PROCEEDINGS

SOUTHERN WEED SCIENCE SOCIETY

New Century: New Opportunities

54th Annual Meeting

Serving Agriculture In:

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

PUERTO RICO

January 22, 23, and 24, 2001
Beau Rivage
Biloxi, Mississippi

ISSN:0362-4463

PREFACE

These PROCEEDINGS of the 54th 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, Weed Scientist of the Year, Outstanding Young Weed Scientist, Outstanding Educator, and Outstanding Graduate Student 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 page 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 2001 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.

Daniel B. Reynolds, Editor
Southern Weed Science Society
www.swss.ws

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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 of 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 publications. Papers not prepared in accordance with these instructions will be returned to the author for retyping, or may not be published.

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 is 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 be 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 number 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, copies, and diskette file 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 text. Single space with double space between paragraphs and major divisions. **Do not indent paragraphs**. See example below.

   2. 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) Word Perfect, 2) Microsoft Word, or 3) ASCII. If abstract or paper contains graphs or figures, they must be in Word Perfect Graphics (WPG) and be black and white. Label diskette giving 1) title of abstract, 2) abstract number, 3) author, 4) section, 5) daytime phone, and 6) file format. If you do not have access to compatible software, secretarial assistance is available at $25.00 per abstract. Contact Daniel B. Reynolds at (662) 325-0519 or at DReynolds@WeedScience.MSState.EDU.

2. Content:

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

   Papers - Title, Author(s), Organizations(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), Organizations(s), Location - Start immediately after title. Use the 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.

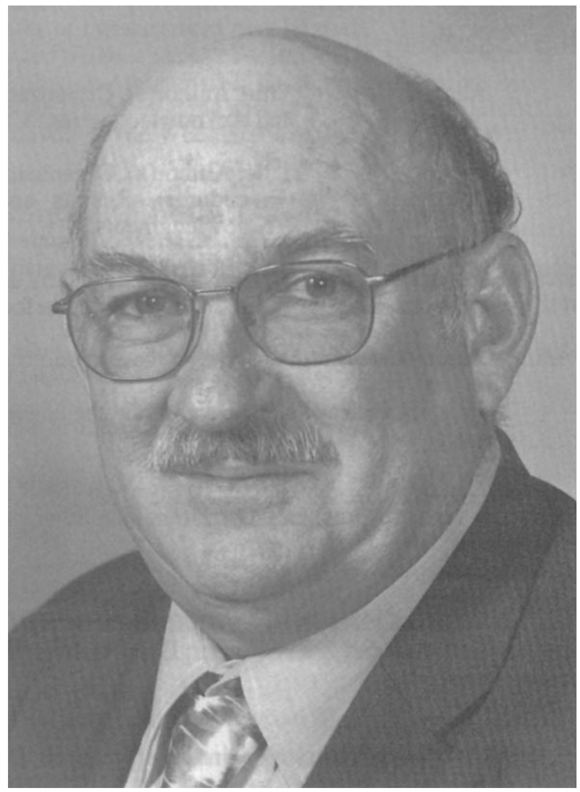
Tables and Figures - Place these after literature citations. Single space all tables. Tables should be positioned vertically on the page. Figures must be black and white photographs or pen and ink drawings on white bond paper. Store charts, graphs, figures, etc., as WPG files on diskette with abstract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

2001 AWARDS

2001 DISTINGUISHED SERVICE AWARD - ACADEMIA

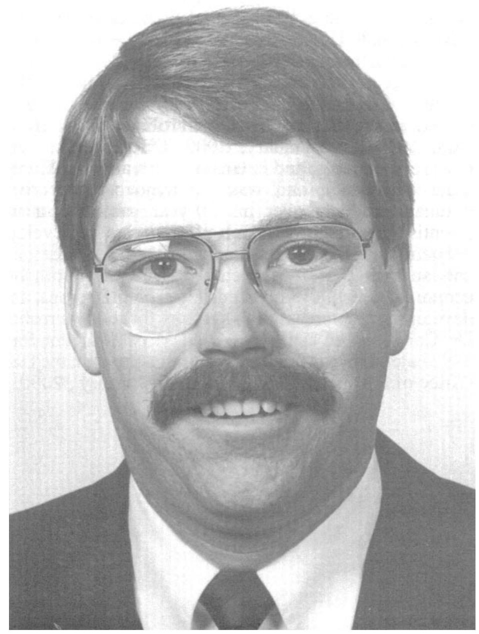
Robert M. Hayes

Robert M. Hayes has been a member of SWSS since 1974. He and his students have participated in the annual meeting over the years by presenting papers and posters. He has served the society in many different roles including as a member of the Board of Directors, as Vice-President, President-Elect, President (1997-98), Past President, Program Chair, Nominating Chair, Finance Chair, and as a member of most of the commit- tees. In addition he has judged student paper and poster contests and was a member of the team when the University of Tennessee hosted the Student Weed Contest in 1997. He has also been a section chair, moderator, projectionist, and has even been entrusted to 'work the lights' during sessions at the annual meeting. Under his leadership the Board approved placing the Weed ID guide on CD-ROM and providing the seed monies and support that led to Forest Plants of the South- east. He has also been a strong supporter of the SWSS endowment and the student programs that it supports. Bob is a professor of Plant and Soil Sciences at The University of Tennessee where he has been involved in Weed Science Research and Graduate Student-training since 1978. He is a native of the 'Volunteer State' and received his B.S. in Agronomy from UT ,and after military duty during the Vietnam era, his Ph. D. in Agronomy (Weed Science) from the University of Illinois. Dr. Hayes held a research and teaching position at the University of Kentucky after completing his Ph.D. Bob has served as the major advisor of 8 M.S. and 7 Ph.D. candidates, and has served on the advisory committee for an additional 15 graduate students. His research has focused on weed management in no-tillage systems and is reported in the popular press, technical publications, journal publications, book chapters, and abstracts. He has presented papers on his research at WSSA, NCWSS, SWSS, and Beltwide Cotton Conferences. Papers on his research were presented at symposiums in Monheim GE, Leverkuzen GE, Lyon FR, and Santa Marta Columbia. He attended and made several presentations during an on-farm educational tour throughout Argentina with the Foundation for Producer Conservation. Dr. Hayes is involved in committees with WSSA, having served on the Finance, Editorial, and Awards Committees. He served a term as Associate Editor *(Weed Technology)* and is a frequent reviewer for *Weed Science, Weed Technology, and* J *of Cotton Science.* He is a recent graduate of the ESCOP/ACOP Leadership Development Program and participated in CAST Conversation on Changes workshop.



2001 DISTINGUISHED SERVICE AWARD - INDUSTRY

Randall L. Ratliff



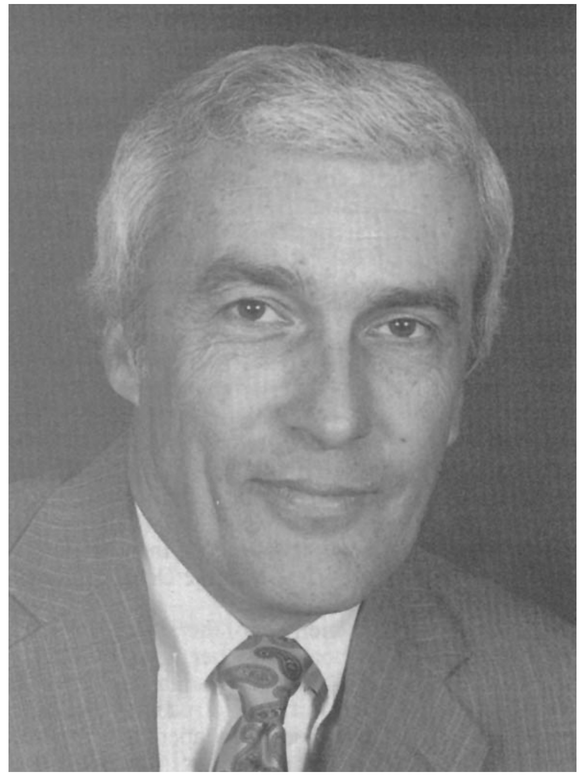
Randy was born January 4,1959 in Ft. Cobb, OK. He gained production experience while working on a small family farm and helping others in the community as a self-employed custom harvester and hay hauler. He graduated from Cameron University in 1981 with a B.S. in Agriculture. Randy entered graduate school at Oklahoma State University and received both a MS (1985) and a Ph.D. (1986). He worked as a Graduate Research Assistant and Senior Agriculturist for the ,mall Grains Weed Control Project. He joined Sandoz Agro, Inc. in February 1987 as a Field Rep in Mississippi. In July 1989, Randy was promoted to Technical Product Specialist for Insecticides and moved to Des Plaines, IL. In January 1991, Randy became the Field 3tation Manager in Greenville, MS. In January 1994, Randy became Regional Manager for the Southern U.S. and Greenville Field Station. In January 1997, Randy joined Novartis Crop Protection, Inc. as Director of Research & Development Herbicide Products Business Unit. Since December 1997, Randy has been Director of Field Research & Development for Novartis. He is responsible for the supervision and coordination of all research, development and sales support activities for the department. Randy has been named to the inaugural class of the Novartis Agribusiness Executive Development Team.

He has been an active member of the SWSS since joining in 1982 and served as a board member. In 1998 Randy served as President of the SWSS. As a graduate student he served on the Placement Committee and received V Place in the 1984 Graduate Student Research Paper Contest. In 1989 he became Chairman of the Placement Committee. He has served as a judge for the Graduate Student Research Paper Contest and acted as a host for the Graduate Student Weeds Contest. Randy received the Mississippi Weed Science Society Industry Award in 1995 and served as that organization's president. He also belongs to the American Society of Agronomy, Crop Science Society of America, and the Entomological Society of America. Randy has been married to Susan since 1981 and has two children.

2001 WEED SCIENTIST OF THE YEAR

Harold D. Coble

Harold D. Coble is Professor of Weed Science at North Carolina State University. Dr. Coble received his BS and MS degrees in Crop Science from North Carolina State University in 1965 and 1967, respectively, and his PhD in agronomy from the University of Illinois in 1970. He served on the faculty at North Carolina State University from 1970 until January, 2000. Dr. Coble served in research, teaching, and extension roles at North Carolina State University, and was the major advisor for 52 graduate students over his 30-year career as a weed scientist. His major research efforts were in developing economic weed control systems for cotton, peanuts, corn, and soybeans. He was active in the development of economic thresholds for weeds in agronomic crops, and in developing implementation systems for those thresholds. Dr. Coble served as the USDA IPM Coordinator for the 1998 calendar year and began a new career with the USDA Office of Pest Management Policy in January , 2000.



