundus*), Florida beggarweed (*Desmodium tortuosum*), pitted morningglory (*Ipomoea lacunosa*) control, and yields.

Injury. Diclosulam AC tank-mixed with regional standard injured peanut 11% 51 DAT. Injury was less than 2% for all treatments 72 DAT. *Florida Beggarweed.* Diclosulam PRE alone or fb POST, AC, and diclosulam AC fb POST provided greater than 88% control at 51 DAT. Diclosulam AC and the regional standard controlled Florida beggarweed 78%. Imazapic POST provided significantly lower control at 62% at 51 DAT. At 72 DAT, all treatments maintained control with the exception of diclosulam AC reducing control to 55%. *Pitted morningglory.* All treatments provided greater than 85% control except diclosulam AC tank-mixed with the regional standard and the regional standard POST 51 DAT. All treatments maintained control with the exception of the regional standard POST reducing to 45% control. *Purple Nutsedge.* All treatments provided >55% control 51 DAT with imazapic control at 85%. At 72 DAT, imazapic maintained 85% control. Diclosulam AC and PRE provided 72% and 65% control, respectively. *Yields.* The greatest yields were obtained with the diclosulam AC fb POST treatments at 1120 lb/A. All other treatments yielded comparably except imazapic POST at 650 lb/A.

Diclosulam PRE provided excellent control of Florida beggarweed and pitted morningglory late season while not resulting in any visible injury. Purple nutsedge control was 65% or greater with diclosulam alone treatments late season. Imazapic was the only treatment that provided control greater than 80%. Yields were greatest with diclosulam PRE fb the regional standard POST or diclosulam AC.

FLUMIOXAZIN INJURY TO PEANUT. W. K. Vencill, Crop and Soil Sciences, University of Georgia, Athens.

ABSTRACT

Greenhouse studies were initiated to replicate injury symptoms that were observed under field observations with flumioxazin. Peanut planting depth by flumioxazin placement depth was arranged in a factorial design to determine if there was a flumioxazin by peanut planting depth interaction. Washed quartz sand was treated with flumioxazin to equal a 94 g a.i./ha rate. A layer of flumioxazin treated soil was placed at 0-0.5, 0.5-1, and 1-1.5 cm in sytrofoam cups. Treated and untreated layers were separated by a layer of activated charcoal to prevent flumioxazin movement between each respective layer. Peanut 'Georgia Green' was planted into each respective layer. All cups were subirrigated to restrict flumioxazin movement. Peanut fresh shoot and root weight measurements were taken 3 WAP. Both roots and shoots responded similarly to flumioxazin placement. Peanut injury tended to increase when flumioxazin and peanut were planted in the same zone. This was particularly evident with peanut planted at 0.5 cm into flumioxazin treated soil. These data support a hypothesis that extraordinary injury symptoms in growers fields from flumioxazin in 2001 resulted from specific conditions in which there was little subsoil so that received irrigation or precipitation created a wetting front in the soil that moved a very short distance because of dry subsoil conditions. These unique environmental conditions lead to surface-applied flumioxazin being concentrated at the soil surface where peanut had been planted shallow because of dry conditions. When peanut germinated in the higher than normal concentrations of flumioxazin, injury occurred. More research is needed to fully elucidate these results.

YELLOW NUTSEDGE (*Cyperus esculentus* L.) MANAGEMENT WITH DICLOSULAM AND METOLACHLOR COMBINATIONS IN TEXAS HIGH PLAINS PEANUT. B.L. Porter, P.A. Dotray, J.W. Keeling, and T.A. Baughman; Texas Tech University, Texas Agricultural Experiment Station, Lubbock, and Texas Cooperative Extension, Vernon.

ABSTRACT

Yellow nutsedge (*Cyperus esculentus* L.) infests numerous acres on the Texas Southern High Plains. Metolachlor has been used to control yellow nutsedge in peanut for several years. Due to concern about potential injury from preplant incorporated and preemergence applications, many growers apply metolachlor early postemergence. Experiments were conducted in 1999 and 2000 to evaluate yellow nutsedge control with diclosulam applied PRE at four rates (0, 0.008, 0.016, and 0.024 pounds (active ingredient) per acre), metolachlor applied postemergence (POST) at four rates (0, 0.5, 1.0, and 1.3 pounds per acre), and combinations of these herbicides. Florunner peanut was planted in 2000 in a producer's field near Denver City, TX, and FlavorRunner 458 peanut was planted in a producer's field near Seminole TX in 2001 in areas heavily infested with yellow nutsedge. Applications were made using a tractor mounted compressed air sprayer that delivered 10 gallons per acre at 24 psi. Yellow nutsedge control and peanut injury was evaluated 31, 53 and 71 days after planting (DAP) in 2000 and 40, 55, and 69 DAP in 2001.Yellow nutsedge densities were counted at season's end and plots were harvested with a plot combine. Data was subjected to an analysis of variance with partitioning appropriate for a factorial arrangement. Means were separated using Fisher's Protected LSD at $\alpha = 0.05$.

Diclosulam at 0.008, 0.016, and 0.024 lbs/A PRE controlled yellow nutsedge 47%, 62%, and 78% (71 DAP) in 2000. Metolachlor at 0.5, 1.0, and 1.3 lbs/A POST controlled yellow nutsedge 15%, 38%, and 52% (71 DAP). A diclosulam by metolachlor interaction was observed 71 DAP. When diclosulam was applied at 0.008 lbs/A PRE, additional applications of metolachlor POST did not provide acceptable yellow nutsedge control 71 DAP. When diclosulam was applied at 0.016 lbs/A PRE, metolachlor at 1.3 lbs/A POST improved yellow nutsedge control to 88%. This control was better than metolachlor at 0.5 or 1.0 lbs/A POST, and equivalent to diclosulam 0.024 lbs/A PRE with any rate of metolachlor POST. When diclosulam was applied at 0.024 lbs/A PRE, all metolachlor POST rates provided equivalent control of yellow nutsedge (85 to 88%). End of season yellow nutsedge density was similar across herbicide combinations, with plots averaging from 0.4 to 2.5 yellow nutsedge plants per foot^2. Untreated plots averaged 17.9 plants per foot^2. Metolachlor POST did not injure peanut. Diclosulam at 0.008 lbs/A injured peanut 4% 31 DAP, but no injury was observed 53 DAP in 2000. Diclosulam at 0.016 lbs/A injured peanut 11% at 31 DAP, but injury decreased to 4% at 71 DAP. Similar injury was observed from diclosulam at 0.024 lbs/A (16% at 31 DAP and 6% at 71 DAP). No injury was observed at harvest, and neither grade nor yield was affected by any herbicide treatment. Yields averaged 1,532 lbs/A.

Diclosulam at all rates controlled yellow nutsedge greater than 90% 40 and 55 DAP in 2001, but control dropped to less than 75% 69 DAP. Metolachlor at 1.0 and 1.3 lbs/A controlled yellow nutsedge greater than 75% 55 and 69 DAP. A diclosulam by metolachlor interactions was observed 69 DAP. All herbicide combinations provided acceptable control of yellow nutsedge. When diclosulam was applied at 0.008 lbs/A, metolachlor at 1.3 lbs/A controlled yellow nutsedge 95%. This control was similar to the yellow nutsedge control provided by the highest herbicide-rate combinations. When metolachlor was applied at 1.3 lbs/A, all rates of diclosulam controlled yellow nutsedge more effectively than metolachlor at 0.5 lbs/A. End of season yellow nutsedge density was similar across herbicide combinations, with plots averaging from 0.2 to 1.6 yellow nutsedge plants per foot^2. Untreated plots averaged 6.8 plants per foot^2. Metolachlor POST did not injure peanut. Diclosulam at 0.008 lbs/A did not injure peanut in 2001. Diclosulam at 0.016 lbs/A injured peanut 4% (40 DAP), and injury persisted at 69 DAP. Similar injury was observed from diclosulam at 0.024 lbs/A (12% at 40 DAP and 12% at 69 DAP). No injury was observed at harvest, and neither grade nor yield was affected by any herbicide treatment. Yields averaged 4,857 lbs/A.

GRASS CONTROL WITH RICESTAR AND BROADLEAF HERBICIDE COMBINATIONS. C. T. Leon, E. P. Webster, W. Zhang, and K. J. Pellerin. Louisiana State University AgCenter, Baton Rouge, LA 70803.

ABSTRACT

Studies were conducted at the Rice Research Station near Crowley, Louisiana during 2000 and 2001 to evaluate the effect of tank-mixes on Ricestar (fenoxaprop + safener) efficacy. During both years of the study, rice (*Oryza sativa* L.) was drill-seeded using conventional tillage practices. The studies had a factorial arrangement of treatments in a randomized complete block design with 4 replications. Factor A consisted of the Ricestar rates 0, 15, or 20 oz/A applied mid postemergence (MPOST) in 2000 and 0, 15, or 17 oz/A applied early postemergence (EPOST) in 2001. Factor B consisted of 1.5 pt/A Basagran (bentazon), 6 pt/A Arrosolo (propanil + molinate), 1 oz/A Londax (bensulfuron), 1 oz/A Permit (halosulfuron), 1 oz/A Aim (carfentrazone), or 0.67 pt/A Grandstand (triclopyr). In 2001, 5.3 oz/A Facet was added to Factor B. Herbicide applications were made at the 3- to 5-leaf stage (MPOST) in 2000, and 1- to 2-leaf stage (EPOST) in 2001. Visual weed control ratings and crop injury were taken. Weeds evaluated were barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.], Amazon sprangletop [*Leptochloa panicoides* (Presl) Hitchc.], and broadleaf signalgrass [*Brachiaria platyphylla* (Griseb.) Nash]. Herbicide interactions were determined using a mathematical procedure described by Colby.

In 2000, 15 oz/A Ricestar + Arrosolo controlled barnyardgrass 88 to 90% at 18 and 35 days after MPOST (DAMPOST), respectively. Barnyardgrass control 18 DAMPOST with 20 oz/A Ricestar was 84 to 85% with a single application of Ricestar or tank-mixed with Basagran. At 35 DAMPOST, 20 oz/A Ricestar alone or tank-mixed with Basagran or Arrosolo controlled barnyardgrass 88 to 94%. Barnyardgrass control with Ricestar was generally antagonized when tank-mixed with Londax, Permit, Aim, or Grandstand. Amazon sprangletop control was 86% at 18 DAMPOST with 15 oz/A Ricestar + Arrosolo. All other treatments and rating intervals controlled Amazon sprangletop less than 85%. All tank-mixtures, with the exception of Basagran, generally antagonized Ricestar applied MPOST. Rice injury was 0 to 5%.

In 2001, a single application of 15 oz/A and 17 oz/A Ricestar or in any tank-mix controlled barnyardgrass 93% at 18 DAMPOST. All treatments resulted in an additive effect 18 DAMPOST. By 35 DAMPOST, 15 and 17 oz/A Ricestar + Facet controlled barnyardgrass 91%, but all other treatments controlled barnyardgrass less than 75%. Grandstand or Permit + 15 oz/A Ricestar were synergistic with respect to barnyardgrass control 35 DAMPOST. Basagran, Arrosolo, and Aim were antagonistic when combined with 17 oz/A Ricestar at 35 DAMPOST. Broadleaf signalgrass control was at least 83% with all treatments 18 DAMPOST; however, Aim was antagonistic to Ricestar at 18 DAMPOST. At 35 DAMPOST, Arrosolo or Facet + 15 or 17 oz/A Ricestar controlled broadleaf signalgrass 91 to 94%. Londax, Permit, Aim, and Grandstand + 17 oz/A Ricestar improved broadleaf signalgrass control over Colby's expected value, yet control for all tank-mixtures was less than 30%. Reduced grass control was primarily due to late-season grass emergence. No rice injury was observed for either rating interval. Yields were 2170 to 5680 lbs/A.

In conclusion, Ricestar tank-mixtures applied EPOST were less likely to exhibit antagonism when applied to smaller grasses under favorable growing conditions, and did not differ in weed control response with respect to Ricestar rate. The loss of grass control 35 DAMPOST is primarily due to subsequent grass emergence after the EPOST application. However, Ricestar tank-mixed with Facet or Arrosolo controlled barnyardgrass and broadleaf signalgrass 88 to 95% at 35 DAMPOST.

DETERMINATION OF HYBRIDIZATION BETWEEN RICE AND RED RICE USING MICROSATELLITE MARKERS. L.E. Estorninos, Jr., D.R. Gealy*, T.L. Dillon, F.L. Baldwin, N.R. Burgos, and T.H. Tai. University of Arkansas, Fayetteville, AR 72701 and USDA-ARS, Dale Bumpers -National Rice Research Center, Stuttgart, AR. 72160.

ABSTRACT

Simultaneous flowering of cultivated rice and red rice creates a favorable environment for hybridization. Hybridization can be assessed based on molecular markers. Four simple sequence repeat (SSR) markers, previously found to discriminate hybrids from cultivated rice and red rice, were used to determine the rate of hybridization.

In the 2000 rice planting season at Stuttgart, AR, two IMI herbicide resistant rice cultivars (CF 2551 and CF 0051) were found to flower nearly simultaneously with a strawhull red rice biotype. Red rice-infested IMI rice plots were combine harvested. From these samples, 12,000 apparent red rice seeds (medium grain) were selected by hand. At the same field site, 13,000 seeds were harvested directly from panicles on numerous red rice-like plants (tall with rough leaves) growing between IMI rice plots. All 25,000 seeds were planted in the greenhouse and seedlings were sprayed three times with 0.063 lb/A (0.07 kg/ha) imazethapyr herbicide at 7 day intervals. Sixty-nine of the 12,000 apparent red rice seeds and 78 of the 13,000 from red rice-like plants survived the three herbicide applications. DNA was extracted from survivors and fingerprinted. Only three of the 147 survivors had banding patterns consistent with true hybridization indicating an outcrossing rate of about 0.012%. Although this number is very small, it may translate into hundreds or thousands of plants per field depending on the level of red rice infestation.

A field infested with red rice that had been planted with CF 2551 in 2000 was sprayed three times with imazethapyr herbicide in 2001. The initial red rice population density in 2001 was approximately 122 plants/ft^2 (1310 plants/m^2) in the 30,000 /ft^2 plot area. Seven hundred twenty plants survived the three herbicide applications. DNA was extracted and fingerprinted from the initial 173 survivors. Seventeen percent of the 173 survivors had bands consistent with CF 2551 in all four SSR markers and about 51% had bands consistent with at least three of the four markers. About 5% of the 173 survivors produced banding patterns in all four markers that were consistent with true hybridization between CF 2551 and Stuttgart strawhull red rice, while 22% produced similarly consistent bands in at least three of the four markers. These survivors had generally pale, rough, and droopy leaves, and were very late to mature. These characteristics are consistent with those found in red rice hybrids observed previously.

An outcrossing test was also done between a nonherbicide resistant rice and red rice. Starbonnet rice was found to flower almost simultaneously with Stuttgart blackhull red rice. About 2,500 seeds of Starbonnet from the year 2000 outcrossing pairs were planted in the greenhouse. DNA was extracted from 14-day-old seedlings and fingerprinted. None of the bands showed hybridization patterns consistent with Starbonnet and Stuttgart blackhull red rice.

RESPONSE OF RICE VARIETIES TO CLOMAZONE. M.A. Thompson, Southeast Missouri State Univ., Cape Girardeau, MO; J.A. Kendig, Univ. of Missouri Delta Center, Portageville, MO; D. Beighley, Southeast Missouri State Univ., Missouri Rice Research Farm, Malden MO.

ABSTRACT

A preemergence (PRE) application of clomazone can improve the control of barnyardgrass and certain other grass weeds in rice. However, some researchers have reported increased clomazone injury to medium grain varieties or to rice grown on silt loam soils, with occasional yield reductions. This study evaluated the response of selected rice varieties to clomazone on a Crowley silt loam soil.

Field research was conducted at the Missouri Rice Research farm at Glennonville, MO in 2001. All varieties were drill seeded and included one medium grain variety ‘Earl’ and nine long grain varieties: ‘Cocodrie’, ‘Drew’, ‘Wells’, ‘Madison’, ‘Saber’, ‘Priscilla’, ‘Lagrue’, ‘Cypress’, and ‘Ahrent’. Varieties included were those currently recommended by the University of Missouri or those expected to be important to Missouri growers in the future. Clomazone was applied PRE with a CO2 pressurized backpack sprayer at rates equivalent to 0.5 lb ai/A or 1.0 lb ai/A. An untreated check was included with each variety for comparison. Visual injury (bleaching), stand count prior to tillering, 50% heading date, and yield were used to evaluate crop response.

Bleaching injury increased with rate of clomazone, and was present at 2, 5 and 7 weeks after treatment (WAT). At the ‘use’ rate of 0.5 lb ai/A, bleaching was generally less than 10% by 7 WAT. At 1.0 lb ai/A clomazone, varieties had bleaching of 10 to 34% at 7 WAT. The medium grain variety ‘Earl’ had the highest bleaching injury 7 WAT of 13% at 0.5 lb ai/A and 34% at 1.0 lb ai/A. Stand was reduced at the 0.5 lb ai/A rate for ‘Drew’ and ‘Priscilla’ by 16 and 10 plants per meter of row, respectively. Stand was reduced by 10 to 26 plants per meter of row for ‘Cocodrie’, ‘Lagrue’, ‘Cypress’, ‘Wells’, ‘Priscilla’, ‘Madison’, and ‘Drew’ at 1.0 lb ai/A clomazone. Date of 50% heading was delayed by 1-4 days for all varieties at either clomazone rate except for ‘Drew’ which was unaffected at either rate and ‘Wells’ which showed no heading delay at the 0.5 lb ai/A rate. Bleaching injury and stand reduction observed early in the season, and delay in heading did not significantly reduce yields for any of the varieties evaluated in this study.

USE OF ANTISENSE GENES TO CHARACTERIZE THE PHYSIOLOGICAL FUNCTIONS OF GLUTATHIONE *S*-TRANSFERASES IN TRANSGENIC RICE SEEDLINGS AND ARABIDOPSIS SEEDLINGS. F. Deng, J. Jelesko, C. Cramer, and K.K. Hatzios; Department of Plant Pathology, Physiology and Weed Science, Virginia Tech, Blacksburg, VA 24060.

ABSTRACT

Glutathione S-transferases (GSTs) are key metabolic enzymes catalyzing the detoxification of many herbicides in plants. Rice GSTs catalyze the conjugation of the herbicide pretilachlor with glutathione and this reaction is enhanced by the safener fenclorim. In our ongoing studies to characterize rice GSTs, we used antisense GSTs in order to characterize the physiological functions of these important enzymes.

An antisense cDNA construct of the gene coding the GST II subunit of rice (*Os*GST II) was linked to a dual-enhanced CaMV 35S promoter by PCR2.1 and PRTL2 and cloned to PBC302 vectors. The final clone containing the *bar* gene as marker was used to transform Lemont rice and *Arabidopsis thaliana* seedlings. The construct was transferred to Lemont rice callus and *Arabidopsis thaliana* seedlings by *Agrobacterium tumefaciens*. Rice and Arabidopsis seedlings transformed with the antisense GST gene exhibited resistance to glufosinate because of the presence of the *bar* gene. Transgenic rice plants were sensitive to the herbicide pretilachlor. Transgenic *Arabidopsis* seedlings were not sensitive to pretilachlor, but flowered late and developed fewer fruits.

Transgenic *Arabidopsis* seedlings were identified by PCR and DNA gel blot analysis showed that they contained one copy of the OsGST II gene. Transgenic rice seedlings contained one-two copies of the *Os*GST II gene. Northern Blot analysis showed that GST mRNA contents were increased in fenclorim-treated wild type rice seedlings and cells. GST mRNA content was low in transgenic rice cells. However, GST mRNA content was increased in transgenic rice cells treated with the safener fenclorim. GST activity measured with cinnamic acid, CDNB, and pretilachlor was decreased more in rice transgenic plants than in transgenic *Arabidopsis*. The *Os*GST II-II isozyme was purified and partially characterized from wild type rice seedlings. SDS-PAGE analysis showed that the band of the *Os*GST II subunit band was very faint in rice seedling transformed with antisense *Os*GST II construct. The levels of phenolic chemicals in transgenic rice seedlings were determined by HPLC and HPLC-MS analysis. The levels of cinnamic acid and phenylalanine in transgenic rice seedlings were 45% and 35% higher than their levels detected in the wild type of rice.

These results suggest that the *Os*GST II gene of rice plays an important role in the detoxification of the herbicide pretilachlor and in the secondary metabolism of rice seedlings. The results obtained with transgenic *Arabidopsis*, show that GSTs may be involved in the regulation of flowering by phenolic compounds.

TIMING OF BROADLEAF RICE HERBICIDES FOR REDUCED ANTAGONISM WITH CYHALOFOP-BUTYL. E.F. Scherder, R.E. Talbert, M.L. Lovelace, F.L. Baldwin, K.L. Smith, and R.B. Lassiter. University of Arkansas , Fayetteville, AR; University of Arkansas Cooperative Extension Service, Little Rock, AR and Southeast Research Extension Center, Monticello, AR; and Dow AgroSciences, Indianapolis, IN

ABSTRACT

An experiment was conducted in Arkansas to evaluate the antagonism in grass weed control with cyhalofop-butyl (Clincher) when used in a program with broadleaf herbicides commonly used in rice production. Cyhalofop will be used for selective grass control in rice production and will need to be used with other herbicides to obtain effective control of broadleaf weeds common to rice. Activity of cyhalofop on grass species has been antagonized when tank-mixed with broadleaf herbicides. Experiments were designed to evaluate possible ways of reducing the antagonism of barnyardgrass (*Echinochloa crus-galli*) and broadleaf signalgrass (*Brachiaria platyphylla*) control by using broadleaf herbicides in separate sprays at other application timings than cyhalofop to determine the shortest effective spray application interval between cyhalofop and broadleaf herbicides

Four separate experiments were established at the Rice Research and Extension Center, Stuttgart, Arkansas, the University of Arkansas Pine Bluff, Lonoke, Arkansas, the Southeast Branch Experiment Station, Rohwer, Arkansas, and at a producer farm near Humphrey, Arkansas. Cyhalofop was applied at 210 g ai/ha with Agridex at 2.5 % V/V at a 3- to 4-leaf grass stage. Halosulfuron (Permit) was applied at 52 g ai/ha 5 days (d), 3 d, and 1 d prior to the application of cyhalofop. Halosulfuron was also tank-mixed with cyhalofop and followed cyhalofop at 1 d, 3 d, and 5 d after the 3- to 4-leaf grass application. Halosulfuron treatments were evaluated at all four locations. Propanil (Stam M-4) at 4480 g ai/ha and triclopyr (Grandstand) at 280 g ai/ha were also evaluated at the same application timings as halosufluron at the Stuttgart location only.

Halosulfuron did not reduce cyhalofop activity on barnyardgrass when applied 5 d prior to cyhalofop with control greater than 80%. Barnyardgrass control ranged from 71 to 74% when applied 3 d prior to cyhalofop at two of the four locations. When halosulfuron was applied 1 d prior, control was reduced to 39 to 68% at three of the four locations. Barnyardgrass control was reduced at all locations when halosulfuron and cyhalofop were tank-mixed, with control ranging from 29 to 81%. No reductions in barnyardgrass control were observed at any of the locations when halosulfuron was applied 3 or 5 d after cyhalofop. Broadleaf signalgrass control followed similar trends as observed with barnyardgrass control. Broadleaf signalgrass control ranged from 89 to 96% when halosulfuron was applied 3 d prior to cyhalofop. Broadleaf signalgrass control was reduced at all locations when halosulfuron was tank-mixed with cyhalofop, with control ranging from 13 to 64%. No reductions in broadleaf signalgrass control were observed when halosulfuron was applied 3 d or 5 d after cyhalofop.

Barnyardgrass and broadleaf signalgrass control was not reduced when propanil was applied prior to or after cyhalofop, with control ranging from 94 to 100%. Barnyardgrass control was reduced slightly to 85% when propanil was tank-mixed with cyhalofop; however, broadleaf signalgrass control was not reduced.

Triclopyr proved to be highly antagonistic to cyhalofop activity on barnyardgrass and broadleaf signalgrass. Barnyardgrass control was reduced from 88% when cyhalofop was applied alone to 23 to 51% when triclopyr was applied 5, 3, and 1 d prior to cyhalofop or when tank-mixed with cyhalofop. Barnyardgrass control was not antagonized when triclopyr was applied 3 d and 5 d after cyhalofop with control greater than 93%. Broadleaf signalgrass control was only 25% when tank-mixed with cyhalofop and ranged from 53 to 78% when applied 5, 3, and 1 d prior to cyhalofop. Control ranged from 80% to 100% when applied 1 to 5 d after cyhalofop which was significantly greater than when triclopyr was applied prior to cyhalofop.

STEWARDSHIP FOR NEWPATH™ HERBICIDE (IMAZETHAPYR) IN THE CLEARFIELD™ RICE PRODUCTION SYSTEM. R. Lloyd*, M. Hackworth, A. Rhodes, B. Guice, P. Bruno, R. Scott, A. Floyed and G. Stapleton. BASF Corporation, Research Triangle Park, North Carolina.

ABSTRACT

BASF will introduce NEWPATH herbicide (imazethapyr) for use with the CLEARFIELD Rice Production System in 2002. CLEARFIELD Rice is a new technology for rice production. Developed through enhanced plant breeding techniques, CLEARFIELD Rice was selected by Dr. Tim Croughan at Louisiana State University Agricultural Center to be tolerant to NEWPATH. No foreign DNA was introduced to rice to develop Clearfield Rice; therefore, it is not considered a genetically modified organism.

NEWPATH is a broad spectrum (grass and broadleaf weeds), residual herbicide which controls red rice (Oryza sativa L. ssp. indica), barnyardgrass [Echinochloa crus-galli L. (P. Beauv.)], sprangletop [Leptochloa (P. Beauv.) spp.], broadleaf signalgrass [Brachiaria platyphylla (Griseb.) Nash.] and yellow nutsedge (Cyperus esculentus L.). NEWPATH herbicide was granted reduced risk status by the EPA in July of 200 and will be available under a special local need 24(c) registration for the states of Arkansas, Louisiana, Mississippi, Missouri and Texas for the 2002 use season.

To preserve the long-term efficacy of the CLEARFIELD Rice technology, certain stewardship practices need to be followed. CLEARFIELD Rice producers will be asked to help protect and prolong the usefulness of this technology by following specific requirements/recommendations to help prevent weed resistance.

INFLUENCE OF WEEDS ON INSECT PESTS OF RICE. K.V. Tindall, B.J. Williams, and M.J. Stout. Louisiana State University Agricultural Center, Baton Rouge, LA 70808.

ABSTRACT

The relative preference and performance of the rice water weevil were examined in greenhouse experiments using commercial rice Cv. 'Cocodrie' and seven different weed species: barnyardgrass (*Echinochloa crus-galli*), fall panicum (*Panicum dichotomiflorum*), yellow nutsedge (*Cyperus esculentus*), red rice (*Oryza sativa*), broadleaf signalgrass *(Brachiaria platyphylla*), Amazon sprangletop (*Leptochloa panicoides*), and hemp sesbania (*Sesbania exaltata*). The experimental design was a randomized block design with three replications with 4-8 cages per replication. Variables examined were numbers of eggs, neonate larvae, and late instars. An additional experiment examined adult feeding preference for each of the eight species. Numbers of eggs, neonate larvae, late instars, and area consumed for each species were analyzed using ANOVA and means were separated by Tukey's studentized range test.

Barnyardgrass, fall panicum, yellow nutsedge, and broadleaf signalgrass were more preferred for oviposition than Cocodrie. Hemp sesbania and Amazon sprangletop were less preferred for oviposition than Cocodrie. There were no differences in oviposition between red rice and Cocodrie. More neonate larvae eclosed from eggs on barnyardgrass and yellow nutsedge than eclosed from Cocodrie. Amazon sprangletop and hemp sesbania had fewer numbers of neonate larvae eclose than Cocodrie. Numbers of neonate larvae found on red rice, fall panicum, and broadleaf signalgrass were not different from numbers found on Cocodrie. Numbers of late instars feeding on roots hemp sesbania, yellow nutsedge, and broadleaf signalgrass were significantly fewer than numbers found on Cocodrie. There were no other significant differences in numbers of late instars on other species compared to those found on Cocodrie. Rice water weevils fed most on barnyardgrass; however, the amount of feeding was not significantly different from the feeding on Cocodrie. Barnyardgrass had more feeding scars than hemp sesbania, yellow nutsedge, and broadleaf signalgrass. Data gained from this experiment were used to select a preferred and non-preferred host for the second objective.

Field experiments were conducted to determine if presence of weeds influences infestations of rice water weevils or rice stink bugs. Experiments were conducted at Northeast Research Station (NERS), St. Joseph, La., and Macon Ridge Research Station (MRRS), Winnsboro, La., during the summer of 2001. Plots were 1.5 m X 3 m at NERS and 4 m X 3 m at MRRS. Plots were spaced 1.5 m apart (NERS) or 4 m apart (MRRS) such that each plot was an isolated. Experimental design was a randomized block design with four replications at NERS and three replications at MRRS. There were five treatments involving the arrangement of selected weeds and rice. Weeds selected were a preferred host, barnyardgrass, and a non-preferred host, hemp sesbania, for both insects. Treatments were an entire plot of rice and two mixed plots of each weed species. Mixed plots of weeds and rice differed in arrangement of weeds; weeds surrounding rice or rice surrounding weeds. When insect populations were sampled, they were sampled only within the areas of rice. Rice water weevil larval samples were taken 3 weeks after permanent floods were applied at NERS and MRRS and 5 weeks after flooding at MRRS. Rice stink bugs were sampled once a week for four weeks after rice headed. Insect populations on rice in mixed plots were compared to insect populations on rice in whole plots of rice and analyzed using contrast statements.

Presence of barnyardgrass reduced numbers of rice water weevils by 44% when barnyardgrass surrounded rice; however, there was no difference in numbers of larvae when barnyardgrass was surrounded by rice. Rice had fewer rice water weevil larvae present on roots when rice was grown in association with hemp sesbania in both arrangements of weeds; however, numbers were not significantly different. Rice grown in association with barnyardgrass had larger numbers of rice stink bugs than rice grown in association with rice. However, differences were significant in only two cases. Numbers of adults on rice when rice was located in the center of the plot were significantly higher than the interior section of whole plots of rice. When rice was surrounding barnyardgrass, numbers of nymphs were significantly higher than those on outer margins of whole plots of rice. Hemp sesbania had no impact on rice stink bugs regardless if hemp sesbania was in the interior or exterior portion of the plot.

Although preliminary, data suggest that a preferred host, like barnyardgrass, can influence insect populations in rice. Addition research is needed to confirm these results and to determine if these interactions can be exploited in the management of rice water weevils and/or rice stink bugs.

ACTIVITY OF CYHALOFOP-BUTYL ON PERENNIAL GRASS SPECIES FOUND IN RICE PRODUCTION AREAS OF SW LOUISIANA. R.B. Lassiter, R.E. Strahan, M.L Schlenz, and R.K. Mann; Dow AgroSciences, Little Rock, AR 72212; Louisiana State University Agricultural Center, Baton Rouge, LA 70894; and Dow AgroSciences, Indianapolis, IN 46268.

ABSTRACT

In 2001, greenhouse and field studies were conducted to evaluate the postemergence activity of cyhalofop-butyl, a new postemergence graminicide under development by Dow AgroSciences LLC, on several species of perennial grasses found in water-seeded rice production areas of SW Louisiana. In field studies, excellent activity from cyhalofop-butyl at rates of 210-310 g ai ha^{-1} was observed on 15-91 cm long *Paspalum distichum*, and control was significantly better than fenoxaprop, fenoxaprop + isoxadifen-ethyl, molinate, or bispyribac-sodium. In greenhouse studies, cyhalofop-butyl was evaluated at rates of 105-560 g ai ha^{-1} and compared to labeled rates of other commercially registered herbicides on two growth stages of five species of perennial grasses: *Paspalum distichum, P. acuminatum*, *P. hydrophilum*, *Luziola fluitans*, and *Echinochloa polystachya.* Cyhalofop-butyl at rates of 280-560 g ai ha^{-1} was significantly more active on all grass species than propanil, quinclorac, fenoxaprop, fenoxaprop + isoxadifen-ethyl, molinate, or bispyribac-sodium. The level of activity was dependant on grass species and cyhalofop-butyl rate, and to a lesser extent, grass stage of growth at application. These results suggest the need for expanded field evaluations of cyhalofop-butyl for the management of perennial grasses in rice production areas of SW Louisiana.

OUTCROSSING BETWEEN CLEARFIELD* RICE AND RED RICE. T.L. Dillon, F.L. Baldwin, R.E. Talbert, L.E. Estorninos and D.R. Gealy, U of A Cooperative Extension Service, Little Rock, AR, Crops, Soils and Environmental Sciences U of A, Fayetteville, AR and USDA-ARS-DB-NRRC, Stuttgart, AR.

ABSTRACT

Clearfield* (imidazolinone tolerant) rice will be commercially available to Arkansas rice producers in 2002. The use of Newpath* (imazethapyr), in this system, allows the producer the ability to control red rice in dry seeded rice. There have been many debates on the topic of gene flow from herbicide tolerant rice to the wild rice species. Last year, in two red rice efficacy studies planted to Clearfield varieties CL 2551 and CL 3291, simultaneous flowering of red and Clearfield rice occurred. Red rice seed produced from these three trials have been screened for Newpath resistance in both the greenhouse and in the field. Results of the preliminary greenhouse study were 3 confirmed hybrid plants from 12,000 seed screened. The field area of the three efficacy studies was also screened and many of the surviving plants appear to have red characteristics. These preliminary data demonstrates that gene flow from Clearfield to red rice will occur if a red rice control failure occurs in the field. An excellent stewardship program must be followed at the grower level to preserve the usefulness of this technology.

Acknowledgements: Arkansas Rice Research and Promotion Board, BASF*, and Horizon Ag*.

IMPACT OF RYE COVER CROP ON POSTEMERGENCE WEED CONTROL IN NARROW ROW GLYPHOSATE-RESISTANT, GLUFOSINATE-RESISTANT, AND CONVENTIONAL SOYBEAN. K.N. Reddy, USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS 38776.

ABSTRACT

The long growing season in the Mississippi Delta region permits the use of winter cover crop in row crop production. Cover crops, aside from reducing soil erosion and water runoff, provide additional benefit of weed suppression. Cover crops generally provide species-specific, partial weed control, but cannot eliminate herbicides. Planting soybean in narrow rows can improve weed control compared to wide rows due to a faster canopy closure that results in greater shading and weed suppression. Early-season weed suppression by cover crops coupled with faster canopy closure in narrow row planting has potential to reduce herbicide inputs. This study examines the impact of rye cover crop with one or two postemergence (POST) herbicide applications on weed control, soybean yield, and net return in narrow row glyphosate-resistant, glufosinate-resistant, and conventional soybean systems in the Mississippi Delta region.