2001 OUTSTANDING EDUCATOR AWARD

James L. Griffin

James L. "Jim" Griffin is a Professor of Weed Science in the Department of Plant Pathology and Crop Physiology at Louisiana State University in Baton Rouge, LA. He grew up on a row crop and livestock farm in Greenville, MS and was active in 4-H. He received his B.S. in Agronomy (1975) and M.S. in Agronomy /Weed Science (1976) from Mississippi State University. In 1979, he completed a Ph.D. in Agronomy/Crop Management and Physiology at Pennsylvania State University. From 1979 until 1987 Jim was a project leader at the Rice Research Station in Crowley, LA where his research program involved evaluation of weed management strategies in soybean, rice, grain sorghum, and wheat cropping systems. In 1988 he joined the Department of Plant Pathology and Crop Physiology with responsibility for weed management research in soybeans, sugarcane, and corn. His research interests include integrated weed management, weed-crop competition, weed biology, herbicide persistence, and weed-pathogen-herbicide and weed-insect interactions. Even though Jim has no formal extension appointment, he actively participates in producer meetings, field days, and research update and extension agent training meetings.

His research program has been strongly supported by commodity groups including the Louisiana Soybean and Grain Research and Promotion Board, the American Sugarcane League, and the Louisiana Rice Research Board as well as agri-chemical companies. Efforts with colleagues also have resulted in competitive grant funding from USDA, EPA, and Louisiana Department of Environmental Quality. Over the last 18 years, he has generated 1.78 million dollars in extramural support. He holds a joint appointment with the Louisiana Agricultural Experiment Station and the College of Agriculture (20% teaching) and is a Full Member of the LSU Graduate Faculty. Jim has served or is serving as major professor of26 graduate students and as a member of the advisory committees of 23 others. He currently advises six Ph.D. and two M.S. students. He has served as a coach for the LSU weed team and his students have participated in the Southern Weed Science Society sponsored Weed Contest since 1990. Formal teaching responsibilities include a portion of a team-taught undergraduate pest management course and courses in introductory weed science and field research techniques. Jim was actively involved in the development of the undergraduate Environmental Management Systems Curriculum, which now has an enrollment of more than 130 students. He presently serves as Chairman of the College of Agriculture Courses and Curricula Committee and has been actively involved in developing an undergraduate Agricultural Pest Management degree program, which was approved for the Fall 2000. Jim was recognized for his teaching contributions by being named to the Teaching Merit Honor Roll by the College of Agriculture and Gamma Sigma Delta. In 1995 he received the Joe E. Sedberry Award as the Outstanding Graduate Teacher in the College of Agriculture at Louisiana State University, and in 2000 was recognized as the Outstanding Teacher by the Weed Science Society of America.

During his career Jim has published four book chapters, 74 refereed journal articles, nine Experiment Station Bulletins, and 228 abstracts co-authored with graduate students and colleagues. He is active in the Louisiana Plant Protection Association having served as President and Treasurer. Jim served as Executive Board member of the Southern Weed Science Society and is active on various committees in both the Southern Weed Science Society and Weed Science Society of America. He has served as Associate Editor for *Weed Technology* journal and on numerous peer review panels for competitive grants. Jim was the recipient of the First Mississippi Corporation Award in 1990 for outstanding research in the Louisiana Agricultural Experiment Station, and in 1993 was named the Outstanding Young Weed Scientist by the Southern Weed Science Society. He was recipient of the Research Award for the Louisiana State University Chapter of Gamma Sigma Delta in 1998, and in 1999 received the Doyle Chambers Research Award for career contributions to Louisiana Agriculture.

2001 OUTSTANDING YOUNG WEED SCIENTIST AWARD

John D. Byrd, Jr.

A native of Hartsville, SC, John D. Byrd, Jr., completed his M.S. and Ph.D. at North Carolina State University under Dr. A. C. York and Dr. Harold Coble, respectively. In 1989 he began his career at Mississippi State University in 1989 as an Assistant Extension Specialist and in 1998 was promoted to Professor and Specialist. He is responsible for Extension weed control programs for agricultural and nonagricultural sites, excluding forestry, in Mississippi. In addition, he coordinates and assists with in-service and continuing education weed control programs for county agricultural agents and numerous groups involved in weed control management.

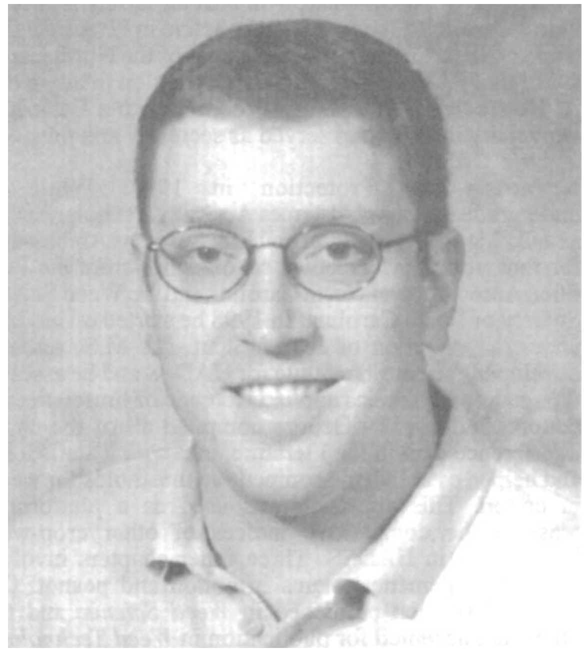
John's current research addresses critical emerging issues in weed science, including noxious weed invasions and herbicide resistance in weeds. His programs have been highly adaptable based on current needs and visionary in addressing

He currently serves as major professor to two Weed Science students at the master's level who are studying the effectiveness of herbicides in controlling cogongrass. As a part of John's teaching appointment, he coordinates the under- graduate Agricultural Pest Management internship, the cooperative education program, and the senior seminar. Other academic endeavors include the 4-H weed science contest and participating in graduate student training.

2001 OUTSTANDING GRADUATE STUDENT AWARD (PH.D.)

Matthew J. Fagerness

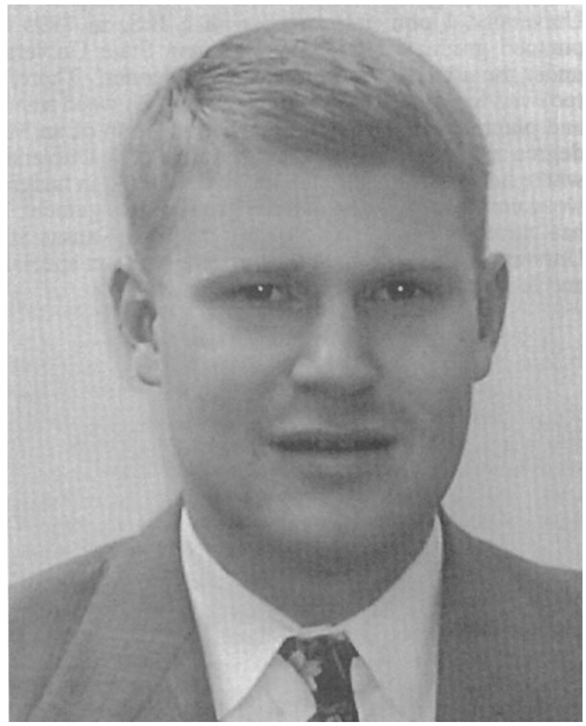
Matt Fagerness was born and raised in Chehalis, WA, a small agricultural and forestry driven town between Seattle and Portland, OR. His interests in the outdoors were founded at a young age but he was not exposed to agronomy until 1989 when he started working as a member of the grounds maintenance staff at Riverside Country Club in Chehalis. He worked seasonally in this context through 1993, by which point he had begun studying turfgrass management at Washington State University. Upon graduating with a B.S. in 1995, he pursued graduate studies at Michigan State University under the advisement of Dr. Donald Penner. There, he received his first in-depth exposure to both weed science and plant growth regulators. His completion of an M.S. degree in 1997 led him to North Carolina State University, where he completed a Ph.D. in 2000 working in turfgrass weed control and bermudagrass growth management. He has currently begun an academic career at Kansas State University where he is the turfgrass extension specialist and focuses upon weed science research.



2001 OUTSTANDING GRADUATE STUDENT AWARD (M.S.)

George H. Scott

George H. Scott was reared on a small family tobacco farm just outside of Milton, a small town in Caswell County, North Carolina. George was very active in FF A in high school and served as vice president and president of the Bartlett Yancey FF A Chapter, vice president of the North Carolina Central Region, and State FFA vice president for the North Carolina FFA Association. George went on to attain the American FF A degree, the highest degree awarded by the FF A. He received his B.S. in Agronomy with a Business Concentration *Magna Cum Laude* from North Carolina State University in 1998 and served as secretary and president of the NCSU



Novartis Crop Protection in 1997. While an undergraduate, he was a James A. Graham scholar, served as a College of Agriculture and Life Sciences Ambassador for four years, and received scholarships from the Plant Food Association of North Carolina and the Weed Science Society of North Carolina. In 1998 he started on his M.S. under the direction of John Wilcut. His M.S. research developed the cotton module for HADSS and he assessed the seedrain dynamics and interference of jimsonweed in cotton. Additionally George compiled all of the cotton interference data in the literature, met with a statistician, and helped establish the competitive thresholds for weeds in cotton. This approach was used as a platform to reassess the competitive indices of other crop-weed interactions in HADSS. Three other chapters involved weed management systems in cotton and peanut. One chapter has been published in *Weed Science* and two others are accepted for publication in *Weed Technology.* In 1999, he was the third highest individual and a member of the winning team at the Northeastern Weed Science Society contest in Blacksburg. George belongs to the Southern Weed Science Society , American Society of Agronomy, the Weed Science Society of North Carolina, and the APRES. He graduated with his M.S. in May 2000 and is currently employed with Universal Leaf Tobacco Corporation and has returned from three months training in Brazil.

SOUTHERN WEED SCIENCE SOCIETY 2000 - 2001
OFFICERS AND EXECUTIVE BOARD

100. SOUTHERN WEED SCIENCE SOCIETY OFFICERS AND EXECUTIVE BOARD

100a. OFFICERS
President - L.L. Whatley - 2002
President Elect - J.E. Street - 2003
Vice President - J.W. Wells - 2004
Secretary-Treasurer - D.W. Monks - 2002
Editor - D.B. Reynolds - 2002
Immediate Past President - D.S. Murray - 2001

100b. ADDITIONAL EXECUTIVE BOARD MEMBERS
Member-at-Large - W.W. Witt - 2001
Member-at-Large - C.D. Youmans - 2001
Member-at-Large - C.T. Bryson - 2003
Member-at-Large - J.E. Driver - 2003
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 - 2001
Student Representative - E. Palmer - 2000

101. SWSS ENDOWMENT FOUNDATION

101a. BOARD OF TRUSTEES - ELECTED
D. Prochaska - President - 2002
H. R. Smith - Vice-President - 2003
T.J. Monaco - Secretary 2004
Vacancy - 2005
A.D. Worsham - Past President - 2001

101b. BOARD OF TRUSTEES - EX-OFFICIO
D. Monks (SWSS Secretary-Treasurer)
J. Wells (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.*

D.S. Murray*	2001	B.J. Brecke	2002
G.E. Coats	2001	J.D. Green	2002
J.F. Stritzke	2001	S. Senseman	2002

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

102a. Distinguished Service Award Subcommittee

P.A. Banks	2001	B.J. Brecke*	2002	P. Dotray	2003
M.C. Boyles	2001	E.C. Murdock	2002	T.R. Murphy	2003
J.B. Weber	2001	S.K. Rick	2002		

102b. Outstanding Young Weed Scientist Award Subcommittee

T.R. Dill	2001	J.W. Boyd	2002	T.C. Mueller	2003
D.R. Shaw	2001	E.F. Eastin	2002	H.D. Skipper	2003
J.F. Stritzke*	2001	J.R. Martin	2002	H. P. Wilson	2003

102c. Weed Scientist of the Year Award Subcommittee

G.E. Coats*	2001	B.W. Bean	2002	C.W. Swann	2003
R. Hoagland	2001	G.N. Rhodes	2002	T. Whitwell	2003
K.L. Smith	2001	W.W. Witt	2002		

102d. Outstanding Educator Award Subcommittee

J.W. Keeling	2001	R.C. Scott	2002	J.D. Burton	2003
E.C. Murdock	2001	S. Senseman*	2002	M. Schraer	2003
D.R. Shaw	2001	R.E. Talbert	2002		

102e. Outstanding Graduate Student Award Subcommittee

T. Baughman	2001	J.A. Dusky	2002	E.S. Hagood	2003
E.P. Webster	2001	E.P. Prostko	2002	R. H. Walker	2003
J.W. Wilcut	2001	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

105. DISPLAY COMMITTEE (STANDING)

K.L. Ferreira	2001	B.W. Bean*	2002
J.A. Mills	2001	J. Braun	2002
D. Porterfield	2001	N.W. Buehring	2002

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	T. Holt	2001	D.W. Monks	2002
J.E. Street	2001	R.M. Hayes	2001	D.Reynolds (Ex-Off)	2002

107. HISTORICAL COMMITTEE (STANDING)

M.C. Boyles	2001	T.R. Dill*	2003
J.A. Baysinger	2001	A. Rankins	2003
E.W. Palmer	2001		

108. LEGISLATIVE AND REGULATORY COMMITTEE (STANDING)

J.D. Byrd	2001	E.F. Eastin	2002	G. MacDonald	2003
M.M. Kenty	2001	K. Melton	2002	C. E. Snipes	2003
T.F. Peeper*	2001	W. Odle	2002		
K.L. Smith	2001	D.G. Shilling	2002		
G. Stapleton	2001				

109. LOCAL ARRANGEMENTS COMMITTEE - 2001 (STANDING)

Chairperson – Mark Kurtz
Audio Visual – Sam Garris
Registration – Laura Clark and Elizabeth Cook
Meal Functions – Rita Helms
Room Setup – David Simpson
Information Booth and Message Center – Rusty Mitchell
Spouses' Program – Robin Arnold
Signs and Exhibits – James Holloway
Graduate Student and Room Reservation – Frank Carey
Public Relations Liaison – Gary Schwarzlose
Placement Liaison – Angus Catchot
Equipment Storage and Security – Larry Walton

110. LONG RANGE PLANNING COMMITTEE (STANDING) – *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.*

R.L. Ratliff*	2001	D.S. Murray**	2002
P.A. Banks	2001	W. W. Witt	2002
R.B. Cooper	2001	T.N. Hunt	2002
J.L. Griffin	2001	F. Yelverton	2002

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.*

W.L. Currey	2001	R. E. Eplee	2002	H.R. Smith	2003
A. Klosterboer*	2001	T.C. Mueller	2003	R. L. Ratliff	2006
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.*

D.S. Murray*	2001	S.O. Duke	2002	H.D. Skipper	2003
C.T. Bryson	2001	J.D. Green	2002	J. Groninger	2003
D. Smith	2001	C.D. Youmans	2002	J. L. Griffin	2003
J.W. Wilcut	2001				

113. PLACEMENT COMMITTEE (STANDING)

K.N. Reddy*	2001	T.A. Baughman	2002	M. McClelland	2003
M. Thornton	2001	T. Heap	2002	S. Murdock	2003
J.W. Wells	2001	E.R. Johnson	2002		

114. PROGRAM COMMITTEE – 2001 (STANDING) – *Consist of the President-Elect as Chairperson and the Program Sectional Chairpersons as the remaining members.*

	Chairperson	J.E. Street
1.1	Agronomic Crops	C.D. Youmans
1.2	Turf, Pasture & Rangeland	T.R. Murphy
1.3	Horticultural Crops	D.K. Robinson
1.4	Forest Vegetation Management	W.D. Mixson
1.5	Utility, Railroad & Highway Rights-of-Way, Industrial Sites	B. Watkins
1.6	Biological, Aquatic & New Weed Problems	C.T. Bryson
1.7	Ecological & Physiological Aspects	P.A. Dotray
1.8	Educational & Regulatory	J.A. Kendig
1.9	Developments from Industry	S.K. Rick
1.10	Application of Herbicides	C.D.Elmore
1.11	Soil & Environmental Aspects	D.L. Jordan
1.12	Research Posters	G.D. Wills

115. PROGRAM COMMITTEE - 2002 (STANDING)

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

116. PUBLIC RELATIONS COMMITTEE (STANDING)

D.P. Montgomery	2001	B. Besler	2002	J.C. Banks	2003
L. Newsom	2001	C.T. Koger	2002	N. Burgos	2003
J.W. Wilcut*	2001	B. Zutter	2002		

117. RESEARCH COMMITTEE (STANDING) – *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.*

J. W. Wells*		2001
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)

C. Moseley	2001	M.C. Boyles	2002	L. Cargill	2003
K.N. Reddy	2001	M. Nespeca	2002	D. Gealy	2003
H.R. Smith	2001	S.M. Zedaker*	2002		

119. SALES COORDINATION COMMITTEE (STANDING)

C.T. Bryson	2001	W.C. Johnson*	2002	M. DeFelice	2003
J.H. Miller	2001	C. Mosely	2002	J.A. Driver	2003
				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	J. Ellis (student rep)

121. STUDENT PROGRAM COMMITTEE (STANDING)

L. Newsom	2001	J.V. Altom	2002	D. Simpson	2003
R.C. Scott*	2001	M.E. Kurtz	2002	R. B. Lassiter	2003
S. Senseman	2001	S.K. Rick**	2002	W. J. Grichar	2003
E.P. Webster	2001	C.D. Youmans	2002	T. Baughman	2003
			G. Stapleton		2003

122. SUSTAINING MEMBERSHIP COMMITTEE (STANDING)

T. Holt*	2001	J.V. Altom	2002	R.L. Ratliff	2003
C. Moseley	2001	T.R. Clason	2002	C. E. Walls	2003
G. Stapleton	2001	C.H. Slack	2002		

123. TERMINOLOGY COMMITTEE (STANDING)

T.D. Klingaman	2001	J.A. Baysinger	2002	J.A. Tredaway	2003
D.R. Shaw	2001	J.W. Boyd*	2002	M.L. Wood	2003
J.W. Wells	2001	C.E. Walls	2002		

124. WEED IDENTIFICATION COMMITTEE (STANDING)

M. DeFelice	2001	J.W. Boyd	2002	M.L. Ketchersid	2003
C. Moseley	2001	C.T. Bryson*	2002		
W.K. Vencill	2001	T.M. Webster	2002		

124a. Forest Weeds Subcommittee

G. Bobo	A.W. Ezell	J.D. Gnegy	K.V. Miller
T.R. Clason	F. Fallis	D.K.Lauer	B. Watkins
C.A. Cobb	W.S. Garbett	J.H. Miller*	J.L. Yeiser

124b. 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	D.L. Jordan	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	F.B. Walls*
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

Minutes of Southern Weed Science Society's Summer Board Meeting
June 24-25, 2000
Beau Rivage Hotel and Casino, Biloxi, MS

President Laura Whatley called the meeting to order at 2:00 pm on June 24, 2000. Attendance included President Elect Joe Street, Vice President Randy Wells, Past President Don Murray, Editor Dan Reynolds, Secretary/Treasurer David Monks, Board Members-at-Large Charles Bryson, Bill Witt, Jackie Driver, Barry Brecke, Clete Youmans, Forestry Representative Shep Zedaker, Graduate Student Representative Eric Palmer, and Business Manager Bob Schmidt.

A motion was made to accept President Whatley's agenda and it passed unanimously.

Business Managers Report
Bob Schmidt gave this report and reported that attendance was down slightly to 524 for members and sustaining members in 2000 compared to 559 for these categories in 1999. Student membership is approximately the same compared to other years. Attendance at the annual meeting was down (476 in 2000, 501 in 1999 and 601 in 1998) for the second year in a row.

Editors report
Dan Reynolds reported that papers from the annual meeting are available in PDF at the SWSS Web site. The Board discussed the possibility of having a committee evaluating abstracts from the annual meeting to prevent misinterpretation and reporting of data that might be damaging to companies. The board suggested that the editor put a disclaimer on the proceedings that says that the society does not support nor endorse data contained in the abstracts.

CAST report
Alan York highlighted all the new CAST issue papers (Invasive Plant Species, Storing Carbon in Agriculture Soils to Help Mitigate Global Warming), briefings (Animal Agriculture and Global Food Supply, Biodiversity) and areas of science (Applications of Biotechnology to Crops: Benefits and Risks, Environmental Science and Engineering for the 21st Century: The Role of the National Science Foundation) on which CAST commented. He also encouraged CAST membership.

WSSA Representative
Barry Brecke reported WSSA's 2002 meeting will be in Reno, Nevada, 2003 in Jacksonville, FL and 2004 in Kansas City, MO. He also discussed the meeting days of Sunday through Wednesday for WSSA's annual meeting. He also highlighted the membership survey and scientific nomenclature. He also mentioned that attendance at the annual meeting was down in 2000 (Toronto) compared to 1999. He also reported that the new Director of Education for WSSA is Leslie Weston of Cornell University, and the description for the Director of Scientific Policy position for WSSA is finalized.

Graduate Student Representative
Eric Palmer reported that the purpose of the Graduate Student Luncheon is to allow students an educational opportunity covering topics of interest. Plans are already underway for the 2001 luncheon. The topic that will be shared with the students at the luncheon will be on "Improving Interviewing Skills" by Dr. Hank Flick from Mississippi State University. In the past, each state's representative was responsible for securing money from industry representatives in their state. He also reported that $200 from industry had already been given to support the luncheon. He also mentioned that there were some inconsistences in the instructions for authors that were mailed out and those online for key words and abstracts. It was also noted by the Board that the electronic instructions for authors should be in the MOP. Also discussed were the forms and questions from the judges to the participants in the poster contest.

The Board commended graduate student members for their activities in their organization. Don Murray made the motion for President Whatley to contact the President of the Endowment Foundation and request them to cover the luncheon for the graduate students at the annual meeting beginning in 2002. Charles Bryson seconded it and it passed unanimously.

Joe Street made a motion for SWSS to cover the graduate representative's expenses to SWSS summer board meeting, Don Murray seconded it and it passed unanimously.

Long Range Planning Committee
A discussion of Committees and their responsibilities covered in the MOP compared to their actual activities was held. Randy Ratliff will send President Whatley suggested changes for the committees and then she will assign a committee to evaluate these changes and make recommendations.

Program Committee
Joe Street reported that the program for the 2001 program at SWSS annual meeting was developing well. He reported that David Brannon, program manager for remote Sensing for NASA, will be giving a talk at the general session this year.