A 3-yr field experiment was conducted during 1999, 2000, and 2001 at Stoneville, MS, on a Dundee silty clay loam. The experiment was conducted in a split-split plot arrangement of treatments in a randomized complete block design with soybean cultivar as main plots, cover crop/tillage systems as sub plots, and herbicide programs as sub-sub plots with three replications. Sub-sub plot size was 4.6 m wide and 7.6 m long. Glyphosate-resistant (DP5806 RR), glufosinate-resistant (A 5547 LL), and conventional (DP 3588) soybean cultivars were planted each year in 19-cm rows. Cover crop systems included rye, no-cover crop conventional tillage (CT), and no-cover crop no-tillage (NT). Rye was planted in October of 1998, 1999, and 2000 and was desiccated the following spring with paraquat at 1.1 kg ai/ha 2 wk before planting soybean. Herbicide treatments included early POST (EPOST), late POST (LPOST), and a no-herbicide control. In glyphosate-resistant soybean, the weed control treatments were one or two applications of glyphosate at 1.12 kg ai/ha each. The glufosinate-resistant soybean weed control treatments included one or two applications of glufosinate at 0.41 kg ai/ha each. In conventional soybean, the weed control treatments were acifluorfen at 0.28 kg ai/ha plus bentazon at 0.56 kg ai/ha plus clethodim at 0.14 kg ai/ha EPOST and chlorimuron at 12 g ai/ha LPOST. EPOST and LPOST herbicides were broadcast-applied 3 and 5 wk after planting soybean, respectively.

Weed control and net return among glyphosate-resistant, glufosinate-resistant, and conventional soybean systems were similar. One POST ($111/ha) application of herbicides was more profitable than two POST ($79/ha) applications regardless of soybean and cover crop systems planted in narrow rows. Rye residue reduced total weed density by 9 to 27% and biomass by 19 to 38% compared to no-cover crop CT and NT. In rye cover crop, input costs were high due to additional cost of seed, planting, and desiccation. The additional cost resulted in lower net return with rye cover crop ($29/ha) compared to no-cover crop CT ($84/ha) or NT ($87/ha) system, even though rye cover crop system produced soybean yield similar to no-cover crop CT and NT systems. These results indicate that due to additional cost, rye cover crop-based soybean production was less profitable compared to existing no-cover crop-based production systems.

EFFECT OF PREPLANT APPLICATION INTERVAL ON SOYBEAN TOLERANCE TO BURNDOWN HERBICIDES. D.R. Lee, D.K. Miller, and A.L. Perritt; Louisiana State University AgCenter, Baton Rouge, LA 70803.

ABSTRACT

Research was conducted in 2001 at the Northeast Research Station in St. Joseph, La on a silty clay loam soil to evaluate tolerance of soybean to preplant application of burndown herbicides Linex (linuron) and Direx (diuron). In separate field studies, Linex or Direx were applied at 1 or 2 lb ai/A 30, 21, 14, or 7 d before planting. A nontreated check was included for comparison. In an additional field study, the following treatments were applied 15 d before planting: Linex or Direx at 1 or 2 lb ai/A alone; and Linex in combination with Direx at 1 + 0.5, 0.5 + 1, 0.5 + 0.5, 0.75 + 0.75, or 1 + 1 lb ai/A, respectively. A nontreated check was included for comparison. Experimental design was a randomized complete block for all studies with a factorial arrangement of herbicide rates and application timings in the Linex/Direx timing studies. Treatments were applied to all rows of each two row, 6.67’ x 30’ plot. Although studies were conducted in a relatively weed-free area, plots were maintained as such by hand hoeing throughout the growing season. Soybean tolerance was evaluated with a visual injury rating 28 d after planting (DAP), plant height measurement 28 and 56 DAP, and yield determination. Data were subjected to ANOVA and means separated by protected LSD (0.05).

For the Linex/Direx timing studies, data analysis indicated no significant herbicide rate by application timing interaction and no significant herbicide rate effect for any parameter measured. Injury was no greater than 5% for either herbicide 28 DAP. Soybean height for the nontreated control averaged 19 and 78 cm and 19 and 70 cm at 28 and 56 DAP in the Linex and Direx studies, respectively. Linex or Direx application at either rate did not reduce height. Soybean yield for the nontreated check averaged 50 and 33 bu/A in the Linex and Direx studies, respectively, which was equal to yield following application of both herbicides at either rate.

In the Linex/Direx combination study applied 15 d before planting, data analysis indicated no negative treatment effects for plant height 28 or 56 DAP or soybean yield. Soybean in nontreated plots averaged 18 cm, 73 cm, and 59 bu/A for these respective parameters.

BIOCONTROL OF REDVINE (*Brunnichia ovata*) AND TRUMPETCREEPER (*Campsis radicans*) IN SOYBEAN (*Glycine max*) IS SYNERGIZED BY GLYPHOSATE AND BIOHERBICIDE APPLICATIONS. C.D. Boyette, K.N. Reddy, and R.E. Hoagland. USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS 38776.

ABSTRACT

Redvine [*Brunnichia ovata* (Walt.) Shinners] and trumpetcreeper [*Campsis radicans* (L.) Seem. ex Bureau] are native perennial , deciduous, woody dicot, shrubby viny weeds found in row crops of the Mississippi Delta. These plants are difficult to control due to extensive deep root systems with many adventitious root buds that are underground regenerative organs capable of producing shoots. Glyphosate [*N*-(phosphonomethyl)glycine] can provide 60 to 90% control of these weeds, but plants reestablish within 4 to 6 weeks after treatment.

Various herbicides, including glyphosate, have been shown to interact with certain plant pathogens causing increased or decreased disease severity. Bioherbicides are plant pathogens used to control weeds. Positive interactions (synergism) of a bioherbicide with a herbicide could result in more efficacious weed control, especially in instances of hard-to-control weeds.

Emulsified formulations of the bioherbicidal fungus *Myrothecium verrucaria* (Alb. & Schwein.) Ditmar:Fr. were tested alone, in combination with, prior to, and following treatment with glyphosate for control of redvine and trumpetcreeper under field conditions in Stoneville, MS in 2000 and 2001. Maximum redvine and trumpetcreeper mortalities (86% and 78%, respectively) occurred nine DAT when the fungal treatments were tank mixed with glyphosate. Infected weeds of each species exhibited similar disease symptomatology within 12 h following treatment. Disease symptomatology was characterized by necrotic flecking on leaves that coalesced into large lesions. Symptoms progressed from infected cotyledons and leaves to produce stem lesions within 48 h. The fungus sporulated profusely on infected tissue and was readily re-isolated. Soybeans that were planted into plots where weeds had been killed emerged normally with no disease or herbicide damage occurring. These results suggest that it may be possible to use combinations of glyphosate to improve the bioherbicidal control potential of *M. verrucaria* for controlling redvine, and trumpetcreeper.

COMPARISON OF GLYPHOSATE AND GLYPHOSATE PLUS SOIL ACTIVE HERBICIDES FOR IVYLEAF MORNINGGLORY, COMMON LAMBSQUARTERS, AND GIANT RAGWEED CONTROL IN SOYBEAN PRODUCTION SYSTEMS. A.T. Lee, C.L. Brommer, C.H. Slack, and W.W. Witt; Department of Agronomy, University of Kentucky, Lexington, KY 40546.

ABSTRACT

Herbicide application in soybeans has shifted from pre-emergence (PRE) to total post-emergence (POE) because glyphosate tolerant soybeans are widely available and popular among producers. The majority of Kentucky producers use only glyphosate, or other POE herbicides that offer no soil residual activity. Total POE herbicide programs introduce unique challenges in weed management including extremely early or late emerging weeds. One answer to these challenges may be to reintegrate residual herbicides in programs focused around glyphosate applied POE. A field study was conducted in 2001 at Lexington, Kentucky to compare soil active treatments to glyphosate on glyphosate tolerant soybeans in 76 cm row spacing. A randomized complete block design was utilized with four replications of five treatments. Glyphosate at 1.12 kg/ha, imazethapyr at 0.07 kg/ha + glyphosate at 0.84 kg/ha, and flufenacet at 0.17 kg/ha + metribuzin at 0.26 kg/ha were evaluated. The flufenacet + metribuzin was applied immediately after planting and followed by glyphosate or imazethapyr + glyphosate when weeds were 10 cm in height (MP). Glyphosate applied MP, imazethapyr + glyphosate applied MP, and glyphosate applied when weeds were 5 cm (EP) followed by glyphosate applied when weeds were 15 cm (LP) were evaluated without a PRE herbicide application. Visual efficacy ratings and soybean yields were used to compare differences among treatments. Efficacy was rated on a percent control basis 3 weeks after planting (WAP), and 8 weeks after POE application (WAT) for common lambsquarters, giant ragweed, and ivyleaf morningglory.

Ivyleaf morningglory. Ivyleaf morningglory control was 80% with flufenacet + metribuzin 3 WAP. Ivyleaf morningglory controls ranged from 84% to 91% 8 WAT, and were not statistically different.

Common lambsquarters. Common lambsquarters control was 95%-98% with flufenacet + metribuzin 3 WAP. Common lambsquarters control 8 WAT with flufenacet + metribuzin PRE followed by imazethapyr + glyphosate MP was 99% and statistically greater than glyphosate MP (94%) and imazethapyr + glyphosate MP (94%).

Giant ragweed. Giant ragweed control was 85%-86% 3 WAP with flufenacet + metribuzin. Giant ragweed control 8 WAT with flufenacet + metribuzin followed by glyphosate was 99% and statistically greater than glyphosate MP (95%) and imazethapyr + glyphosate MP (95%).

Soybean seed yield. Seed yield with glyphosate EP followed by glyphosate LP (3450 kg/ha) was statistically greater than seed yield with glyphosate MP (2800 kg/ha).

In conclusion, treatments with flufenacet + metribuzin applied PRE had greater control of ivyleaf morningglory, common lambsquarters, and giant ragweed 3 WAP than treatments without a PRE herbicide application. Applying flufenacet + metribuzin PRE also improved common lambsquarters and giant ragweed control 8 WAT. Adding imazethapyr to glyphosate applied MP did not improve soybean seed yield, or control of ivyleaf morningglory, common lambsquarters, or giant ragweed. However, glyphosate applied EP followed by glyphosate applied LP had greater soybean seed yield than glyphosate MP.

POSTEMERGENCE TEXASWEED CONTROL IN MISSISSIPPI SOYBEANS. R.M. Griffin, D.H. Poston, M.A. Blaine, and D.R. Shaw, Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762, and Delta Research and Extension Center, Stoneville, MS 38776.

ABSTRACT

Three field studies were conducted in Washington County, Mississippi, to evaluate postemergence (POST) Texasweed [*Caperonia palustris* (L.) St. Hil.] control with conventional herbicides, glyphosate, and tank mixtures of glyphosate with conventional herbicides. Initial herbicide applications were made to V2 – V3 soybean and cotyledon to 2-leaf stage Texasweed. A crop oil concentrate (COC) was used at 1.0% (v/v) with fomesafen, acifluorfen, and bentazon + acifluorfen. No surfactant was used with any treatment containing glyphosate. A nonionic surfactant (NIS) at 0.25% (v/v) was included with all other treatments. Visual evaluations were collected 2 and 5 weeks after application (WAA).

Two greenhouse studies were conducted to evaluate variable glyphosate and fomesafen rates on different sizes (1 - 4 leaf) of Texasweed. Both studies were conducted at the Delta Branch Experiment Station, located at Stoneville, MS. All treatments were applied POST using a spray chamber delivering a spray volume of 15 gpa. Applications were made to 1-, 2-, 3-, and 4- leaf size Texasweed. Visual ratings were made 17 d after postemergence treatment.

At 4 WAT, control with diphenylether herbicides was 76 -88% in 2000 when herbicide applications were made on cotyledon to 3-leaf Texasweed plants. In contrast, Texasweed control ranged from 50 to 71% with the same treatments in 2001 when applications were made on larger plants. Texasweed control 4 WAT with ALS-inhibiting herbicides was less than 60% both years. Glyphosate provided the most consistent control across both years and the level of control with glyphosate was generally similar to that provided by diphenylether herbicides.

Texasweed control with 0.75 and 1.0 lb ai acre^{-1} glyphosate was 83 and 84%, respectively. Tank mixing conventional herbicides with 0.75 lb ai acre^{-1} glyphosate generally did not increase control. However, control was improved with the addition of 0.1175 lbs ai acre^{-1} fomesafen in 2001 when applications were made on cotyledon to 5 - leaf Texasweed.

In the greenhouse, various sized Texasweed plants responded differently to increasing glyphosate rates (Table 4). Excellent control of one- and two-leaf plants was observed with all rates of glyphosate. In contrast, at least 1.0 lb ai acre^{-1} glyphosate was needed to provide control of three- and four-leaf plants. At least 93% control of one-, two, and three-leaf Texasweed plants was observed with fomesafen rates ranging from 0.176 to 0.411 lb ai acre^{-1} (Table 5). With four-leaf plants, control with 0.176 lb ai acre^{-1} fomesafen was significantly less than that observed with smaller plants.

Studies were conducted in the field to evaluate the potential benefit of adding fomesafen to glyphosate applications to improve Texasweed control (Table 3). No glyphosate rate by fomesafen rate interactions were detected. Texasweed control only varied with increasing fomesafen rates 2 WAT. At 4 WAT, there were no differences in treatments.

RR-SOYBEAN WEED CONTROL AS INFLUENCED BY PRE PLUS POST ROUNDUP APPLICATIONS.

R.R. Dobbs, N.W. Buehring and M.P. Harrison. Mississippi State University, Verona, MS.

ABSTRACT

Soybean growers are interested in knowing whether the use of a preemergence (PRE) herbicide in a Roundup (glyphosate) weed control program improves morningglory control and extends the Roundup application window. Therefore, a two year study (2000-2001) was conducted to determine the influence time of Roundup single or sequential applications, applied alone [no preemergence (No-PRE)] or after a PRE application of Squadron (imazaquin + pendimethalin) at 0.87 lb ai/ac, had on weed control in low and high infestations of pitted *(Ipomoea lacunosa)* or entireleaf morningglory *(Ipomoea hederacea)* and sicklepod *(Senna obtusifolia).* The experimental design was a split-split plot with weed infestation level as main plot, PRE application treatments as sub plot and time of Roundup application as sub-sub plot treatments. Both years the PRE application did not extend the Roundup application window. In 2000, the low weed infestation level provided 8 to 10% greater sicklepod and morningglory control, and 3 bu/ac greater yield than high weed infestations with no treatment interactions. The sequential application of Roundup at 1 lb ai/ac 28 days after planting (DAP) + 0.5 lb ai/ac 42 DAP in both PRE and No-PRE showed greater than 78% late season sicklepod and morningglory control. However, the PRE + sequential applications of Roundup (1 lb ai/ac 28 DAP + 0.5 lb ai/ac 42 DAP), produced 40.6 bu/ac, 4 bu/ac more than all other treatments. Weed infestation level in 2001 had no effect on morningglory and sicklepod control or yield. Late season sicklepod control also indicated no interactions between PRE and Roundup applications. All treatments except the check and 14 DAP single Roundup applications showed good sicklepod control (>80%). However, there was a Roundup application time by PRE herbicide treatment interaction for both morningglory control and yield. The sequential application of Roundup (1 lb ai/ac 38 DAP + 0.5 lb ai/ac 52 DAP) in both PRE and No-PRE had similar late season sicklepod and morningglory control (>82%). A PRE herbicide increased soybean yield in all single and sequential Roundup applications, except the sequential 38 DAP + 52 DAP treatments. The PRE or No-PRE plus sequential applications of Roundup at 1.0 or 1.5 lb ai/ac applied 38 DAP + 0.5 lb ai/ac at 52 DAP produced similar yield, and were equal to the PRE plus a single Roundup application at 1.0 or 1.5 lb ai/ac applied 38 DAP, or PRE plus Roundup at 1.0 lb ai/ac applied 21 DAP and repeated at 0.5 lb ai/ac 38 DAP. Although PRE and No-PRE weed control with sequential Roundup applications initiated 28 DAP in 2000 or 38 DAP in 2001 were similar, the two year yield average was 10% greater for the PRE plus Roundup sequential applications.

SOYBEAN INTERFERENCE POTENTIAL OF ALS-INHIBITOR-RESISTANT AND –SUSCEPTIBLE SMOOTH PIGWEED. W.A. Bailey and H.P. Wilson. Eastern Shore Agricultural Research and Extension Center, Virginia Tech, Painter, VA 23420.

ABSTRACT

Field experiments were conducted at the Eastern Shore Agricultural Research and Extension Center near Painter, VA in 2001 to evaluate soybean interference capabilities and economic thresholds of ALS-inhibitor-resistant and –susceptible smooth pigweed. Glyphosate-resistant soybean [*Glycine max* (L.) Merr. 'Pioneer 94B45R'] and ALS-inhibitor-susceptible (S) and –resistant (R) smooth pigweed (*Amaranthus hybridus* L.) biotypes collected from the Eastern Shore of Virginia were used in the experiment. Smooth pigweed biotypes were started in the greenhouse. Shortly after soybean emergence, smooth pigweed biotypes similar in size to soybean were transplanted 12 cm from soybean at densities of 1, 10, 30, and 60 plants/6.1 m of row. Plots were hand-hoed weekly to prevent soybean competition from volunteer weed species. Plant heights of soybean and pigweed were measured weekly throughout the growing season. At soybean senescence, pigweed were harvested and separated into reproductive and vegetative biomass. All pigweed were then removed from plots to facilitate soybean harvest.

Decreases occurred in soybean height but were based on pigweed density and were not influenced by pigweed biotype. No differences in pigweed height due to density or biotype occurred in the first 7 wk after transplanting (WATR). At 12 WATR, however, pigweed at 1 plant/6.1 m of row were significantly taller than pigweed at 10, 30, or 60 plants/6.1 m of row. Reproductive biomass was influenced mainly by pigweed density. However, at a density of 1 plant/6.1 m of row, R pigweed produced more reproductive biomass than S pigweed. Vegetative biomass production, total biomass production, harvest index (reproductive biomass / total biomass), and stem diameter were influenced only by pigweed density. Although most data indicate that differences in growth and biomass production were primarily due to density, differences in soybean yield loss were found due to density and biotype. With no competition from pigweed, soybean yield was 2420 kg/ha. Soybean yield loss ranged from 4% to 42% as smooth pigweed density increased from 1 to 60 plants/6.1 m of row. S pigweed caused significantly greater soybean yield loss than R pigweed at densities of 1, 10, and 30 plants/6.1 m of row. Based on differences in soybean yield loss due to pigweed biotype and a soybean price of $0.20/kg, economic thresholds for control (glyphosate at 1.1 kg/ha ($19.77/ha)) would be less than 1 pigweed/6.1 m of row for S pigweed and greater than 1 pigweed/6.1 m for R pigweed. Although obvious competitive differences in growth and biomass production were not found between S and R biotypes, more subtle differences may allow S populations to compete more effectively with soybean.

WEED MANAGEMENT IN NO-TILL SOYBEAN PLANTED INTO TALL FESCUE SOD. A. Rankins, Jr., M.W. Shankle, and G.B. Triplett, Jr., Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762, and Pontotoc Ridge-Flatwoods Branch Experiment Station, Pontotoc, MS, 38863.

ABSTRACT

Tall fescue (*Festuca arundinacea* Schreb.) is a long-lived perennial bunchgrass adapted for the Mid-South and is an integral part of grazing systems in Mississippi. Older tall fescue cultivars contain an endophyte that produces alkaloids toxic to grazing animals. These toxic effects include elevated body temperature and reduced weight gain. However, the presence of the endophyte increases tall fescue tolerance to drought and insect feeding. The development of non-toxic endophyte tall fescue has allowed high quality forage production without the undesirable toxic effects associated with the endophyte. Current recommendations for pasture renovation of toxic to non-toxic endophyte tall fescue cultivars are expensive. The costs associated with renovation include herbicides, seed, equipment, and loss of production. However, the inclusion of an annual crop in this system may allow producers to offset some the cost associated with renovation. A system that provides adequate control of toxic endophyte tall fescue, control of warm-season weeds, and crop yields that provide positive economic returns may be useful for MS forage producers.

This experiment was conducted in 2001 at the Prairie Research Unit near Prairie, MS on a Houston clay soil. The experimental design was a randomized complete block with four replicates, and plots were 10' x 25'. 'Agrow 4702 RR' soybean [*Glycine max* (L.) Merr.] were drilled (7.5-inch spacing) into tall fescue sod on April 12. Treatment combinations evaluated included 1 lb ai/A glyphosate pre-plant foliar (PPF), 1 lb/A paraquat PPF, 0.19 lb/A sulfentrazone + 0.04 lb/A chlorimuron + 0.75 lb/A pendimethalin preemergence (PRE), single application of 1 lb/A glyphosate postemergence (POST) 3 weeks after planting (WAP), 0.75 lb/A glyphosate POST 2 WAP followed by (fb) 1 lb/A glyphosate POST 4 WAP, and sequential applications of 0.5 lb/A glyphosate POST 2, 3, and 4 WAP. PRE and PPF applications were made on April 12. POST 2, 3, and 4 WAP applications were made on April 26, May 3, and May 10, respectively. Weed control and soybean injury were evaluated at 2-week intervals after planting until 8 WAP. Soybeans were harvested with a small-plot combine on October 4.

Soybean stand establishment was generally better following a PPF application of paraquat when compared to glyphosate PPF , which was likely the result of more rapid foliage desiccation associated with paraquat. This may have facilitated faster soil warming and less green vegetation present at the soil surface, resulting in better soybean germination and seedling emergence. At 2 WAP, glyphosate controlled tall fescue 65%. The inclusion of pendimethalin + sulfentrazone + chlorimuron with glyphosate improved tall fescue control to 76%. However, paraquat PPF alone controlled tall fescue at least 90%. By 6 WAP, all treatments that included sequential applications of glyphosate POST controlled tall fescue at least 90%. Tall fescue control ranged from 75 to 79% when only a single application of glyphosate was applied POST. At 6 WAP, treatments that included glyphosate PPF fb sequential glyphosate applications POST controlled bermudagrass [*Cynodon dactylon* (L.) Pers.] greater than 95%. However, bermudagrass control was significantly reduced with paraquat PPF treatments, when compared to glyphosate PPF. By 8 WAP, all treatments controlled tall fescue at least 93%. At 8 WAP, all treatments controlled bermudagrass at least 94%, with the exception of paraquat PPF fb a single application of glyphosate POST. Soybean yield ranged from 25 to 37 bu/A. In instances where soybean yield differed between identical POST treatments, soybean yield was higher with treatments including paraquat, when compared to those including glyphosate PPF.

Results from these data indicate that herbicide programs that include glyphosate or paraquat PPF followed by sequential glyphosate applications POST in Group IV Roundup Ready soybean can effectively control established tall fescue stands, when soybean are planted into tall fescue sod. Although soybean stand establishment may be better when paraquat is used PPF, glyphosate is more effective when warm-season perennial grasses like bermudagrass also must be controlled. The MS Agricultural Statistics Services reported that the 2001 statewide soybean yield average was 34 bu/A, which included irrigated on non-irrigated fields. Thus, Roundup Ready soybean produced in tall fescue sod can provide comparable yields to statewide averages in Mississippi.

SOIL SEEDBANK REDUCTION IN GLYPHOSATE-TOLERANT SOYBEAN. E.R. Walker and L.R. Oliver, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72701.

ABSTRACT

Since weeds that emerge in the middle to late portion of the season do not reduce yield, they are allowed to mature. Prolific seed production of these weeds increases the number of viable seed in the soil seedbank, ensuring future weed infestations. Therefore, a continuous field study was established at the Pine Tree Experiment Station in 2000 to identify optimum glyphosate rates and timings to reduce weed seed production, germination, and viability in a glyphosate-tolerant soybean production system, ultimately reducing the soil seedbank, while maintaining maximum soybean yield potential. The design of the experiment was a split plot with a factorial arrangement of subplot factors with four replications. The main plot was cultivar, and the subplot was application rate by timing. Plot size was 24 ft by 15 ft with 5-ft borders. Glyphosate-tolerant soybean cultivars Asgrow 4602 RR, Deltapine 5644 RR, and Deltapine 6200 RR were planted on a 30-in row spacing in 2000, and Deltapine 6299 RR was substituted for Deltapine 6200 RR in 2001. Herbicide treatments included glyphosate at 1 lb ai/A applied at the V3 soybean growth stage, followed by 0, 0.125, 0.25, 0.5, and 1 lb/A applied either at first weed flower or at first weed flower followed by sequential applications every 10 days until the 7-day pre-harvest interval. A weedy check was also included. Initial weed populations were determined by collecting and analyzing four 4-in in diameter by 6-in deep soilcores per plot and taking weed counts in 1 yd^2 immediately prior to V3 soybean glyphosate applications. Weed biomass was taken from a representative 1-yd^2 area in each plot immediately prior to harvest. In addition, seed were collected from the samples for count and germination evaluations. Four 1-ft samples per plot were used to determine glyphosate effects on soybean flowering and seed production, and soybean was harvested for yield.

In 2000, late-season glyphosate applications were initiated on July 5 by the flowering of Palmer amaranth (*Amaranthus palmeri*), and seven sequential applications were made. In 2001, late-season glyphosate applications were initiated on August 15 by the flowering of barnyardgrass (*Echinochloa crus-galli*), and four sequential applications were made. Prior to glyphosate applications in 2001, visual weed control ratings were taken at V3 soybean. These ratings reflect the efficacy of the treatments initiated by the first weed to flower in 2000 for managing weed seed production, viability, and germinability.

Sequential applications of glyphosate at 0.5 and 1 lb/A initiated by the first weed to flower in 2000 provided 75% control of barnyardgrass when ratings were taken at the V3 growth stage of soybean in 2001, compared to single applications of glyphosate at 0.5 and 1 lb/A at weed flowering, which provided <42% control. Palmer amaranth was controlled 97% at V3 soybean in 2001 by sequential glyphosate treatments applied at 1 lb/A in 2000 , while a single glyphosate application at this rate resulted in 75% control. All sequential glyphosate applications at weed flowering in 2000 controlled pitted morningglory (*Ipomoea lacunosa*) >75% by V3 soybean in 2001, compared to all single glyphosate applications, which provided <41% control. However, only barnyardgrass and pitted morningglory suppression was significantly higher than the recommended program of 1 lb/A glyphosate applied at V3 soybean followed by another application at V6 soybean in 2000, which provided 50 and 67% control of barnyardgrass and pitted morningglory, respectively, by V3 soybean in 2001. Multiple glyphosate applications did not reduce soybean yield in 2000 or 2001. These results suggest that sequential glyphosate applications at 0.5 lb/A applied to late-season weed escapes at weed flowering in glyphosate-tolerant soybean are effective at reducing weed pressure of certain weed species, such as barnyardgrass and pitted morningglory, with no associated reduction in soybean yield.

SPATIAL DISTRIBUTION OF *KYLLINGA* SPP. IN GOLF COURSE FAIRWAYS. J.S. McElroy, F.H. Yelverton, M.G. Burton, and H.D. Cummings. Dept. of Crop Science, North Carolina State University, Raleigh, NC.

ABSTRACT

Kyllinga brevifolia (green kyllinga) and *K. gracillima* (false-green kyllinga) are rhizomatous, perennial sedge species that are highly invasive into golf course fairways. In North Carolina, *K. brevifolia* has largely a coastal distribution, while *K. gracillima* is found predominately in the piedmont and mountain regions. While, excessive soil moisture has been observed as a factor favoring the establishment of these species in turfgrass systems, the ecology of these species has not been studied.

The spatial distribution of these species was evaluated in golf course fairways. Separate sites for *K. brevifolia* and *K. gracillima* were selected in North Carolina. Selected sites had high *Kyllinga* spp. purity with localized distribution. Fairfield Harbour Country Club, the Harbour Point course, in New Bern, NC, was selected for *K. brevifolia*. Bentwinds Country Club, in Fuquay-Varina, NC, was selected for *K. gracillima*. Four transects, approximately 30 m in length, were established at each site with $0.09m^2$ quadrats spaced 0.6 m apart along each transect. *Kyllinga* spp. shoot density counts (DEN) and soil samples were taken at each quadrat. Characteristics used for correlation analysis were: Cation exchange capacity (CEC), base saturation (BASE), pH, phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), sulfur (S), sodium (Na), relative volumetric soil water (H2O), and Elevation (ELEV). *K. brevifolia* DEN was square-root transformed (SQDEN) to correct for non-normal distribution.

Significant environmental correlations to *K. brevifolia* SQDEN were: ELEV (-0.62), H2O (0.38), Na (0.63), and pH (0.49). H2O was correlated to SQDEN (0.38), however the entire area surveyed had high soil water content (from 41 to 58%). Na was the most highly correlated (0.63) to SQDEN, with high plant densities observed at Na levels exceeding 0.5 $meq/100cm^3$. Tolerance of this species to high Na concentrations may help explain the coastal distribution of this species. pH was positively correlated (0.49) to SQDEN. High pH may have resulted from high concentrations of Ca, Mg, and BASE, which also were correlated to SQDEN (0.60, 0.55, and 0.62, respectively). ELEV was clearly associated with many soil characteristics. SQDEN (-0.62), pH (-0.80), Mg (-0.85), Ca (-0.66), and Na (-0.76) all were negatively correlated to ELEV. ELEV change across the *K. brevifolia* transect area was approximately 2 m.

Significant environmental correlations to *K. gracillima* DEN were: ELEV (-0.64), H2O (0.39), P (-0.42), and pH (-0.6). ELEV was negatively correlated to *K. gracillima* DEN, which is the opposite of what was observed for *K. brevifolia* SQDEN. This apparent inconsistency is explained by the small change in elevation of the *K. gracillima* transects (0.38 m) and their proximity to the golf putting green. High concentrations of *K. gracillima* plant densities were observed in the golf putting green approach area. High soil water was also observed in this area and is largely attributed to runoff from putting green irrigation. *K. gracillima* DEN correlated with low pH, with high plant densities observed in pH ranges of 5 to 5.4. While, *K. gracillima* DEN did correlate with low soil P, minimum P values did not necessitate additional P fertilization.

THE OCCURRENCE OF SIMAZINE-RESISTANT ANNUAL BLUEGRASS IN MISSISSIPPI. K.C. Hutto and G.E. Coats. Mississippi State University. Mississippi State, MS 39762.

ABSTRACT

Research was conducted the spring of 2000 and winter of 2001 to determine the extent of simazine-resistant annual bluegrass (*Poa annua* L.) across Mississippi. Seed samples were collected April through May of 2000, while mature plants were collected December 2000 to February 2001. Mature plants were collected using a 5 cm diameter plug cutter. The total number of sampling sites was 71 (70 golf courses and 1 non-golf site). All samples were grown in a greenhouse at growth temperatures of 24°C day and 18°C night without supplemental lighting. The emerged plants from seed samples were treated at the 3 to 4 leaf stage with 22 kg ai/ha simazine, while mature plant samples were treated as collected with the same rate of simazine. At 4 weeks after treatment (WAT), 32 of 71 (31 of 70 golf courses) sample sites (44%) showing no symptoms of injury. An on-site screening process was developed to identify potential resistance. This method entailed mixing 1teaspoon (~5.0 ml) simazine in 2 L water and applying the entire suspension to a 0.8 m^2 area using a hand-held watering can. This suspension was an approximate rate of 22 kg ai. A total of 90% of the 24 sites tested had at least 1 of 3 treated areas found to contain resistant annual bluegrass 4 WAT.

HERBICIDE PLACEMENT ON CANTALOUPE AND WATERMELON TRANSPLANTED ON POLYETHYLENE COVERED BEDS - WEED CONTROL EFFICACY AND INJURY CONSIDERATIONS.
W.C. Johnson, III; USDA-ARS, Coastal Plain Experiment Station, Tifton, GA 31793.

ABSTRACT

Cucurbit crops are grown on approximately 26,400 ha in Georgia, with watermelon and cantaloupe accounting for 62% of the cucurbit acreage. In previous years, much of the watermelon and cantaloupe acreage was direct seeded on freshly prepared seedbeds. Systems using hybrid cultivars seeded in greenhouses and transplanted on polyethylene covered seedbeds have recently become common. Currently, 57 and 35% of the cantaloupe and watermelon acreage, respectively, are being grown as transplants on polyethylene covered seedbeds. Hybrid seed are costly and transplanting reduces the risk of stand loss associated with direct seedings caused by an assortment of early-season production problems. Polyethylene covered seedbeds warm the soil, allowing for earlier planting and harvest during periods of historically premium commodity prices. Seedbeds are covered with a polyethylene tarp forming a finished seedbed approximately 30 to 150 cm wide. “Wide” seedbeds are used for multiple crops during a growing season with drip irrigation, compared to “narrow” seedbeds used for one crop during a growing season with overhead irrigation. Approximately 51 and 74% of the transplanted cantaloupe and watermelon acreage, respectively, is on “narrow” polyethylene covered seedbeds and irrigated with overhead irrigation. Seedlings are transplanted through the polyethylene tarp two to four weeks after fumigation to allow dissipation of the fumigant.

Field trials were conducted at the Coastal Plain Experiment Station Ponder Farm in 2000 and 2001 to study the effects of herbicide placement on weed control and transplanted cucurbit crop injury in the “narrow” polyethylene tarp production systems. Herbicides evaluated were halosulfuron (36 g ai/ha), clomazone (0.56 kg ai/ha), sulfentrazone (0.14 kg ai/ha and 0.28 kg ai/ha), and a nontreated control. Herbicide placements evaluated were preplant incorporated under the polyethylene tarp before transplanting, over-the-top after transplanting, and semi-directed after transplanting. Semi-directed after transplanting applications were made using TeeJet® OC-03 spray tips onto the shoulders of polyethylene covered seedbeds and into the row middles, without direct contact with ‘Vienna’ cantaloupe and ‘Stargazer’ watermelon transplants. Across all herbicide treatments, preplant incorporated under the polyethylene tarp and semi-directed applications were the least injurious, with over-the-top applications the most injurious. In general, sulfentrazone (0.25 lb ai/A) was the most injurious herbicide and halosulfuron the least injurious, regardless of herbicide placement. Halosulfuron effectively controlled many broadleaf weeds and yellow nutsedge, with minimal phytotoxicity to cantaloupe and watermelon, regardless of placement.

HALOSULFURON: POTENTIAL COMPONENT OF CUCUMBER AND SQUASH SYSTEMS. T.M. Webster, Crop Protection and Management Research Unit, USDA-ARS, Tifton, GA 31794.