Finance Committee
It was reported that Mike Defelice has indicated that the Weed ID CD Rom will not auto-run properly with Windows 2000. A new full version of the CD-Rom will not be available for 2 years. Mike would like to produce an interim bug-fix version upgrade which would include about a dozen minor bug fixes and content corrections as well as a bonus of the new “Intriguing World of Weeds”. Jerry Wells reported that the Finance committee supported charging a $15 bug-fix upgrade to include a time limit of 1 year (December 2001). He also said the committee supported approving $5766 for replicating and printing new insert booklets, CD-Rom, jewel cases, and shrink wrap the 2.1 version. He also reported that the committee recommends charging $120 per CD for the new 2.1 version. A motion was made to accept the recommendations of the finance committee and it passed unanimously.

The Finance Committee also recommended an increase to $20 for weed identification set 7 to cover costs of printing. Bill Witt made a motion to accept the bid from Cecil Printing (4626 Poplar Ave., Memphis, TN 38117; 901-685-5155), Barry Brecke seconded the motion and it passed unanimously. David Monks moved to increase the price of each weed identification set to $20 per set when purchased individually and change the cost of the book (7 sets plus binder) to $125.00. Joe Street seconded the motion and it passed unanimously.

Advertising in the SWSS Newsletter was also discussed. President Whatley will refer this to a special committee (to include SWSS Newsletter Editor) to look at this topic.

The price of the old WSSA publications that SWSS currently stores was discussed. The Finance committee recommended to sell these publications for $5.00 per copy with no charges for the cost of domestic shipping (no international orders will be shipped), to advertise these publications in the annual newsletter and at annual meetings, and to make these publications available for a period of the next two annual meetings. A motion was made by Jerry Wells and seconded by Barry Brecke to accept these recommendations and the motion passed unanimously.

The Board discussed discounts on the Forestry ID. A motion was made by Dan Reynolds and seconded by Joe Street to extend a 10% discount on the Forestry ID guide when 4 or more whole cartons of 24 are purchased (note: must be in multiples of 24). The motion passed unanimously.

The Board discussed the CD for the Forestry ID Guide and the use of a watermark on each of the photographs to prevent unauthorized use. This technology from Digimarc sounded promising to the Board but they would like more information on the technology. The Board supported going forward with this technology to give SWSS credit and protection for the photographs in this publication. The Board asks the Finance Committee to look at the policy regarding requests for use of photographs from the Forestry ID Guide (note: this includes all uses including those that would further weed science and SWSS).

Discussed the Forestry ID Guide and the costs of the CD and Book including how the pricing structure might change if both were bought. This discussion was tabled to a later time.

It was suggested that the Finance committee look at registration fee for 2002 as fees for 2001 will stay the same.

Site Selection Committee
Arlen Klosterboer and Ray Smith discussed the procedure for site selection and the benefits of using the Site Selection committee. They also suggested that when there is a change in responsibilities of the Site Selection committee that the MOP should reflect this change. A motion was made by Joe Street and seconded by Bill Witt for Arlen Klosterboer and Ray Smith to proceed with the 2003 meeting site planning as described by the MOP. The motion passed. A second motion was made by Joe Street and seconded by Jackie Driver to change the MOP to say that the Site Selection committee will use Helms Briscoe (beginning with selection for the 2004 meeting) to identify properties suitable for our society’s annual meeting and Helms Briscoe will negotiate a contract with the site selected. The motion passed unanimously.

Endowment Committee
GLP training will be from January 20-22, 2001 at the upcoming site of SWSS annual meeting. It was suggested by the board for people registering for the GLP training pay SWSS and then expenses for the training could be taken out prior to transferring funds to the Endowment fund. The Board also discussed Bob Schmidt’s expenses for GLP training. The Board will ask for $500 plus expenses for his additional work at this training. Also discussed were expenses for the breakfast for the Endowment committee being paid by the Society and it was felt by the Board that breakfast for this committee should not be covered by the Society.

Resolution and Necrology Committee
The topic of disbanding this committee was tabled for a later date.

Awards
Outstanding Graduate Student Award Subcommittee
Discussed suggested changes by Todd Baughman with regard to this subcommittee’s suggested rule of eligibility changes for the Outstanding Graduate Student Awards. First, changing the wording allowing previous MS winners of this award to be considered for the Outstanding Graduate Student Award for PhD students was not supported by the

Board. There was also a motion to change the time frame that a student is eligible for the award. This motion failed to pass.

Don Murray reported that he had contacted the chairs of the subcommittees and informed them of information that is in the newsletter and also so they can encourage members to nominate people for the awards.

Minutes
Joe Steet made a motion to accept amended minutes from January 24, 25 and 28, 2000 Board meeting. Bill Witt seconded the motion and it passed unanimously.

Computer Applications Committee
SWSS web site was discussed with Dan Reynolds, chair of this committee, indicating that the goal of this web site is service (MOP, minutes, calendar of events). Two tasks for the committee were laid out: 1) to draft a description of their committee (as a standing committee) for the MOP, and 2) develop the goal of this committee.

Budget
A motion was made to accept the budget (with minor amendment relating to the increased cost of completing weed ID set 8) by Bill Witt, seconded by Dan Reynolds and it passed unanimously.

Banquet
A motion was made by Joe Street that a total of no more than $40 per meal be spent for the banquet meal at the SWSS 2001 annual meeting. It was seconded by Dan Reynolds and it passed unanimously.

The meeting was adjourned at approximately 11:30 a.m

Minutes for SWSS Board Meeting
Beau Rivage and Casino, Biloxi, MS
January 21 and 22, 2001

President Laura Whatley called the meeting to order at 1:00pm on January 21, 2001. Attendance included Past President Don Murray, President Elect Joe Street, Vice President Jerry Wells, Eric Webster, Rob Hedburg, Forestry representative Shep Zedaker, Secretary Treasurer David Monks, CAST representative Alan York, Board Members-at-Large Jackie Driver, Charles Bryson, Barry Brecke, Bill Witt, Cletus Youmans, Eric Palmer graduate student representative, Business Manager Bob Schmidt, and Constitution and Operating Procedures Chair Gene Wills.

A motion to accept President Whatley's agenda was made be Joe Street and seconded by Bill Witt. The motion was approved.

David Monks read the minutes from the June 24-25, 2000 summer board meeting. A motion to accept the minutes was made by Barry Brecke with a second by Cletus Youmans. The motion was approved. David Monks indicated that there is some interest in voting by e-mail. The Board discussed this issue and decided that at this time authenticity would be hard to verify thus they do not support this method of voting.

Business Managers Report - Bob Schmidt
He gave his report. It was also suggested that there needed to be a decision before June on whether GLP training would be offered at the SWSS annual meeting so that it could be advertised extensively in newsletters, etc. This request was taken to the Endowment committee by David Monks.

CAST - Alan York
He presented the activities of CAST in 2000. He also indicated that Dick Stuckey would be retiring this year.

WSSA Report - Barry Brecke
He reported that Dick Oliver is President and Laura Whatley is secretary of WSSA. He also reported the results from the survey on use of scientific names and common names in the Journal of Weed Science and the survey on the WSSA meeting time (days of week). He reported that WSSA will meet in Reno Nevada in 2002, Jacksonville, FL in 2003 and Kansas City MO in 2004.

Old Business
Endowment Committee
Endowment Foundation agreed to cover the cost of the graduate student luncheon beginning in 2002.

Finance Committee
A motion was made by Bill Witt that stated for SWSS not to accept advertising (excluding SWSS) in their newsletter until a such time that formal policy on advertising had been established. A second was made by Barry Brecke. The motion passed. The finance committee will develop a recommendation regarding a policy on advertising.

MOP - Gene Wills
It was decided that the electronic instruction for the Outstanding Graduate Student Nomination needed to be in MOP. Electronic instructions are not from MOP. It was discussed that MOP needs to be updated on the Web. With the current system, updates/changes tend to be slow. Therefore, Dan Reynolds and Gene Wills agreed to work out a method to keep MOP more current. MOP versus award nominees was discussed. Don Murray made a motion for the Distinguished Service award stipend to be increased to $500 so that it was in line with other award. The motion passed unanimously.

Resolution and Necrology Committee
A motion was made that this committee be disbanded. The motion died because no second was made. The Board felt that this committee was still a viable committee and it should not change.

Awards Committee
There was a motion made by Don Murray concerning the Outstanding Young Weed Scientist Award to change MOP from reading "Must be 40 years of age or younger on January 31st of year of nomination," to "Must be 40 years of age or younger on January 31st of the year they receive the award." The motion was seconded by Joe Street. The motion carried with one opposed and one abstention. They reported the names of the award winners for the 2001 meeting. It was discussed that the Board of Directors felt that the deadline for nominating students for awards should be firm and without exception.

Terminology Committee
Joe Street made a motion that the Board recommends that Terminology Committee be disbanded. There was a second and the motion carried. This will be announced in the 1st newsletter of the year.

Proceedings
The Board discussed putting proceedings of annual meetings from the last several years on CD. Dan Reynolds will develop a proposal with regard to this process. He has at least 6 years of files that could be put on CD. Dan Reynolds also said that by next year we could be ready for electronic transmission of abstracts and titles.

Meeting contract
There was a motion made that Bob Schmidt, the business manager, will sign contracts with the hotel regarding the annual meeting. The motion passed unanimously. The Board also felt that there needed to be an indemnity clause negotiated for and included in contracts for the annual meetings sites.

Meeting recessed at 5:00 pm.

January 22, 2001
Call to order at 10:00 am

Finance Committee
The Finance Committee had several recommendations. Don Murray made a motion to accept the Finance Committee's recommendation that 1) Images of weeds (from Forest Plants of the Southeast and their Wildlife Uses) cannot be sold, 2) these Images can be used for educational and non-commercial purposes with the business manager's approval, and 3) Contributors can use their images for any uses that do not conflict with SWSS goals. The motion was seconded by Charles Bryson and it passed. The Finance Committee also recommended that the CD of "Forest Plants of the Southeast and their Wildlife Uses sell for $36 and the CD plus book sell for $60. A motion was made and seconded but failed unanimously after discussion. A motion was made by Don Murray for a CD of "Forest Plants of the Southeast and their Wildlife Uses" to be $50, and both the book (currently $36) plus CD to be $75. Bill Witt seconded the motion and it carried. A motion was made to approve moving set 8 of the Weed ID set to CD. The motion passed unanimously. Registration fee at the annual meeting was discussed to determine if it should be increased or adjusted to cover the cost of the meeting. It will be discussed again at the summer board meeting.

Forest Weeds Subcommittee
Joe Street made a motion that the Forest Weeds Subcommittee be disbanded. A second was made by Jackie Driver. The motion passed unanimously.

Endowment Committee Report
It was discussed that a maximum limit for the luncheon to be $3,500 starting in 2002. Advertisement for GLP was discussed. Suggestions were to advertise GLP on the web, in newsletters, and by e-mailing to members. A suggestion was also made to hold raffling events, such as fishing and hunting to cover graduate student activities.

Business Managers Report
There was a motion made by Jerry Wells to increase Bob Schmidt's salary by 10 % effective, January 1, 2001. Bill Witt seconded the motion and the motion passed unanimously. There was also a motion made to give Bob Schmidt a bonus of $1,000 for extra efforts that he has done this year and the motion passed unanimously.