ABSTRACT

The elimination of methyl bromide in 2005 will leave the vegetable industry without an effective broad-spectrum fumigant with activity against many pests, including weeds. Two of the primary weeds in cucurbit plasticulture systems are purple nutsedge (*Cyperus rotundus*) and yellow nutsedge (*Cyperus esculentus*). Halosulfuron is an effective nutsedge herbicide, but cucurbit crop tolerance may be an issue. Greenhouse and field studies were conducted from 1999 to 2001 to evaluate the cucumber (*Cucumis sativus*) and squash (*Cucurbita pepo*) tolerance to halosulfuron. A greenhouse study evaluated the sensitivity of six cucumber and six squash cultivars to three rates of halosulfuron (17, 35, and 53 g ai/ha), three application methods (PRE, POST, and 0.5X rate PRE + 0.5X rate POST), and two planting methods (direct seeded and transplanted). The cucumber cultivars used were: 'Calypso' (pickling cultivar), 'Dasher II' (slicing cultivar), 'Marketmore' (slicing cultivar), 'Speedway' (slicing cultivar), 'Sumter' (pickling cultivar), and 'Thunder' (slicing cultivar). The squash cultivars were: 'Dixie' (yellow crookneck), 'Lemondrop' (yellow straightneck), 'Senator' (zucchini), 'Spineless beauty' (zucchini), 'Supersett' (yellow crookneck), and 'Tigress' (zucchini). A field study was conducted to determine the effect of halosulfuron on squash ('Spineless beauty') and cucumber ('Marketmore') growth and yield. The field study was arranged as a split plot with main plot being treatments applied to spring squash (first crop) and the split plot being the treatments applied to the subsequent fall crop (cucumber). Main plot treatments included halosulfuron (35 g/ha) applied PRE to the soil prior to laying plastic, halosulfuron (35 g/ha) applied through drip irrigation, metham (357 kg ai/ha) applied through drip irrigation, a nontreated control with plastic mulch, and a bare-ground nontreated control. Each treatment included transplants and direct seeded plants. Crop growth, yield, and weed control were rated throughout the season. In general, cucumbers appeared to be more tolerant to halosulfuron than were squash. Squash plants were most sensitive to PRE applications of halosulfuron; injury to squash increased with rate of halosulfuron when applied PRE or PRE+POST. Cucumber injury did not increase with halosulfuron rate, application method, or planting method. Plant biomass at the conclusion of the greenhouse study was reduced more with squash, relative to the nontreated control, than with cucumber cultivars. There was a significant cultivar by application method interaction; halosulfuron applied PRE reduced squash biomass 11 to 61% (average of all cultivars was 29%) and cucumber biomass 2 to 17% (average of all cultivars was 10%). Halosulfuron applied POST reduced squash biomass 0 to 66% (average of all cultivars was 24%) and cucumber biomass up to 6% (average of all cultivars was a 2% increase in plant biomass). Halosulfuron applied PRE+POST reduced squash biomass 14 to 55% (average of all cultivars was 37%) and cucumber 0 to 16% (average of all cultivars was 10%). In cucumber, the recommended program in Georgia will most likely be halosulfuron at 26 g/ha PRE + 26 g/ha POST. In the field study, metham treated plots had the highest crop yields relative to all other treatments, except halosulfuron applied through drip irrigation to transplants. Halosulfuron applied to direct seeded squash had similar crop yields to the nontreated control which, due to the lack of heavy weed pressure, indicated that halosulfuron did not negatively affect crop yield. Early season purple nutsedge control was equivalent among all treatments that included black plastic mulch. The number of purple nutsedge shoots early in the season in the black plastic mulch–nontreated plots was reduced 79% relative to the nutsedge shoot populations in the bare-ground nontreated control. By the conclusion of the first crop season, metham (76% control) and halosulfuron treatments (66 to 75% control) reduced purple nutsedge populations relative to the black plastic mulch–nontreated control. Purple nutsedge in the bare-ground nontreated control was out-competed for resources (primarily light) by other weeds [e.g. Florida pusley (*Richardia scabra*), crowfootgrass (*Dactyloctenium aegyptium*), Texas panicum (*Panicum texanum*)] by the conclusion of the first crop season. Cucumber yields were not affected by the crop 2 treatments of halosulfuron applied through the drip tape (relative to the crop 2 nontreated controls), with the exception of the halosulfuron PRE (crop 1) followed by halosulfuron Drip (crop 2) sequence. One of the most effective systems tested appeared to be metham (crop 1) followed by halosulfuron Drip (crop 2). There was no difference in cucumber yield between this treatment and metham (crop 1) followed by nontreated control (crop 2). The lack of heavy purple nutsedge pressure resulted in negligible losses due to weed interference in the nontreated control (crop 2), indicating that halosulfuron Drip (crop 2) did not reduce crop yield. Halosulfuron will be a valuable tool for nutsedge management in cucumber. However the excessive crop injury observed with some of the squash cultivars when halosulfuron was applied PRE, POST, PRE+POST, or through Drip irrigation should restrict the utility of this herbicide in summer squash and zucchini.

TOLERANCE OF ADVANCED SOUTHERNPEA BREEDING LINES TO SELECTED BROADLEAF HEBICIDES. E.N. Cable-Stiers, N.R. Burgos, S.A. Payne, O.C. Sparks, and J.W. Moore; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72701. T.E. Morelock; Department of Horticulture, University of Arkansas, Fayetteville, AR 72701. L. Martin and S. Eaton; Vegetable Substation, University of Arkansas, Kibler, AR 72791.

ABSTRACT

Southernpea (*Vigna unguiculata* L.) is an important legume crop grown throughout the tropical and subtropical parts of the world, especially in Asia, Africa, and America. Currently, southernpea producers have few options for postemergence broadleaf weed control. Imazethapyr is the predominant herbicide in the market, but the threat of weed resistance and soil persistence for rotational crops are problems associated with this herbicide. Since southernpea is a legume like soybean (*Glycine max* L.) it is reasonable to look at current soybean herbicides for possible fits into this market. Fifty advanced southernpea breeding lines from the University of Arkansas' southernpea breeding program were planted on June 27, 2001 at the University of Arkansas' Vegetable Substation in Kibler, AR. Plots consisted of one row on 76 cm centers and were 6.1 m long. To ensure weed-free environment, all plots were treated with 0.56 kg ai/ha trifluralin and 0.069 kg ai/ha imazethapyr PPI using a tractor sprayer. Postemergence herbicides were applied using a CO_2 backpack sprayer calibrated to deliver 187 L/ha. Each treatment was separated by an untreated row. Treatments were not replicated due to space constraints. Visual injury data was taken 2 weeks after treatment (WAT) and plots were harvested September 13, 2001. Yield was recorded. The top ten yielding lines will be planted in a replicated study in the summer of 2002.

Injury for bentazon and acifluorfen was relatively low (<20%) for all lines, with acifluorfen being a little more injurious than bentazon. Fomesafen showed a wide range of injury from 15 to 70%. Lines 14, 17, 39, and 46 showed high tolerance to both bentazon and acifluorfen. Lines 23 and 33 showed high tolerance to both bentazon and fomesafen. Line 45 showed high tolerance to acifluorfen and fomesafen. Line 37 showed high tolerance to all three herbicides. These lines generally yielded numerically higher than line 1, which was commercial cultivar 'Early Scarlet,' and should be considered for next year's replicated screen. Crop injury data did not correlate with yield, which shows the high capability of southernpea to recover from herbicide-induced injury. Therefore, yield differences are primarily due to genetics. These lines have already been selected for desirable horticultural characteristics, and should be acceptable to processors and consumers.

RESPONSE OF FOUR SOUTHERNPEA CULTIVARS TO BENTAZON AND ACIFLUORFEN. J.W. Moore, N.R. Burgos, S.A. Payne, O.C. Sparks, E.N. Cable-Stiers, T.E. Morelock, L. Martin, and S. Waton. University of Arkansas, Fayetteville, AR 72704.

ABSTRACT

A field experiment was conducted near Kibler, AR in 2001 to evaluate the response of four southernpea cultivars to bentazon and acifluorfen applied alone or tank mixed. The experimental design was a split-plot with four replications. The main plots were southernpea cultivars AR blackeye #1, Coronet, Early Scarlet, and Erect Set. Subplots were herbicide treatments bentazon at 1.12 kg ai/ha (labeled rate), bentazon at 2.24 kg ai/ha, acifluorfen at 0.56 kg ai/ha (labeled rate for soybean), acifluorfen at 1.12 kg ai/ha, bentazon at 0.56 kg ai/ha + acifluorfen at 0.56 kg ai/ha, bentazon at 1.12 kg ai/ha + acifluorfen at 0.56 kg ai/ha, and an untreated check. The parameters recorded were southernpea injury at 2 and 5 wk after treatment, plant height, number of pods/plant, and southernpea yield from the two center rows of each plot.

Coronet, Early Scarlet, and Erect Set had more herbicide tolerance than Arkansas blackeye #1 2 WAT. Injury was greater with treatments containing acifluorfen compared to bentazon alone, regardless of rate. The labeled rate of bentazon showed acceptable injury (10%) on all cultivars, but injury doubled with bentazon at 2.24 kg ai/ha. Acifluorfen, tank-mixed with bentazon, increased injury to about 50% on all cultivars. Erect Set had the most number of pods/plant followed by Arkansas blackeye #1, but this does not correlate with yield because pod and seed size vary between cultivars. Despite generally high levels of injury early, number of pods/plant was not reduced by herbicide treatments except for acifluorfen at 1.12 kg ai/ha. Yields of Arkansas blackeye #1, Coronet, and Erect Set were equivalent without herbicide treatment. Yields of all cultivars were not reduced by bentazon at 2.24 kg ai/ha. Yield of Arkansas blackeye #1 was reduced by acifluorfen at 0.56 kg ai/ha while that of Coronet was reduced only by acifluorfen at 1.12 kg ai/ha. Tank mixes of bentazon and acifluorfen reduced yield of Arkansas blackeye #1 but not the other cultivars. Pod maturity of Coronet, Early Scarlet, and Erect Set was delayed by all treatments containing acifluorfen, especially acifluorfen at 1.12 kg ai/ha; however, no herbicide treatment affected pod maturity for Arkansas blackeye #1.

EFFECTS OF *Phomopsis amaranthicola* ON THE INTERFERENCE OF *Amaranthus dubius* WITH EGGPLANT (*Solanum melongena*). J.P. Morales-Payan, R. Charudattan, W.M. Stall, and J. DeValerio. Institute of Food and Agricultural Sciences. University of Florida. Gainesville, FL 32611.

ABSTRACT

Studies were conducted in San Cristóbal, Dominican Republic, to determine the influence of the mycoherbicide *Phomopsis amaranthicola* on the interference of *Amaranthus dubius* (spleen amaranth) with 'Jira' eggplant. The weed was started from seed and the crop from transplants. Treatments were *A. dubius* population densities (0, 1, 2, 3, and 4 plants/m^2) with or without foliar application of *P. amaranthicola*. The fungus was sprayed on the plots 10 days after weed emergence (18 days after transplanting the crop) at a rate of 1.0 million conidia per ml. Treatments were arranged in randomized complete blocks with three replications. The crop and the weed were allowed to interfere season-long. Throughout the study, eggplant did not present symptoms of disease caused by *P. amaranthicola.* Symptoms of *P. amaranthicola* were found on leaves and stems of *A. dubius* within 20 days of application. Stems presented symptoms of disease more abundantly than leaves. Approximately 20% of the *A. dubius* plants sprayed with the conidia had stems strangled by the fungal lesions and died within 30 days of the application. *A. dubius* plants surviving the application were shorter, and had less foliar area and less biomass than those not sprayed. About 30% of the weed population did not present typical symptoms of *P. amaranthicola*, which may be partially attributed to the large genetic variability of this weed species. Increasing the population density of the weed resulted in increased weed biomass production and reduced crop yield. At each *A. dubius* density, spraying *P. amaranthicola* reduced the extent of crop yield loss at least by 10%. At a density of four plants of *A. dubius* per m^2, eggplant yield loss was about 60%. At that same weed density, when *P. amaranthicola* was sprayed, the loss of crop yield was 16% lower. These results indicate that *P. amaranthicola* may be a valuable component in an integrated strategy to manage *A. dubius* in eggplant.

SUGARCANE SEED RESPONSE TO 2,4-D. J.D. Siebert, J.L. Griffin, C.A. Jones, and K.A. Gravois; Louisiana State University Agricultural Center, Baton Rouge, LA 70803.

ABSTRACT

Sugarcane growers often use 2,4-D to control morningglories in late season to facilitate crop harvest. Although considered tolerant to 2,4-D, germination of buds from sugarcane stalks harvested for seed following a late season application can be affected. A field experiment was conducted at the St. Gabriel Research Station in St. Gabriel, LA, to evaluate the effect of 2,4-D application timing on the new sugarcane variety LCP 85-384 harvested for seed and planted using both whole stalks and billets.

Using a CO_2 backpack sprayer calibrated to deliver 8 GPA, 2,4-D was applied at 1.5 qt/A (3.8 lb ai/gal) 7, 5, 3, and 1 week before planting. Sugarcane stalks were harvested on September 12, 2000, and planted at a constant seeding rate (2 stalks with a 3 node overlap). For the billet planting, whole stalks placed in the opened row were hand cut into 18-inch sections (billets). Sugarcane was covered with 3 to 4 inches of soil and beds were packed twice. A split plot experimental design with 5 replications was used. Whole plots consisted of planting method (whole stalk or billet) and sub plots were 2,4-D application timings. A significant application timing by planting method interaction was not observed for any of the parameters measured, but the main effects were significant.

Averaged across planting methods, differences in sugarcane shoot population among 2,4-D timings were observed from mid-October through April, but differences were not observed in September, a year following planting. Sugarcane shoot population was higher for the billet planting method throughout the season regardless of 2,4-D application timing, but stalk height was not affected by planting method. Sugarcane stalk height was reduced when 2,4-D was applied 5, 3, and 1 week before planting when compared to the nontreated control, but a reduction was not observed when applied 7 weeks before planting. Sugarcane and sugar yield were reduced 12 to 15% when 2,4-D was applied 5, 3, and 1 week before planting when compared to the nontreated control, but a reduction was not observed when applied 7 weeks before planting. Regardless of 2,4-D application timing, sugarcane and sugar yield averaged 19 and 18% higher, respectively, for billet planting when compared with whole stalk planting.

Results show that LCP 85-384 sugarcane was not injured when 2,4-D at 1.5 qt/A was applied 7 weeks before harvest for seed whether planting whole stalks or billets at the same seeding rate. When 2,4-D was applied 5 weeks or closer to planting, however, sugarcane and sugar yield were reduced.

ITALIAN RYEGRASS CONTROL IN WHEAT WITH MESOSULFURON-METHYL PLUS IODOSULFURON-METHYL (AEF130060) WITH SAFENER MEFENPYR-DIETHYL (AEF107892). R.M. Hayes, T.C. Mueller, and P.B. Brawley, Plant Sciences and Landscape Systems, University of Tennessee, Knoxville, TN 37901.

ABSTRACT

Italian ryegrass (*Lolium multiflorum* Lam.) is a serious weed problem in winter wheat, especially in many of the states in the southern region. Producers relied on diclofop for control of Italian ryegrass until resistance became prevalent. Recently, tralkoxydim was introduced and provided improved but not complete control, possibly due to cross-resistance. A field at the Milan Experiment Station with >10 years of annual diclofop use for Italian ryegrass control and poor control in 1999-2000 with 10X diclofop was selected to evaluate a new experimental herbicide mixture.

'Pioneer 2552' wheat was planted on October 31, 2000. Fall treatments were applied to wheat (2 leaf, 5 cm) tall and ryegrass (2 leaf, 4 cm) November 21, 2000. Spring treatments were applied March 14, 2001 to wheat (4 to 5 tillers, 12 cm) and ryegrass (3 to 4 tillers, 5 to 10 cm). Application parameters were 214 kPa, 6.4 km/h, 80015VS tips delivering 93.5 L/ha. Treatments were replicated four times in a RCB design. Plot size was 3 m by 9 m with center 2 m by 9 m treated. Treatments were mesosulfuron + mefenpyr diethyl at 15 + 30 g ai/ha with and without methylated seed oil (MSO) and 28% N solution in fall, diclofop at 840 g ai/ha in fall, mesosulfuron + mefenpyr diethyl at 15 and 30 g /ha in spring with and without MSO + 28% N, and mesosulfuron + mefenpyr diethyl at 18 + 36 g/ha without MSO + 28 % N, and tralkoxydim at 200 g ai/ha in spring. An untreated control was included. Production practices other than weed control followed University of Tennessee recommendations.

Wheat was injured 24 % by mesosulfuron + mefenpyr diethyl 14 days after fall treatment (DAT). MSO +28 % N increased injury to 55 %. By spring (113 DAT) injury was 13 and 15 %, respectively. Spring treatments of mesosulfuron + mefenpyr diethyl injured wheat 16 to 26 % 14 DAT with greater injury with MSO + 28 % N. By 23 DAT, wheat injury was <10 %.

Italian ryegrass was not controlled by fall application of mesosulfuron + mefenpyr diethyl 14 DAFT, but by 113 DAFT control was 93 and 94 % compared to <10 % with diclofop and 40% with tralkoxydim. Following spring treatment with mesosulfuron + mefenpyr diethyl, Italian ryegrass was controlled ~50 % 14 DAT, but improved to ≥94 % at 35 DAT, while fall treatments with mesosulfuron + mefenpyr diethyl peaked at 94 % control 148 DAT and declined to 85 % control by 178 DAT. Italian ryegrass was controlled only 28 % at 178 DAT with tralkoxydim, but the diclofop treatment was indistinguishable from the untreated.

Wheat yields paralleled the Italian ryegrass control, and ranged from 3230 kg/ha in the untreated to 5240 kg/ha with mesosulfuron + mefenpyr diethyl at 15 + 30 g/ha applied in fall or spring. Wheat yield with diclofop was identical to the untreated, but wheat treated with tralkoxydim produced 4700 kg/ha. Apparently the 25 to 58 % control and associated suppression was sufficient for the tralkoxydim treatment to improve yield by 46 % over the untreated. MSO + 28 % N did not improve Italian ryegrass control or yield, in fact there was a trend for reduced yields, presumably due to increased wheat injury.

While this is only one trial, mesosulfuron + mefenpyr diethyl holds tremendous potential for controlling Italian ryegrass, including diclofop resistant grass.

PHYSIOLOGICAL BEHAVIOR OF SULFENTRAZONE IN TOBACCO. L.R. Fisher, A.J. Price, I.C. Burke, J.W. Wilcut, and W.D. Smith; Department of Crop Science, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

Research was conducted to evaluate root uptake, translocation, and metabolism of ^{14}C-sulfentrazone alone in solution or in a mixture with clomazone in solution in flue-cured tobacco transplants. Uptake and translocation of sulfentrazone was rapid and was not affected by the addition of clomazone. Fifty-nine percent and 65% of the ^{14}C absorbed by the plant was translocated to the leaves within 24 h with sulfentrazone alone and in the clomazone plus sulfentrazone mixture, respectively. Sulfentrazone was also readily metabolized by tobacco transplants and differences were observed between sulfentrazone alone and the mixture with clomazone. After 3 h, 66 versus 91% of the ^{14}C recovered in the leaves was metabolized when sulfentrazone was used alone compared to the mixture, respectively. This difference would indicate that metabolism of sulfentrazone by tobacco transplants was enhanced by the presence of clomazone. Over the next 6 h, percentage of sulfentrazone metabolized did not significantly change with either sulfentrazone alone or the mixture of sulfentrazone and clomazone.

OLDWORLD DIAMONDFLOWER AND CARPETWEED CONTROL IN TIFDWARF BERMUDAGRASS.
W.J. Weathers, R.H. Walker, J. Belcher and L.L. Somerville, Agronomy and Soils Department, Auburn University, Auburn Univ., AL 36849-5412.

ABSTRACT

Two field studies were conducted in 2000 and 2001 in east-central Alabama to evaluate the activity of various herbicides on Old World diamondflower [*Hedytotis corymbosa* (L.) Lam.] (OLDCO) and carpetweed (*Mollugo verticillata* L.) (MOLVE). Both weeds are summer annuals that are problematic in newly planted or freshly tilled sites. Due to their low prostrate growing height, they can also be a problem in established turf or sod.

In the first study, herbicides were postemergence-applied (POST) to newly-sprigged Tifdwarf bermudagrass [*Cynodon dactylon* (L.) Pers. x *Cynodon transvaalensis* Burtt-Davy]. Herbicides and rates (lbs active/A) were as follows: chlorsulfuron, 0.25; metsulfuron, 0.125; rimsulfuron, 0.125; Trimec Southern, 0.86; Trimec Plus, 2.4; clopyralid, 0.25; fluroxypyr, 0.125; clopyralid, 0.25 + fluroxypyr, 0.063; and UHS 302; 1.10. Chlorsulfuron, metsulfuron, rimsulfuron, fluroxypyr, fluroxypyr + clopyralid and UHS 302 controlled MOLVE ≥ 85%. All treatments except rimsulfuron and fluroxypyr controlled OLDCO greater than ≥ 85%. Bermudagrass injury was acceptable with all treatments. Overall, only metsulfuron, chlorsulfuron, clopyralid + fluroxypyr and UHS 302 provided ≥ 85% control of both weed species.

In the second study, various combinations of preemergence-applied (PRE) and POST-applied herbicides were evaluated for annual sedge (*Cyperus compressus* L.) (CYCPC), MOLVE and OLDCO control. Herbicides and rates (lb ai/A) were: trifloxysulfuron, 0.016 and 0.032; rimsulfuron, 0.016 and 0.032; metsulfuron, 0.062; imazaquin, 0.38; bentazon, 1.0; and MSMA, 2.0; rimsulfuron, 0.016 + metribuzin, 0.25; and treatments of MSMA, 2.0 plus either: oryzalin, 2.0; dithiopyr, 0.5; prodiamine, 1.0; oxadiazon, 2.5; pendimethalin, 2.5; or metolachlor, 1.5. When treatments were applied, annual sedge was the predominant species with few MOLVE and OLDCO present. Control of CYCPC was ≥ 89% 5 WAT with POST-applied rimsulfuron, trifloxysulfuron, halosulfuron and MSMA. Trifloxysulfuron (0.032 lb ai/A), rimsulfuron + metribuzin, MSMA + oxadiazon and MSMA + pendimethalin applied to OLDCO provided ≥ 94% control, while these same treatments plus imazaquin and trifloxysulfuron (0.016 lb/A) provided ≥ 88% control of MOLVE. The addition of PRE-applied herbicides had no supplemental effect on MOLVE, but provided greater control of OLDCO.

VALIDATION AND PREDICTIONS OF THE ANNAGNPS RUNOFF MODEL FOR PORTIONS OF THE UPPER PEARL RIVER WATERSHED. M.L. Tagert*, D.R. Shaw, J.H. Massey, and T.H. Koger. Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Landsat images were combined with other digital data such as digital elevation models (DEMs) and soil classification information to be used as inputs in the United States Department of Agriculture's (USDA) Annualized Agricultural Non-Point Source (ANNAGNPS) pollution model. ANNAGNPS is a set of computer programs used to predict non-point source pollutant loadings in agricultural watersheds. DEMs with a 1:24,000 resolution were obtained from the United States Geological Survey's (USGS) National Elevation Database (NED), and digital soil data is from the USDA Natural Resources Conservation Service (NRCS) State Soil Geographic Database (STATSGO), at a scale of 1:250,000. All digital data were re-projected from their original form into a modified Universal Transverse Mercator (UTM) projection. The TopAGNPS module of ANNAGNPS, using the DEM as the main input, performed a topographic evaluation of the watershed as well as drainage area identification, synthetic channel networks, watershed segmentation, and subcatchment parameters. Sediment sampling began in September, 2001, and will continue for at least one year in the Upper Pearl River watershed. Water sampling is being performed at the following sites: Burnside, Edinburg, and Carthage. Sampling was performed during a major storm event in October, 2001. This major storm event resulted in an average sediment concentration of 22 mg/L at Burnside, while Edinburg and Carthage had average concentrations of 26 mg/L and 49 mg/L, respectively. Sediment samples were analyzed via the filtration method. Field data is as expected thus far, with progressively larger sediment concentrations moving towards the outlet of the watershed. USGS field sampling methods and laboratory procedures were followed for the retrieval and analysis of sediment samples.

GRASS CONTROL WITH POST-FLOOD APPLICATIONS OF CYHALOFOP-BUTYL IN DRY SEEDED RICE. V.B. Langston, R.B. Lassiter, D.M. Simpson, R.K. Mann, F.L. Baldwin, J.A. Kendig, A. Klosterboer, M.E. Kurtz, K. Smith, R.E. Strahan, R.E. Talbert, E.P. Webster, and B.J. Williams. Dow AgroSciences, LLC, Indianapolis, IN, Arkansas Cooperative Extension Service, Lonoke, AR, University of Missouri Delta Center, Portageville, MO, Texas A&M, College Station, TX, Mississippi State University, Stoneville, MS, University of Arkansas, Fayetteville, AR, Louisiana State University, Baton Rouge, LA

ABSTRACT

Cyhalofop-butyl is being developed by Dow AgroSciences, LLC for postemergence control of grass weeds in dry- and water-seeded rice in the southern U.S. and California. From 1997 to 2001, cyhalofop-butyl was tested for weed control efficacy and rice tolerance in over 160 small-plot field trials in the U.S. As a postemergence, post-flood application in dry-seeded rice 1 to 3 weeks after permanent flood or as a “rescue” type application in water-seeded rice in the southern U.S., cyhalofop-butyl at 280 or 310 g ai/ha will be labeled to provide control of tillered grasses. These grasses include barnyardgrass (*Echinochloa crus-galli*), junglerice (*E. colonum*), sprangletop (*Leptochloa* spp), broadleaf signalgrass (*Brachiaria platyphylla*), and large crabgrass (*Digitaria sanguinalis).* Rice has excellent tolerance to cyhalofop-butyl regardless of application timing.

YIELD COMPARISON OF HERBICIDE RESISTANT CORN HYBRIDS WITH CONVENTIONAL HYBRIDS. K.D. Brewer, B.A. Besler, W.J. Grichar, E.P. Prostko and W.K. Vencill. Texas Agricultural Experiment Station, Yoakum, TX, University of Georgia, Tifton, GA, and University of Georgia, Athens, GA.

ABSTRACT

Field studies were conducted at the Texas Agricultural Experiment Station, Yoakum (2000 and 2001) and the University of Georgia at Tifton and Athens (2 locations, 2001). The objectives were to evaluate the yield of herbicide resistant corn hybrids to the yield of conventional hybrids and to assess if resistant corn hybrids caused yield drag when herbicides were applied. Herbicide resistant corn hybrids included in the study consisted of Clearfield, Roundup Ready and Liberty-Link varieties. All appropriate herbicides were applied according to label. Tests at each location were replicated 3 to 4 times and designed as a split-plot. Plot areas were maintained weed-free at all location. In Georgia at both locations, no significant differences were seen between the resistant herbicide hybrids and the conventional corn hybrids. Several herbicide resistant hybrids tested in Georgia show promise for corn production including Garst 8222 IT, NK 83Z8 LL, and Dekalb 662 RR. At Yoakum in 2000, most herbicide resistant herbicide corn hybrids were significantly lower than the conventional hybrids. However, in 2001 no significant differences were seen between the resistant herbicide hybrids and the conventional corn hybrids. The corn hybrid Agri Pro 9829IMI at Yoakum was consistently higher than most corn hybrids both years.

HERBICIDES IN THE ENVIRONMENT: ISSUES AFFECTING THE FUTURE OF FOREST HERBICIDE USE. James P. Shepard, National Council for Air and Stream Improvement, P. O. Box 141020, Gainesville, FL.

ABSTRACT

Herbicide use in American forestry has increased dramatically in the past 20 years. Herbicide application is viewed by industry as indispensable for competing in the global forest products marketplace. However, society has several questions and concerns associated with using herbicides in forests. These are: human health concerns, effects on wildlife, regulatory constraints, and forest certification. The public has voiced concern over use of herbicides in forestry regarding off-site drift, potential drinking water contamination, and effects on wildlife.

Thus far there is no documented case of silvicultural herbicides in drinking water supplies. There are several aspects to concerns about herbicides and wildlife. Are silvicultural herbicides toxic to wildlife? Do they bioaccumulate? Modern silvicultural herbicides have low toxicity to wildlife because their mode of action targets biochemical systems present only in plants. No silvicultural herbicides bioaccumulate. There have been claims that herbicides are potential endocrine disrupters, thus possibly affecting wildlife and human reproductive functions. However, there is little or no proof of this in the peer-reviewed literature. While properly applied silvicultural herbicides are not likely to be toxic to wildlife, they certainly can affect wildlife habitat. There is a concern that increased use of herbicides will accelerate plantation development and shorten the early successional stage that is good wildlife habitat. This may be true on a stand level, but a mosaic of different plantation ages should provide sufficient habitat.

There are several concerns with how the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) tests chemicals. FIFRA allows inclusion of toxic compounds to be labeled "inert" on pesticide labels. FIFRA usually tests only the herbicide's active ingredient, whereas the commercial formulation may include components that are more toxic, surfactants for example. Another concern is the potential for synergistic toxicity from mixtures of two or more herbicides. FIFRA does not test mixtures of different herbicides. Some feel that FIFRA relies too heavily on lethal toxicological endpoints, while sub-lethal effects may be significant. FIFRA primarily uses a small number of sentinel species for toxicological testing. However, testing individual species cannot predict ecological consequences due to the interaction of many organisms with each other and with the environment. Several states regulate forestry herbicides more stringently than the federal regulations. For example CA has its own registration program and Vermont has initiated a 5-year moratorium on aerial or broadcast application of silvicultural pesticides. Ballot initiatives in Maine and Oregon have unsuccessfully attempted to ban use of pesticides in forestry. Certification programs differ in how they address use of silvicultural chemicals.

WHAT HAS SCIENCE TAUGHT US ABOUT INTENSIVE PINE MANAGEMENT WITH HERBICIDES? RESEARCH NEEDS FOR FOREST WEED SCIENCE. S.M. Zedaker and M.P. Blair; Department of Forestry, Virginia Tech, Blacksburg, VA 24061.

ABSTRACT

Forest vegetation management for pine production has changed dramatically over the past two decades. Undoubtedly contributing to this change was the research conducted by scientists participating in the Southern Weed Science Society's (SWSS) Forest Vegetation Management Section. To evaluate the contributions of these scientists to the field and to determine future research needs, a survey of the papers presented at SWSS between 1982 and 2001 was conducted.

Over the past 20 years, 646 papers were contributed by forest vegetation managers who clearly focused on the use of chemical weed control (89% of the papers). Loblolly pine was the most researched pine and was the topic of 80% of the papers that mentioned a crop species. Screening studies, in which the efficacy of herbicides was evaluated on the basis of weed control and crop responses, were the dominant topics (48% of the papers). Among the screening studies, active ingredient rates and application timing were studied most. Interest in tank-mixing herbicides increased over the two decades while single active ingredient applications were less studied. In the 1980's, site preparation, herbaceous weed control and woody plant release were equally studied, while timber stand improvement (TSI) attracted little interest. Studies that focused on herbaceous weed control increased dramatically in the 90's, while interest in woody release waned. Hexazinone and triclopyr were the most studied woody plant herbicides from 1982-1986. From 1987 to the present, presentations on the efficacy of imazapyr have dominated the woody plant control papers. Throughout two decades of herbaceous weed control research, sulfometuron methyl has been the most studied herbicide. An industry standard tank mix of hexazinone and sulfometuron, studied extensively in the SWSS Forestry Section, undoubtedly led to the introduction of Oustar™ by DuPont Agricultural Products.

In striking contrast to the voluminous research on herbicide efficacy, research on the mechanisms of competition, the physiology of herbicide activity, thresholds for weed control responses, and the economic returns from forest vegetation management has been scant. Over 20 years, only 29 papers mentioned the relative costs of herbicide applications, and far fewer evaluated the economic returns from forest vegetation management. Equally striking, given the public's overriding concern over the environmental effects of pesticide use, is that only 8% of the papers dealt with soil sustainability, leaching/contamination, plant diversity, or wildlife impacts. Papers dealing with application and applicator safety were almost non-existent. Also sorely lacking were papers which summarized the state of knowledge for different issues relevant to the science of vegetation management - a clear justification for the symposium being held.

SYMPOSIUM

HERBICIDES IN THE ENVIRONMENT: ISSUES AFFECTING THE FUTURE OF FOREST HERBICIDE USE.

J.P. Shepard, National Council for Air and Stream Improvement, P. O. Box 141020, Gainesville, FL.

ABSTRACT

Herbicide use in American forestry has increased dramatically in the past 20 years. Herbicide application is viewed by industry as indispensable for competing in the global forest products marketplace. However, society has several questions and concerns associated with using herbicides in forests. These are: human health concerns, effects on wildlife, regulatory constraints, and forest certification. The public has voiced concern over use of herbicides in forestry regarding off-site drift, potential drinking water contamination, and effects on wildlife.

Thus far there is no documented case of silvicultural herbicides in drinking water supplies. There are several aspects to concerns about herbicides and wildlife. Are silvicultural herbicides toxic to wildlife? Do they bioaccumulate? Modern silvicultural herbicides have low toxicity to wildlife because their mode of action targets biochemical systems present only in plants. No silvicultural herbicides bioaccumulate. There have been claims that herbicides are potential endocrine disrupters, thus possibly affecting wildlife and human reproductive functions. However, there is little or no proof of this in the peer-reviewed literature. While properly applied silvicultural herbicides are not likely to be toxic to wildlife, they certainly can affect wildlife habitat. There is a concern that increased use of herbicides will accelerate plantation development and shorten the early successional stage that is good wildlife habitat. This may be true on a stand level, but a mosaic of different plantation ages should provide sufficient habitat.

There are several concerns with how the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) tests chemicals. FIFRA allows inclusion of toxic compounds to be labeled "inert" on pesticide labels. FIFRA usually tests only the herbicide's active ingredient, whereas the commercial formulation may include components that are more toxic, surfactants for example. Another concern is the potential for synergistic toxicity from mixtures of two or more herbicides. FIFRA does not test mixtures of different herbicides. Some feel that FIFRA relies too heavily on lethal toxicological endpoints, while sub-lethal effects may be significant. FIFRA primarily uses a small number of sentinel species for toxicological testing. However, testing individual species cannot predict ecological consequences due to the interaction of many organisms with each other and with the environment. Several states regulate forestry herbicides more stringently than the federal regulations. For example CA has its own registration program and Vermont has initiated a 5-year moratorium on aerial or broadcast application of silvicultural pesticides. Ballot initiatives in Maine and Oregon have unsuccessfully attempted to ban use of pesticides in forestry. Certification programs differ in how they address use of silvicultural chemicals.

WHAT HAS SCIENCE TAUGHT US ABOUT INTENSIVE PINE MANAGEMENT WITH HERBICIDES? RESEARCH NEEDS FOR FOREST WEED SCIENCE.