Meeting adjourned at 12:15 pm.

Minutes for SWSS Board Meeting
Beau Rivage and Casino, Biloxi, MS
January 25, 2001

President Joe Street called the meeting to order at 7:05 a.m. on January 25, 2001. Attendance included Past President Laura Whatley, President-Elect Jerry Wells, Vice President Bill Witt, Student Representative Chad Arnold, Editor Dan Reynolds, Board Members-at-Large Barry Brecke, Charles Bryson, Jackie Driver, Bob Scott, Eric Webster, Business Manager Bob Schmidt, CAST Representative Alan York, Secretary Treasurer David Monks, and Constitution and Operating Procedures Chair Gene Wills.

Old WSSA Publications
The Board discussed whether to further discount old WSSA publications that we have. The feeling of the Board was to not have any further discounts.

Long Range Planning Committee
A motion was made by Charles Bryson to drop the Display Committee and items from the Display Committee in MOP that are suitable for Local Arrangements Committee (LAC) be placed in LAC and items suitable for Sustainable Membership Committee (SMC) go into SMC. A second was made by Barry Brecke and the motion passed unanimously. A motion was made by Laura Whatley stating the Continuing Education Committee be changed to a standing committee. The motion was seconded by Charles Bryson and the motion carried.

Research Report Committee
The Board will discuss whether to rename this committee at the summer board meeting.

Meeting Dates
There was some discussion of changing the meeting dates for our annual meeting.

Public Relations
The President of SWSS will revitalize the committee and encourage the committee to send press releases to home town newspapers of award winners.

Dropping Committees
The Board suggests that a mail out ballot be sent to membership on the committees that will be dropped.

Computer Application Report
A proposal was made for a new web-page for MOP. Laura Whatley will help out with rewording the committee description and moving it to the summer board meeting.

Old Business
The dates for the summer board meeting were discussed. Suggestions were June 2nd and 3rd or June 9th and 10th.

Student Program Committee
It was discussed to allow graduate students to participate in the Student Program Committee. There was a motion made by Bob Scott for the Vice President to provide a list of graduate students submitting papers at the annual meeting to the Graduate Student Program Committee's Chairman by November 15. Bill Witt seconded the motion and the motion carried. There was another motion made by Bob Scott that the Student Organization Representative be an ex-officio member of the Student Program Committee. Laura Whatley seconded the motion and the motion carried unanimously.

Program Sections
A motion was made to rename Section VII in the program of the annual meeting from "Ecological, Physiological and Biological Aspects of Weed Science" to "Physiological and Biological Aspects of Weed Science", and to delete Section VI and renumber accordingly. Bill Witt made the motion, Jerry Wells seconded the motion and it passed (1 opposed). Laura Whatley made a motion to do away with the numbering system for each of the sections and refer to the title only. David Monks seconded the motion. The motion failed from lack of support.

MOP
The Board discussed how to fill vacancies for the executive board if they could not fulfill their duties. Gene Wills will develop a language for the MOP with regard to this and bring it to the summer board meeting.

Graduate Student Report
Graduate Students discussed the importance of Endowment. They suggested that the Endowment have a Web Page to highlight the programs that they do. The graduate students will work with Endowment on a raffle to raise money.

Business Management Report

The attendance was stated to be 492. Marathon, Monsanto and Helena were picked up as sustaining members. It was discussed that copies of the images of photographs, slides, etc from the "Forest Plants of the Southeast and their Wildlife Uses" book were needed for the Business Manager to have them available for educational and non-commercial purposes. Joe Street will check with Jim Miller on photos, slides, etc.

Meeting adjourned at 9:30 am.

BUSINESS MANAGERS REPORT - Bob Schmidt

January 18, 2001

Southern Weed Science Society

Business Manager's Report

Membership as of December 31

	2000	1999	1998	1997	1996	1993	1988
Members and Sustaining Members	527	559	662	661	637	756	824
Students	131	136	136	120	139	103	102
Totals	658	695	798	781	879	776	1,015

Research Methods to date

Expense $37,107 Income $40,328

Weed Identification Guide to date

Expense $396,523 Income $728,486

Weed ID sales for the first 6 months is $1,368 as compared to $5,197 for the same period a year ago. Budget for year was projected with sales ofcomplete Weed ID and set #7 of $20,000

Weed CD-ROM version 1, final report
Expenses $21,936 Income $57,691

Weeds of the United States and Canada CD-ROM
Expenses $6,051 Income $69,038

We are now down to less than 50 copies of version 2

Forest Plants of the Southeast and Their Wildlife Uses

Expenses $102,773 Income $74,237

Good Laboratory Practice for the Field

Registration	
Basic	3
Advance	8
Basic and advance	10

Endowment Foundation

Only ten people order the "Veteran" buttons when they registered for the SWSS meeting.

Preregistration

	2001	2000	1999	1998	1997	1996	1995	1994	
Members	248	249	261	285	292	282	331	319	
Students	87	115	116	74	74	63	67	63	
Total	335	364	377	359	365	345	398	382	
Percentage of final		75%	75%	75%	67%	62%	60%	56%	61%
Total Attendance	446 est 476	501	601	584	566	703	622		

EDITORS REPORT - Presented by Daniel B. Reynolds

Summary of Progress: The 2000 Proceedings contained 431 pages. This was a decrease of 56 pages over the Proceedings from 1999. 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. 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.		69	
General Session	3	14	2
Weed Management in Agronomic Crops	84	47	0
Weed Management in Turf, Pasture, and Rangeland	21	13	0
Weed Management in Horticultural Crops	11	6	0
Forest Vegetation Management	40	62	11
Vegetation Management in Utility, Railroads & Highway Right-of-Ways, and on Industrial Sites	12	11	1
Ecological & Physiological Aspects of Weed Management	24	12	0
Educational & Regulatory Aspects of Weed Management	33	6	1
Developments from Industry	23	14	1
Application Technology	9	6	0
Soil & Environmental Aspects of Weed Science	12	15	1
Posters	76	48	1
Symposiums	9	6	0
State Extension Publications, Weed Survey, Economic Losses, Index		36	
Indexes, Registrants, etc		66	
Total Abstracts & Papers	357	246	17
Total - Other		185	
Grand Total	**348**	**431**	**17**

Objective(s) for Next Year: To have electronic copy posted to web by March 1st, and hardcopy to printer by April 1st. The second objective is to have paper and abstract submission capabilities functional by summer Executive Board Meeting. Revise the information for authors and graduate students. Develop more specific guidelines relative to publishing full manuscripts that contain tables and figures to facilitate timely publication with minimal editing.

Recommendation or Request for Board Action:

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 for election of the officers of Vice President, Board Member-at-Large (Academia, and Industry), Editor, and Endowment Trustees (4 and 5 year Trustees) were mailed out on October 11, 2000 with a November 15, 2000 deadline. Ballots returned by November 15, 2000 were tabulated and the officers elected for 2001 are Bill Witt - Vice president, Eric Webster - Board Member-at-Large, Bob Scott - Board Member-at-Large, Peter Dotray - Editor, Phil Banks - Endowment Trustee (4-year term), and Bob Hayes - Endowment Trustee (5 year term). A total of 276 ballots were cast with the highest number of votes being cast for Vice President and the Endowment Trustees. Only 6 votes came in after the deadline of November 15, 2000.

The net worth of the Southern Weed Science Society as of May 31, 2000 is $253,820. 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

Summary of Progress:

The balance sheet for the SWSS Endowment Foundation , Inc. of September 2000, shows assets of $218,278.47. This is an increase of $41,000.00 over the 1999 Financial Statement of the same time. This amount was obtained from the following:

$24,000 ------------ Contributions including $12,000 from GLP training.
$10,000 ------------ Interest on investments.
$10,000 ------------ Income transferred from SWSS general budget.
$ -3,000 ------------ Operating expense including awards and cost of stock transfer.

Income from 2001 GLP training will be approximately $6,100 - $6,500 after expenses are subtracted. This will be a permanent feature at the SWSS annual meetings. We will offer the education be supplied by all Chemical companies, not just Syngenta. This annual GLP meeting will be advertised in many Newsletters including all Weed Science Society, NAICC, ESA, ASA, Hort. Society, Path.Society, IR-4, etc. The GLP meeting will be a complete 2.0 day meeting because the present 1.5 day meeting may be rushed for all to absorb the amount of information provided.

The Endowment has agreed to support the annual Student Luncheon held during the SWSS annual meeting with a cap of $3,500. This amount will be taken from proceeds from GLP training. This way the students will not have to obtain funds from Industry.

Members of the Endowment Committee suggested that we support a raffle to raise money for the Foundation. Prizes would be a **Quail hunt in Ga., Deer hunt in S. Texas, Duck hunt in Stuttgart, Ark., Turkey hunt in Ga., Goose hunt in Texas or Louisiana., Bed & Breakfast from a list of Southern establishments, Original Paintings from Southern Artist. These are a list of considerations and majority of events will be donated to the Endowment**. Raffle tickets will be sold by Weed Science Students, Industry representatives, and University personnel. Details will be finalized in March.

Donations to anyone retiring or deceased can be made to the Endowment Foundation in memory of a specific individual. When any present or past member of the SWSS passes away, their friends would like to show their respect. This is a way to do it. A donation “In Honor of Someone” can be made to the Endowment. It can be from an individual, company with matching funds or group of his/her friends. A box in each Newsletter will have the information on each deceased person and the application form to complete.

David Prochaska
President
SWSS Endowment Foundation

Committee #: 102	**Committee Name:** Awards Committee (Standing)

Summary of Progress:
The annual call for nomination for the seven awards was published in the summer newsletter. There were multiple nominees for the awards and subcommittee chairpersons informed me that the quality of the nominees were especially good and their choices were very difficult to make. The award and recipients are as follows:

Distinguished Service Award, Industry - Randy Ratliff

Distinguished Service Award, Academia - Bob Hayes

Outstanding Young Weed Scientist Award - John D. Byrd, Jr.

Weed Scientist of the Year Award - Harold Coble

Outstanding Educator Award - James Griffin

Outstanding Graduate Student Award, M.S. - George H. Scott

Outstanding Graduate Student Award, Ph.D. - Matthew Fagerness

Objective(s) for Next Year: According to the MOP, the nomination files of all unsuccessful nominees will be forwarded to the next subcommittee chair with the exception of the nominees for the Outstanding Graduate Student Awards.

Recommendation or Request for Board Action: None; however, for future reference it would be my suggestion to continue with the restriction of OGSA being eligible for nomination during their year of graduation and not extending this time line. I hope both candidates are present at the awards banquet this year, both are now employed and living outside the southern states and their ability to attend the banquet was a little questionable.

Finances (if any) Requested: With the exception of the OYWSA which is industry sponsored, I think that we have all awards on financial parity now.