S.M. Zedaker and M.P. Blair; Department of Forestry, Virginia Tech, Blacksburg, VA 24061.

ABSTRACT

Forest vegetation management for pine production has changed dramatically over the past two decades. Undoubtedly contributing to this change was the research conducted by scientists participating in the Southern Weed Science Society's (SWSS) Forest Vegetation Management Section. To evaluate the contributions of these scientists to the field and to determine future research needs, a survey of the papers presented at SWSS between 1982 and 2001 was conducted.

Over the past 20 years, 646 papers were contributed by forest vegetation managers who clearly focused on the use of chemical weed control (89% of the papers). Loblolly pine was the most researched pine and was the topic of 80% of the papers that mentioned a crop species. Screening studies, in which the efficacy of herbicides was evaluated on the basis of weed control and crop responses, were the dominant topics (48% of the papers). Among the screening studies, active ingredient rates and application timing were studied most. Interest in tank-mixing herbicides increased over the two decades while single active ingredient applications were less studied. In the 1980's, site preparation, herbaceous weed control and woody plant release were equally studied, while timber stand improvement (TSI) attracted little interest. Studies that focused on herbaceous weed control increased dramatically in the 90's, while interest in woody release waned. Hexazinone and triclopyr were the most studied woody plant herbicides from 1982-1986. From 1987 to the present, presentations on the efficacy of imazapyr have dominated the woody plant control papers. Throughout two decades of herbaceous weed control research, sulfometuron methyl has been the most studied herbicide. An industry standard tank mix of hexazinone and sulfometuron, studied extensively in the SWSS Forestry Section, undoubtedly led to the introduction of Oustar™ by DuPont Agricultural Products.

In striking contrast to the voluminous research on herbicide efficacy, research on the mechanisms of competition, the physiology of herbicide activity, thresholds for weed control responses, and the economic returns from forest vegetation management has been scant. Over 20 years, only 29 papers mentioned the relative costs of herbicide applications, and far fewer evaluated the economic returns from forest vegetation management. Equally striking, given the public's overriding concern over the environmental effects of pesticide use, is that only 8% of the papers dealt with soil sustainability, leaching/contamination, plant diversity, or wildlife impacts. Papers dealing with application and applicator safety were almost non-existent. Also sorely lacking were papers which summarized the state of knowledge for different issues relevant to the science of vegetation management - a clear justification for the symposium being held.

STATE EXTENSION WEED CONTROL PUBLICATIONS

J. D. Byrd, Jr., Section Chairman

Extension weed identification and control publications for all commodities are listed by state. Publication numbers, titles and ordering sources are provided. Publications that must be purchased are designated with price in parentheses following the title. URL addresses are listed for states that have Extension weed control information on the Internet. This report will be updated each year, and published in the Proceedings.

State: ALABAMA

Prepared by: John W. Everest and Mike Patterson

Internet URL: http://www.aces.edu/pubs/

Source: Bulletin Room, Alabama Cooperative Extension System, #6 Duncan Hall, Auburn University, Auburn, AL 36849

Number	Title
CIRCULARS	
ANR-48	Weed Control in Lake and Ponds
ANR-65	Kudzu: History, Uses, & Control
ANR-104	Controlling Smutgrass in Alabama Pastures
ANR-322	Weed Control in Home Gardens
ANR-453	Christmas Tree IPM
ANR-465	Weed Control for Commercial Nurseries
ANR-600A	Alabama Pesticide Handbook, Vol. 1 Ag ($20.00)
ANR-600B	Alabama Pesticide Handbook, Vol. 2 Hort ($19.00)
ANR-616	Weeds of Southern Turfgrasses ($8.00)
ANR-715	Cotton Defoliation
ANR-811	Conservation Tillage for Corn in Alabama
ANR-854	Weed Control in Residential Landscape Plantings
ANR-908	Moss and Algae Control in Lawns
ANR-909	Tropical Soda Apple in Alabama
ANR-951	Weed Control Around Poultry Houses and Other Farm Building
ANR-975	Poisonous Plants of the Southeastern United States ($4.00)
ANR-1058	Brush Control
ANR-1128	Weed Identification for Horticultural Crops
INFORMATION SHEETS	
2002IPM-2	Commercial Vegetable IPM
2002IPM-8	Peach IPM
2002IPM-11	Apple IPM
2002IPM-22	Weed Control in Commercial Turfgrass
2002IPM-27	Pecan IPM
2002IPM-28	Forage Crops IPM
2002IPM-223	Noncropland IPM
2002IPM-360	Peanut IPM
2002IPM-413	Soybean IPM
2002IPM-415	Cotton IPM
2002IPM-428	Corn IPM
2002IPM-429	Grain Sorghum IPM
2002IPM-453	Christmas Tree IPM
2002IPM-458	Small Grain IPM
2002IPM-478	Small Fruit IPM
2002IPM-590	Chemical Weed Control for Home Lawns
2002IPM-978	Alfalfa IPM

State: ARKANSAS

Prepared by: Ford Baldwin, John Boyd, and Ken Smith

Internet URL:

Order from: Dr. Ford Baldwin or Dr. John Boyd, Box 391, 2301 South University, University of Arkansas Cooperative Extension, Little Rock, AR 72204
[1]Bernadette Hinkle, Box 391, Little Rock, AR 72203

Number	Title
PUBLICATIONS	
MP-44	Recommended Chemicals for Weed and Brush Control in Arkansas
MP-169[1]	Weeds of Arkansas Lawns, Turf, Roadsides, and Recreation Areas: A Guide to Identification ($5.00)
MP-193[1]	Identifying Seedling and Immature Weeds of Arkansas Field Crops ($2.00)
MP-370	Turfgrass Weed Control for Professionals
MP-371	Principles of Turfgrass Weed Control
MP-415	Weed Control in Landscape Plantings
FS-2060	Managing Problem Weeds in Turf
FSA-2080	Pasture Weed Control
FSA-2081	Pasture Brush Control
FSA-2085	Non-Cropland Weed Control
FSA-2105	Alternative Weed Control for Vegetables
FSA-2109	Home Lawn Weed Control
FSA-2145	Spot Spraying Pasture Brush
FSA-2146	Thistle Control in Arkansas Pastures
FSA-3054	Musk Thistle

A weed control chapter is included in each of the following publications:

MP-192	Rice Production Handbook
MP-197	Soybean Production Handbook
MP-214	Corn Production Handbook
-----	Grain Sorghum Production Handbook
-----	Technology for Optimum Production of Soybeans

Information fact sheets for weed problems in commodity groups such as rice, soybean, forage, cotton, etc. are published as necessary. Color posters of weeds in Wheat, Pastures, and Lawns I and II are also available.

State: FLORIDA

Prepared by: Joyce Ducar, Ken Langeland, William Stall, and Brian Unruh

Internet URL: http://edis.ifas.ufl.edu

Order from: Dr. Joyce Tredaway, Extension Weed Specialist, Agronomy Department, 303 Newell Hall, P. O. Box 110500, University of Florida, Gainesville, FL 32611-0500

1 Dr. W. M. Stall, Extension Vegetable Weed Specialist, 1255 Fifield Hall, Univ. of Florida, Gainesville, FL 32611-0690

2 Dr. D. P. H. Tucker, Extension Citrus Management Specialist, IFAS-AREC, 700 Experiment Station Road, Lake Alfred, FL 33850

3 Dr. K. A. Langeland, Extension Aquatic Weed Specialist, Center for Aquatic Plant Research, 7922 NW 71st Street, Gainesville, FL 32606

4 Dr. B. R. Unruh, 1523 Fifield Hall, Gainesville, FL 32611

5 University of Florida Publications, P. O. Box 110011, Gainesville, FL 32611-0011

Number	Title
PUBLICATIONS	
SS-AGR-001	Weed Control in Tobacco
SS-AGR-002	Weed Control in Corn
SS-AGR-003	Weed Control in Peanuts
SS-AGR-004	Weed Control in Cotton
SS-AGR-005	Weed Control in Soybeans
SS-AGR-006	Weed Control in Sorghum
SS-AGR-007	Weed Control in Small Grains Harvested for Grain
SS-AGR-008	Weed Control in Pastures and Rangeland
SS-AGR-009	Weed Control in Sugarcane
SS-AGR-010	Weed Control in Rice
SS-AGR-012	Florida Organo-Auxin Herbicide Rule
SS-AGR-014	Herbicide Prepackage Mixtures
SS-AGR-015	Diagnosing Herbicide Injury
SS-AGR-016	Approximate Herbicide Pricing
SS-AGR-11	Weed Management in Transgenic, Herbicide-Resistant Soybeans
SS-AGR-13	Weed Management in Transgenic, Herbicide-Resistant Cotton
SS-AGR-17	Brazilian Pepper-Tree Control
SS-AGR-22	Identification and Control of Bahiagrass Varieties in Florida
SS-AGR-50	Tropical Soda Apple in Florida
SS-AGR-52	Cogongrass (*Imperata cylindrica*) Biology, Ecology and Control in Florida
SS-AGR-58	Tropical Soda Apple Control - Best Management Practices in 2001
SS-AGR-80	NATURAL AREA WEEDS: Skunkvine (*Paederia foetida*)
SS-AGR-100	Principles of Weed Management
SS-AGR-101	Application Equipment and Techniques
SS-AGR-102	Calibration of Herbicide Applicators
SS-AGR-103	Trade Name, Active Ingredient and Manufacturer
SS-AGR-104	Trade Names of Herbicides Containing a Given Active Ingredient
SS-AGR-105	Common Name, Chemical Name, and Toxicity Rating of Some Herbicides
SS-AGR-106	Names and Addresses of Some Herbicide Manufacturers and Formulators
SS-AGR-108	Using Herbicides Safely and Herbicide Toxicity
SS-AGR-109	Adjuvants
SS-AGR-111	Weed Management in Fence Rows and Non-Cropped Areas
SS-AGR-112	Poison Control Centers
SS-AGR-164	Natural Area Weeds: Air Potato (*Dioscorea bulbifera*)
SS-AGR-165	Natural Area Weeds: Carrotwood (*Cupaniopsis anacardioides*)
SS-Agr-21	Natural Area Weeds: Old World Climbing Fern (*Lygodium microphyllum*)
SS-ORH-004[4]	2000 University of Florida's Pest Control Recommendations for Turfgrass Managers

AGR-72	Labelled Aquatic Sites for Specific Herbicides
AGR-74	Listing of Herbicide, Registrant, and Amount of Active Ingredient
AGR-79	Florida Department of Environmental Protection Aquatic Plant Management Permits
A-87-6[3]	Application Procedure for Use of Grass Carp for Control of Aquatic Weeds
A-87-7[3]	Biology and Chemical Control of Algae
A-87-10[3]	Biology and Chemical Control of Duckweed
A-87-11[3]	Chemical Control of Hydrilla
A-87-12[3]	Florida DNA Aquatic Plant Control Permit Program
ENH-84	Weed Control Guide for Florida Lawns
ENH-88	Activated Charcoal for Pesticide Deactivation
ENH-90	Pesticide Calibration Formulas and Information
ENH-94	Metric System Conversion Factors
ENH-100	Response of Turfgrass and Turfgrass Weeds to Herbicides
ENH-124	Pest Control Guide for Turfgrass Managers
FS WRS-7	Tropical Soda Apple: A New Noxious Weed in Florida
HS-88	Weed Management in Apples
HS-89	Weed Management in Blackberries
HS-90	Weed Managment in Blueberries
HS-91	Weed Management in Grapes
HS-92	Weed Management in Nectarines
HS-93	Weed Management in Peaches
HS-94	Weed Management in Pears
HS-95	Weed Management in Pecans
HS-96	Weed Management in Plums
HS-97	Susceptibility of Weeds to Herbicides
HS-107	2001 Florida Citrus Pest Management Guide
HS-188[1]	Weed Management in Commercial Citrus
HS-189[1]	Weed Control in Cole or Brassica Leafy Vegetables
HS-190[1]	Weed Control in Cucurbit Crops
HS-191[1]	Weed Control in Eggplant
HS-192[1]	Weed Control in Okra
HS-193[1]	Weed Control in Bulb Crops
HS-194[1]	Weed Control in Potato
HS-195[1]	Potato Vine Dessicants
HS-196[1]	Weed Control in Strawberry
HS-197[1]	Weed Control in Sweet Corn
HS-198[1]	Weed Control in Sweet Potato
HS-199[1]	Weed Control in Pepper
HS-200[1]	Weed Control in Tomato
HS-201[1]	Weed Control in Carrots and Parsley
HS-202[1]	Weed Control in Celery
HS-203[1]	Weed Control in Lettuce, Endive, and Spinach
HS-706[1]	Estimated Effectiveness of Recommended Herbicides on Selected Common Weeds in Florida Vegetables

CIRCULAR, BOOKS, AND GUIDES

SS-AGR-20	2002 Weed Management Guide in Agronomic Crops and Non-Crop Areas
280[5]	Families, Mode of Action and Characteristics of Agronomic, Non-Crop and Turf Herbicides
459[2]	Weed Control Guide for Florida Citrus
676	Weed Control in Centipede and St. Augustinegrass
678	Container Nursery Weed Control
707	Weed Control in Florida Ponds
852[4]	Weed Control in Sod Production
1114	Weed Management for Florida Golf Courses
-----[5]	Florida Weed Control Guide ($8.00)
DH-88-05[4]	Turfgrass Weed Control Guide for Lawn Care Professionals
DH-88-07[4]	Commercial Bermudagrass Weed Control Guide

SM-44[5]	Aquatic and Wetland Plants of Florida ($11.00)
SP-35[5]	Identification Manual for Wetland Plant Species of Florida ($18.00)
SP-37[5]	Weeds in Florida ($7.00)
	Florida Weeds Part II ($1.00)
SP-79[5]	Weeds of Southern Turfgrasses ($8.00)
SP-242	Control of Non-native Plants in Natural Areas of Florida

State: GEORGIA

Prepared by: Stanley Culpepper, Tim R. Murphy, and Eric Prostko

Internet URL: http://www.ces.uga.edu/pubs/pubsubj.html (use for print-on-demand publications)
http://www.gaweed.com/ (contains weed science slide presentations, some publications, etc.)
http://www.georgiaturf.com (contains weed science popular articles related to turfgrasses, weed identification, etc.)

Order from: [1]Ag. Business Office, Room 203, Conner Hall, The University of Georgia, Athens, GA 30602
Make check payable to: Georgia Cooperative Extension Service
[2]HADSS, c/o AgRenaissance Software LLC, P. O. Box 68007, Raleigh, NC 27613

The University of Georgia Cooperative Extension Service is currently in the process of switching to a print -on-demand system for Extension publications. Unless noted by an asterisk (*) the publications shown below are not available at this time through the print-on-demand system. Hard copies of these publications may be obtained by contacting one of Georgia weed scientists listed above.

Number	Title
LEAFLETS	
263	Renovation of Home Lawns
400	Musk Thistle and It's Control
418	Use of Sterile Grass Carp to Control Aquatic Weeds
425	Florida Betony Control in Turfgrass and Ornamentals
CIRCULARS	
713	Commercial Blueberry Culture
796	Roadside Vegetation Management
823	Controlling Moss and Algae in Turf
855	Wild Poinsettia Identification and Control*
EXTENSION BULLETINS	
654	Weed Control in Noncropland
829	Principles and Practices of Weed Control in Cotton
978	Weed Control in Home Lawns
984	Turfgrass Pest Control Recommendations for Professionals
986	Forest Site Preparation Alternatives
996	Commercial Watermelon Production
998	Conservation Tillage Crop Production in Georgia
1004	Herbicide Use in Forestry
1005	Georgia Handbook of Cotton Herbicides
1006	Weed Control in Ponds and Small Lakes
1008	Weed Facts: Texas Panicum
1009	Weed Facts: Morningglory Complex
1010	Weed Facts: Sicklepod and Coffee Senna
1019	Cotton Defoliation and Crop Maturity
1023	Herbicide Incorporation
1032	Forestry on a Budget
1043	Weed Facts: Yellow and Purple Nutsedge
1049	Perennial Weed Identification and Control in Georgia
1069	How to Set Up a Post-Emergence Directed Herbicide Sprayer for Cotton
1070	Forage Weed Management
1072	Weed Facts: Florida Beggarweed
1093	Guide to Field Crop Troubleshooting
1098	How to Control Poison Ivy

1100	Peanut Herbicides for Georgia
1118	Non-Chemical Weed Control Methods
1125	Weed Management in Conservation Tillage Cotton
1135	Intensive Wheat Management in Georgia
1138	Conservation Tillage for Peanut Production
1144	Commercial Production of Vegetable Transplants

SPECIAL BULLETINS

28[1]	Georgia Pest Control Handbook ($15.00)*

MISCELLANEOUS

Pub. 46	2002 Georgia Peach Spray and Production Guide
Pub. 377	2002 Georgia Tobacco Growers Guide
Pub. 380	2002 Cotton Production Package
Hdbk. No. 1[1]	Peach Growers Handbook ($25.00)
[1]	Pecan Pest Management Handbook ($20.00)
[1]	Weeds of Southern Turfgrasses ($8.00)
[1]	Poisonous Plants of the Southeastern United States ($4.00)
761[1]	Weeds of the Southern United States ($3.00)
839[1]	Identification and Control of Weeds in Southern Ponds ($3.00)*
----[2]	Georgia HADSS ($95)

State:	KENTUCKY
Prepared by:	J. D. Green
Internet URL:	http://www.ca.uky.edu/
Order from:	Dr. J. D. Green, Extension Weed Control Specialist, Department of Agronomy, N-106B Ag. Sci. Bldg-North, University of Kentucky, Lexington, KY 40546 Dr. James R. Martin, Extension Weed Control Specialist, University of Kentucky Research and Education Center, P. O. Box 469, Princeton, KY 42445

Number	Title
AGR-6	Chemical Control of Weeds in Kentucky Farm Crops
AGR-12	Weeds of Kentucky Turf
AGR-78	Weed Control Recommendations for Kentucky Bluegrass and Tall Fescue Lawns and Recreational Turf
AGR-117	Winter Annual Weeds of Kentucky
AGR-118	Summer Annual Broadleaf Weeds of Kentucky
AGR-135	Perennial Broadleaf Weeds of Kentucky
AGR-139	Herbicide Persistence and Carryover in Kentucky
AGR-140	Herbicides with Potential to Carryover and Injure Rotational Crops in Kentucky
AGR-148	Weed Control Strategies for Alfalfa and Other Forage Legume Crops
AGR-172	Weed Management in Grass Pastures, Hayfields, and Fencerows
ID-2	Some Plants of Kentucky Poisonous to Livestock
ID-36	Commercial Vegetable Crop Recommendations
ID-125	A Comprehensive Guide to Wheat Management in Kentucky ($10.00)
ID-139	A Comprehensive Guide to Corn Management in Kentucky ($10.00)

State: LOUISIANA

Prepared by: Reed Lensce and Steve Kelly

Internet URL: http://www.agctr.lsu.edu

Order from: Dr. Reed Lensce, Knapp Hall, Louisiana State University, Baton Rouge, LA 70803-1900

Number	Title
PUBLICATIONS	
1565	Louisiana's Suggested Chemical Weed Control Guide for 2000 $4
1618	Prescribed Burning in Louisiana Pinelands $1
2314	Controlling Weeds in Sugarcane $0.50
2398	Aquatic Weed Management Herbicides $0.50
2410	Aquatic Weed Management Control Methods $0.50
2472	Aquafacts: Algal Blooms in Fish Production Ponds $0.50
2476	Aquafacts: Grass Carp for Aquatic Vegetation Control $0.50
2500	Herbicide Application for the Small Landowner $0.50
2740	Control Weeds in Soybeans with Pre and Postemergence Chemicals in 2000 $1
2746	2000 Controlling Weeds in Cotton $1
2778	Nonchemical Weed Control for Home Landscapes $0.50
2820	Louisiana Sugarcane Burning $1
8909	Conservation Tillage Systems for Energy Reduction -- Preplant Weed Control in Cotton $0.50

State: MISSISSIPPI

Prepared by: John D. Byrd, Jr.

Internet URL: http://www.ces.msstate.edu/anr/plantsoil/weeds

Order from: Department of Plant & Soil Sciences, Box 9555, Mississippi State, MS 39762-9555

[1] Dr. Marty Brunson, Wildlife & Fisheries, Box 9690, Mississippi State, MS 39762-9690

[2] Dr. John Byrd, Plant & Soil Sciences, Box 9555, Mississippi State, MS 39762-9555

[3] Dr. Andy Londo, Forestry Department, Box 9681, Mississippi State, MS 39762-9681

[4] Mr. Herb Willcutt, Agric. & Bio. Engineering, Box 9632, Mississippi State, MS 39762-9632

[5] Dr. Joe Street, Delta Research & Extension Center, P. O. Box 68, Stoneville, MS 38776

[6] HADSS, c/o AgRenaissance Software LLC, P.O. Box 68007, Raleigh, NC 27613

Number	Title
INFORMATION SHEETS	
673[1]	Control of Fish Diseases and Aquatic Weeds
803	Grain and Forage Sorghum Weed Control
875	Cotton Postemergence and Layby Herbicides
945	Forages Weed Control in Pastures
962	Soybean Preplant Foliar and Preplant Incorporated
963	Soybean Preemergence Weed Control
1024	Soybean - Management Strategies for Sicklepod
1025[1]	Aquatic Weed Identification and Control--Bushy Pondweed and Coontail
1026[1]	Aquatic Weed Identification and Control--Willows and Arrowhead
1027[1]	Aquatic Weed Identification and Control--Cattail and Spikerush
1028[1]	Aquatic Weed Identification and Control--Pondweed and Bladderwort
1029[1]	Aquatic Weed Identification and Control--Fanwort and Parrotfeather
1030[1]	Aquatic Weed Identification and Control--Frogbit and Watershield
1031[1]	Aquatic Weed Identification and Control--Burreed and Bulrush
1032[1]	Aquatic Weed Identification and Control--White Waterlily and American Lotus
1033[1]	Aquatic Weed Identification and Control--Duckweed and Water Hyacinth
1034[1]	Aquatic Weed Identification and Control--Hydrilla and Alligatorweed
1035[1]	Aquatic Weed Identification and Control--Algae
1036[1]	Aquatic Weed Identification and Control--Methods of Aquatic Weed Control
1037[1]	Aquatic Weed Identification and Control--Smartweed and Primrose
1500	Flame Cultivation in Cotton
1527	Peanut Weed Control Recommendations
1528	Kenaf Weed Control Recommendations
1580	Nonchemical Weed Control for Home Owners
1619	Cotton Preplant and Preemergence Weed Control
-----[2]	Tropical Soda Apple in Mississippi
-----[2]	Tropical Soda Apple in the United States
-----[2]	Management Strategies for Tropical Soda Apple in Mississippi
PUBLICATIONS	
475	Corn Weed Control Recommendations
461	Commercial Pecan Pest Control-Insects, Diseases and Weeds
553	Weed Science for 4-H'ers
1005[3]	Christmas Tree Production in Mississippi
1006[4]	Calibration of Ground Spray Equipment
1091	Garden Tabloid
1100	Soybeans Postemergence Weed Control
1217[5]	Rice Weed Control
1277[3]	Forest Management Alternatives for Private Landowners

1322	Establish and Manage Your Home Lawn
1344	Weed Control in Small Grain Crops
1532	2002 Weed Control Guidelines for Mississippi ($7.00)
1664	Disease, Insect and Weed Control Guide for Commercial Peach Orchards
1744	Weed Control in Home Lawns
1907	Herbicide Resistance Prevention and Detection
1934	Weed Response to Selected Herbicides
1962	Pesticides - Benefits and Risks
2036	Organic Vegetable IPM Guide
2166[2]	Poisonous Plants of the Southeastern United States

TECHNICAL NOTES

MTN-SG[3]	Weed Control in Christmas Tree Plantations
MTN-7F[3]	An Overview of Herbicide Alternatives for the Private Forest Landowner
MTN-8F[3]	Tree Injection: Equipment, Methods, Effective Herbicides, Productivity, and Costs
MTN-11F[3]	Effective Kudzu Control

COMPUTER SOFTWARE

-----[6]	Mississippi HADSS ($95.00)

State: MISSOURI

Prepared by: Andy Kendig

Internet URL: http://etcs.ext.missouri.edu/publications/xplor/

Order from: Extension Publications, 2800 Maguire, University of Missouri, Columbia, MO 65211
Add $1.00 for shipping and handling with each order.

Number	Title
MP575	Weed Control Guide for Missouri Field Crops ($7.50)
MP581	Weed and Brush Control Guide for Forages, Pastures, and Non-Cropland in Missouri ($5.00)
MP686	Using Reduced Herbicide Rates for Weed Control in Soybeans ($1.00)
G4251	Cotton Weed Control ($0.75)
G4851	Atrazine: Best Management Practices and Alternatives in Missouri ($0.75)
G4856	Aquatic Weed Control in Missouri ($1.00)
G4871	Waterhemp Management in Missouri ($0.50)
G4872	Johnsongrass Control
G4875	Control of Perennial Broadleaf Weeds in Missouri Field Crops ($0.75)
NCR614	Early Spring Weeds of No-Till Production

State:	NORTH CAROLINA
Prepared by:	Stratford Kay, David Monks, Joe Neal, Fred Yelverton, and Alan York
Internet URL:	http://ipmwww.ncsu.edu/agchem/ac8.html
Order from:	Dr. Fred Yelverton or Dr. A. C. York, Crop Science Department, Box 7620, North Carolina State University, Raleigh, NC 27695-7620
1	Dr. J. C. Neal or Dr. D. W. Monks, Department of Horticulture, Box 7609, North Carolina State University, Raleigh, NC 27695-7609
2	Communication Services, N. C. State University, 3210 Faucette Dr., Box 7603, Raleigh, NC 27695-7603
3	Dr. David Ritchie, Department of Horticulture, Box 7609, North Carolina State University, Raleigh, NC 27695-7609
4	HADSS, c/o AgRenaissance Software LLC, P. O. Box 68007, Raleigh, NC 27613

Number	Title
PUBLICATIONS	
AG-37[1]	Agricultural Chemicals for North Carolina Apples
AG-146[1]	Peach and Nectarine Spray Schedule
AG-187	Tobacco Information - 2002
AG-208	Identifying Seedling and Mature Weeds in Southeastern United States ($7.00)
AG-331	2002 Peanut Information
AG-348	Turfgrass Pest Management Manual ($7.00)
AG-408	Pest Control for Professional Turfgrass Managers 2001
AG-417	2002 Cotton Information
AG-427[1]	Weed Control Suggestions for Christmas Trees, Woody Ornamentals and Flowers ($7.50)
AG-437	Weed Management in Small Ponds
AG-438	Weed Control in Irrigation Water Supplies
AG-442	Using Activated Charcoal to Inactivate Agricultural Chemicals Spills
AG-449	Hydrilla, A Rapidly Spreading Aquatic Weed in North Carolina
AG-456	Using Grass Carp for Aquatic Weed Management
AG-572[2]	Integrated Orchard Management Guide for Commercial Apples in the Southeast
AG-580	Small Grain Production Guide
AG-594	North Carolina Corn Production Guide
B-414	Stock-Poisoning Plants of North Carolina ($5.00)
-----	North Carolina Agricultural Chemicals Manual ($15.00-Revised yearly)
-----[3]	Southern Peach, Nectarine, and Plum Pest Management and Cultural Guide
INFORMATION LEAFLETS	
HIL205B[1]	Weed Control Options for Strawberries on Plastic
HIL325[1]	Peach Orchard Weed Management
HIL380	Orchard Floor Management in Pecans
HIL449	Weed Management in Conifer Seedbeds
HIL570	Greenhouse Weed Management
HIL643[1]	Weed Control for Bulbs in the Landscape
HIL644	Weed Management in Annual Color Beds
HIL647	Controlling Yellow Nutsedge in Landscape Plantings
HIL648	Postemergence, Nonselective Herbicides for Landscapes and Nurseries
HIL649	Weed Management in Conifer Seedbeds and Transplant Beds
HIL8101[1]	Weed Control in Vegetable Gardens
HIL900	Musk Thistle
HIL901	Canada Thistle
HIL902	Mugwort
HIL903	Mulberry Weed
HIL904	Florida Betony

HIL905	Japanese Stiltgrass
—[4]	North Carolina HADSS ($95)

State:	OKLAHOMA
Prepared By:	Jim Stritzke
Internet URL:	http://bubba.ucc.okstate.edu/OSU_Ag/agedcm4h/pearl/agronomy/weeds/weeds.htm
Videotapes:	Agricultural Communications, Room 111, Public Information Building, Oklahoma State University, Stillwater, OK 74078
Publications:	Central Mailing Services, Publishing and Printing, Oklahoma State University, Stillwater, OK 74078

Number	Title
CIRCULAR	
E-806	Peanut Production Guide for Oklahoma
E-821	Soybean Production and Pest Management Guide for Oklahoma (Publication Fee)
E-827	Commercial Vegetable, Insect, Disease and Weed Control (Publication Fee)
E-832	OSU Extension Agents Handbook of Insect, Plant Disease and Weed Control (Publication Fee)
E-879	Turfgrass Pest Management (Publication Fee)
E-885	Roadside Vegetation Management
E-896	Roadside Research Summary Manual (Publication Fee)
MP-122	Roadside Development and Erosion Control
FACT SHEETS	
1215	Selecting the Proper Nozzle Type and Size for Low Pressure Ground Sprayers
1216	Calibrating a Low Pressure Ground Sprayer
1217	The Low Pressure Ground Sprayer
1218	Pumps for Low Pressure Ground Sprayers
2750	Guide to Effective Weed Control
2751	Weed Control in Agronomic Crops
2755	Bindweed Control in Oklahoma
2758	Weed Control in Rangeland with Herbicides
2761	Chemical Weed Control in Alfalfa
2762	Weed Management in Cotton
2763	Chemical Weed Control in Grain Sorghum
2768	Factors Affecting Herbicide Performance
Reprint 2769	Weed Control in Corn
2770	Weed Control in Winter Wheat
2771	Weed Control in Pastures
2773	Wild Buckwheat Control in Wheat
2774	Cheat Control in Wheat
6008	Weed Control in Vegetables
6015	Weed Control in Home Gardens
Reprint 6242	Weed Control in Pecans, Apples and Peaches
6423	Controlling Grassy Weeds in Home Lawns
Reprint 6424	Suggested Herbicides for Roadside Weed Problems
6601	Broadleaf Weed Control for Lawns in Oklahoma
7450	Safe Use of Pesticides in the Home and Garden
7451	Agricultural Pesticide Storage
7453	First-Aid for Pesticide Poisoning
7454	Check Your Pesticide Label
7457	Toxicity of Pesticides
7458	Integrated Pest Management for Crops in Oklahoma
VIDEOTAPES	
VT-315	Herbicide Activity on Crops and Weeds

State:	SOUTH CAROLINA
Prepared By:	Bert McCarty, Ed Murdock, and Ted Whitwell
Internet URL:	http://AgWeb.clemson.edu/AgNews/Publications/Pages/pubs.htm
Order From:	Dr. E. C. Murdock, Pee Dee Res. & Ext. Center, 2200 Pocket Road, Florence, SC 29501-9706
[1]	Bulletin Room, Room 82, Poole Agricultural Center, Clemson University, Clemson, SC 29634-0311

Number	Title
CIRCULAR	
463	Small Grain Production Guidelines for South Carolina
569	South Carolina Tobacco Grower's Guide
588	Peanut Production Guide for South Carolina
669	Canola Production in South Carolina
699	2002 Pest Control Recommendations for Professional Turfgrass Managers
-----[1]	2001 Pest Management Handbook ($25.00)
LEAFLETS	
Forage No. 6	Weed Control in Bermudagrass
Forage No. 9	Weed Control in Tall Fescue
Forage No. 17	Weed Management in Perennial Pastures and Hay Fields

State: TENNESSEE

Prepared By: G. Neil Rhodes, Jr. and Darren K. Robinson

Internet URL: http://www.utextension.utk.edu/weedcontrol/weedcontrol.html

Order From: Extension Mailing Room, P.0. Box 1071, University of Tennessee, Knoxville, TN 37901

Number	Title
PUBLICATIONS	
956	Managing Lawn Weeds: A Guide for Tennessee Homeowners
1197	Commercial Fruit Spray Schedules
1226	Weed Management in Ornamental Nursery Crops
1282	Commercial Vegetable Disease, Insect and Weed Control
1521	Hay Crop and Pasture Weed Management
1538	Chemical Vegetation Management on Noncropland
1539	Weed Management Recommendations for Professional Turfgrass Managers
1580	2001 Weed Control Manual for Tennessee Field Crops
1659	Weeds in Ornamental Plantings: A Management Plan for Tennessee Homeowners

State: TEXAS

Prepared By: Dr. Paul A. Baumann

Internet URL: http://leviathan.tamu.edu:70/7wc/pubs/waisindex/index.inv?weed+control

Order From: Dr. Paul A. Baumann, Extension Weed Specialist, 349 Soil & Crop Sciences, Texas A&M University, College Station, TX 77843-2474

Number	Title
B-1466	Chemical Weed and Brush Control - Suggestions for Rangeland
B-5038	Suggestions for Weed Control in Pastures and Forage Crops
B-5039	Suggestions for Weed Control in Cotton
B-5042	Suggestions for Weed Control in Corn
B-5045	Suggestions for Weed Control in Sorghum
B-6010	Suggestions for Weed Control in Peanuts
L-1708	Wild Oat Control in Texas
L-2254	Common Weeds in Corn and Grain Sorghum
L-2301	Common Weeds in Cotton
L-2302	Common Weeds in West Texas Cotton
L-2339	Field Bindweed Control in the Texas High Plains
L-2436	Silverleaf Nightshade Control in Cotton in West Texas
L-5102	Perennial Weed Control During Fallow Periods in the Texas High Plains
B-6081	Herbicides: How They Work and The Symptoms They Cause
B-6079S	Como identificar malezas: Las estructuras de la planta son la clave
B-6079	Weed Identification: Using Plant Structures as a Key
L-5205	Reducing Herbicides in Surface Waters-Best Management Practices
L-5204	Some Facts About Atrazine
L-5324	Protecting the Environment-Using Integrated Weed Management in Lawns

State:	VIRGINIA
Prepared By:	Scott Hagood
Internet URL:	gopher://ext.vt.edu:70/11/vce-data
Order From:	Virginia Polytechnic Institute and State University, Extension Distribution Center, Landsdowne St., Blacksburg, VA 24061

Number	Title
PUBLICATIONS	
456-016	Pest Management Guide for Field Crops
456-017	Pest Management Guide for Horticultural and Forest Crops
456-018	Pest Management Guide for Home Grounds and Animals

Revised annually ($16.00 per copy, or $45.00 per set)

WEED SURVEY- SOUTHERN STATES

2002

Vegetable, Fruit and Nut Crops Subsection

(Cucurbits, Fruiting Vegetables, Cole Crops and Greens, Other Vegetables, Peaches, Apples, Fruits and Nuts, Citrus Crops)

Theodore M. Webster
Chairperson

Information in this report is provided by the following individuals:

Alabama	Mike Patterson	Bobby Boozer
Arkansas	John Boyd	
Georgia	A. Stanley Culpepper	Wayne Mitchem
Kentucky	J. D. Green	J. R. Martin
	John Strang	
Mississippi	John Byrd	
Missouri	Andy Kendig	
North Carolina	Wayne Mitchem	
Oklahoma	Jim Shrefler	John Damicone
	Jonathan Edelson	Lynn Brandenberger
	Beck Johnson	Dean McCraw
	Mike Smith	Ken Karner
Puerto Rico	Nelson Semidey	
South Carolina	Wayne Mitchem	
Tennessee	Darren Robinson	
Texas	Paul A. Baumann	
Virginia	Jeffrey F. Derr	

Table 1. The Southern States 10 Most Common and Troublesome Weeds in Apples.