Respectively submitted;

Don S. Murray, Awards Committee Chair

B.J. Brecke, Chair, Distinguished Service Award Subcommittee

P.A. Banks	E.C. Murdock	P. Dotray
M.C. Boyles	S.K. Rick	T.R. Murphy
J.B. Weber		

J.F. Stritzke, Chair, Outstanding Young Weed Scientist Award Subcommittee

T.R. Dill	J.W. Boyd	T.C. Mueller
D.R. Shaw	E.F. Eastin	H.D. Skipper
	J.R. martin	H.P. Wilson

G.E. Coats, Chair, Weed Scientist of the Year Award Subcommittee

R. Hoagland	B.W. Bean	C.W. Swann
K.L. Smith	G.N. Rhodes	T. Whitwell
	W.W. Witt	

S. Senseman, Chair, Outstanding Educator Award Subcommittee

J.W. Keeling	R.C. Scott	J.D. Burton
E.C. Murdock	R.E. Talbert	M. Schraer
D.R. Shaw		

T. Baughman, Chair, Outstanding Graduate Student Award Subcommittee

E.P. Webster	J.A. Dusky	E.S. Hagood
J.W. Wilcut	E.P. Prostko	R.H. Walker
	J.D. Green	

Committee #: 102a **Committee Name:** Distinguished Service Award Subcommittee

Summary of Progress: A call for DSA nominations was published in the SWSS newsletter and the chair requested those nominating candidates in 1999 not selected to update the award nomination. Nominations for two candidates from academia and one from industry were received. All three nominees were very strong candidates. The committed was polled and Bob Hayes, University of Tennessee, was selected for DSA-Academia and Randy Ratliff, Novartis, for DSA-Industry.

Objective(s) for Next Year:Continue to encourage members to nominate individuals deserving of the DSA ~ award so size of the candidate pool can be increased.

Recommendation or Request for Board Action: No Board Action required

Finances (if any) Requested:

Respectively submitted:

P .A. Banks 2001	B.J. Brecke 2002, Chair	P. Dotray 2003
M.C. Boyles 2001	E.C. Murdock 2002	T .R. Murphy 2003
J.B. Weber 2001	S.K. Rick 2002	

Committee #: 102b	**Committee Name:** Outstanding Young Weed Scientist Award Subcommittee

Summary of Progress: July 25, 2000- I wrote a letter to everyone on the subcommittee and asked that each member actively review and submit if appropriate the young weed scientists working in their states, plus asked several members to review scientist in one adjacent state. I personally contacted the two people that nominated non-recipients from last year's pool.

September 30, 2000-We received five nominations for the Award by the deadline.

October 9, 2000- Nomination packets and ranking sheets were sent to all members, with deadline of October 23, 2000.

Novemer 1, 2000- I mailed results of our recommention to Don Murray, Chairman of Awards Committee, plus copy of nomination packet (with photo and biographical sketch) of winner

Objective(s) for Next Year: Chairman and subcommittee need to repeat process.

Recommendation or Request for Board Action: Need to reword item (c) in the listing of requirements currently listed in the NOMINATION FORMAT. (c) must be 40 years or age or younger on January 31 of the year nominated for the award, as changed, would read, (c) must be 40 years of age or younger on January 31 of the year they receive the award.

I realize that or was probably a typo carried over from the past, but it needs to be corrected by the Board to insure that it is correct next year in newsletter, etc.

As (c) is currently listed, the year nominated for the award leads to confusion because they are actually nominated in September of 2000 for the 2001 Award. So, is the year nominated 2000 or 2001?

Finances (if any) Requested:

Respectively submitted:

Subcommittee Chair: J. F. Stritzke
Chair Phone: 405-744-6419
Chair e-mail: jstritz@okstate.edu

Subcommittee Members and terms of service:

T.R. Dill 2001	J.W. Boyd 2002	T.C. Mueller 2003
D.R. Shaw 2001	E.F. Eastin 2002	H.D. Skipper 2003
J.F. Stritzke 2001	J.R. Martin 2002	H.P. Wilson 2003

Committee #: 102e **Committee Name:** Outstanding Graduate Student Award Subcommittee

Summary of Progress:
Summary of Progress: The Outstanding Graduate Student Award had 4 M.S. level students and 5 Ph.D. level students nominated this past year. The Subcommittee voted to award the M.S. level award to George Scott (North Carolina State University) and to award the Ph.D. level award to Matthew Fagerness (North Carolina State University).

Objective(s) for Next Year:
There is no action plan from the subcommittee at this time.

Recommendation or Request for Board Action: There are no recommendations from the Subcommittee for the Board at this time.

Finances (if any) Requested: There is no additional financial request for the Board at this time.

Respectively submitted:
Committee Chair: Todd Baughman
Chair Phone: 940/552-9941
Chair e-mail: ta-baughman@tamu.edu

Committee Members and terms of service:

J. A. Dusky	2002	E. S. Hagood	2003	(new member)	2004
J.D. Green*	2002	R. H. Walker	2003	(new member)	2004
E.P. Prostko	2002	(new member)	2003	(new member)	2004

(new members have yet to be named)

Committee #: 103	**Committee Name:** Computer Applications (Standing)

Summary of Progress:
The committee's primary focus at this point is the website. The group decided that on the front end this should be a service to the membership rather than an educational site. Emphasis has been placed on completing the title and abstract submission procedures for the web. The group has already developed two list-servers. One is for the general membership and the other is only for use by the Executive Board. These list-servers allow anyone to send a message to all members subscribed to the list. Transparent to the user, all messages are held in a send que until reviewed and approved by the web-site administrator.

First Draft of Verbage for MOP
The Computer Application Committee shall:
1)Consist of a Web Editor appointed to a two-year term, website administrator, and eight other members each appointed to a four-year term. Appointed members will be selected from industry, academy, and governmental weed science programs. The web editor will be selected from the group having at least one year of service on the committee.

2) Establish mechanisms, including publications and symposia, to provide awareness, support, and technical advice to membership on the website and advances in computer technology and software applications for their research, teaching, extension, and regulatory needs.

3) Promote information exchange and foster the development of electronic publications that will be used by members and non-members.

4) The Web Editor shall appoint sub-committee chairs to a two-year term from the Computer Applications Committee membership. It will be the responsibility of the sub-committee chair to develop a structured support group that promotes the submission of information by other committees and members, edits content when necessary, and provides technical advice to the Web Editor. Current sub-committee groups include but will not be restricted to (a) Awards, (b) Title Submission, (c) jobs, (d) related websites, (e) new technology; and (f) other.

5) To insure desired information is posted on website, the Web Editor will get approval from SWWS President before posting or deleting information and major information postings or policy decisions will have to be approved by the Board.

6) Assist the Society's administration with computer application needs that will improve the efficiency and management of the annual meeting and society business such as LCD presentations and electronic publications.

Objective(s) for Next Year: The group would like to have on-line submission of titles, abstracts, and committee reports available for the 2002 annual meeting. This would greatly increase the efficiency with which the editor would collect electronic copies of the reports.

Recommendation or Request for Board Action:

Finances (if any) Requested: $500 for web support.

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

Committee #: 104 **Committee Name:** Constitution and Operating Procedure (Standing)

Summary of Progress: At the summer meeting of the SWSS Executive Board in June 1999 and at the annual meeting in January 2000, suggestions for changes in the SWSS Operating Procedures were presented to the Executive Board. Following the January 2000 Annual Board Meeting, approved revisions and directives for changes as derived by the Executive Board were made in the SWSS Manual of Operating Procedures (MOP). During May 2000, the revised edition of the MOP was submitted for distribution on the SWSS Web Site, http://www.swss.ws

Objective(s) for Next Year: To continue with timely revisions of the SWSS Manual of Operating Procedures as directed by the SWSS Executive Board

Recommendation or Request for Board Action: None

Finances (if any) Requested: None

Respectively submitted:

Chair: Gene D. Wills
Chair Phone: 662-686-9311
Chair e-mail: gwills@drec.msstate.edu
Committee Members and Terms of Service: Joan Dusky, 2003 and Robert Hayes, 2003, Gene Wills 2003

Committe #: 105 **Committee Name:** Display Committee (Standing)

Summary of Progress:
All SWSS sustaining members were sent a letter asking for their participation in presenting a display at the 2001 SWSS annual meeting. The following indicated their desire to present a display:
PBI/ Gordon Corporation
Mississippi State University
Burch Company
CAST
Bellspray, Inc.
University of Missouri - 2000 Weeds Contest

Unfortunately the participation of sustaining members in presenting a display continues to be low. Consideration should be given to allowing displays of companies other than sustaining members

Objective(s) for Next Year:

Recommendation or Request for Board Action:

Finances (if any) Requested:

Respectively submitted:
Brent Bean, Chairman

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

Summary of Progress:

The Finance Committee was requested by the Executive Board to provide recommendations on 4 topics and present them to the board in Biloxi at the annual meeting for their review.

Policy on using photographs from Forest Plants of the Southeast.

The following information was obtained from a conversation with James Miller, co-author of the book. The society paid a professional photographer, Ted Bodner to take the photographs. The society has the rights to these images. About a third of the images in the book were taken by James Miller. Several other people also donated photographs to be used in the book. There will be a copyright notification on each image used in the CD Rom version of the publication. The entire collection of images is copyrighted by SWSS. Images were copyrighted to protect the society from someone using the images from the CD Rom without permission for gain.

The board specifically wanted this committee to provide a policy for the potential sale of images to third parties for their review.

The committee agreed that a policy should be written to aid future SWSS boards who may not be familiar with or recall the circumstances for the development of the book.

The following policy is submitted for review:

Policy for selling images from the book and CDRom versions of Forest Plants of the Southeast.

Images can not be sold.
Images can be used for educational/noncommercial purposes with the approval of the SWSS business manager, SWSS permission to use should be cited where images are used.
Contributors will be allowed to use their images at no charge for any use that does not conflict with SWSS sales of the book/CD.

Registration Fees for 2002

The annual meeting should be self supporting and the intent should be to adjust the registration fees to cover the meeting expenses. Historically, there have been many more meetings come up short than not. In 2000 in Tulsa an additional $8.58 per person would be required to have met the meeting expenses. In 1999, registration fees could have been $5.09 less to meet expenses. In 1998 in Birmingham we were short by $10.08 per person.

Objective(s) for Next Year:

Recommendation or Request for Board Action:

The recommendation of the finance committee is to adjust the registration fee for 2002 to cover the actual meeting expenses. While there is some uncontrollable variability, the recommendation is for the Finance Committee to review the final numbers from the Biloxi meeting in 2001 and review the contract for 2002 and adjust to registration fee and submit at the summer board meeting for approval.

The committee also recommends that income from selling copies of abstracts at the meeting should be used to pay for meeting expenses. If the registration fees and other meeting income exceeds the meeting expenses the SWSS Executive Board can donate the money to the Endowment if it desires.

Funding for transferring Arlyn Evans slides to Photo CD

Finance Committee recommends unanimously to approve funds for transferring slides.

Cost of Forestry book and CD Rom when purchased together.

Recommend that the CD sell for $36, the book and CD sell for $60 if purchased at the same time.

Finances (if any) Requested:

Respectively submitted:
Jerry Wells, Chairman

Jerry Wells 2002	T. Holt 2001	D.W. Monks 2002
J.E. Street 2001	R.M. Hayes 2001	D. Reynolds (Ex-Off) 2002

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

Summary of Progress:
The committee met virtually via email several times during the year and met at the Annual Meeting in Biloxi, MS. At the request of the President, the committee focused on a review of SWSS committees and committee structure. Several specific recommendations were made and are attached as an appendix to this report. It was generally felt that the MOP was out of date for most committees and a general recommendation to update the MOP was made. It is recommended that the Display, Terminology and Newsletter Information committees be dropped. The committee also would recommend that all of the Special committees be re-evaluated for either conversion to standing committee status, continuing as a special committee or ceasing to exist.