	States		
Ranking	Alabama	Arkansas	Georgia
Ten Most Common Weeds			
1	Crabgrass spp.	Horsenettle	Morningglory spp.
2	Pigweed spp.	*Smilax* spp. (greenbriar)	Crabgrass spp.
3	Cutleaf eveningprimrose	Bermudagrass spp.	Bermudagrass spp.
4	Bermudagrass spp.	Woody sprouts	Horsenettle
5	Prickly sida	Poison ivy	Common chickweed
6	Ragweed spp.	Virginia creeper	Henbit
7	Common lambsquarters	Trumpetcreeper	Spotted spurge
8	Yellow nutsedge	Blackberry spp.	Bramble spp.
9	Purple nutsedge	Southern dewberry	Pigweed spp.
10	Morningglory (*Ipomoea*) spp.	Broomsedge	Common ragweed
Ten Most Troublesome Weeds			
1	Blackberry spp.	Horsenettle	Morningglory spp.
2	Southern dewberry	*Smilax* spp. (greenbriar)	Bramble spp.
3	Yellow nutsedge	Bermudagrass spp.	Virginia creeper
4	Purple nutsedge	Woody sprouts	Horsenettle
5	Prickly sida	Poison ivy	Nutsedge spp.
6	Ragweed spp.	Virginia creeper	Lespedeza spp.
7	Common lambsquarters	Trumpetcreeper	Poison ivy
8	Cutleaf eveningprimrose	Blackberry spp.	Dwarf fleabane
9	Bermudagrass spp.	Southern dewberry	*Smilax* spp. (greenbriar)
10	Bahiagrass	Broomsedge	Johnsongrass

Table 1. The Southern States 10 Most Common and Troublesome Weeds in Apples (continued).

	States		
Ranking	Kentucky	North Carolina	South Carolina
Ten Most Common Weeds			
1	Large crabgrass	White clover	Bermudagrass spp.
2	Foxtail spp.	Crabgrass spp.	Johnsongrass
3	Common ragweed	Morningglory spp.	Tall fescue
4	Common lambsquarters	Dandelion	Morningglory spp.
5	Dandelion	Spotted spurge	Bramble spp.
6	Horseweed	Horseweed	Plantain spp.
7	Johnsongrass	Bramble spp.	Horsenettle
8	Yellow nutsedge	Virginia creeper	Crabgrass spp.
9	Ivyleaf morningglory	Common lambsquarters	Horseweed
10	Horsenettle	Plantain spp.	Perennial aster spp.
Ten Most Troublesome Weeds			
1	Yellow nutsedge	Morningglory spp.	Bramble spp.
2	Honeyvine milkweed	Bramble spp.	Morningglory spp.
3	Field bindweed	Poison ivy	Horsenettle
4	Johnsongrass	Horsenettle	Poison ivy
5	Bigroot morningglory	Bermudagrass spp.	Virginia creeper
6	Trumpetcreeper	Virginia creeper	*Smilax* spp. (greenbriar)
7	Horsenettle	*Smilax* spp. (greenbriar)	Tall fescue
8	Tall fescue	Dallisgrass	Yellow nutsedge
9	Poison ivy	Spotted spurge	Lespedeza spp.
10	Blackberry spp.	Yellow nutsedge	Dallisgrass

Table 1. The Southern States 10 Most Common and Troublesome Weeds in Apples (continued).

	States	
Ranking	Tennessee	Virginia
Ten Most Common Weeds		
1	Tall fescue	Large crabgrass
2	Large crabgrass	Dandelion
3	Common ragweed	Morningglory spp.
4	Smooth pigweed	Common ragweed
5	Dandelion	Common lambsquarters
6	Morningglory spp.	Horsenettle
7	Plantain spp.	Poison ivy
8	Johnsongrass	Bramble spp.
9	Horsenettle	Virginia creeper
10	Poison ivy	Tall fescue
Ten Most Troublesome Weeds		
1	Poison ivy	Bramble spp.
2	Bramble spp.	Poison ivy
3	Horsenettle	Virginia creeper
4	Virginia creeper	Japanese honeysuckle
5	Tall fescue	Horsenettle
6	Honeysuckle spp.	Dandelion
7	Trumpetcreeper	Bindweed spp.
8	*Smilax* spp. (greenbriar)	Morningglory spp.
9	Dandelion	Tree of Heaven
10	Morningglory spp.	Black locust

Table 2. The Southern States 10 Most Common and Troublesome Weeds in Citrus.

	States	
Ranking	Puerto Rico	Texas
Ten Most Common Weeds		
1	Guineagrass	Texas panicum
2	Spreading dayflower	Guineagrass
3	Dumbcane	Field sandbur
4	Alexandergrass spp.	Bermudagrass spp.
5	Morningglory spp.	Field bindweed
6	Balsamapple	Johnsongrass
7	Bermudagrass spp.	Silverleaf nightshade
8	Hairy grass	Western salsify
9	Dearly vines	Stranglervine
10		Common sunflower
Ten Most Troublesome Weeds		
1	Dumbcane	Bermudagrass spp.
2	Bermudagrass spp.	Guineagrass
3	Dearly vines	Johnsongrass
4	Gully root	Silverleaf nightshade
5	Spreading dayflower	Texas panicum
6	Sour paspalum	Western salsify
7	Alexandergrass spp.	Field sandbur
8	Red sprangletop	Strangelervine
9	Morningglory spp.	Common sunflower
10	Guineagrass	

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Cole Crops and Greens.

	States		
Ranking	Alabama	Georgia	Mississippi
Ten Most Common Weeds			
1	Annual ryegrass	Henbit	Annual bluegrass
2	Virginia pepperweed	Cutleaf eveningprimrose	Common chickweed
3	Cutleaf eveningprimrose	Pigweed spp.	Foxtail fescue
4	Carolina geranium	Pink purslane	Mouseear chickweed
5	Henbit	Swinecress	Wild garlic
6	Common lambsquarters	Wild radish	Sibara
7	Vetch spp.	Florida pusley	Smallflowered bittercress
8	Chickweed spp.	Texas panicum	Swinecress
9	Wild radish	Chickweed spp.	Shepherdspurse
10	Purslane spp.	Yellow nutsedge	Virginia pepperweed
Ten Most Troublesome Weeds			
1	Wild radish	Wild radish	Wolftail sedge
2	Cutleaf eveningprimrose	Yellow nutsedge	Wild garlic
3	Carolina geranium	Purple nutsedge	Henbit
4	Henbit	Pink purslane	Mouseear chickweed
5	Vetch spp.	Cutleaf eveningprimrose	Common chickweed
6	Chickweed spp.	Pigweed spp.	Speedwell spp.
7	Common lambsquarters	Swinecress	Venuslookingglass
8	Virginia pepperweed	Henbit	Virginia pepperweed
9	Annual ryegrass	Chickweed spp.	Swinecress
10	Purslane spp.	Morningglory (*Ipomoea*) spp.	Cutleaf eveningprimrose

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Cole Crops and Greens (continued).

	States		
Ranking	Missouri	Oklahoma	Puerto Rico
Ten Most Common Weeds			
1	Chickweed spp.	Common cocklebur	Nutsedge spp.
2	Henbit	Volunteer wheat	Morningglory spp.
3	Purple deadnettle	Cutleaf eveningprimrose	Spider flower
4	Annual bluegrass	Henbit	Jimsonweed
5	Mustard spp.	Shepherdspurse	Pigweed spp.
6	Little barley	Common lambsquarters	Ragweed parthenium
7	Cheat	Pigweed spp.	Crabgrass spp.
8		Johnsongrass	Goosegrass
9		Volunteer potato	Hogweed
10			Wild poinsettia
Ten Most Troublesome Weeds			
1	Chickweed spp.	Volunteer wheat	Nutsedge spp.
2	Henbit	Henbit	Morningglory spp.
3	Purple deadnettle	Shepherdspurse	Goosegrass
4	Annual bluegrass	Common lambsquarters	Ragweed parthenium
5	Mustard spp.	Cutleaf eveningprimrose	Hogweed
6	Little barley		Pigweed spp.
7	Cheat		Spiny amaranth
8			Purslane spp.
9			Eclipta
10			Junglerice

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Cole Crops and Greens (continued).

	States	
Ranking	Tennessee	Texas
Ten Most Common Weeds		
1	Large crabgrass	London rocket
2	Smooth pigweed	Purslane spp.
3	Carpetweed	Common mallow
4	Goosegrass	Volunteer corn
5	Johnsongrass	
6	Common ragweed	
7	Common cocklebur	
8	Morningglory spp.	
9	Yellow nutsedge	
10	Bermudagrass spp.	
Ten Most Troublesome Weeds		
1	Yellow nutsedge	London rocket
2	Hophornbeam copperleaf	Purslane spp.
3	Bermudagrass spp.	Common mallow
4	Hairy galinsoga	Volunteer corn
5	Smooth pigweed	
6	Morningglory spp.	
7	Common ragweed	
8	Goosegrass	
9	Large crabgrass	
10		

Table 4. The Southern States 10 Most Common and Troublesome Weeds in Cucurbit Crops.

	States		
Ranking	Alabama	Georgia	Mississippi
Ten Most Common Weeds			
1	Sicklepod	Pigweed spp.	Southern crabgrass
2	Crabgrass spp.	Florida pusley	Spiny amaranth
3	Pigweed spp.	Texas panicum	Common bermudagrass
4	Florida pusley	Yellow nutsedge	Florida pusley
5	Yellow nutsedge	Smallflower morningglory	Smallflower morningglory
6	Morningglory (*Ipomoea*) spp.	Morningglory (*Ipomoea*) spp.	Pitted morningglory
7	Purple nutsedge	Sicklepod	Broadleaf signalgrass
8	Florida beggarweed	Crabgrass spp.	Entireleaf morningglory
9	Smallflower morningglory	Florida beggarweed	Common purslane
10	Arrowleaf sida	Pink purslane	Sicklepod
Ten Most Troublesome Weeds			
1	Yellow nutsedge	Yellow nutsedge	Purple nutsedge
2	Sicklepod	Purple nutsedge	Spiny amaranth
3	Purple nutsedge	Pigweed spp.	Yellow nutsedge
4	Morningglory (*Ipomoea*) spp.	Morningglory (*Ipomoea*) spp.	Smallflower morningglory
5	Texas panicum	Sicklepod	Sicklepod
6	Smallflower morningglory	Smallflower morningglory	Florida pusley
7	Wild radish	Florida pusley	Horsenettle
8	Arrowleaf sida	Texas panicum	Pitted morningglory
9	Florida pusley	Coffee senna	Entireleaf morningglory
10	Pigweed spp.	Bermudagrass spp.	Nodding spurge

Table 4. The Southern States 10 Most Common and Troublesome Weeds in Cucurbit Crops (continued).

	States		
Ranking	Missouri	Puerto Rico	Oklahoma
Ten Most Common Weeds			
1	Palmer amaranth	Nutsedge spp.	Palmer amaranth
2	Crabgrass spp.	Wild poinsettia	Carpetweed
3	Smooth pigweed	Pigweed spp.	Large crabgrass
4	Puncturevine	Junglerice	Horsenettle
5	Sandbur spp.	Ragweed parthenium	Pigweed spp.
6	Pitted morningglory	Crabgrass spp.	Yellow nutsedge
7	Entireleaf B Ivyleaf morningglory	Itchgrass	Morningglory spp.
8	Common cocklebur	Jimsonweed	Bermudagrass spp.
9	Tropic croton	Morningglory spp.	Crownbeard
10	Southern pea		Johnsongrass
Ten Most Troublesome Weeds			
1	Palmer amaranth	Nutsedge spp.	Palmer amaranth
2	Entireleaf B Ivyleaf morningglory	Morningglory spp.	Eclipta
3	Pitted morningglory	Wild poinsettia	Yellow nutsedge
4	Puncturevine	Ragweed parthenium	Horsenettle
5	Tropic croton	Hogweed	Tropic croton
6		Pigweed spp.	Woolly croton
7		Spiny amaranth	Morningglory spp.
8		Purslane spp.	Crownbeard
9		Itchgrass	Buffalobur
10		Johnsongrass	Hophornbeam copperleaf

Table 4. The Southern States 10 Most Common and Troublesome Weeds in Cucurbit Crops (continued).

	States	
Ranking	Tennessee	Texas
Ten Most Common Weeds		
1	Large crabgrass	Nutsedge spp.
2	Smooth pigweed	Purslane spp.
3	Carpetweed	Redroot pigweed
4	Goosegrass	Panicum spp.
5	Johnsongrass	Field sandbur
6	Common ragweed	
7	Common cocklebur	
8	Morningglory spp.	
9	Yellow nutsedge	
10	Bermudagrass spp.	
Ten Most Troublesome Weeds		
1	Yellow nutsedge	Nutsedge spp.
2	Hophornbeam copperleaf	Purslane spp.
3	Bermudagrass	Redroot pigweed
4	Hairy galinsoga	Panicum spp.
5	Smooth pigweed	Field sandbur
6	Morningglory spp.	
7	Common ragweed	
8	Goosegrass	
9	Large crabgrass	
10		

Table 5. The Southern States 10 Most Common and Troublesome Weeds in Fruit and Nut Crops.

	States		
Ranking	Alabama[A]	Arkansas	Georgia[B]
Ten Most Common Weeds			
1	Bahiagrass	Horsenettle	Crabgrass spp.
2	Bermudagrass spp.	*Smilax* spp. (greenbriar)	Bermudagrass spp.
3	Crabgrass spp.	Bermudagrass spp.	Bahiagrass
4	Pigweed spp.	Virginia creeper	Cutleaf eveningprimrose
5	Morningglory (*Ipomoea*) spp.	Trumpetcreeper	Morningglory spp.
6	Florida pusley	Honeysuckle spp.	Bramble spp.
7	Yellow nutsedge	Southern dewberry	Common ragweed
8	Purple nutsedge	Blackberry spp.	Johnsongrass
9	Ragweed spp.	Crabgrass spp.	Sida spp.
10	Common lambsquarters	Cutleaf eveningprimrose	Annual ryegrass
Ten Most Troublesome Weeds			
1	Blackberry spp.	Bermudagrass spp.	Bahiagrass
2	Southern dewberry	Yellow woodsorrel	Nutsedge spp.
3	Yellow nutsedge	Johnsongrass	Bermudagrass spp.
4	Arrowleaf sida	Virginia creeper	Bramble spp.
5	Trumpetcreeper	Trumpetcreeper	Vaseygrass
6	Purple nutsedge	Honeysuckle spp.	Vetch spp.
7	Spotted spurge	Southern dewberry	Camphorweed
8	Morningglory (*Ipomoea*) spp.	Blackberry spp.	Cutleaf eveningprimrose
9	Bahiagrass	Horsenettle	Horseweed
10	Bermudagrass spp.	Woody sprouts	Johnsongrass

[A] This survey refers primarily to Pecan for Alabama.
[B] This survey refers to Blueberry, Grape, Pecan, and Strawberry for Georgia.

Table 5. The Southern States 10 Most Common and Troublesome Weeds in Fruit and Nut Crops (continued).

Ranking	States: Mississippi	Oklahoma[C]	South Carolina[D]
Ten Most Common Weeds			
1	Common bermudagrass	Pigweed spp.	Bermudagrass spp.
2	Southern crabgrass	Common ragweed	Bahiagrass
3	Goosegrass	Giant ragweed	Large crabgrass
4	Fall panicum	Cutleaf eveningprimrose	Carolina geranium
5	Horsenettle	Johnsongrass	Palmer amaranth
6	Pennsylvania smartweed	Bermudagrass spp.	Johnsongrass
7	Common knotweed	Crabgrass spp.	Prickly sida
8	Southern dewberry	Nutsedge spp.	Cutleaf eveningprimrose
9	Annual sedge	Trumpetcreeper	Florida pusley
10	Annual lespedeza	Nightshade spp.	Blue vervain
Ten Most Troublesome Weeds			
1	Annual sedges	Bermudagrass spp.	Bahiagrass
2	Bahiagrass	Nutsedge spp.	Nutsedge spp.
3	Horsenettle	Poison ivy	Florida pusley
4	Common bermudagrass	Nightshade spp.	Bermudagrass spp.
5	Pennsylvania smartweed	Dock spp.	Bramble spp.
6	Southern dewberry	Smartweed spp.	Vetch spp.
7	Southern crabgrass	Morningglory spp.	*Smilax* spp. (greenbriar)
8	Goosegrass	Trumpetcreeper	Palmer amaranth
9	Japanese honeysuckle	Nettle spp.	Camphorweed
10	Fall panicum	Giant ragweed	Cutleaf eveningprimrose

[C] This survey refers to Pecan for Oklahoma.
[D] This survey refers to Blueberry, Grape, Pecan, and Strawberry for South Carolina.

Table 6. The Southern States 10 Most Common and Troublesome Weeds in Fruiting Vegetables.

	States		
Ranking	Alabama	Georgia	Mississippi
Ten Most Common Weeds			
1	Crabgrass spp.	Pigweed spp.	Southern crabgrass
2	Sicklepod	Florida pusley	Spiny amaranth
3	Morningglory (*Ipomoea*) spp.	Texas panicum	Common bermudagrass
4	Yellow nutsedge	Smallflower morningglory	Florida pusley
5	Purple nutsedge	Yellow nutsedge	Smallflower morningglory
6	Pigweed spp.	Sicklepod	Pitted morningglory
7	Florida pusley	Florida beggarweed	Broadleaf signalgrass
8	Florida beggarweed	Morningglory (*Ipomoea*) spp.	Entireleaf morningglory
9	Bristly starbur	Pink purslane	Common purslane
10	Arrowleaf sida	Goosegrass	Sicklepod
Ten Most Troublesome Weeds			
1	Yellow nutsedge	Yellow nutsedge	Purple nutsedge
2	Purple nutsedge	Purple nutsedge	Spiny amaranth
3	Morningglory (*Ipomoea*) spp.	Morningglory (*Ipomoea*) spp.	Yellow nutsedge
4	Horsenettle	Sicklepod	Smallflower morningglory
5	Texas panicum	Smallflower morningglory	Sicklepod
6	Spotted spurge	Pigweed spp.	Florida pusley
7	Smartweed spp.	Goosegrass	Horsenettle
8	Bristly starbur	Texas panicum	Pitted morningglory
9	Florida beggarweed	Florida pusley	Entireleaf morningglory
10	Arrowleaf sida	Pink purslane	Nodding spurge

Table 6. The Southern States 10 Most Common and Troublesome Weeds in Fruiting Vegetables (continued).

	States		
Ranking	Missouri	Puerto Rico	Tennessee
Ten Most Common Weeds			
1	Smooth pigweed	Nutsedge spp.	Large crabgrass
2	Crabgrass spp.	Morningglory spp.	Smooth pigweed
3	Palmer amaranth	Spiderflower	Carpetweed
4	Broadleaf signalgrass	Jimsonweed	Goosegrass
5	Johnsongrass	Pigweed spp.	Johnsongrass
6	Common cocklebur	Ragweed parthenium	Common ragweed
7	Pitted morningglory	Crabgrass spp.	Common cocklebur
8	Entireleaf B Ivyleaf morningglory	Itchgrass	Morningglory spp.
9	Prickly sida	Hogweed	Yellow nutsedge
10		Wild poinsettia	Bermudagrass spp.
Ten Most Troublesome Weeds			
1	Entireleaf B Ivyleaf morningglory	Nutsedge spp.	Yellow nutsedge
2	Johnsongrass	Morningglory spp.	Hophornbeam copperleaf
3		Wild poinsettia	Bermudagrass spp.
4		Ragweed parthenium	Hairy galinsoga
5		Hogweed	Smooth pigweed
6		Pigweed spp.	Morningglory spp.
7		Spiny amaranth	Common ragweed
8		Purslane spp.	Goosegrass
9		Spiderflower	Large crabgrass
10		Johnsongrass	

Table 6. The Southern States 10 Most Common and Troublesome Weeds in Fruiting Vegetables (continued).

Ranking	State Texas
Ten Most Common Weeds	
1	Nutsedge spp.
2	Purslane spp.
3	Redroot pigweed
4	Panicum spp.
5	Field sandbur
6	
7	
8	
9	
10	
Ten Most Troublesome Weeds	
1	Nutsedge spp.
2	Purslane spp.
3	Redroot pigweed
4	Panicum spp.
5	Field sandbur
6	
7	
8	
9	
10	

Table 7. The Southern States 10 Most Common and Troublesome Weeds in Other Vegetable Crops.

Ranking	States		
	Arkansas	Georgia	Missouri[A]
Ten Most Common Weeds			
1	Palmer amaranth	Pigweed spp.	Crabgrass spp.
2	Pitted morningglory	Florida pusley	Palmer amaranth
3	Smooth pigweed	Texas panicum	Smooth pigweed
4	Entireleaf morningglory	Yellow nutsedge	Broadleaf signalgrass
5	Sicklepod	Smallflower morningglory	Johnsongrass
6	Hemp sesbania	Sicklepod	Common cocklebur
7	Common cocklebur	Morningglory (*Ipomoea*) spp.	Entireleaf B Ivyleaf morningglory
8	Carpetweed	Crabgrass spp.	Pitted morningglory
9	Crabgrass spp.	Florida beggarweed	Prickly sida
10	Yellow nutsedge	Pink purslane	Goosegrass
Ten Most Troublesome Weeds			
1	Palmer amaranth	Yellow nutsedge	Palmer amaranth
2	Pitted morningglory	Purple nutsedge	Entireleaf B Ivyleaf morningglory
3	Smooth pigweed	Pigweed spp.	Johnsongrass
4	Entireleaf morningglory	Morningglory (*Ipomoea*) spp.	Eastern black nightshade
5	Sicklepod	Sicklepod	Jimsonweed
6	Hemp sesbania	Smallflower morningglory	Common ragweed
7	Common cocklebur	Florida pusley	Common cocklebur
8	Crabgrass spp.	Texas panicum	
9	Southwest cupgrass	Pink purslane	
10	Yellow nutsedge	Wild radish	

[A] This survey refers to Potatoes for Missouri.

Table 7. The Southern States 10 Most Common and Troublesome Weeds in Other Vegetable Crops (continued).

	States		
Ranking	Puerto Rico	Tennessee	Texas
Ten Most Common Weeds			
1	Nutsedge spp.	Large crabgrass	Nutsedge spp.
2	Wild poinsettia	Smooth pigweed	Purslane spp.
3	Spiderflower	Carpetweed	Pigweed spp.
4	Johnsongrass	Goosegrass	Texas panicum
5	Pigweed spp.	Johnsongrass	Field sandbur
6	Junglerice	Common ragweed	London rocket
7	Crabgrass spp.	Common cocklebur	Common mallow
8	Goosegrass	Morningglory spp.	
9	Hogweed	Yellow nutsedge	
10	Morningglory spp.	Bermudagrass spp.	
Ten Most Troublesome Weeds			
1	Nutsedge spp.	Yellow nutsedge	Nutsedge spp.
2	Morningglory spp.	Hophornbeam copperleaf	Purslane spp.
3	Goosegrass	Bermudagrass spp.	Pigweed spp.
4	Ragweed parthenium	Hairy galinsoga	Texas panicum
5	Johnsongrass	Smooth pigweed	Field sandbur
6	Pigweed spp.	Morningglory spp.	London rocket
7	Itchgrass	Common ragweed	Common mallow
8	Purslane spp.	Goosegrass	
9	Eclipta	Large crabgrass	
10	Junglerice		

Table 8. The Southern States 10 Most Common and Troublesome Weeds in Peaches.

Ranking	States: Alabama	Arkansas	Georgia
Ten Most Common Weeds			
1	Crabgrass spp.	Horsenettle	Crabgrass spp.
2	Pigweed spp.	*Smilax* spp. (greenbriar)	Bermudagrass spp.
3	Morningglory (*Ipomoea*) spp.	Bermudagrass spp.	Cutleaf eveningprimrose
4	Sicklepod	Woody sprouts	Carolina geranium
5	Prickly sida	Poison ivy	Pigweed spp.
6	Yellow nutsedge	Virginia creeper	Sida spp.
7	Purple nutsedge	Trumpetcreeper	Texas panicum
8	Florida pusley	Blackberry spp.	Bahiagrass
9	Arrowleaf sida	Southern dewberry	Common chickweed
10	Bermudagrass spp.	Broomsedge	Nutsedge spp.
Ten Most Troublesome Weeds			
1	Blackberry spp.	Horsenettle	Bahiagrass
2	Bermudagrass spp.	*Smilax* spp. (greenbriar)	Bermudagrass spp.
3	Yellow nutsedge	Bermudagrass spp.	Nutsedge spp.
4	Purple nutsedge	Woody sprouts	Bramble spp.
5	Ragweed spp.	Poison ivy	Cutleaf eveningprimrose
6	Sicklepod	Virginia creeper	Camphorweed
7	Morningglory (*Ipomoea*) spp.	Trumpetcreeper	Poison ivy
8	Florida pusley	Blackberry spp.	Wild radish
9	Arrowleaf sida	Southern dewberry	Texas panicum
10	Bahiagrass	Broomsedge	Curly dock

Table 8. The Southern States 10 Most Common and Troublesome Weeds in Peaches (continued).

	States		
Ranking	Kentucky	Mississippi	North Carolina
Ten Most Common Weeds			
1	Large crabgrass	Southern crabgrass	Crabgrass spp.
2	Foxtail spp.	Goosegrass	Bermudagrass spp.
3	Common ragweed	Common bermudagrass	Camphorweed
4	Common lambsquarters	Dallisgrass	Horsenettle
5	Dandelion	Bahiagrass	Southern sandbur
6	Horseweed	Horsenettle	Pigweed spp.
7	Johnsongrass	Broadleaf signalgrass	Henbit
8	Yellow nutsedge	Henbit	Cutleaf eveningprimrose
9	Ivyleaf morningglory	Annual sedges	Horseweed
10	Horsenettle	Wild garlic	Virginia pepperweed
Ten Most Troublesome Weeds			
1	Yellow nutsedge	Poison ivy	Bermudagrass spp.
2	Honeyvine milkweed	Horsenettle	Bramble spp.
3	Field bindweed	Trumpetcreeper	Florida pusley
4	Johnsongrass	Southern dewberry	Poison ivy
5	Bigroot morningglory	Roundlead greenbriar	*Smilax* spp. (greenbriar)
6	Trumpetcreeper	Common bermudagrass	Camphorweed
7	Horsenettle	Bahiagrass	Nutsedge spp.
8	Tall fescue	Annual sedges	Maypop passionflower
9	Poison ivy	Henbit	Horsenettle
10	Blackberry spp.	Common chickweed	Crabgrass spp.

Table 8. The Southern States 10 Most Common and Troublesome Weeds in Peaches (continued).

	States		
Ranking	Oklahoma	South Carolina	Texas
Ten Most Common Weeds			
1	Bermudagrass spp.	Crabgrass spp.	Palmer amaranth
2	Johnsongrass	Palmer amaranth	Johnsongrass
3	Foxtail spp.	Cutleaf eveningprimrose	Common bermudagrass
4	Nightshade spp.	Bermudagrass spp.	Silverleaf nightshade
5	Honeyvine milkweed	Johnsongrass	Texas panicum
6	Horseweed	Yellow nutsedge	Crabgrass spp.
7	Crabgrass spp.	Bramble spp.	Purple nutsedge
8	Sandbur spp.	Wild mustard	Common ragweed
9	Cutleaf eveningprimrose	Horsenettle	Common purslane
10	Morningglory spp.	Horseweed	Henbit
Ten Most Troublesome Weeds			
1	Bermudagrass	Bahiagrass	Johnsongrass
2	Johnsongrass	Bermudagrass spp.	Bermudagrass spp.
3	Nightshade spp.	Florida pusley	Yellow nutsedge
4	Honeyvine milkweed	Nutsedge spp.	Purple nutsedge
5	Sandbur spp.	Bramble spp.	Texas panicum
6	Cutleaf eveningprimrose	Poison ivy	Field bindweed
7	Morningglory spp.	Cutleaf eveningprimrose	
8	Goosegrass	Wild mustard	
9	Nutsedge spp.	Palmer amaranth	
10	Horseweed	Camphorweed	

Table 8. The Southern States 10 Most Common and Troublesome Weeds in Peaches (continued).

Ranking	State Virginia
Ten Most Common Weeds	
1	Large crabgrass
2	Dandelion
3	Morningglory spp.
4	Common ragweed
5	Common lambsquarters
6	Horsenettle
7	Poison ivy
8	Bramble spp.
9	Virginia creeper
10	Tall fescue
Ten Most Troublesome Weeds	
1	Bramble spp.
2	Poison ivy
3	Virginia creeper
4	Japanese honeysuckle
5	Horsenettle
6	Dandelion
7	Bindweed spp.
8	Morningglory spp.
9	Tree of Heaven
10	Black locust

Economic Losses Due to Weeds in Southern States

Fruits, Nuts, and Vegetables

Eric P. Webster, Section Chair

The following estimates are based on the knowledge and experience of those individuals or other specialist within the state with whom they conferred.

Table 1. 2001 Estimated Losses Due to Weeds in Alabama[1].			
	Peach	Pecan	Vegetable[2]
Cost of Herbicides			
a. Acres	6.5	29	10.7
b. Cost/A	35.00	22.00	45.00
c. Value	227	638	482
Loss in Yield			
a. Acres	3	25	6
b. Cost/A	200.00	45.00	200.00
c. Value	600	1,125	1,200
Loss in Quality			
a. Acres	N/A	N/A	N/A
b. Cost/A	N/A	N/A	N/A
c. Value	N/A	N/A	N/A
Loss in Extra Land Preparation and Cultivation			
a. Acres	N/A	N/A	N/A
b. Cost/A	N/A	N/A	N/A
c. Value	N/A	N/A	N/A
Loss in Land Value			
a. Acres	N/A	N/A	N/A
b. Cost/A	N/A	N/A	N/A
c. Value	N/A	N/A	N/A
Loss in Increase Cost of Harvesting			
a. Acres	N/A	N/A	N/A
b. Cost/A	N/A	N/A	N/A
c. Value	N/A	N/A	N/A
Total Losses	827	1,763	1,682

[1]Acres = no. X 1000; Cost/A = $/A; Value = Acres X Cost/A X 1000

[2]Vegetables: potatoes 4,100 A; sweet corn 1,400 A; tomatoes 1,200 A; watermelon 4,000 A.

Contributing Author: M. G. Patterson

Table 3. 2001 Estimated Losses Due to Weeds in Georgia.				
	Peaches	Pecans	Fruits	Vegetables
Cost of Herbicides				
a. Acres	20	180	9	185
b. Cost/A	25.00	22.00	25.00	35.00
c. Value	500	3960	225	5,550
Loss in Yield				
a. Acres	7.8	30	3.6	74.1
b. Cost/A	325.00	60.00	80.00	225.00
c. Value	2,535	1,800	288	16,650
Loss in Quality				
a. Acres	5.6	30	2	40
b. Cost/A	110.00	20.00	60.00	65.00
c. Value	616	600	120	2,600
Loss in Extra Land Preparation and Cultivation				
a. Acres	1	1	0.5	110.9
b. Cost/A	12.00	20.00	15.00	15
c. Value	12	20	7.5	1,665
Loss in Increase Cost of Harvesting				
a. Acres	0.5	40	0.5	58.5
b. Cost/A	14.00	12.00	14.00	15.00
c. Value	7.0	480	7	877.5
Total Losses	3,670	6,860	647.5	27,342.5

Acres = no. X 1000; Cost/A = $/A; Value = Acres X Cost/A X 1000.

Contributing Authors: Wayne Mitchum and Stanley Culpepper

Table 5. 2001 Estimated Losses Due to Weeds in Louisiana[1]							
	Pecans	Vege- tables	Peaches	Sweet Potatoes	Blue- berry	Straw- berry	Citrus
Cost of Herbicides							
a. Acres	12	7	0.7	25	0.35	0.4	0.9
b. Cost/A	100.00	30.00	100.00	35.00	100.00	25.00	200.00
c. Value	1,200	210	70	875	35	10	180
Loss in Yield							
a. Acres	5	3.5	0.3	8	N/A	0.2	0.5
b. Cost/A	10.00	200.00	50.00	200.00	N/A	20.00	50.00
c. Value	50	700	15	160	N/A	4	25
Loss in Quality							
a. Acres	5	3.5	0.3	8	N/A	0.2	0.5
b. Cost/A	10.00	100.00	15.00	100.00	N/A	10.00	50.00
c. Value	50	350	4.5	800	N/A	2	25
Loss in Extra Land Preparation and Cultivation							
a. Acres	N/A	0.5	N/A	2	N/A	N/A	N/A
b. Cost/A	N/A	100.00	N/A	100.00	N/A	N/A	N/A
c. Value	N/A	50	N/A	200	N/A	N/A	N/A
Loss in Increase Cost of Harvesting							
a. Acres	5	3.5	0.3	8	100	0.2	0.5
b. Cost/A	50.00	100.00	100	100.00	100.00	25.00	50.00
c. Value	250	350	300	800	10	5	25
Total Losses	1,550	1,600	360	1,960	10	11	75

[1]Acres = no. X 1000; Cost/A = $/A; Value = Acres X Cost/A X 1000.

Contributing Authors: James Boudreaux and Ron Strahan

Table 6. 2001 Estimated Losses Due to Weeds in Arkansas[1].		
	Vegetables	Fruit, Nut, Vines
Cost of Herbicides		
a. Acres	10	7.1
b. Cost/A	22.00	25.00
c. Value	220	1,775
Loss in Yield		
a. Acres	10	3.5
b. Cost/A	100	200.00
c. Value	100	700
Loss in Quality		
a. Acres	N/A	N/A
b. Cost/A	N/A	N/A
c. Value	N/A	N/A
Loss in Extra Land Preparation and Cultivation		
a. Acres	N/A	N/A
b. Cost/A	N/A	N/A
c. Value	N/A	N/A
Loss in Increase Cost of Harvesting		
a. Acres	N/A	N/A
b. Cost/A	N/A	N/A
c. Value	N/A	N/A
Total Losses	320	2,475

[1]Acres = no. X 1000; Cost/A = $/A; Value = Acres X Cost/A X 1000.

Contributing Author: Bob Scott

Author Index

A

B

Crop Index

L

M

O

P

R

S

T

V

W

Z

Weed Index

O

p

Q

R

S

T

V

W

X

Y

Z

Subject Index

P

R

Pesticide Index

Herbicide Names and Manufacturers

Common or Code Name	Trade Name	Chemical Name	Manufacturer
A			
Acetochlor	Harness Surpass Micro-Tech	2-chloro-*N-(*ethoxymethyl*)* *N*-(2-ethyl-6-methylphenyl) acetamide	Monsanto Dow AgroSciences Monsanto
Acifluorfen	Ultra Blazer	5-[2-chloro-4-(trifluoromethyl)phenoxy] -2-nitro-benzoic acid	BASF
Acifluorfen + bentzaon	Storm	see acifluorfen and bentazon	BASF
Alachlor	Lasso, Partner	2-chlor-*N*-(2,6-diethyl-phenyl)-*N*- (methoxymethyl) acetamide	Monsanto
Ametryn	Evik	*N*-ethyl-*N*-(1-methylethyl)-6- (methylthio)-1,3,5-triazine-2,4-diamine	Syngenta
Asulam	Asulox	methyl[(4-aminophenyl) sulfonyl] carbamate	Aventis
Atrizine	Aatrex /others	6-chloro-N-ethyl-*N*-(1-methylethyl)- 1,3,5-triazine-2,4-diamine	Syngenta / others
Azafenidin	Milestone	2-[2,4-dichloro-5-(2-propynyl-oxy_phen)	DuPont
B			
BAS 625H	Aura	2-[1-2-(4-chlorophenoxy) propoxyimino) -butyl]3-oxo-5-thian-3-ylcyclohex-1-enol	BASF
BAY FOE5043	Axiom	*N*-(4-fluorophenyl)-*N*-(1-methyl-ethyl) -2-[[5-(trifluoromethyl)-1,3,4-thiadiazol-2-yl] oxy]acetamide	Bayer
BAY MKH 6561		methyl 2-[[[(4,5-dihydro-4-methyl-5-oxo- 3-propoxy-1H-1,2,4-triazole-1-yl) carbonyl]amino]sulfonyl]benzoate, sodium salt	Bayer
Benefin	Balan	*N*-butyl-*N*-ethyl-*N*-2,6-dinotro-4- (trifluoromethyl)benzeneamine	Dow AgroSciences
Bensulfuron	Londax	2-[[[[[4,6-dimethoxy-2-pyrimidiny) amino]sulfonyl]methyl]benzoic acid	DuPont
Bentazon	Basagran	3-(1-methylethyl)-(1*H*)-2,1,3- benzothidiazin-4(3*H*)-one 2,2-dioxide	BASF
Bispyribac-sodium	Regiment	Sodium2,6-bis[(4,6-dimethozypyrimidin-2- yl)oxy]benzoate	Valent USA

Bromacil	Hyvar X	5-bromo-6-methyl-3-(1-methylpropyl) -2,4(1*H*,3*H*) pyrimidinedione	DuPont
Bromoxynil	Buctril, Bronate	3,5-dibromo-4-hydroxy-benzonitrile	Aventis
C			
Carfentrazone	Shark	∝2-dichloro-5-[4-difluoro-methyl)-4,5-dihydro-3-methyl-5-oxo-1*H*-1,2,4-triazol -1-yl]-4-fluoro-benzenepropanoic acid	FMC
CGA-362622			Syngenta
Chlorimuron	Classic	2-[[[[(4-chloro-6-methoxy-2-pyrimidinyl) amino]carbonyl]amino]sulfonyl]benzoic acid	DuPont
Chlorimuron + sulfentrazone	Authority	see chlorimuron and sulfentrazone	DuPont
Chlorimuron + metribuzin	Canopy XL	see chlorimuron and sulfentrazone	DuPont
Chlorimuron + thifensulfuron	Synchrony	see chlorimuron and sulfentrazone	DuPont
Chlorsulfuron	Glean	2-chloro-*N*-[[(4-methoxy-6-methyl) -1,3,5,-triazin-2-yl)amino]carbonyl] benzene-sulfonamide	DuPont
Chlorsulfuron + metsulfuron	Finesse	see chlosulfuron and metsulfuron	DuPont
Clethodium	Select, Envoy	(*E*,*E*)-±-2-[1-[[3-chloro-2-propenyl) oxy]imino]propyl]-5-[2-ethylthio) propyl]-3-hydroxy-2-cyclohexen-1-one	Valent USA
Clomazone	Command	2-[(2-chlorophenyl)methyl]-4,4 -dimethyl-3-isoxazoli-dinone	FMC
Clopyralid	Lontrel Stinger	3,6-dichloro-2-pyridine-carboxylic acid	Dow AgroSciences
Cloransulam	FirstRate	3-chloro-2-[[5-ethoxy-7-fluoro[1,2,4] triazolo[1,5-*c*]pyrimidin-2yl)sulfonyl] amino]benzoic acid	Dow AgroSciences
Chloransulam + flumetsulam	Frontrow	see cloransulam and flumetsulam	Dow AgroSciences
Cyanazine	Bladex CyPro	2-[[4-chloro-6-(ethylamino)-1,3,5,-triazin -2-yl]amino]-2-methylpropanenitrile	DuPont Griffin Dow AgroSciences

D

2,4-D	Several	2,4-dichlorophenoxy)acetic acid	Several
2,4-D + MCPP + dicamba	Trimec Classic	see 2,4-D and MCPP and dicamba	PBI Gordon
2,4-DB	Butoxone Butyrac	4-(2,4-dichlorophenoxy) butanoic acid	Aventis Aventis
DCPA	Dacthal	dimethyl 2,3,5,6-tetra-chloro-1,4-benzenedicarboxylate	Amvac
Dicamba	Banvel Clarity Vanquish	3,6-dichloro-2-methoxy-benzoic acid	MicroFlo BASF Syngenta
Dicamba + diflufenzopyr	Distinct	see dicamba and diflufenzopyr	BASF
Dicamba + diflufenzopyr + nicosulfuron	Celebrity Plus	see dicamba and difluzenopyr and nicosulfuron	BASF
Dicamba + 2,4-D	Weedmaster	see dicamba + 2,4-D	BASF
Dichlobenil	Casoron	2.6-dichlorobenzonitrile	Uniroyal
Dichlorprop (2,4-DP)	Several	(±)-(2,4-dichlorophenoxy)propanoic acid	Aventis
Diclofop	Hoelon	(±)-(2,4-dichloro-phenoxy)phenoxy] propanoic acid	Aventis
Diclosulam	Strongarm	*N*-(2,6-dichloropheyyl)-5-ethoxy -7-fluoro [1,2,4]triazolo[1,5-*c*]pyrimidine -2-sulfonamide	Dow AgroSciences
Dimethenamid	Frontier	2-chloro-*N*-[1-methyl-2-methoxy)ethyl]-*N* -(2,4-dimethyl-thien-3-yl)-acetamide	BASF
Dimethenamid-P	Outlook	(S)-2-chloro-N[(1-methyl-2-methoxy)ethyl] -N-(2,4-dimethyl-thien-3-yl)-acetamide	BASF
Diquat	Reglone, Reward	6,7-dihydrodipyrido[1,2-∝:2',1'-*c*] pyrazinediium ion	Syngenta
Dithiopyr	Dimension	*S*,*S*-dimethyl 2-(difluoro-methyl)-4-(2-methylpropyl)-6-(trifloromethyl) -3,5-pyridine-dicarbothioate	Rohm & Haas
Diuron	Karmex Direx	*N*'-(3,4-dichlorophenyl)-*N*,*N*-dimethylurea	Griffin Griffin

E			
Endothall	Endothal	7-oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid	Pennwalt
Ethalfluralin	Sonalan	*N*-ethyl-*N*-(2-methyl-2-propenyl)-2,6-dinitro-4-(tri-fluoromethyl)benzenamine	Dow AgroSciences
Ethofumesate	Prograss	(±)-2-ethoxy-2,3-dihydro-3,3-dimethyl -5-benzofuranyl-methanesulfonate	Aventis
F			
Fenoxaprop	Whip, Bugle	(±)-2-[4-[(6-chloro-2-bezoxazoly)oxy] phenoxy] propanoic acid	Aventis
Fluzazifop-P	Fusilade DX	(*R*)-2-[4-[[5-(trifluoro-methyl)-2pyridinyl] oxy]phenoxy]propanoic acid	Syngenta
Fluzazifop + fenoxapropr	Fusion	see fluazifop and fenoxaprop	Syngenta
Flufenacet + metribuzin + atrazine		*N*-(4-Fluorophenyl)-*N*-(1-methylethyl)-2-[[5-(trifluoromethyl)-1,3,4-thiadiazol-2-yl] -oxy]acetamide and metribuzin and atrazine	Bayer
Flumetsulam	Broadstrike	N-(2,6-difluorophenyl)-5-methyl[1,2,4] triazolo[1,5-∝] pyrimidine-2-sulfonamide	Dow AgroSciences
Flumetsulam + clorpyralid	Hornet	see flumetsulam and clopyralid	Dow AgroSciences
Flumetsulam + clopyralid +2,4-D	Scorpion III	see flumetsulam and clopyralid and 2,4-D	Dow AgroSciences
Flumetsulam + metolachlor	Dual	see flumetsulam and metolachlor	Dow AgroSciences
Flumiclorac	Resource	[2-chloro-4-fluoro-5-(1,3,4,5,6,7-hexahydro-1,3-dioxo-2*H*-isoindol-2-yl) phenoxy]acetic acid	Valent USA
Flumioxazin	Valor, V-53482	2-[7-fluoro-3,4-dihydro-3-oxo-4-(2-propynyl)-2*H*-1,4-benzoxazin-6-yl]-4,5,6,7 -tetrahydro-1*H*-isoindole-1,3,(2*H)*-dione	Valent USA
Fluometuron	Cotoran Meturon	*N*,*N*-dimethyl-*N*'-[3-(tri-fluoromethyl) phenyl]urea	Griffin Griffin
Fluoroxypyr	Vista	4-amino-3,5-dichloro-6-fluoro-2-pyridyloxyacetic acid	Dow AgroSciences

Fluthiaceat methyl	Action		Syngenta
	Appeal		KI USA
Fomesafen	Reflex	5-[2-chloro-4-(trifluoro-methyl)phenoxy] -*N*-(methyl-) sulfonyl)-2-nitrobenzamide	Syngenta
Fosamine	Krenite	ethyl hydrogen (aminocarbonyl)-phosphonate	DuPont
G			
Glufosinate	Liberty	2-amino-4-hydroxymethyl	Aventis
	Rely	phosphinyl)butanoic acid	Aventis
	Ignite		Aventis
Glyphosate	Roundup Ultra	N-(phosphonomethyl)glycine	
	Max		Monsanto
	Accord, Rodeo		Dow AgroSciences
	D-Pak		Monsanto
	Roundup		
	Original		Monsanto
	Roundup Ultra Dry		Monsanto
	Touchdown		Syngenta
H			
Halosulfuron	Permit	methyl 5-[[4,6-dimethoxy-2-pyrimidinyl]	Monsanto
	Sempra	amino]carbonylamino-sulfonyl] -3-chloro -1-methyl-1-*H*- pyrazole -4-carboxylate	
Hexazinone	Velpar	3-cyclohexyl-6-(dimethyl-amino)-1-methyl- 1,3,5-triazine-2,4(1*H*,3*H*)-dione	DuPont
I			
Imazamethabenz	Assert	(±)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl) -5-oxo-1*H*-imidazol-2yl]-4(and 5)-methyl-benzoic acid (3:2)	BASF
Imazamox	Raptor	2-[4,5-dihydro-4methyl-4-(1-methylethyl)-5 -oxo-1*H*-imidazol-2yl]-5-(methoxy-methyl)-3-pyridinecarboxylic acid	BASF
Imazapic	Cadre	(±)-2-[4,5-dihydro-4-methyl-4-4(1-	BASF
	Plateau	methylethyl)-5-oxo-1*H*-imidazol-2-yl] -5-methyl-3-pyridine-carboxylic acid	
Imazapyr	Arsenal	(±)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)	BASF
	Chopper	-5-oxo-1*H*-imidazol-2-yl]-3-	BASF
	Stalker	pyridinecarboxylic acid	BASF
	Habitat		BASF
Imazaquin	Scepter	2-[4,5-dihydro-4-methyl-4-(1-methylethy)	BASF
	Image	-5-oxo-1*H*-imidazol-2-yl)-3-ethyl-3-quinoline-carboxylic acid	BASF

Imazaquin + glyphosate	Backdraft	see imazaquin and glyphosate	BASF
Imazethapyr	Pursuit NewPath	2-[4,5-dihydro-4methyl-4-(1-methylethyl) -5-oxo-1*H*-imidazol-2yl]-5-ethyl-3 -pyridinecarboxylic acid	BASF BASF
Imazethapyr + glyphosate	Extreme	see imazethapyr and glyphosate	BASF
Imazethapyr + imazapyr	Event	see imazethapyr and imazapyr	BASF
Isoxaben	Gallery	*N*-[3-(1-ethyl-1-methyl-propyl)-5-isoxazoyl] -2,6-dimethyl-benzamide	Dow AgroSciences
Isoxaben + oryzalin	Snapshot DF	see isoxoben and oryzalin	Dow AgroSciences
Isoxoben + trifluralin	Snapshot TG	see isoxoben and trifluralin	Dow AgroSciences
Isoxaflutole	Balance	5-cyclopropyl-4-(2-methyl-sulphonyl -4-trifluoromethyl-)benzoyl)isoxazole	Aventis
L			
Lactofen	Cobra	(±)-2-ethoxy-1-methyl-2-oxoethyl-5- [2-chloro-4-(trifluoromethyl)phenoxy] -2-nitrobenzoate	Valent USA
M			
MCPA	Several	(4-chloro-2-methyphenoxy acetic acid)	Several
Mecoprop	Several	(±)-2-(4-chloro-2-methyl-phenoxy) propanoic acid	Several
Mesotrione	Callisto	2-[4-methylsulfonyl-2-nitrobenzoyl]-1,3- cyclohexanedione	Syngenta
Metham	Vapam	methylcarbamodithioic acid	Amvac
Methyl bromide	Bromo-gas	bromomethane	Great Lakes
Metolachlor	Dual Magnum Pennant	2-chloro-*N*-(2-ethyl-6-methylphenyl)-*N*- (2-methoxy-1)-methylethyl)acetamide	Syngenta Syngenta
Metolachlor + atrizine	Bicep	see metolachlor and atrazine	Syngenta
Metribuzin	Sencor	4-amino-6-(1-dimethyl-ethyl)-3- (methylthio)-1,2,4 triazin -5(4*H*)-one	Bayer
Metribuzin + metolachlor	Turbo	see metribuzin and metolachlor	Bayer
Metribuzin + trifluralin	Salute	see metribuzin and trifluralin	Bayer

Metsulfuron	Ally Escort	2-[[[[(4-methoxy-6-methyl-1,3,5-triazin -2-yl)amino] sulfonyl]benzoic acid	DuPont DuPont
Molinate	Ordram	*S*-ethyl hexahydro-1*H*-azepine-1-carbothioate	Syngenta
MSMA	Several	monosodium salt of methyl-arsenic acid	Several
N			
Napropamide	Devrinol	*N*-*N*-diethyl-2-(1-naphthalen-yloxy) propanamide	Syngenta
Nicosulfuron	Accent	2-[[[[4,6-dimethoxy-2-pyrimidinyl-amino] carbonyl]amino]sulfonyl]-*N*,*N*-dimethyl -3-pyridinecarboxamide	DuPont
Nicosulfuron + rimsulfuron + atrazine	Basis Gold	see nicosolfuron and rimsulfuron and atrazine	DuPont
Nicosulfuron + rimsulfuron +	Steadfast	see nicosulfuron and rimsulfuron	DuPont
Norflurazon	Zorial, Solicam, Evital	4-chloro-5-metthylamino)-2-(3-(trifluoromethyl)phenyl) -3(2*H*)-pyridazinone	Syngenta Syngenta
O			
Oryzalin	Surflan	4-(dipropylamino)-3,5-dinitrobenzenesulfonamide	Dow AgroSciences
Oxadiazon	Ronstar	3-[2,4-dichloro-5-(1-methyl-ethoxy)phenyl] -5-(1,1-)dimethyl-ethyl)-1,3,4-oxadiazol -2-(3*H*)-one	Aventis
Oxadiazon + prodiamine	Regalstar	see oxadiazon and prodiamine	Regal Chemical Company
Oxasulfuron		2-[[[[(4,6-dimethyl-2-pyrimidinyl)amino] carbonyl]amino]sulfonyl]benzoic acid	Norstart
Oxyfluorfen	Goal	2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4 -trifluoro-methyl)benzene	Rohm & Haas
Oxyfluorfen + oryzalin	Rout	see oxyfluorfen and oryzalin	The Scotts Company
Oxyfluorfen + oxadiazon	Regal	see oxyfluorfen and ozadiazon	Regal Chemical Company
Oxyfluorfen + pendimethalin	Ornamental Herbicide II	see oxyfluorfen and pendimethalin	The Scotts Company

P

Paraquat	Gramoxone Max Gramoxone Extra, Starfire Cyclone	1,1'-dimethyl-4,4'-bi-pyridinium ion	Syngenta
Pelargonic Acid	Scythe	nonanoic acid	Mycogen
Pendimethalin	Prowl Pendulum Pentagon Lesco PRE-M Corral	N-(1-ethylpropyl)-3,4-dimethyl-2,6 -dinitrobenzeneamine	BASF BASF BASF Lesco The Scotts Company
Pendimethalin + imazaquin	Squadron	see pendimethalin+imazaquin	BASF
Pendimethalin + imazaquin + imazethapyr	Steel	see pendimethalin+imazaquin+imazethapyr	BASF
Pendimethalin + trifluralin	Tri-Scept	see pendimethalin+trifluralin	BASF
Picloram	Tordon	4-amino-3,5,6-trichloro-2-pyridinecarboxylic acid	Dow AgroSciences
Primisulfuron	Beacon	primisulfuron + 3,6-dichloro -2-methoxybenzoic acid	Syngenta
Primisulfuron + dicamba	NorthStar	see primisulfuron and dicamba	Syngenta
Prodimaine	Barricade Factor	2,4-dinitro-N^3,N^3-dipropyl-6-(trifluoromethyl) -1,3-benezenediamine	Syngenta
Prohexadione		3,5-dioxo-4-(1-oxopropyl) cyclohexanecarboxylic acid	BASF
Prometryn	Caparol Cotton Pro	*N*,*N*'-bis(1-methylethyl)-6-(methylthio) -1,3,5-triazine-2,4-diamine	Syngenta Griffin
Propanil	Stam, Stampede	*N*-(3,4-dichlorophenyl) propanamide	Rohm & Haas
Prosulfuron	Peak	1-(4-methoxy-6-methyl-triazin2-yl)-3-[2-(3,3,3-)trifluoropropyl)phenyl-sulfony]urea	Syngenta
Prosulfuron + Primisulfuron	Exceed Spirit	see prosulfuron and primisulfuron	Syngenta Syngenta
Pyridate	Tough	*O*-(6-chloro-3-phenyl-4-pyridazinyl)*S*-octyl-carbonothioate	Syngenta

Pyrithiobac	Staple	2-chloro-6-[(4,6-dimethoxy-2-pyrimidiny) thio]benzoic acid	DuPont
Pyrithiobac + glyphosate	Staple Plus	see pyrithiobac and glyphosate	DuPont
Q			
Quinclorac	Facet Drive Paramount	3,7-dichloro-8-quinoline-carboxylic acid	BASF BASF BASF
Quizalofop	Assure II	(±)-2-[4-[(6-chloro-2-quinoxalinyl)oxy] phenoxy]propanoic acid	DuPont
R			
Rimsulfuron	Titus, Matrix	N-[[4,6-dimethoxy-2-pyrimidinyl)amino] carbonyl]-3-(ethylsulfonyl)-2-pyridine-sulfonamide	DuPont
Rimsulfuron + thifensulfuron	Basis	see rimsulfuron and thifensuluron	DuPont
S			
Sethoxydim	Poast, Poast Plus	2-[1-(ethoxyamino)-butyl]-5-[2-(ethylthio) propyl]-3-hydroxy-2-cyclohexen-1-one	BASF
Simazine	Princep	6-chloro-*N*,*N*'-diethyl-1,3,5-triazine -2,4-diamine	Novartis
Sulfentrazone	Authority	N-[2,4-dichloro-5-[4-difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1*H*-1,2,4-triazol -1-yl]phenyl]methanesulfonamide	FMC
Sulfentrazone + clomazone	Authority One-Pass	see sulfentrazone and clomazone	FMC
Sulfometuron	Oust	2-[[[[(4,6-dimethyl-2-pyrimidinyl)amino] carbonyl]amino]sulfonyl]benzoic acid	DuPont
Sulfosate	Touchdown	trimethylsulfonium carboxymehylaminomethyl-phosphate	Zeneca
Sulfosulfuron	Monitor Maverick	1-(4,6-dimehoxypyrimidin-2-yl)-3-[(ethanesulfonyl-imidazo) [1,2-a]-pyridine-3-yl)sulfonyl]urea	Monsanto Monsanto
T-Z			
Tebuthiuron	Spike	*N*-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol l-2-yl]-*N*,*N'*dimethylurea	Dow AgroSciences
Terbacil	Sinbar	5-chloro-3-(1,1-dimethyl-ethyl)-6-methyl-2,4 (1*H*,3*H*)-pyrimidinedione	DuPont

Thiafluamide + metribuzin	Axiom	see thiafluamide and metribuzin	Bayer
Thiazopyr	Dimension Spindle, Visor	methyl 2-(difluoromethyl)-5-(4,5-dihydro-2 -thiazolyl)-4- (2-methylpropyl)-6-(trifluoromethyl)-3-pyridinecarboxylatea	Rohm & Haas Rohm & Haas
Thifensulfuron	Harmony GT		DuPont
Thifensulfuron + tribenuron	Harmony GT	see thifensulfuron and tribenuron	DuPont
Triasulfuron	Amber	2-(2-chloroethoxy)-*N*-[[(4-methoxy-6-methyl-1,3,5-)triazin-2-yl)amino]carbonyl]benezene-sulfonamide	Novartis
Triasulfuron + dicamba	Rave	2-(2-chloroethoxy)-N-[[4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl] benzenesulfonamide and dicamba	Novartis
Tribenuron	Express	2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl) methylamino]carbonyl]amino]sulfonyl] benzoic acid	DuPont
Triclopyr	Garlon Grandstand	[3,5,6-trichloro-2-pyridinyl)oxy]acetic acid	Dow AgroSciences Dow AgroSciences
Trifloxysulfuron Sodium	Brawn Enfield Krismat	N–[(4,6-dimethoxy-2-pyrimidinyl)carbamoyl] -3-(2,2,2-trifluoroethoxy)-pyridin-2-sulfonamide sodium salt	
Trifluralin	Treflan Trifluralin	2,6-dinitro-*N*-*N*-dipropyl-4-(trifluoromethyl) benzeneamine	Dow AgroSciences Dow / Others
Trinexapac-ethyl	Primo Palisade	ethyl 4-(cyclopropylhydroxymethylene)-3,5-dioxocyclohexanecar=boxylate	Novartis Novartis

REGISTRANTS FOR 2002 ANNUAL MEETING

A

Adcock, Tim
United Agri Products
219 Redfield Dr
Jackson TN 38305
Tel. 731/661-0396
Fax. 731/662-9981
tim.adcock@uap.com

Ahuja, Gopal
University of Georgia
DW Brook Drive
Athens GA 30605
Tel. 706/353-9472
gopal2000@hotmail.com

Alford, Jason
252 Ellington Bldg
2431 Center Dr
Knoxville TN 37996
Tel. 865/974-8805
Fax. 865/974-7997
jalford@utk.edu

Altom, John V
Valent USA Company
3799 NW 91st C-300
Gainesville FL 32606
Tel. 352/336-4844
Fax. 352/336-7752
john.alton@valent.com

Armel, Greg
Virginia Tech University
33446 Research Dr
Painter VA 23420
Tel. 757/414-0724
Fax. 757/414-0730
garmel@vt.edu

Arsenovic, Marija
IR-4 Project
681 US Hwy 1 South
New Brunswick NJ 08902
Tel. 732/932-9575
Fax. 732/932-8481
arsenovic@aesop.rutgers.edu

Ashley, James
AshGrow Crop Management
PO Box 88
Ivor VA 23866
jeashley@askgrow.com

Askew, Shaw
Viriginia Tech
Box 0330
Blacksburg VA 24061
Tel. 540/231-5807
Fax. 540/231-5755
saskew@vt.edu

Atwell, Kevin
Monsanto Company
PO Box 311
Silverhill AL 36576
Tel. 251/964-6236
Fax. 251/964-5801
kevin.d.atwell@mosanto.com

Austin, David A
PBI/Gordon Corp
PO Box 014090
Kansas City MO 64101
Tel. 816/421-4070
Fax. 816/460-3781
daustin@pbigordon.com

Auxier Turner, Barbara
AgriScope LLC
105 Hearthstone Ct
Athens GA 30605
Tel. 706/354-8299
Fax. 706/546-0572
agriscope@aol.com

B

Bachman, Walter W
Syngenta Crop Protection
21 Hunters Green Cove
Jackson TN 38305
Tel. 731/664-6877
Fax. 731/664-6877
walt.bachman@syngenta.com

Bailey, Andy
1908 Shadow Lake Rd #1
Blacksburg VA 24060
Tel. 757/414-0724
Fax. 757/414-0730
wabailey@vt.edu

Baldwin, Ford
Practical Weed Consultant
PO Box 605
Lonoke AR 72086
Tel. 501/605-8460

Bales, Clay
Texas Forest Service
PO Box 310
Lufkin TX 75902
Tel. 936/639-8170
Fax. 936/639-8175
cbales@tfs.tamu.edu

Banks, J C
Oklahoma State Univ
RT 1 Box 15
Altus OK 73521
Tel. 580/482-2120
Fax. 580/482-0208
jcb@osu.altus.ok.us

Banks, Philip A
Marathon-Ag & Envir Cons
2649 Navajo Rd
Las Cruces NM 88005
Tel. 505/527-8853
Fax. 505/527-8853
marathonag@zianet.com

Bararpour, Mohammad T
Univesity of Arkansas
1366 W Altheimer Dr
Fayetteville AR 72704
Tel. 501/575-3955
Fax. 501/575-3975
mbararpo@uark.edu

Barber, Thomas
Miss State Univ
Box 9555
Miss State MS 39762
Tel. 662/325-2614
Fax. 662/325-8742
ltb31@pss.msstate.edu

Barnes, Jeff
University of Arkansas
276 Altheimer Dr
Fayetteville AR 72704
Tel. 501/986-9659
Fax. 501/575-3975

Barnett, Jay
BASF Corporation
1875 Barkada Rd
Monticello AR 71655
Tel. 870/367-7935
Fax. 870/367-7939
barnetjw@basf-corp.com

Barrentine, James L
University of Arkansas
115 Plant Sciences
Fayetteville AR 72701
Tel. 501/575-2354
Fax. 501/575-7465
jbarren@uark.edu

Batts, Roger B
NCSU Hort Dept
Box 7609
Raleigh NC 27695
Tel. 919/515-1668
Fax. 919/515-7747
roger-batts@ncsu.edu

Baughman, Todd
Texas A&M University
PO Box 2159
Vernon TX 76385
Tel. 940/552-9941
Fax. 940/553-4657
ta-baughman@tamu.edu

Baumann, Paul
Texas A&M University
Dept of Crop Science
College Station TX 77843
Tel. 979/845-4880
Fax. 979/845-0604
p-baumann@tamu.edu

Beam, Josh
Virginia Tech
1908 Shadowlake Rd Apt 1
Blacksburg VA 24060
Tel. 540/231-5807
jbeam@ut.edu

Beeler, Joe
252 Ellington Bldg
2431 Center Drive
Knoxville TN 37996
Tel. 865/974-8805
Fax. 865/974-7997
jbeeler5@utk.edu

Belcher, Jason
Auburn University
201 Funchess Hall
Auburn AL 36849
Tel. 334/844-3977
Fax. 334/844-3945
jbelcher@acesag.auburn.edu

Bennett, Andrew
University of Florida
3200 E Palm Beach Rd
Belle Glade FL 33430
Tel. 561/993-1555
Fax. 561/993-1582
bennett@ufl.edu

Besler, Brent
Texas A&M University
PO Box 755
Yoakum TX 77995
Tel. 361/293-6326
Fax. 361/293-2054
b-besler@tamu.edu

Bianco, Carlos
Dow AgroSciences
753 Highway 438
Greenville MS 38701
Tel. 662/379-8970
Fax. 662/379-8999
clolanco@dowagro.com

Black, David
Syngenta Crop Portection
110 Fieldcrest Dr
Searcy AR 72143
Tel. 501/306-4365
Fax. 501/305-4354

Blair, Mitchell
Virginia Tech Forestry
228 Cheatham Hall
Blacksburg VA 24061
Tel. 540/231-7672
Fax. 540/231-3330
miblair@vt.edu

Bloodworth, Kent
Miss State Univ
Box 9555
Miss State MS 39762
Tel. 662/325-0871
Fax. 662/325-8742

Bollich, Pat
LSU Ag Center
PO Box 1429
Crowley LA 70527
Tel. 337/788-7531
Fax. 337/788-7553
pbollich@agctr.lsu.edu

Bond, Jason A
University of Arkansas
1366 W Altheimer Dr
Fayetteville AR 72704
Tel. 501/575-3955
Fax. 501/575-3975
jabond@uark.edu

Bone, Jim
Griffin LLC
PO Box 1847
Valdosta GA 31603
Tel. 229/293-4064
Fax. 229/245-0462
jim.bone@griffinllc.com

Bonnell, B Todd
Clemson University
D-136 P&A Bldg
Clemson SC 29631
Tel. 864/656-6365
Fax. 864/656-4960
btbunne@clemson.edu

Boyd, John
Coop Extension Service
PO Box 391
Little Rock AR 72203
Tel. 501/671-2224
Fax. 501/671-2303
jboyd@uaex.edu

Branson, Jeff W
SE Res & Extn Ctr
PO Box 3508
Monticello AR 71656
Tel. 870/460-1091
branson@uamont.edu

Braverman, Michael
IR-4 Project, Rutgers Un
681 US Highway 1 South
N Brunswick NJ 08902
Tel. 732/932-9575
Fax. 732/932-8481
braveman@aesop.rutgers.edu

Braxton, Bo
Dow AgroSciences
9630 Miccosukee Rd
Tallahassee FL 32308
Tel. 850/656-9616
lbraxton@dowagro.com

Bray, Shane
University of Florida
PO Box 110500
Gainesville FL 32611
Tel. 352/392-7512
Fax. 352/392-1840
csbray@ufl.edu

Brecke, Barry J
University of Florida
4253 Expereiment Rd HWY
Jay FL 32565
Tel. 850/994-5215
Fax. 850/994-9589
bjbe@gnv.ifas.ufl.edu

Breeder, Greg
252 Ellington
2431 Center Dr
Knoxville TN 37996
Tel. 865/974-7208
Fax. 865/974-7997
gbreeder@utk.edu

Breen, John
Dow AgroSciences
207 Swiss Lake Dr
Cary NC 27513
Tel. 919/467-6800
Fax. 919/467-4831
breen@dow.com

Bremer, John E
Texas Extension Service
Rt 1 Box 137
Sinton TX 78387

Brewer, Chad
University of Arkansas
1621 S Price Ave
Fayetteville AR 72701
Tel. 501/575-3955
cbrewer@uark.edu

Brewer, Kevin D
Texas A&M University
PO Box 755
Yoakum TX 77995
Tel. 361/293-6326
Fax. 361/293-2054
b-breser1@tamu.edu

Bridges, David
University of Georgia
PO Box 748
Tifton GA 31793
Tel. 229/386-3338
Fax. 229/386-7058
dbridges@tifton.cpes.peachenet.edu

Brinkman, Eric
Bellspray Inc
419 Hwy 104
Opelonsas LA 70570
Tel. 337/942-1001
Fax. 337/942-7841
eric@co2sprayers.com

Brommer, Clad L
University of Kentucky
N-101 Ag Science North
Lexington KY 40546
Tel. 859/257-7326
clbroom@uky.edu

Brooks, Rob
Dow AgroSciences
14 James Switzer Rd
Purvis MS 38475
Tel. 601/794-6566
Fax. 601/794-6544
jrbrooks@dowagro.com

Brown, Steven M
Rural Development Center
PO Box 1209
Tifton GA 31793
Tel. 229/386-7497
Fax. 229/386-7308
smbrown@uga.edu

Bryson, Charles T
USDA ARS
PO Box 350
Stoneville MS 38776
Tel. 662/686-5259
Fax. 662/686-5422
cbryson@ars.usda.gov

Buehring, Nathan
Miss State Univ
Box 9555
Miss State MS 39762
Tel. 662/325-2614
Fax. 662/325-8742
nwb4@pss.msstate.edu

Buehring, Normie
Miss State Univ
PO Box 219
Verona MS 38879
Tel. 662/566-2201
Fax. 662/566-2257
buehring@ra.msstate.edu

Bullock, Roy
TSU
3500 John Merritt
Nashville TN 37209
Tel. 615/963-5449
Fax. 615/963-5833
fbullock@tustate.edu

Bulter, Twain
Texas A&M Res & Extn
1229 Hwy 281
Stephenville TX 76401
Tel. 254/968-4144
Fax. 254/965-3759
t-bulter@tamu.edu

Burch, Pat
Dow AgroSciences
3425 Elk Creek Dr
Christianburg VA 24073
Tel. 540/382-3062
Fax. 540/382-1549
plburch@dow.com

Burgos, Nilda R
University of Arkansas
276 Altheimer Dr
Fayetteville AR 72704
Tel. 501/575-3984
Fax. 501/575-3975
nburgos@uark.edu

Burke, Ian C
North Carolina State Univ
Box 7620
Raleigh NC 27694
Tel. 919/515-5654
icburke@bellsouth.net

Burnell, Keith
Miss State Univ
Box 9555
Miss State MS 39762
Tel. 662/325-2311
Fax. 662/325-8742
kdb105@pss.msstate.edu

Burns, Brent
Texas Tech University
Rt 3 Box 219
Lubbock TX 79403
Tel. 806/785-4894
Fax. 806/742-0775
bcburns@hotmail.com

Burton, Michael
North Carolina State Univ
Box 7620
Raleigh NC 27695
Tel. 919/515-2860
Fax. 919/515-5315
mike_burton@ncsu.edu