The committee continues to be concerned with the declining membership of the Society. Other Regional Societies appear to be more stabile in membership than the SWSS and the committee wonders if the timing of our meeting is a reason for this continued decline. To address this possibility, the committee urges the Board to conduct a membership survey concerning moving the meeting to either the summer or fall. We would like the survey developed to present several options for ranking by the members. We also encourage this topic to be mentioned at the General Session, Business meeting and Banquet to stimulate interest and discussion in the membership. We also would like to develop a vehicle to understand why people who choose not to attend our meeting.

The committee recommends that the MOP and constitution be referenced by version and adoption date and a copy of each year's MOP be archived. This would allow for future boards to examine the minutes of previous meetings to understand the thinking behind the MOP and constitution. This would be a great decision aid when considering new changes to the MOP and/or constitution. Accompanying this recommendation, the committee would like to insure that a continued effort be made by the Secretary to capture sufficient detail in the minutes to facilitate an understanding of the discussion that leads to Board decisions.

The committee would welcome input from the President and Executive Board as to future topics to address.

Review of and Recommendations for SWSS Committees

Awards Committee. Carefully review the MOP.

Constitution and Operating Committee. Establish a committee with defined term limits. Form a small elite editorial committee to organize and clean up the MOP.

Display. Drop the committee. Assign a person on the Local Arrangements Committee to handle the displays. They generally handle it anyway.

Finance Committee. Make it very clear in the MOP that budget items should go through this committee and then this committee will make a "recommendation" to the Board for approval, disapproval, or modification. This is especially important for large budget items.

Historical Committee. The MOP is in desperate need of review. The Board should discuss the mission of this committee and either support or disband. We feel that a SWSS history is a great project, but are unclear how to drive it forward.

Legislative and Regulatory. Major MOP revisions are necessary. We have not had a Washington D.C. trip in at least 3 or 4 years. We should be involved with southern states legislation or legislation that affects the southern states. Should update the MOP to include a description of how the Washington Liaison representation of SWSS operates. A Memorandum of Agreement with WSSA should be included in the MOP. This committee is still needed and should be composed of one representative from each state.

Local Arrangement. Continue to update the MOP as necessary.

Long Range Planning. This committee should continue to function with specific objectives that are measurable.
Meeting Site Selection. Revise to require the use of Helms-Brisco. We would suggest that H/B come forward with a list of appropriate properties, then the committee make the recommendation to the Board.

Nominating Committee. Okay.

Placement Committee. Okay.

Program Committee. Okay.

Public Relations. This committee is not functioning at all like their duties are described in the MOP. If all we want is a photographer at the banquet, roll that duty into the responsibility of Local Arrangements Committee and drop this committee. If we do want the committee to function as described in the MOP, we need to find very energetic people to serve on this committee.

Research. Consider renaming to more closely align name with function such as 'Weed Survey and Extension Publications'.

Resolutions and Necrology. Okay

Sales Coordination. An important committee and at present is probably not getting enough help to be fully effective. Is there a Helms-Brisco out there that would help with distributing our publications? I know there is Amazon.com and others who will "sell" the products, but I think we need someone or an organization who can make contact with these sellers on our behalf. We recommend hiring a consultant to help us in this area. We also suggest adding 'Advertisement' to the title and scope of this committee. On a related note, we urge the President to appoint someone to visit with the WSWS concerning their arrangement with Amazon.com.

Southern Weed Contest. Okay, although it is a very large committee.

Student Program. Insure that the MOP states that rule changes must be approved by the Board of Directors after recommendations from the committee.

Sustaining Membership. This committee needs to be revitalized. We need to expand our scope beyond basic chemical manufacturers.

Terminology Committee. Drop this committee after insuring that the SWSS is included on the WSSA Terminology Committee.

Weed Identification. Continue as currently organized.

Computer Applications. Change to a standing committee. Encourage the committee to keep the website up to date.

Continuing Education. Change to a standing committee since CEUs are offered at all of our meetings.

Newsletter Information. Drop this committee if the Editor feels that it is not being used.

Others. (External Funding, Herbicide Resistance, Membership, and Sales) We recommend that the Board review these committees and their purpose and results. We feel that if a committee is needed long term it should be made to a standing committee and not continue as a special committee for several years. In general, we feel that if a committee is in existence for over 3 years, it should be made a standing committee or discontinued.

Objective(s) for Next Year:

Recommendation or Request for Board Action:

Finances (if any) Requested:

Respectively submitted:

Respectfully submitted:

R. L. Ratliff, Chair P. A. Banks R. B. Cooper J. L. Griffin D. S. Murray
W. W. Witt T. N. Hunt F. Yelverton

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

Summary of Progress: During May 2000 the Nominating Committee was activated and asked to submit potential candidates for Vice President, Board Member-at-Large from Academia and Industry, Endowment Trustee (4-year term) and Endowment Trustee (5-year term). The reason for the Endowment Trustee with a 4-year term was to fill a position not filled by election the year before. The committee members were asked to provide potential candidates who were willing to run for office if selected by the Nominating Committee. Names of several candidates were submitted and these were ranked by the committee. Ballots were mailed to the voting membership in a timely manner in October and approximately 275 members cast their ballots. The Secretary/Treasurer reported the results of the election to me and President Whatley shortly after the November 15 deadline. President Whatley notified both the successful and unsuccessful candidates. The following candidates were placed on the ballot and the successful candidate has an asterisk by their name.

Vice President	Joan Dusky Bill Witt*
Board Member-at-Large (Academia)	Scott Senseman Eric Webster*
Board Member-at-Large (Industry)	Renee Keese Robert Scott*
Endowment Trustee (4-year term)	J.C. Banks* Eric Prosko
Endowment Trustee (5-year term)	Bob Hayes* Tom Mueller

Objective(s) for Next Year: The entire list of potential candidates will be given to President Whatley for consideration by her committee.

Recommendation or Request for Board Action: None

Finances (if any) Requested: None

Respectively submitted:

D.S. Murray, Chair	C.T. Bryson	D. Smith
J.W. Wilcut	S.O. Duke	J.D. Green
C.D. Youmans	H.D. Skipper	J. Groninger
J.L. Griffin		

Objective(s) for Next Year:

Recommendation or Request for Board Action:

Finances (if any) Requested:

Respectively submitted:

Committee #: 113	**Committee Name:** Placement Committee (Standing)

Summary of Progress:

Position desired and position available forms were included in the December 2000 issue of the SWSS Newsletter. Local Arrangement Committee provided excellent personnel and computer facilities to run placement service during the 2001 annual meeting. Thirteen position available and 17 position desired forms were filled out and were on display at the 2001 annual meeting in Biloxi, MS. Copies of these forms were forwarded to the WSSA Placement Committee Chairperson.

Objective(s) for Next Year: No new objectives

Recommendation or Request for Board Actions: None

Finances (if any) Requested: None

Respectfully Submitted:
T.A. Baughman, E.R. Johnson, T. Heap, M. McClelland, S. Murdock, M. Thornton, J.W. Wells, K.N. Reddy, Chairperson.

Committee #: 114	**Committee Name:** Program Committee: 2000 (Standing)

Summary of Progress:
The theme of the 54th annual Southern Weed Science Society Meeting in Biloxi, MS will be: "New Century - New Opportunities". This theme reflects the new opportunities in the frontier of remote sensing. Dr. Jon Arvik, Remote Sensing Technology Center, Mississippi State University, will deliver the general session keynote address on the opportunities for weed scientists in the area of remote sensing. "Meeting the Challenge" will be the title of Dr. Laura Whatley's presidential address.

The Board of Directors meeting will begin on Sunday afternoon and continue Monday morning. Numerous committees will meet Monday morning also. 1ne program will begin Monday afternoon with concurrent sessions. A total of 90 posters and 209 papers will be presented at the annual meeting. The draft program was sent to Bob Schmidt on November 1. and the printed program was delivered to the membership in early December.

Sixty graduate students entered the Graduate Student Contest, which will begin on Tuesday afternoon. Bob Scott, Chairman of the Graduate Student Contest Committee, organized the sections for the contest.

The mixer and annual awards banquet will conclude the meeting on Wednesday evening.

Objective(s) for Next Year: None

Recommendation or Request for Board Action: None

Finances (if any) Requested: None

Respectively submitted:
Committee Chair: Joe E. Strcct
Chair Phone: 662-686-3271
Chair e-mail: JStreet@DREC.msstate.edu
Committee Members and terms of service:
C.D. Yownans, B. Watkins S.K. Rick , T.R. Murphy, C.T. Bryson, C.D. Elmore, O.K. Robinson, P .A. Dotray, D.L. Jordan, W.OMixson, A. Kendig, D. Poston

Committee #: 117	**Committee Name:** Research Committee Report (Standing)

Summary of Progress: This is the second year of the expanded format of the Economic Losses and Weed Survey section with four subsections on a four-year rotation. This year, the report will include the Grass crops, turf, range, and pastures.

Ted Webster replaced Clyde Dowler as chairman of the Weed Survey – Southern States subsection

Objective(s) for Next Year:

Recommendation or Request for Board Action: None

Respectfully Submitted:
J.D.Byrd, Vic Ford, E.P. Webster, Ted Webster, J.E. Street, Chair

Committee #: 119	**Committee Name:** Sales Coordination Committee (Standing)

Summary of Progress: Discussed actions of earlier committees in regard to promoting the sales of the Society publications; specifically the Forestry Weed ID Guide, SWSS Weed ID Guide, SWSS Weed ID Guide on CD-ROM. The challenge is there are few options left for SWSS to advertise these publications without investing significant funds to purchase advertising time. In order to reach the next level of potential customers, the Committee discussed other options that will be address in 2001:

Objective(s) for Next Year:
Prepare a color brochure describing the Forestry Weed ID Guide, which includes an order form.

Encourage members in the society to advertise the publications on project/group web pages and distribute the proposed brochures at sponsored activities and field days.

Advertise the publication on the SWSS, WSSA, and other regional society web pages.

Keep advertising the publications in the newsletters and Weed Technology.

Devise means to alter the price structure of the publications that would allow distributors to advertise and market the publications. This will require the Society significantly reducing the price of the publications for large volume sales

Recommendation or Request for Board Action:

Release funds for development of a color brochure advertising the major publications, particularly the Forestry Weed ID Guide.

Consider the price structure of the major publications and allow substantial discounts for large purchases. This would allow for distributors to purchase the publications from SWSS, advertise, and sell the publications, reaching a much larger audience.

Finances (if any) Requested: The Committee does not have an estimate on preparing a color brochure. However, a tentative allotment of $2,000 would be in order to prepare and distribute a brochure.