Byrd, John
Miss State Univ
Box 9555
Miss State MS 39762
Tel. 662/325-2311
Fax. 662/325-8742
jbyrd@pss.msstate.edu

C

Cable-Stiers, Erin
veristy of Arkansas
1366 W Altheimer Dr
Fayetteville AR 72704
Tel. 501/575-3955
Fax. 501/575-3975
ecable@uark.edu

Cargill, Lonnie
Oklahoma State Univ
360 Ag Hall
Stillwater OK 74078
Tel. 405/624-7538
Fax. 405/624-1918
lonniecargill@hotmail.com

Caviness, Darlene
Griffin LLC
PO Box 1847
Valdosta GA 31605
Tel. 229/293-4242
Fax. 229/249-5977
darlene.caviness@griffinllc.com

Chandler, James M
Texas A&M University
Soil & Crop Sci Dept
College Station TX 77843

Chen, Sophia
Monsanto Company
700 Chesterfield Parkway
Chesterfield MO 63198
Tel. 636/737-7121
sophia.y.chen@monsanto.com

Clason, Terry R
LSU Agric Expt Station
11959 Hwy 9
Homer LA 71040
Tel. 318/927-2578
Fax. 318/927-9505
tclason@agctr.lsu.edu

Clemmer, Kevin C
North Carolina State Univ
7057 Holts Store Rd
Barlington NC 27215
kcclemme@unitx.ncsu.edu

Clewis, Scott B
North Carolina State Univ
Box 7620
Raleigh NC 27695
Tel. 919/515-5655
Fax. 919/515-5315
scott_clewis@ncsu.edu

Cloud, Gavy L
Syngenta Crop Prot
3400 Blue Quill
Tallahassee FL 32312
Tel. 850/893-3222
Fax. 850/893-9067
gary.cloud@syngenta.com

Coats, Euel
Miss State Univ
Box 9555
Miss State MS 39762
Tel. 662/325-2311
Fax. 662/325-8742
ecoats@pss.msstate.edu

Cobb, J O
Dow AgroSciences
664 Longwood Cricle
Auburn AL 36830
Tel. 334/887-2803
jocobb@dowagro.com

Collins, Jim
Aventis CropScience
1105 Harney St #503
Omaha NE 68102
Tel. 919/624-5233
jim.collins@aventis.com

Copes, Dan B
LSU Ag Center
16 Crothens Dr
Tallulah LA 71282
Tel. 318/766-3769
dcopes@agctr.lsu.edu

Corbett, Jerry
Aventis Envir Science
981 NC 42 East
Clayton NC 27520
Tel. 919/553-4651
jerry.cobett@aventis.com

Corbin, Billy R
Valent USA Corporation
PO Box 5008
Greenville MS 38704
Tel. 662/390-4406
Fax. 662/335-6302
bcorb@valent.com

Corkern, Chris B
Monsanto Company
PO Box 388
Stoneville MS 38776
Tel. 662/378-1021
Fax. 662/378-1033
chris.b.croken@monsanto.com

Cornish, Ronal
Dow AgroSciences
9330 Zionsville Rd
Indianapolis IN 46268
Tel. 317/337-5120
rgcornish@dow.com

Costello, Richard
Louisiana State Univ
PO Box 438
St Joseph LA 71366
Tel. 318/766-4607
rcostello@agctr.lsu.edu

Courville, Alan J
230 Marigold Dr
Opelousas LA 70570
Tel. 337/594-8153
Fax. 337/594-8153
alvsouth@eate1.net

Cox, Campbell
Clemson University
D-133 PA&S Bldg
Clemson SC 29634
Tel. 864/656-6365
Fax. 864/656-4960

Cranmer, John
Valent USA Corporation
1135 Kildaire Farm 250-3
Cary NC 27511
Tel. 919/467-6293
Fax. 919/481-3599

Creighton, Jerre
International Paper
8 Windjammer Way
Savannah GA 31419
Tel. 912/238-7613
Fax. 912/238-7160
jerr.creighton@ipaper.com

Crittenden, Michael
Mid-South Ag Research
2383 Hinkley Rd
Proctor AR 72376
Tel. 870/732-2981

Crooks, H Lane
North Carolina State Univ
Box 7620
Raleigh NC 27695
Tel. 919/515-2865
lane_crooks@ncsu.edu

Crumby, Tom
FMC Corporation
PO Box 479
Bolton MS 39041
Tel. 601/866-9945
Fax. 601/866-9946
tom_crumby@fmc.com

Culpepper, A Stanley
University of Georgia
PO Box 1209
Tifton GA 31793
Tel. 229/386-3194
Fax. 229/386-7308
stanley@arches.uga.edu

Cummings, Hennen
13110 Six Forks Rd
Raleigh NC 27614
Tel. 919/870-5797
hennen_cummings@ncsu.edu

Currey, Wayne L
Weed Systems Equipment
260 Commerce Circle
Heystone Height FL 32656
Tel. 352/481-0329
Fax. 352/481-7016
wlcurrey@aol.com

Czarnota, Mark A
University of Georgia
1109 Experiment St
Griffin GA 30223
Tel. 770/228-7398
Fax. 770/412-4764
mac@griffin.peachnet.edu

D

Dahl, Gregory K
Agriliance LLC
PO Box 64089
St Paul MN 55516
Tel. 651/451-4942
Fax. 651/451-4561
gkdahl@agrilance.com

Davidson, Chris
International Paper
PO Box 1391
Savannah GA 31415
Tel. 912/238-6595
Fax. 912/238-7160
chris.davidson@ipaper.com

de Avila, Luis
Texas A&M University
2474 TAMU
College Station TX 77843
Tel. 979/845-4620
Fax. 979/845-0456
laavila@ag.tamu.edu

DeFelice, Michael
Pioneer Hi-Bred Int'l
PO Box 1150
Johnston IA 50131
Tel. 515/334-6705
Fax. 515/334-6567

Deng, Fan
Virginia Tech
R203 RMB 435 Old Glade
Blacksburg VA 24061
Tel. 540/231-5835
Fax. 540/231-5755
fandeng@vt.edu

Dillon, Tomilea
University of Arkansas
PO Box 357
Lonoke AR 72086
Tel. 501/676-3124
Fax. 501/676-7847
tdilon@uaex.edu

Dillon, Troy
Lonoke Co Extn Office
PO Box 357
Lonoke AR 72086
Tel. 501/676-3124
Fax. 501/676-7847
twdillon@uaex.edu

Dixon, Gregg A
Monsanto Company
25920 Experiment Farm Rd
Loxley AL 36551
Tel. 251/964-6236
Fax. 251/964-5801
gregg.a.dixon@monsanto.com

Dobbs, Robert
Miss State Univ
PO Box 1690
Verona MS 38879
Tel. 662/566-2201
Fax. 662/566-2257
rdobbs@ra.msstate.edu

Doran, Jon
Dow AgroSciences
PO Box 578
Talbott TN 37877
Tel. 423/736-6020
Fax. 423/586-5997
jtdoran@dow.com

Dotray, Peter A
Texas Tech University
Box 52122
Lubbock TX 79409
Tel. 806/742-1634
Fax. 806/742-0988
p-dotray@tamu.edu

Driver, Jacquelyn
Syngenta Crop Protection
205 Tampico Dr
Hewitt TX 77643

Driver, Tony L
Syngenta Crop Protection
305 Tampico Dr
Hewitt TX 76643

Dunand, Richard T
Rice Research Station
PO Box 1429
Crowely LA 70527
Tel. 337/788-7531
Fax. 337/788-7553
rdunand@agctr.slu.edu

Dusky, Joan
EREC-Univ of Florida
PO Box 110210
Gainesville FL 32611
Tel. 352/392-1761
Fax. 352/392-3583
jadusky@mail.ifas.ufl.edu

E

Edenfield, Mike
Aventis Corporation
3024 E Kingsfield Rd
Pensacola FL 32514
Tel. 850/587-3514
mike.edenfield@aventis.com

Estes, Alan
Clemson University
D-136 P&A Bldg
Clemson SC 29634
Tel. 864/656-4959
Fax. 864/656-4966
aestes@clemson.edu

Etheredge, Luke M
TX Cooperative Exten
10921 River Rd
College Stat TX 77845
Tel. 979/845-0817
Fax. 979/845-0604
lme7071@hotmail.com

Etheridge, Robert
DuPont
Rt 2 Box 477-A
Ridgeland SC 29936
Tel. 601/497-3816
repalemetto@hotmail.com

Everest, John W
Auburn University
107 Extension Hall
Auburn AL 36849
Tel. 334/844-5493
Fax. 334/844-4586
jeverest@acesag.auburn.edu

Ezell, Andrew W
Miss State Univ
Box 9681
Miss State MS 39762

F

Fagerness, Matt
Kansas State University
2021 Throckmorton Hall
Manhattan KS 66506
Tel. 785/532-1442
Fax. 785/532-5780
mfargerne@oznet.ksu.edu

Faircloth, Wilson H
Auburn University
263 Funchess Hall
Auburn AR 36849
Tel. 335/844-3911
Fax. 334/844-3945
wfairclo@acesag.auburn.edu

Farris, Rodney
Oklahoma State Univ
368 Ag Hall
Stillwater OK 74078
Tel. 405/744-6420
Fax. 405/744-5269
frodney@mail.pss.oksate.edu

Ferrell, Jay
University of Georgia
3111 Miller Plant Sci
Athens GA 30602
Tel. 706/542-0920
jferrell@uga.edu

Fisher, Loren
North Carolina State Univ
Box 7620
Raleigh NC 27695
Tel. 919/515-4059
Fax. 919/515-7959
loren_fisher@ncsu.edu

Fletcher, April
US Fish & Wildlife Serv
PO Box 1306
Albuquerque NM 87103
Tel. 505/248-6632
Fax. 505/248-6874
april_fletcher@fws.gov

Flick, Scott L
Westvaco Corp
Rt 4 Box 134
Appomattox VA 24522
Tel. 434/352-7132
Fax. 434/352-8390
slflick@westvaco.com

Ford, Victor L
Westvaco
PO Box 608
Rupert WV 25984
Tel. 304/392-6334
Fax. 304/392-6075
vlford@westvaco.com

Futch, Stephen H
Citrus Rex & Education
700 Experiment Station
Lake Alfred FL 33850

G

Gannon, Travis
North Carolina State Univ
Box 7620
Raleigh NC 27695
Tel. 919/515-5651
Fax. 919/515-5315
travis_gannon@ncsu.edu

Garbett, Bill
International Paper
PO Box 1391
Savcinnah GA 31402
Tel. 912/238-6122
bill.garbett@ipaper.com

Garr, John A
Garrco Products Inc
PO Box 619
Converse IN 46919
Tel. 765/395-3441
Fax. 765/395-3444
mrfoam1@earthlink.net

Gealy, David
USDA-ARS
PO Box 1091
Stuttgart AR 72160
Tel. 870/672-9300
Fax. 870/673-7581
dgealy@spa.ars.usda.gov

Gerngross, Cecilia
Texas A&M University
2474 TAMU
College Station TX 77843
Tel. 979/845-4620
Fax. 979/845-0456
cecilia@tamu.edu

Gillham, Larry B
Griffin LLC
2083 Athens Highway
Elberton GA 30635
Tel. 706/283-6018
Fax. 706/283-9281
larry.gillham@griffinllc.com

Gilliam, Scott
Helena Chemical
212 Corectry Lakes
Lexington SC 29072
Tel. 803/822-8028
Fax. 803/822-8774
gilliams@helenachemical.com

Gnegy, John D
Westvaco Corp
PO Box 1950
Summerville SC 29484
Tel. 843/873-0055
Fax. 843/875-7185
jdgnegy@westvaco.com

Godley, John Lee
R&D Research Farm Inc
7033 Highway 103
Washington LA 70589
Tel. 337/585-7455
Fax. 337/585-1006
rdfarm@acadian.net

Gooden, Dewitt T
Pee Dee Rec
2200 Pocket Rd
Florence SC 29506
Tel. 843/669-1912
Fax. 843/661-5676
dgooden@clemson.edu

Gray, Cody
Miss State Univ
Box 9555
Miss State MS 39762
Tel. 662/325-2311
Fax. 662/325-8742
cig41@pss.msstate.edu

Gray, Timothy L
University of Georgia
1109 Experiment St
Griffin GA 30223
Tel. 770/233-5540
Fax. 770/412-4734
tgrey@gaes.griffin.peachnet.edu

Green, J D
University of Kentucky
N-106B Ag Science N
Lexington KY 40546
Tel. 859/257-4898
Fax. 859/257-7874
jgreen@ca.uky.edu

Gregg, Matt
Clemson University
204 Oak St Apt # 7
Clemson SC 29631
Tel. 864/656-6365
Fax. 864/656-4960

Grichar, W James
Texas A&M University
PO Box 755
Yoakum TX 77995
Tel. 361/239-6326
Fax. 361/293-2054
w-grichar@tamu.edu

Griffin, James L
LSU AgCenter
104 Star Hall
Baton Rouge LA 70803
Tel. 225/578-1768
Fax. 225/578-4673
jgriffien@agctr.lsu.edu

Griffin, Matt
Miss State Univ
Box 9555
Miss State MS 39762
Tel. 662/325-2614
Fax. 662/325-8742
mgriffin@pss.msstate.edu

Groninger, John
Southern Illinios Univ
Dept Forest MS Code 441
Carbondale IL 62901
Tel. 618/453-7462
Fax. 618/453-7475
groninge@siu.edu

Grove, Melvin
ISK BioScience
2237 Haden Rd
Houston TX 77015
Tel. 713/450-2810
Fax. 713/455-1959
grovem@iskbc.com

Groves, Frank
134 South Chester
Monticello AR 71655
Tel. 870/644-3101
Fax. 870/664-3612

Grymes, Charles
Syngenta Crop Protection
Rt 2 Box 214
Idalou TX 79329
Tel. 806/892-2130
Fax. 806/892-2377
charles.grymes@syngenta.com

Guy, Charles B
G&H Associates Inc
PO Box 97
Tillar AR 71670
Tel. 870/392-2009
Fax. 870/392-2009
cbguygh@ipa.net

H

Hackworth, Max
BASF Corporation
PO Box 90
Pocahontas AR 72455
Tel. 870/892-4157

Hadden, James
Syngenta Crop Protection
97 William Gibbs Rd
Tifton GA 31794
Tel. 229/391-9032
Fax. 229/391-9136
james.hadden@syngenta.com

Hagan, John W
Miles Farm Supply
1119 Castlewood Place
Owensboro KY 42303
Tel. 270/926-2420
johhag@milesnmoer.com

Hainds, Mark
LongLeaf Alliance
RR 7 Box 131
Andalusia AL 36420
Tel. 334/427-1029
Fax. 334/222-0581
lla@alaweb.com

Hall, David W
3666 NW 13th Place
Gainesville FL 32605
Tel. 352/375-1370
Fax. 352/377-2729

Hammes, Glenn
DuPont
361 Black Ankle
Cherrylot GA 30522
Tel. 706/838-5585

Hancock, Gary H
FMC Corporation
832 Barnes Mill Rd
Hamilton GA 31811
Tel. 706/628-5431
Fax. 706/628-4356
gary_hancock@fmc.com

Hand, Shane
Aventis CropScience
2103 Austell St
Opelika AL 33680
Tel. 334/742-9680
Fax. 334/749-2619
shane.hand@aventis.com

Hanks, James E
USDA-ARS
141 Experiment Station
Stoneville MS 38776
Tel. 662/686-5382
Fax. 662/686-5334
jhanks@avs.usda.gov

Harden, John S
BASF Corporation
5909 Rock Canyon Rd
Raleigh NC 27613
Tel. 919/547-2019
Fax. 919/547-2901
hardenj@basf.com

Harrison, Mark
Miss State Univ
PO Box 1690
Verona MS 38879
Tel. 662/566-2201
Fax. 662/566-2257
mph31@ra.msstate.edu

Harrison, Steve
Syngenta Crop Protection
8000 Centerview PK 501
Cordova TN 38018
Tel. 901/751-5206
Fax. 901/751-5223
steve.harrison@syngenta.com

Hartrim, John Wm
DuPont Company
173 Ivy Lakes Dr
Jacksonville FL 32259
Tel. 904/287-1658
jack.w.hartrim@usa.dupont.com

Hawf, Larry R
Monsanto Company
PO Box 188
Sasser GA 31785
Tel. 292/698-2111
Fax. 229/698-2211
larry.r.hawf@monsanto.com

Hayes, Robert
University of Tennessee
605 Airways
Jackson TN 38301
Tel. 731/425-4750
Fax. 731/425-4760
rhayes1@utk.edu

Heap, Todd
Shoffner Farm Research
191 Jacson 136
Newport AR 72112
Tel. 870/744-8237
Fax. 870/744-3314
kth@shoffneragresearch.com

Henry, Brian
Miss State Univ
Box 9555
Miss State MS 39762
Tel. 662/325-2614
Fax. 662/325-8742
bhenry@pss.msstate.edu

Henseworth, L Douglas
Syngenta Crop Protection
2777 Ocean Oak Dr
Fernandina FL 32034
Tel. 904/321-0795
Fax. 904/321-0239
doug.houseworth@syngenta.com

Hensley, Jerry
Hensley Agricutlural
26 Shadowridge Dr
Jackson TN 38305
Tel. 731/664-9185
Fax. 731/664-9264
jerryh3483@aol.com

Hickey, Jesse A
AgriScope LLC
105 Hearthstone Ct
Athens GA 30605
Tel. 706/354-8299
Fax. 706/546-0572
agriscope@aol.com

Hientze, Cynthia
2999 S Wayside
Houtson TX 77023
Tel. 713/742-1413
Fax. 713/945-1037
cynthia.heintze@cityofhouston.net

Hinklin, Britton
University of Missouri
2184 Co Hwy 305
Portageville MO 63873
Tel. 573/379-5431
bhinklin@missouri.edu

Hinton, Jason
North Carolina State Univ
Box 7620
Raleigh NC 27695
Tel. 919/515-2865
Fax. 919/515-5315
jason_hinton@ncsu.edu

Hoagland, Robert
Southern Weed Sci Lab
PO Box 350
Stoneville MS 38776
Tel. 662/686-5210
Fax. 662/686-5422
rhoagland@ars.usda.gov

Holloway, James C
Syngenta Crop Protection
1840 Lance Dr
Greenville MS 38701
Tel. 662/332-2881
james.holloway@syngenta.com

Holt, Tom
BASF Corporation
26 Davis Dr
Res Tria Park NC 27709
Tel. 919/547-2178
Fax. 919/547-2910
holtt@basf.com

Hughes, Michael R
Pioneer
6767 Old Madison Pk #110
Huntsville AL 35806
Tel. 256/971-0760
Fax. 256/971-0433
michael.j.hughes@usa.dupont.com

Hurst, Harold
Delta Branch Expt Stn
PO Box 197
Stoneville MS 38776
Tel. 662/686-3217
lclark@drec.msstate.edu

Hutto, Kendall C
Miss State Univ
Box 9555
Miss State MS 39762
Tel. 662/325-2614
Fax. 662/325-8742
khutto@pss.msstate.edu

I

Iron, Steve M
Aventis CropScience
PO Box 7
Cantonment FL 32533
Tel. 850/587-3505
Fax. 850/587-5472
steve.irons@aventis.com

Iverson, Rick
BASF Corporation
105 Heart Pine Dr
Cary NC 27511
Tel. 919/854-0533
iverson@basf-corp.com

J

Jackson, Meral
Virginia Tech Forestry
228 Cheatham Hall
Blacksburg VA 24061
Tel. 540/231-6378
Fax. 540/231-3330
mejackso@vt.edu

Jackson, Wayne
Lawrence Farners Coop
163 Crews Rd
Lawrenceburg TN 38466
Tel. 931/762-7139
Fax. 931/766-1838
lawcoop@bellsouth.net

Jacobson, Brent D
BASF Corporation
607 E 48th St
Tifton GA 31794
Tel. 229/391-9121
jacobsb1@basf.com

Jain, Rakesh
Syngenta Crop Protection
7145 - 58th Ave
Vero Beaach FL 32967
Tel. 561/567-5218
Fax. 561/567-5229
rakesh.jain@syngenta.com

Jennings, Katherine
BASF Corporation
110 Canyon Lake Circle
Morrisville NC 27560
Tel. 919/547-2647
Fax. 919/547-2910
jenninkm@basf.com

Jewett, Darryl
US Forest Service
320 Green Street
Athens GA 30602
Tel. 706/559-4250
djewett@fs.fed.us

Johnson, Wiley C
Coastal Plain Expt Sta
PO Box 748
Tifton GA 31793
Tel. 229/386-3172
Fax. 229/386-3437
cjohnson@tifton.cpes.peachnet.edu

Jones, Curlis A
Louisiana State Univ
104 Sturgis Hall
Baton Rouge LA 70803
Tel. 225/578-1767
cjones@agctr.lsu.edu

Jones, Elizabeth
Delta Res & Extn Ctr
PO Box 197
Stoneville MS 38776
Tel. 662/686-3228
Fax. 662/686-7336
ejones@drec.msstate.edu

Jordan, David
North Carolina State Univ
Box 7620
Raleigh NC 27695
Tel. 919/515-4068
Fax. 919/515-7959
david_jordan@ncsu.edu

K

Kammerer, Steven
Syngenta Crop Protection
100 Rivers Edge Rd N
St Augustine FL 32092
Tel. 904/829-9581
Fax. 904/829-1968
steve.kammerer@syngenta.com

Kand, Shawn
Milts Farms Supply
4418 Hunters Trace
Owensboro KY 42302
Tel. 270/926-2420
shakan@milesnmore.com

Karnei, Jarred
TX Agri Expt Stn
Rt 3 Box 219
Lubbock TX 79403
Tel. 806/746-6101
Fax. 806/746-6528
j-karnei@tamu.edu

Keeling, Wayne
Texas Agric Expt Sta
Rt 3 Box 219
Lubbock TX 79401
Tel. 806/746-6101
Fax. 806/746-6528
wkeeling@tamu.edu

Keese, Renee J
Syngenta Crop Protection
985 Arrowwood Dr
Carmel IN 46033
Tel. 317/846-8812
Fax. 317/846-8832
renee.keese@syngenta.com

Keiper, Jason
Stepan Company
22 W Frontage Rd
Northfield IL 60093
Tel. 847/501-2081
Fax. 847/446-9359

Kelley, Frank
Miss State Univ
Box 9555
Miss State MS 39762
Tel. 662/325-2253
Fax. 662/325-8742
rsk2@pss.msstate.edu

Kelley, Jason
Oklahoma State Univ
2425 W Lakeview
Stillwater OK 74074
Tel. 405/624-7063
jkelley@mail.pss.okstate.edu

Kelly, Steve
LSU Ag Center
21213 Macon Ridge Rd
Winnsboro LA 71295
Tel. 318/435-2908
Fax. 318/435-2902
skelly@agctr.isu.edu

Kendig, Andy
University of Missouri
PO Box 160
Portageville MO 63873
Tel. 573/379-5431
Fax. 373/379-5875
kendig@missouri.edu

Kenty, Michael M
Helena Chemical Co
424 Quail Crest Dr
Collierville TN 38017
Tel. 901/853-6525
Fax. 901/853-5622
mmkenty@aol.com

Kirksey, Bruce
Stoneville Pedigreed
7622 Moore Road
Memphis TN 38120
Tel. 901/252-2291
Fax. 901/252-2290
bkirksey@stoneville.com

Kline, Bill
Dow AgroSciences
2716 Saxon Dr
Daluth GA 30096
Tel. 770/623-6818
wnkline@dowagro.com

Klosterboer, Arlen
Texas A&M University
354 Soil & Crop Science
College Station TX 77843
Tel. 979/845-1461
Fax. 979/845-0604
a-kosterboer@tamu.edu

Knowe, Steve
University of Tenn
PO Box 1071
Knoxville TN 37901
Tel. 865/974-1557
sknowe@utk.edu

Koger, Trey
USDA ARS
PO Box 350
Stoneville MS 38776
Tel. 662/686-5290
Fax. 662/686-5422
ckoger@ars.usda.gov

Krutz, Larry J
Texas A&M University
2474 TAMU
College Station TX 77843
Tel. 979/845-5384
Fax. 979/845-0456
krutz1@msn.com

Kurtz, Mark E
Miss State Univ
PO Box 197
Stoneville MS 38776
Tel. 662/686-3227
Fax. 662/686-7336
mekurtz@drec.msstate.edu

L

Lanclos, David
Concord Research Center
7570 Auburn RD
Concord OH 44077
Tel. 440/357-3155
lanclos d@crc.com

Langston, Vernon
Dow AgroSciences
314 N Maple Galde Circle
The Woodlands TX 77832

Lanier, James E
North Carolina State Univ
604-2A Charleston Rd
Raleigh NC 27606
Tel. 919/515-4068
jelanier@unity.ncsu.edu

Lassiter, Ralph
Dow AgroSciences
10 Cherry Creek Cove
Little Rock AR 72212
Fax. 501/223-2088
rblassiter@dowagro.com

Lauer, Dwight K
Silvics Analytic
12314 Lullington Dr
Richmond VA 23233
Tel. 804/754-8868
dklauer@att.net

LeClair, Jack J
United Agric Products
2006 Hayden Ln
Corinth TX 76210
Tel. 940/498-0911
Fax. 940/498-0911
jack.leclair@uap.com

Lee, Andrew
3250 Ironworks Pike #9
Lexington KY 40511

Lee, Donna R
Northeast Reasearch
PO Box 438
St Joseph LA 71366
Tel. 318/766-4607
drlee@agctr.lsu.edu

Leifker, Jamie
FMC Corporation
1512 NW 78Th ST
Kansas City MO 64118
Tel. 816/801-5612
jamie leifker@fmc.com

Leon, Chris
Louisiana State Univ
104 Sturgis Hall
Baton Rouge LA 70803
Tel. 225/578-1767
Fax. 225/578-4673
cleon@agctr.lsu.edu

Levy, R J
Louisiana Coop Extn Serv
157 Cherokee Dr
Crowley LA 70526
Tel. 337/788-8821
Fax. 337/788-8816
rlevy@agctr.lsu.edu

Lickfeldt, Darin
DowAgro Sciences
125 Sagamore Ct
Fayetteville GA 30214
Tel. 770/969-2375
Fax. 770/969-5674
dwlickfeldt@dow.com

Lloyd, Randy W
BASF Corporation
PO Box 13528
Res Tria Park NC 27709
Tel. 919/547-2805
Fax. 919/547-2428
lloydr@basf.com

Locke, Martin
USDA ARS SWSL
PO Box 350
Stoneville MS 38776
Tel. 662/686-5213
Fax. 662/686-5422
lbell@ars.usda.gov

Lovelace, Michael
University of Arkansas
1366 W Altheimer Dr
Fayetteville AR 72704

Lowe, Todd
United Staes Golf Ass
58 Annapolis Lane
Rofonda West FL 33947
Tel. 941/828-2625
tlowe@usga.org

Loyd, G Neil
DuPont Company
4917 Brrokurst
Raleigh NC 27609
Tel. 919/850-9931
Fax. 919/954-0083
g-neil.loyd@usa.dupont.com

Lunsford, James N
Syngenta Crop Protection
218 Lakewood Dr
Enterprize AL 36330
Tel. 334/790-4825
james.lunsford@sygenta.com

Lyon, LeAnna
TX Agric Expt Stn
Rt 3 Box 219
Lubbock TX 79403
Tel. 806/746-6101
Fax. 806/746-6528
l-lyon@tamu.edu

M

MacDonald, Greg
University of Flordia
304 Newell Hall
Gainesville FL 32611
Tel. 352/392-1811
Fax. 352/392-1840
gemac@gnv.ifas.ufl.edu

Magin, Ralph
Magin & Associates
17643 Crossing Blvd
Baton Rouge LA 70810
Tel. 225/752-4628
Fax. 225/752-4628
rmagin2@cox.net

Main, Chris
252 Ellington Bldg
2431 Center Dr
Knoxville TN 37996
Tel. 865/974-8805
Fax. 865/974-7997
cmain@utk.edu

Malik, Mayank S
University of Arkansas
1366 W Altheimer Dr
Fayetteville AR 72704
Tel. 501/575-3955
Fax. 501/575-3975
msm10@uark.edu

Marchbanks, Ryan
Miss State Univ
Box 9555
Miss State MS 39762
Tel. 662/325-2311
Fax. 662/325-8742
prm1@pss.msstate.edu

Marshall, Michael W
University of Kentucky
N-106 Ag Science Bldg N
Lexington KY 40546
Tel. 859/257-7326
marshal@uky.edu

Martin, Scott H
Syngenta Crop Protection
778 Mitcham Orchard Rd
Ruston LA 71270
Tel. 318/251-9412
Fax. 318/255-0064
scott.martin@sygenta.com

Mask, Brent
BASF Corporation
182 County Road 2250
Saltillo MS 38866
Tel. 662/312-2006
maskd@basf-corp.com

Massey, Joseph P
Miss State Univ
Box 9555
Miss State MS 39762
Tel. 662/325-2311
Fax. 662/325-8742
jmassey@pss.msstate.edu

Mazour, Chandler
BASF Corporation
26 Davis Dr
RTP NC 27709
Tel. 919/547-2649
Fax. 919/547-2488
mazourd@basf.com

McCarty, Lambert B
Clemson University
Box 340375
Clemson SC 29634
Tel. 864/565-0120
Fax. 864/656-4960
bmccrty@clemson.edu

McCarty, Micheal T
Carolina Ag Research
PO Box 132
Elico SC 29826
Tel. 803/266-7008
Fax. 803/266-7925
carolina-ag@tds.net

McClelland, Marilyn
University of Arkansas
1366 W Althemier Dr
Fayetteville AR 72704
Tel. 479/575-8779
Fax. 479/575-3975
mmcclell@uark.edu

McElroy, Scott
North Carolina State Univ
Box 7620
Raleigh NC 27695
Tel. 919/515-5654
scott mcelroy@ncsu.edu

McKemie, Tom
BASF Corporation
7 Cameroons Place
Durham NC 27703

McLaughlin, Chrishna
TX Agric Expt Stn
Rt 3 Box 219
Lubbock TX 79403
Tel. 806/746-6101
Fax. 806/746-6528
c-mclaughlin@tamu.edu

McLean, Henry
Syngenta Crop Protection
410 Swing Road
Greensboro NC 27319
Tel. 336/632-7246
henry.mclean@syngenta.com

McMullan, Patrick
Agrobiology Research
Box 57-777 Walnut Grove
Memphis TN 38120
Tel. 901/757-2730
Fax. 901/756-0104
agrobio@earthlink.net

McWright, Barrett T
LSU AG Center
212 Macon Ridge Rd
Winnsboro LA 71295
Tel. 318/435-2908
Fax. 318/435-2902
bmcknight@agctr.lsu.edu

Medlin, Case R
Oklahoma State Univ
279 Ag Hall
Stillwater OK 74078
Tel. 405/744-9588
crm@mail.pss.okstate.edu

Merrick, James E
Aventis ES
PO Box 2029
Riverview FL 33568
Tel. 813/657-4045
Fax. 813/657-4109
jim.merrick@aventis.com

Miller, Carrie
Arnold AFB
305 Jackson Circle
Tullahoma TN 37388
Tel. 931/454-5043
Fax. 931/454-5126
carrie.miller@arnold.af.mil

Miller, Donnie K
Northeast Research Stn
PO Box 438
St Joseph LA 71366
Tel. 317/766-4607
Fax. 318/766-4278
dmiler@agctr.lsu.edu

Miller, James H
USDA Forest Service
520 DeVall Dr
Auburn AL 36849

Miller, Kyle
BASF Corporation
14000 Princess Mary Rd
Chesterfield VA 23838
Tel. 804/739-6044
Fax. 804/739-7498
millerkj@basf.com

Minton, Bradford W
Syngenta Crop Protection
20130 Lake Spring Ct
Cypress TX 77429
Tel. 281/304-0609
Fax. 281/304-0609
brad.minton@syngenta.com

Mitchell, Joe M
BASF Corporation
10016 Colonnade Dr
Tampa FL 33647
Tel. 813/973-7485
Fax. 813/991-5507
mitchejm@basf.com

Mitchell, Rusty
FMC Corporation
PO Box 678
Louisville MS 39339
Tel. 662/773-6697
Fax. 662/773-6674
rusty.mitchell@fmc.com

Mitchem, Wayne
North Carolina State Univ
402 Davids Chapel Ch Rd
Vale NC 28168
Tel. 704/472-0770
Fax. 704/276-1584
wayne mitchem@ncsu.edu

Mixson, Dan
DuPont
4771 Byou Blvd
Pensacola FL 32503
Tel. 850/469-0600
Fax. 850/469-0011
william.d.mixson@usa.dupont.com

Mize, Terry
FMC Corporation
7502 Dreyfuss Dr
Amarillo TX 79121
Tel. 806/352-8195
Fax. 806/352-1910
terry_mize@fmc.com

Monaco, Thomas J
North Carolina State Univ
Box 7609
Raliegh NC 27695
Tel. 919/515-3131
Fax. 919/513-3191
tom_monaco@ncsu.edu

Monks, David
North Carolina State Univ
Box 7609
Raleigh NC 27695
Tel. 919/515-5320
Fax. 919/515-7347
david_monks@ncsu.edu

Montgomery, Doug
Oklahoma Stat Univ
360 Ag Hall
Stillwater OK 74078
Tel. 405/624-7538
dpm_100gr@hotmail.com

Montgomery, Robert F
Monsanto Company
2211 N Old Troy Rd
Union City TN 38261
Tel. 731/884-8823
Fax. 731/884-0175
robert.f.montgomery@monsanto.
com

Moore, Frederick
Texas Cooperative Exten
1309 Remington Ct
College Stat TX 77845
Tel. 979/845-0817
Fax. 979/845-0604
f-moore@tamu.edu

Moore, J Michael
University of Georgia
PO Box 1209
Tifton GA 31793
Tel. 229/386-7498
Fax. 229/386-7308
jmmoore@uga.edu

Moore, Jerry W
University of Arkansas
1366 W Altheimer Dr
Fayetteville AR 72704
Tel. 501/575-3955
Fax. 501/575-3975
jwm05@mail.uark.edu

Morales-Payan, Jose
University of Florida
1246 Fifield Hall
Gainesville FL 32611
Tel. 352/392-1928
Fax. 352/392-5653
pmorales@mail.ifas.ufl.edu

Morgan, Gaylon
343 Ellington Bldg
2431 Center Dr
Knoxville TN 37996
Tel. 865/974-8827
Fax. 865/974-7997
gmorgan2@utk.edu

Morozon, Ivan
Virigina Tech
410 Price Hall
Blacksburg VA 24061
Tel. 540/231-7176
Fax. 540/231-7477
imorozov@vt.edu

Mudge, Laurence
Aventis ES
2171 Mallard Lane
Camden Sc 29020
Tel. 803/475-0635
Fax. 803/475-0645
laurence.mudge@aventis.com

Mueller, Tom
252 Ellington Bldg
2431 Center Dr
Knoxville TN 37996
Tel. 865/974-8805
Fax. 865/974-7997
tmueller@utk.edu

Mullahey, Jeffrey
University of Florida
4253 Experiment Rd Hwy
Jay FL 32565
Tel. 850/983-2632
Fax. 850/983-2637
jjm@mail.ifas.ufl.edu

Murdock, Edward C
Clemson University
2200 Pocket Rd
Florence SC 29506
Tel. 843/662-3526
Fax. 843/661-5676
emrdck@clemson.edu

Murdock, Shea
Oklahoma State Univ
368 Ag Hall
Stillwater OK 74078
Tel. 405/744-6420
Fax. 405/744-5269
swm@mail.pss.okstate.edu

Murphree, Trent
Texas Tech University
Rt 3 Box 219
Lubbock TX 79403
Tel. 806/747-5560
Fax. 806/746-6528
tmurph35@hotmail.com

Murphy, Michael S
University of Georgia
8 Brooks Dr
Athens GA 30602
Tel. 706/542-1196
mmurphy@smokey.forestry.uga.
edu

Murphy, Tim
University of Georgia
1109 Experiment St
Griffin GA 30223
Tel. 770/228-7300
Fax. 770/412-4774
tmurphy@uga.edu

Murray, Don S
Oklahoma State Univ
272 AGH
Stillwater OK 74078
Tel. 405/744-6420
Fax. 405/744-5269
dsm@mail.pss.okstate.edu

Muzyk, Kenneth R
Gowan Co
408 Larrie Ellen Way
Brandon FL 33511
Tel. 813/657-5271
Fax. 813/684-8404
kmuzyk@gowanco.com

Myers, Don
Aventis ES
102 Mapel Ave
Goshen NY 10924
Tel. 845/294-4462
don.myers@aventis.com

N

Namenek, Robin C
University of Arkansas
PO Box 3508
Monticello AR 71656
Tel. 870/460-1091
Fax. 870/460-1415
namenek@uamont.edu

Nelson, Jeff A
Dow Agro Sciences
1804 Warwick Cove
Cedar Park TX 78613
Tel. 512/260-2224
janelson@dowagro.com

Nelson, Larry
Clemson University
272 Lehotsky Hall
Clemson SC 29630
Tel. 864/656-4866
lnelson@clemson.edu

Nespeca, Matt
BASF Corporation
2335 Sunnyside
Charleston SC 29403
Tel. 843/958-9574
Fax. 843/958-9518
nespecm@basf-corp.com

Newell, Sandy
BASF Corporation
806 W H Smith Rd
Statesboro GA 30458
Tel. 912/865-3370
Fax. 912/865-3371
newells@basf.com

Nezat, Linza
Bellspray Inc
PO Box 269
Opelousas LA 70571
Tel. 337/942-1011
Fax. 337/942-7841
rdspray@co2sprayers.com

Nichols, Robert L
Cotton Incorporated
6399 Weston Pkwy
Cary NC 27513
Tel. 919/678-2371
Fax. 919/678-2233
bnichols@cottoninc.com

Nichols, Stevne P
Miss State Univ
PO Box 197
Stoneville MS 38776
Tel. 662/686-3238
Fax. 662/686-3334
snichols@drec.msstate.edu

Norsworthy, Jason K
Clemson University
64 Research Rd
Blackville SC 29817
Tel. 803/284-3343
Fax. 803/284-3684
jnorswo@clemson.edu

O

O'Barr, John H
Texas A&M University
Soil & Crop Scie Dept
College Station TX 77843
Tel. 979/845-5384
Fax. 979/845-0456
john-obarr@tamu.edu

Oliver, Dick
University of Arkansas
1440 Hillcrest
Fayetteville AR 72703
Tel. 501/575-3976
Fax. 501/575-3975
oliver@uark.edu

Oliver, Jamie
SFASU
Rt 3 Box 91
Rusk TX 75785
Tel. 903/743-5397
jamie_oliveroe@hotmail.com

Ottis, Brian
Texas A&M University
Dept of Soil & Crop Sci
College Station TX 77843
Tel. 979/845-5384
Fax. 989/845-0456
bottis@taesgw.tamu.edu

P

Palmer, Eric
Syngenta Crop Protection
67 Pine Wood Rd
Hudson NY 12534
Tel. 518/851-2122
Fax. 518/851-9790
eric.palmer@syngenta.com

Park, Robert
DuPont Crop Protection
1202 Spaich Dr
San Jose CA 95117
Tel. 408/249-1225
Fax. 408/261-0973
robert.h.park@usa.dupont.com

Parrish, Mark
Aventis CropScience
2508 Bembridge Dr
Raleigh NC 27613
Tel. 919/549-2939
Fax. 919/549-3952
mark.parrish@aventis.com

Patterson, Michael G
Auburn University
108 Extension Hall
Auburn AL 36849
Tel. 334/844-5492
Fax. 334/844-5492
mpatters@acesag.auburn.edu

Paulsgrove, Mary
Avnetis CropScience
124 Chestnut Rd
Chapel Hill NC 27514
Tel. 919/549-2177
Fax. 919/549-3952
mary.paulsgrove@aventis.com

Pawlak, John
Valent USA Corporation
530 S Creyts
Lansing MI 47917
Tel. 517/321-7340
john.pawlak@valent.com

Payne, Scott
University of Arkansas
276 Altheimer Dr
Fayetteville AR 72704
Tel. 501/575-3955
Fax. 501/575-3975
sapayne@uark.edu

Pearrow, Nathan
Lonoke Co Extn Office
PO Box 357
Lonoke AR 72086
Tel. 501/676-3124
Fax. 501/676-7847
npearrow@uaex.edu

Pearson, Charles
Syngenta Corp Protection
8000 Centerview Pkwy 501
Cordova TN 38018
Tel. 901/751-5208
Fax. 901/751-5223
charles.pearson@syngenta.com

Peeper, Tom
Oklahoma Stat Unvi
Plant & Soil Sciences
Stillwater OK 74078
Tel. 405/744-9589
Fax. 405/744-5269
tfp@maill.pss.okstate.edu

Pellerin, Krisie
Louisiana State Univ
302 Life Science
Baton Rouge LA 70803
Tel. 225/578-1189
kpellerin@agctr.lsu.edu

Peters, Alan
Texas Tech University
Rt 3 Box 219
Lubbock TX 79403
Tel. 806/744-6247
Fax. 806/742-0775
alan.peters@ttu.edu

Pitts, Jerry
DuPont
22407 N Lake Village Dr
Katy TX 77485
Tel. 281/693-3375

Pline, Wendy
North Carolina State Univ
Box 7620
Raleigh NC 27695
Tel. 919/515-5654
Fax. 919/515-5315
wapline@unity.nscu.edu

Porpiglia, Peter J
Kuiai America
11 Martine Ave 9th Floor
White Plains NY 10606
Tel. 914/682-8934
Fax. 914/682-9050
porpigliap@aol.com

Porter, Bruce
TX Agric Expt Stn
Rt 3 Box 219
Lubbock TX 79403
Tel. 806/746-6101
Fax. 806/746-6528
b-porter@tamu.edu

Porterfield, Dunk
Syngenta Crop Protection
101 Glen Alpine Circle
Cary NC 27513
Tel. 919/380-1812
Fax. 919/380-1816
dunk.porterfield@syngenta.com

Poston, Daniel
Miss State Univ
PO Box 197
Stoneville MS 38776
Fax. 662/686-7336
dposton@drec.msstate.edu

Powell, William G
Miss State Univ
Box 9555
Miss State MS 39762
Tel. 662/325-2311
Fax. 662/325-8742
wgp4@pss.msstate.edu

Price, Andrew J
North Carolina State Univ
Box 7620
Raleigh NC 27694
Tel. 919/513-4197
Fax. 919/515-5855
andy-price@ncsu.edu

Prinster, Mark
TryGreen-ChemLawn
360 Sweetwater Church Rd
Gouglasville GA 30134
Tel. 770/949-4922
Fax. 770/949-7727
markprinster@trugreenmail.com

Prochaska, Nelson
R&D Research Farm Inc
7033 Highway 103
Washington LA 70589
Tel. 337/585-7455
Fax. 337/585-1006
rdfarm@acadian.net

Prostko, Eric
Rural Development Center
PO Box 1209
Tifton GA 31796
Tel. 229/386-3194
Fax. 229/386-7308
epostko@uga.edu

Q

Quicke, Harry
BASF Corporation
234 Pine Hills Ave
Auburn AL 36830

R

Rajguru, Satyendra
University of Arkansas
276 Altheimer Dr
Fayetteville AR 72704
Tel. 501/575-3955
Fax. 501/575-3975
srajgur@comp.uark.edu

Ramsey, Craig
University of Florida
5560 Andromda Dr
Milfon FL 32570
Tel. 850/983-2632
cramsey@ufl.edu

Rankins, Al
Miss State Univ
Box 9555
Miss State MS 39762
Tel. 662/325-3341
Fax. 662/325-8742
arankins@pss.msstate.edu

Ratliff, Randall L
Syngenta Crop Protection
PO Box 18300
Greensboro NC 27419
Tel. 336/632-2549
Fax. 336/632-6950

Ratto, David B
DuPont Ag Products
105 Wheaton Way
Tyrone GA 30290
Tel. 770/486-6684
Fax. 770/486-6687
david.b.ratto@usa.dupont.com

Reddy, Krishna N
USDA ARS
PO Box 350
Stonevile MS 38776

Reynolds, Daniel B
Miss State Univ
Box 9555
Miss State MS 39762
dreynolds@pss.msstate.edu

Rhodes, Alvin R
BASF Corporation
137 Cypress Lake Blvd S
Madison MS 39110
Tel. 601/853-1417
Fax. 601/853-8488
rhodes@basf-corp.com

Rhodes, G Neil
University of Tennessee
PO Box 1071
Knoxville TN 37901
Tel. 865/974-7208
Fax. 865/974-8850
nrhodes@utk.edu

Rhodes, Lee
Helena Chemical Co
385 New Bridge Rd
Aiken SC 29801
Tel. 803/642-4000
Fax. 803/642-3303
lwrhodes@dnesouth.net

Richardson, Rob
Virginia Tech University
33446 Research Dr
Painter VA 23420
Tel. 757/414-0724
Fax. 757/414-0730
rorichar@vt.edu

Richburg, John S
Dow AgroSciences
9330 Zionaville Rd
Indianapolis IN 46268
Tel. 317/337-3619
jsrichburg@dow.com

Rick, Susan
E I DuPont
2021 Gardnerbook Dr
Raleigh NC 27606

Robinson, Bridget
North Carolina State Univ
608 Charleston Rd #1-S
Raleigh NC 27606
Tel. 919/858-7468
big robinb@hotmail.com

Robinson, Darren
252 Ellington Bldg
2431 Center Dr
Knoxville TN 37996
Tel. 865/974-7208
Fax. 865/974-7997

Rodriguez, Ian R
Clemson University
205 Calhown St
Clemson SC 29631
Tel. 864/656-6365
irodrig@clemson.edu

Rogers, Brent C
Morehead State Univ
UPO 702
Morehead KY 40351
Tel. 606/783-2660
Fax. 606/783-5067
brogers@moreheadstate.edu

Roider, Chris
Louisiana State Univ
302 Life Sciences
Baton Rouge LA 70803
Tel. 225/388-1767
croider@bellsouth.ent

Rountree, Tom
AshGrow Crop Management
PO Box 88
Ivor VA 23866
rountree@askgrow.com

Royal, Stanley
Griffin LLC
4265 Harmoney Rd
Girard GA 30426
Tel. 912/829-3826
stanley.royal@griffinllc.com

Rummer, Robert B
USDA Forest Service
520 DeVall Dr
Auburn AL 36849
Tel. 334/826-8700
Fax. 334/821-0037
rrummer@fs.fed.us

S

Sanders, Dearl
Louisiana State Univ
4419 Idlenuild Rd
Clinton LA 70722
Tel. 225/683-5848
dsanders@agctr.lsu.edu

Sanders, Jason C
Miss State Univ
Box 9555
Miss State MS 39762
Tel. 662/325-2614
jsanders@pss.msstate.edu

Sanderson, John
Aventis CropScience
902 Dixon Rd
Willow SpringNC 27592
Tel. 919/894-1675
Fax. 919/894-7079
john.sanderson@aventis.com

Sankula, Sujatha
National Center Food&Ag
1616 P St NW Suite 108
Washington DC 20036
Tel. 202/328-5057
Fax. 202/328-5133
sankula@ncfap.org

Savage, Kenneth E
Mid-South Ag Research
2382 Hinkley Rd
Proctor AR 72376
Tel. 870/732-2981
Fax. 870/735-7752

Schaff, Dennis
FMC Corporation
1735 Market St
Philadelphia PA 19103
Tel. 215/299-6202
Fax. 215/299-6810
dennis_schaff@fmc.com

Scherder, Eric
University of Arkansas
276 Altheimer Dr
Fayetteville AR 72704
Tel. 501/575-3955
Fax. 501/575-3975
escherde@mail.uark.edu

Schmidt, Bob
NCWSS & SWSS
1508 W University Ave
Champaign IL 61821
Tel. 217/352-4212
Fax. 217/352-4241
raschwssa@aol.com

Schraer, Marty
Syngenta Crop Protection
1210 s Fifth Ave
Cleveland MS 38732
Tel. 662/686-5765
Fax. 662/686-9859
marty.schraer@syngenta.com

Schwarzlose, Gary
Aventis CropScience
1331 Rolling Creek
Spring Branch TX 78070
Tel. 830/885-4287
Fax. 830/885-7382
gary.schwarzlose@aventis.com

Scott, Robert C
BASF Corporation
1204 Hidden Tree Ln
Jonesboro AR 72404
Tel. 870/910-5897
Fax. 870/910-5898
scottrd@basf.com

Sciumbato, Audie
Texas A&M University
Dept of Soil & Crop Sci
College Stat TX 77843
Tel. 979/845-4629
Fax. 979/845-0456
audie@tamu.edu

Scott, Tracy D
Arkansas State Univer
PO Box 1080
State Univ AR 72467
Tel. 870/972-2087
Fax. 870/972-3885
tscott@astate.edu

Senseman, Scott
Texas A&M University
Dept of Soil & Crop Sci
College Stat TX 77843
Tel. 979/845-5375
Fax. 979/845-0456
s-senseman@tamu.edu

Shaikh, Nasir P
University of Florida
Dept of Agronomy
Gainesville FL 32611
Tel. 352/392-1811
Fax. 352/392-1840
npshaikh@yahoo.com

Shankle, Mark W
Pontotoc Expt Stn
8320 Hwy 15 S
Pontotoc MS 38863

Shaw, David R
Miss State Univ
Box 9555
Miss State MS 39762
Tel. 662/325-2598
Fax. 662/325-8742
dshaw@weedscience.msstate.edu

Shelton, Delbert G
DuPont Company
3750 Banyan Ln
Alphareita GA 30022
Tel. 770/760-1313
Fax. 770/740-1314
delbert.g.shelton@usa.dupont.com

Shepard, Jim
NCASI
PO Box 141020
Gainesville FL 32614
Tel. 352/377-4708
jshepard@ncasi.org

Shillig, Donn
University of Florida
2725 Binion
Apopka FL 32703
Tel. 407/884-2340
Fax. 407/814-6186
dgs@lne.ifas.ufl.edu

Sholar, Ron
Oklahoma State Univ
376 Ag Hall
Stillwater OK 74078
Tel. 405/744-6421
Fax. 405/744-0354
sholar@okstate.edu

Siebert, Jonathan D
Louisiana State Univ
302 Life Sciences Bldg
Baton Rouge LA 70803
Tel. 225/578-1767
Fax. 225/578-4673
jsiebert@agctr.lsu.edu

Singh, Megh
Univ of Florida IFAS
700 Experiment Stn Rd
Lake Alfred FL 33850

Singh, Samunder
University of Florida
700 Experiment Stn Rd
Lake Alfred FL 33850
Tel. 863/956-1151
Fax. 803/956-4631
samunder@lal.ufl.edu

Slack, Charles H
University Kentucky
N 106 D Ag Sci Ct
Lexington KY 40546
Tel. 859/257-3168
cslack@uky.edu

Smith, Kenneth L
University of Arkansas
PO Box 3508
Monticello AR 71656
Tel. 870/460-1091
Fax. 870/460-1415
smithken@uamont.edu

Smith, M Cade
Mississippi State Univ
117 Dorman Hall
Miss State MS 39762
Tel. 662/325-7499
Fax. 662/325-8742
csmith@pss.msstate.edu

Smith, Ray H
Biological Rsearch Serv
4601 Spyglass
College Station TX 77843
Tel. 979/777-5602
Fax. 979/690-6272
vsmithbrs@cox-internet.com

Snipes, Charles
Miss State Univ
PO Box 197
Stoneville MS 39762
Tel. 662/686-9311
Fax. 662/686-3334
csnipes@dvec.msstate.edu

Somerville, Laurence
Auburn University
1309 Gatewood Dr
Auburn AL 36830
Tel. 334/844-3585
somerla@ausag.auburn.edu

Sparks, Oscar
University of Arkansas
1366 W Altheimer Dr
Fayetteville AR 72704
Tel. 515/753-9550
Fax. 515/575-3975
osparks@comp.uark.edu

Sphongthong, Thatsaka
University of Kentucky
N 101 Ag Sci Bldg North
Lexington KY 40546
Tel. 859/257-7326

Stall, William M
1243 Fifield Hall
PO Box 110690
Gainesville FL 32611
Tel. 352/392-2134
wms@mail.ifas.ufl.edu

Staples, Johnny T
Auburn University
702 Harper Ave
Auburn AL 36830
Tel. 334/844-3977
Fax. 334/844-3945
jstaples@acesag.auburn.edu

Stapleton, Gregory
BASF Corporation
916 Flicker Dr
Dyersburg TN 38024
Tel. 731/286-2629
Fax. 731/286-6988
stalpegs@basf.com

Steele, Greg
Texas A&M University
Dept of Soil & Crop Sci
College Station TX 77843
Tel. 979/845-8696
Fax. 979/845-0456
gsteele@tamu.edu

Stephenson, Daniel
University of Arkansas
1366 W Altheimer Dr
Fayetteville AR 72704
Tel. 501/575-3955
Fax. 501/575-3975
dosteph@uark.edu

Stevens, David F
DuPont Ag Products
PO Box 1256
Natchitoches LA 71458

Stewart, Alexander
Louisiana State Univ
8105 Tom Bowman Dr
Alexandria LA 71302
Tel. 318/473-6522
Fax. 318/473-6535
sstwert@agctr.lsu.edu

Strachan, W Fred
Aventis CropScience
8967 Ashmere Dr
Germantown TN 38139
Tel. 901/758-1740
Fax. 901/758-8315
fred.strachan@aventis.com

Strahan, Ron
Louisiana State Univ
LSU Agricultural Center
Baton Rouge LA 70803
Tel. 225/578-4070
Fax. 225/578-0776
rstrahan@agctr.lsu.edu

Street, Joe
Delta Branch Expt Stn
PO Box 197
Stoneville MS 38776
Tel. 662/686-3271
Fax. 662/686-5645
jstreet@ext.msstate.edu

Stritzke, Jim F
Oklahoma State Univ
Dept Plant & Soil Sci
Stillwater OK 74078
Tel. 405/744-6419
Fax. 405/744-5269
jstritz@okstate.edu

Swann, Charles W
Tidewater Agri Res & Ext
6321 Holland Rd
Suffolk VA 23437
Tel. 757/657-6450
Fax. 757/657-9333
cswann@vt.edu

T

Tagert, Mary Love
Miss State Univ
Box 9555
Miss State MS 39762
Tel. 662/325-2311
Fax. 625/325-8742
mimortimer@pss.msstate.edu

Takama, Kenji
K-1 Chemical USA
11 Martine Ave, 9th Floo
White Plains NY 10514
Tel. 914/682-8934
Fax. 914/682-9050
kichem@msn.com

Talbert, Ronald E
University of Arkansas
276 Altheimer Dr
Fayetteville AR 72704
Tel. 501/575-2657
Fax. 501/575-3975
rtalbert@uark.edu

Taylor, James M
Miss State Univ
Box 9555
Miss State MS 39762
Tel. 662/325-7555
Fax. 662/325-8742
jtaylor@pss.msstate.edu

Teem, David H
Auburn University
250 Funchess Hall
Auburn AL 36849
Tel. 334/844-3981
Fax. 334/844-3945
teemdav@auburn.edu

Tenpenny, Rachel
University of Florida
817 NW 15th Ave
Gainesville FL 32601
Tel. 352/335-4079
rmtenpenny@yahoo.com

Teuton, Travis
University of Florida
2849 SW 38 PL
Gainesville FL 32608
Tel. 352/392-7512
tteuton@ufl.edu

Thomas, James M
Helena Chemical Co
7664 Moore Rd
Memphis TN 38120
Tel. 901/752-4435
Fax. 901/758-2817
thomasj@helenachemical.com

Thomas, Walter E
North Carolina State Univ
Box 7620
Raleigh NC 27695
Tel. 919/515-5654
Fax. 919/515-5315
wethomas@unity.ncsu.edu

Thompson, Jesse W
Temple-Inland Forest
PO Box 70
Franklin GA 30217
Tel. 706/675-3562
Fax. 706/675-3569
jthompso@templeinland.com

Tindall, Kelly V
Louisiana State Univ
402 Life Sciences Bldg
Baton Rouge LA 70808
Tel. 225/578-1850
utindal@unix1.sncc.lsu.edu

Tingle, Chris
NE Res & Extn Ctr
PO Box 48
Keiser AR 72351
Tel. 870/526-2199
Fax. 870/526-2582
ctingle@uaex.edu

Toce, Mike
BASF Corporation
26 Davis Drive
Res Tria Park NC 27709
Tel. 919/547-2032
Fax. 919/547-2410
toccm@basf.com

Tredaway, Joyce A
University of Florida
PO Box 110500
Gainesville FL 32611
tredaway@ufl.edu

Troxler, Shawn C
3701 Ed Drive
Raleigh NC 27612
Tel. 919/515-5654
Fax. 919/515-5315
sctroxle@unity.ncsu.edu

Trusler, Chad
BASF Corporation
7910 N MacArthur #3032
Irving TX 75063
Tel. 972/556-9001
Fax. 972/556-9195
truslec@basf-corp.com

Tucker, Brian
Clemson University
D-133 PA&S Bldg
Clemson SC 29634
Tel. 864/656-6365
bjtucke@clemson.edu

Tucker, Kevin
Texas A & M
355B Heep Center
College Stat TX 77843
Tel. 979/862-4365
ktucker@taexgw.tamu.edu

Turner, James C
AgriScope LLC
105 Hearthstone Ct
Athens GA 30605
Tel. 706/354-8299
Fax. 706/546-0572
agriscope@aol.com

Turner, Jay
TopPro Specialties
8080 Meadow Creek Cv
Olive Branch MS 38654
Tel. 662/890-7553
Fax. 662/890-7543
jay.turner@topprospecialties.com

U

Unruh, J Bryan
University of Florida
4253 Experiment Dr
Jay FL 32565
Tel. 850/994-5215
Fax. 850/994-9589
jbu@ufl.edu

V

Vader, Judy
Texas A&M University
2474 TAMU
College Station TX 77843
Tel. 979/845-4620
Fax. 979/845-0456
jvader@agr.state.tx.us

VanderSchaaf, Curtis
Auburn University
108 M White Smith Hall
Auburn AL 36849
Tel. 334/844-1033
Fax. 334/844-1084
vandecl@auburn.edu

Vencill, William
University of Georgia
3111 Miller Plant Sci
Athens GA 30602
Tel. 706/542-3117
Fax. 706/542-0914
wvencill@uga.edu

Vidrine, P Roy
Dean Lee Res Stn LSU
8105 E Campus Ave
Alexandria LA 71302
Tel. 317/473-6525
Fax. 318/473-6535
pvidrine@agctr.lsu.edu

Viets, Lloyd O
UAP Timberland
6923 Candlewych Ln
Charlotte NC 28226

Voth, Richard D
Monsanto Company BB1E
700 Chesterfield Pkwy N
St Louis MO 63198
Tel. 636/737-7589
Fax. 636/737-6662
richard.d.voth@monsanto.com

W

W MacRae, Andrew W
North Carolina State Univ
Kilgore Hall Box 7609
Raleigh NC 27695
Tel. 919/661-1302
Fax. 919/515-7747
awmacrae@untiy.ncsu.edu

Walker, Eric R
University of Arkansas
276 Altheimer Dr
Fayetteville AR 72704
Tel. 501/575-3955
Fax. 501/575-3975
erwalke@uark.edu

Walker, Harold
Auburn University
201 Funchess Hall
Auburn AL 36849
Tel. 334/844-3992
Fax. 334/844-3945
rwalker@acesag.auburn.edu

Walls, Carroll E
UAP Timberland
3300 Foxcroft Rd
Little Rock AR 72227
Tel. 501/227-5675
Fax. 501/227-8459
cwalls7760@aol.com

Waltz, Clint
C&SS Redding Bldg
1109 Experiment St
Griffin GA 30223
Tel. 770/228-7300
Fax. 770/412-4774
cwaltz@uga.edu

Warren, Leon S
North Carolina State Univ
Box 7620
Raleigh NC 27695
Tel. 919/515-5651
Fax. 919/515-5315
leon_warren@ncsu.edu

Watkins, Bobby
BASF Corporation
2220 Amelia Ln
Starkville MS 39759
Tel. 662/323-7950
Fax. 662/325-7210
watkinrm@basf.com

Wayland, Mark
BASF Corporation
8432 Stone Wood Cove W
Cordova TN 38018
Tel. 901/737-4858
Fax. 901/737-4859
swayland@midsouth.rr.com

Weathers, William J
Auburn University
272 Funchess Hall
Auburn AL 36849
Tel. 334/844-3985
weathwj@acesag.auburn.edu

Weber, Jerome B
Weed Sci Dept NCSU
PO Box 7620
Raleigh NC 27695
Tel. 919/515-5649
Fax. 919/515-5315
jbweber@ncsu.edu

Webster, Eric P
LSU Ag Center
104 Stugis Hall
Baton Rouge LA 70803
Tel. 225/578-5976
Fax. 225/578-5976
ewebster@agctr.lsu.edu

Webster, Ted
USDA ARS
PO Box 748
Tifton GA 31794
Tel. 229/386-3363
Fax. 229/386-3437
twebster@tifton.cpes.peachnet.edu

Wehtje, Glenn
Auburn University
233 Funchess Hall
Auburn AL 36849
Tel. 334/844-3993
Fax. 334/844-3945
gwehtje@acesag.auburn.edu

Wells, Jerry W
Syngenta Corp Protection
PO Box 18300
Greensboro NC 27419
Tel. 336/632-6324
Fax. 336/292-6374
jerry.wells@syngenta.com

Wells, Wayne
Miss State Univ
PO Box 9555
Miss State MS 39762
Tel. 662/325-2311
Fax. 662/325-8742
wwells@pss.msstate.edu

Whatley, Laura L
BASF Corporation
PO Box 13528
Res Tria Park NC 27709
Tel. 919/547-2291
Fax. 919/547-2880
whatlel@basf-corp.com

Wiese, Ann
Aventis ES
5017 Andover Dr
Plano TX 75023
Tel. 972/633-9176
Fax. 972/633-9176

Wilcut, John
North Carolina State Univ
Box 7620
Raleigh NC 27695
Tel. 919/515-5647
Fax. 919/515-5315
john_wilcut@ncsu.edu

Wiley, Gerald
Valent USA Corp
22401 Hwy 31 S
Underwood IN 47177
Tel. 812/292-3340
Fax. 812/294-3217
gwile@valent.com

Wilkerson, Gail G
NCSU - Crop Science
Box 7620
Raleigh NC 27695
Tel. 919/515-5816
Fax. 919/515-5855
gail_wilkerson@ncsu.edu

Wilkerson, Jessie
Monsanto Company
4006 Old Leland Rd
Leland MS 38756
Tel. 662/378-1021
Fax. 662/378-1033

Williams, Bill
LSU Ag Center
PO Box 438
St Joseph LA 71366
Tel. 318/766-4607
bwilliams@agctr.lsu.edu

Williams, Bob
DuPont
10918 Bullrush Terrace
Bradenton FL 34202
Tel. 941/907-0768
Fax. 941/907-8498
robert.w.williams@usa.dupont.com

Williams, Mark
University of Kentucky
N 318 Ag Sci Center N
Lexington KY 40546
Tel. 859/257-2638
Fax. 859/257-2859
mawillia@uky.edu

Williams, Rick
University of Arkansas
PO Box 3468
Monticello AR 71656
Tel. 870/460-1748
Fax. 870/460-1092
williams@uamont.edu

Williams, Walker A
Auburn University
263 Funchess Hall
Auburn AL 36849
Tel. 334/844-3911
Fax. 334/844-3945
willw7@acesag.auburn.edu

Wills, Gene
Delta Res & Extn Ctr
PO Box 197
Stoneville MS 38776
Tel. 662/686-9311
Fax. 662/686-7336
gwills@drec.msstate.edu

Wilson, Alan
Boise Cascade
288 McReynolds Circle
DeRidder LA 70634

Wilson, David G
Miss State Univ
Box 9555
Miss State MS 39762
Tel. 662/325-2614
Fax. 662/325-8742
dawilson@pss.msstate.edu

Wilson, Galen
FMC Corporation
2070 N Frongate Ct #203
Collierville TN 38017
Tel. 901/565-8054
galen-wilson@fmc.com

Wilson, Henry P
Virginia Tech University
33446 Research Dr
Painter VA 23420
Tel. 757/414-0724
Fax. 757/414-0730
hwilson@vt.edu

Wilson, Sam
United Agri Products
209-3 Dawson Rd
Columbia Sc 29223
Tel. 803/419-1820
Fax. 803/419-6600
sam.wilson@uap.com

Witt, William W
Univeristy of Kentucky
N 106 Ag Sci Bldg
Lexington KY 40546
Tel. 859/257-1823
wwitt@uky.edu

Woods, Rob
Monsanto Company
5191 Robinsonville Rd
Atmore AL 36502
Tel. 251/368-8637
marshall.r.woods@monsanto.com

Wright, Denise
R&D Research Farm Inc
7033 Highway 103
Washington LA 70589
Tel. 337/585-7455
Fax. 337/585-1006
rdfarm@acadian.net

Wright, Ronald S
Miss State Univ
Box 9555
Miss State MS 39762
Tel. 662/325-8201
Fax. 662/325-8742
swright@pss.msstate.edu

Wright, Terry R
Dow AgroSciences
753 Highway 438
Greenville MS 38701

Y

Yanes, Jamie
Agri Business Group
1583 Collingham Dr
Collierville TN 38017
Tel. 901/861-6917
Fax. 901/861-6918
jyanes@abginc.com

Yeiser, Jimmie L
SF Austin State Univ
PO Box 5610
Nacogdoches TX 75962
Tel. 936/468-4806
Fax. 936/468-2359
jyeiser@sfasu.edu

Yelverton, Fred
North Carolina State Univ
Box 7620
Raleigh NC 27695
Tel. 919/515-5639
Fax. 919/515-5315
fred_yelverton@ncsu.edu

Yopp, Frank
Helena Chemical Co
7664 Moore Rd
Memphis TN 38120
yoppf@helenachemical.com

York, Alan C
NC State University
PO Box 7620
Raleigh NC 27695
Tel. 919/515-5643
Fax. 919/515-5315
alan_york@ncsu.edu

Youmans, Cletus D
BASF Corporation
1875 Viar Rd
Dyersburg TN 38024
Tel. 731/697-2943
Fax. 731/287-1788
youmansc@basf.com

Z

Zedaker, Shepard M
Virginia Tech Forestry
228 Cheatham Hall
Blacksburg VA 24061
Tel. 540/231-4855
Fax. 540/231-3330
zedaker@vt.edu

Zhang, Wei
Louisiana State Univ
302 Life Sciences Bldg
Baton Rouge LA 70803
Tel. 225/578-1189
Fax. 225/578-4673
wzhang@agctr.lsu.edu

Zielinski, Meghan
Dow AgroSciences
12592 82nd Terrace n
Seminole FL 33776
Tel. 727/415-0431
Fax. 727/397-7793
mjzielinski@dowagro.com

SUSTAINING MEMBERS

A & L Agric. Laboratories, Inc.
411 North Third Street
Memphis, TN 38105

ALMACO Company
Box 296
Nevada, IA 50201

Aqumix, Inc.
218 Simmons Dr.
Cloverdale,VA 24077

Aventis Crop Science
8967 Ashmere Dr.
Germantown, TN 38139

Ball Research, Inc.
PO Box 1411
E. Lansing, MI 48826

BASF Corporation
7 Cameroons Place
Durham, NC 27703

Bayer Corporation
PO Box 4913
Kansas City, MO 64120

Bellspray Inc dba R&D Sprayers
PO Box 269
Opelousas, LA 70571

Dow AgroSciences
314 N. Maple Glade Circle
The Woodlands, TX 77832

DuPont Ag Products
5363 Old Woodall Court
Doraville, GA 30360

Farm Press Publications
PO Box 1420
Clarksdale, MS 38614

Farmers Supply Cooperative
PO Box 1799
Greenwood, MS 38930

FMC Corporation
1735 Market Street
Philadelphia, PA 19103

Gandy Corporation
528 Gandrud Rd.
Owatonna, MN 55060

Griffin LLC
PO Box 1847
Valdosta, GA 31603

Gylling Data Management, Inc.
405 Martin Blvd.
Brookings, SD 57006

Helena Chemical Company
225 Schilling Blvd., Suite 300
Collierville, TN 38017

Louisiana Agric Consultants
5 Carl Circle
Vidalia, LA 71373

Monsanto Company
1609 Iredell Dr.
Raleigh, NC 27608

PBI/Gordon Corporation
PO Box 014090
Kansas City, MO 64101-0090

Progressive Farmer Magazine
1001 N. Central Ave.
Tifton, GA 31798

Regal Chemical Company
PO Box 900
Alpharetta, GA 30239

SSI Maxim Company, Inc.
PO Box 1954
Kilgore, TX 75662

Syngenta Crop Protection
8000 Centerview Pkwy., Suite 501
Cordova, TN 38018

Tennessee Farmers Coop
PO Box 3003
LaVergne, TN 37086

Thomson Publications
PO Box 9335
Fresno, CA 93791

Timberland Enterprises, Inc.
PO Box 557
Monticello, AR 71655

Valent USA Corporaiton
PO Box 5008
Greenville, MS 38704

Waldrum Specialites, Inc.
4050 A.Dkyron Drive
Doylestown, PA 18901

Weed Systems Equipment Inc.
260 Commercial Circle
Keystone Heights, FL 32656

Weeds, Inc.
250 Bodley Rd.
Aston, PA 19014