Respectively submitted:
W. C. Johnson, III, M. DeFelice, J. H. Miller, C. Mosley, J. A. Driver, and W. L. Barrentine

Committee #: 120	**Committee Name:** Southern Weed Contest Committee (Standing)

Summary of Progress:
The 21st annual Southern Weed Contest was held August 8, 2000 at the University of Missouri Delta Center near Portageville, MO. Drs. Andy Kendig and Anthony Ohmes and the entire staff of the Delta 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 hazards in a pesticide storage facility.

A total of 46 contestants from 8 universities competed this year. Universities represented were the University of Arkansas, University of Florida, Louisiana State University, Mississippi State University, North Carolina State University, Oklahoma State University, Texas A&M University, and Texas Tech University. The university participation was excellent this year. The Weed Contest Committee would like to encourage every university affiliated with the Southern Weed Science Society to attend the 2001 contest.

Winning teams and individuals were as follows:

Team A wards:
1st University of Arkansas ($500)
2nd Mississippi State University ($300)
3rd Louisiana State University ($200)

Individual Awards:
1st Cade Smith, Mississippi State University ($400)
2nd Jeff Edwards, University of Arkansas ($250)
3rd Oscar Sparks, University of Arkansas ($100)
6th Eric Scherder, University of Arkansas
7th Tom Barber, University of Arkansas
8th Greg Steele, Texas A&M University

4th Scott Payne, University of Arkansas ($75)
5th Shawn Askew, NC State University ($50)
9th Chris Leon, Mississippi State University
l0th Trey Koger, Mississippi State University

The traveling "Broken Hoe" trophy was presented to the University of Arkansas 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.

Objective(s) for Next Year: The 2001 Southern Weed Contest will be hosted by Drs. Steve Kelly, Donnie Miller and Bill Williams at the Louisiana State University AgCenter's Northeast Research Station Macon Ridge Location near Winnsboro, LA. I am sure that Steve, Donnie, and Bill will have a great and competitive contest.

Recommendation or Request for Board Action: None

Finances (if any) Requested: None -Sustaining members for 1999 ($2,000+) - BASF, Dow Agro, FMC, Monsanto, Novartis, Rhone-Poulenc, and Zeneca; Biennials (1,000-1,999)-Bayer, Griffm, R&D Sprayers, and Valent; Annuals ($1-999)-Helena and Rohm and Haas.

Respectively submitted:
Committee Chair: Eric P. Webster Chair Phone: (225) 388-5976
Chair e-mail: ewebster@agctr.lsu.edu
Committee Members:

J. L. Griffm, T. C. Mueller, T. Whitwell, C. T. Bryson, L. R. Oliver, Steve 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, D. Ferguson, J. Barrentine, T. Webster, J. Wilcut, A. Ohmes, J. C. Holloway, Frank Carey, J. Wilcut, J. Stritzke, B. McCarty, B. Scott, R. Lassiter, E. P. Webster, Chairperson

Committee #: 121 **Committee Name:** Student Program Committee (Standing)

Summary of Progress: There were 55 Students in the paper and poster contest this year. Contest sections consisted of 2 poster sections and 5 talk sections, Agronomic Crops A & B, Ecological/Physiological, Soils, and combined section of Turf, Pasture and Forestry for a total of 7 sections.

There are a total of 125 students presenting papers and posters at this meeting.

One student was allowed to change from a paper to poster after the program was printed due to an error on the title submission form. One student withdrew from the contest due to an error on an electronic submission form. Three students withdrew from the contest and were not in attendance at the meeting.

Dr. Sue Rick will be the chair of this committee for 2001-2 and Dr. Greg Stapleton will serve as vice chairperson of the student program committee for 2002-2003 term. The traditional rotation of Industry/University has been off for some time. The committee feels that this has not effected its continuity or effectiveness.

There were problems and delays this year with the collection of the names of all the graduate students attending the SWSS meeting and giving a paper/poster for the purpose of room reimbursement. The Committee recommends changes in the MOP to include instructions for the program committee chair (vice president) to provide a copy of the title submission forms of all the graduate student and undergraduate students presenting papers or posters to the student program committee chairperson by November 15.

The Student program committee also approved a request from the graduate student organization to allow a student representative to serve a 1 year term on the committee, pending approval of the Vice president and the Executive Board.

Objective(s) for Next Year:

Recommendation or Request for Board Action:

Finances (if any) Requested:

Respectively submitted:
Robert C. Scott

Committee #: 123 **Committee Name:** Terminology Committee (Standing)

Summary of Progress:
Summary of Progress:

Objective(s) for Next Year:

Recommendation or Request for Board Action:
After reviewing the duties of the SWSS Terminology Committee and the WSSA Terminology Committee it is my recommendation is that we disband the SWSS Terminology Committee because it is a largely redundant operation.

Finances (if any) Requested:

Respectively submitted:

Committee Chair: J. W. Boyd
Chair Phone: 501-671-2303
Chair e-mail: jboyd@uaex.edu

Committee Members and terms of service:

T.D. Klingaman 2001	J.A. Baysinger 2002	J.A. Tredaway 2003
D.R. Shaw 2001	J.W. Boyd* 2002	M.L. Wood 2003
J. W. Wells 2001	C.E. Walls 2002	

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

Summary of Progress:
Photos, maps, and write-ups for SWSS Weed ID Guide set number 7 (50 weeds) were edited and presented to the printer in July. Black and white galley proofs were reviewed and corrected by Arlyn Evans and Charles Bryson. in August, September, and again with color proofs in November, 2000. Printing and delivery to Bob Schmidt should be completed by the 2001 SWSS annual meeting. Write-ups have been completed for 49 weeds for SWSS Weed ID Guide set number 8. Maps for 12 of these weeds have been generated. Data-based descriptions were developed by two graduate students, John R. MacDonald and Brett R. Serviss, at Mississippi State University for about 90% of the weeds currently in the SWSS Weeds of the United States and Canada CD-ROM and about 90% and 50% of those in SWSS Weed ID Guide sets number 7 and 8, respectively. These descriptions are being sent to Mike DeFelice as completed and will be used to develop an interactive key for mature and immature weeds in version 3.0 of the Weed ill CD-ROM. Mike DeFelice discovered that the CD-ROM version 2.0 was not compatible with Windows 2000. He has fixed the bug, made a few corrections, added eight new World of Weed Articles, and will test the program for a month prior to sending it to manufacturing in early January.

Objective(s) for Next Year :All data-base descriptions for all weeds currently in the Weed ID CD-ROM and additional weeds in Weed ID Guide (hardcopy) will be completed and edited in 2001. Editing of weed write-ups and maps for SWSS Weed ID Guide set number 8 should be completed by March 2001. Photos for SWSS Weed ID Guide set number 8 will be selected from the Photo CDs of Arlyn Evans' slides. Hopefully, all write-ups, maps and photo selections for set number 8 can be completed by July, 2001. If so, a request for, printing will be submitted at the summer SWSS Board meeting. The Weed ID CD-ROM version 2.1 should be ready for distribution following the SWSS meeting.

Recommendation or Request for Board Action: Recommendations for Board Action: Approve transfer of Arlyn Evans' slides to Photo CD for SWSS Weed ID Guide set number 8 at the estimated cost of $2,500.00.

Finances (if any) Requested: $2,500.00

Respectively submitted:
Committee Chair: C. T. Bryson Chair Phone: 662-686-5259
Chair e-mail: cbryson@ars.usda.gov
Committee Members and Terms of Service:

M. DeFelice 2001	J. W. Boyd 2002	M.L. Ketchersid 2003
C. Mosley 2001	C.T. Bryson* 2002	W.K. Vencill 2001
T.M. Webster 2002		

Committee #: 124a **Committee Name:** Forest Weeds Subcommittee

Summary of Progress:

1. Book sells are around $75,000 during the first year, about 2,800+ copies sold.
2. The book won the "Best of Category" Books and Manual: 4 or more colors, from the Printing Industry Association of the South. Praising reviews have been published in the journal, Forest Science, Georgia Forestry Magazine, Alabama Treasured Forests, Alabama Wildlife, and several forestry organization newsletters.
3. All acquisition librarians at state universities in the SE have been mailed notifications of availability, summaries, and copies of published reviews to prompt their acquiring the Book.
4. The CD version is undergoing final preparations for replication with the Society's copyright stated on each high-resolution image. The budget of $3300 has been previously approved.

Objective(s) for Next Year: Even though the subcommittee will be deactivated, J. Miller will continue to move towards replication and sales of CD version. He will advise anyone or committee appointed to advertise the Book and CD on publications in the forestry community.

Recommendation or Request for Board Action:
1. Assign the responsibility for advertising the book Forest Plants of the Southeast to someone or another committee in the Society. James Miller cannot handle this due to the federal service code of conduct. There is an approved budget of $5,400 for advertising. J. Miller will provide list of publications where advertising would probably be most efficient for the forestry community.

2. Deactivate this special subcommittee because its mission has been fulfilled.

Finances (if any) Requested:

Respectively submitted:
Committee Chair: James H. Miller
Chair Phone: 334-826-8700
Chair e-mail: jmiller01@fs.fed.us

Committee Members and terms of service:

T.R. Clason	C.A. Cobb	A.W. Ezell
F. Fallis	W.S. Garbett	J.D Gnegy
D.K. Lauer	K.V. Miller	B. Watkins
J.L. Yeiser		

Committee #: 124b **Committee Name:** Herbicide Resistant Weed Subcommittee

Summary of Progress:
At our last meeting the subcommittee updated our list of herbicide resistant weeds. Greg MacDonald, our representative to the North American Herbicide Resistance Working Group (NAHRWG), provided an update of related issues at the national level. Information exchange among members in regard to issues that may impact development of herbicide resistance to include gene transfer through outcrossing of transgenic crops and weeds were discussed. Differential tolerance of red rice to glufosinate, potential for glyphosate resistance development and weed shifts in response to intensive glyphosate use, uniform testing procedures to confirm herbicide resistance, and mode of action labeling of pesticide containers were also discussed.

Objective(s) for Next Year: To provide an update of the current status of herbicide resistant weeds within the SWSS region through the SWSS newsletter and in both the WSSA and SWSS web sites.

Recommendation or Request for Board 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. Our subcommittee recommends that current updates of resistant weeds in the Southern region be provided on both the WSSA and SWSS websites.

Finances (if any) Requested: None

Respectively submitted:
James L. Griffin, Chariman

W.L. Barrentine, S.O. Duke, D.L. Jordan, T .F. Peeper, M. Barrett, M.L. Fischer, J.A. Kendig, R. Smeda,,T .A. Bewick, J.L. Griffin, C.C. Kupatt, J.D. Smith, N. 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

Committee #: 125 **Committee Name:** Continuing Education Units (Special)

Summary of Progress:
The Texas Department of Agriculture (TDA) approved the 2000 SWSS conference for continuing education units (CEUs) for licensed applicators. The department then contacted the other states in the region for approval of recertification credit for applicators attending from their state. Eighteen states approved all or portions of the conference for CEUs.

TDA prepared the proper forms for the applicators and personnel from the Texas Agricultural Extension Service attended the meeting to distribute the forms and answer questions. The forms were collected at the end of the session.

Fifty-four licensed pesticide applicators requested continuing education credits (CEUs) from 11 state agencies during the 2000 SWSS conference.

Objective(s) for Next Year: The department jas requested that SWSS Business Manager, Robert A. Schmidt set out the CEU materials at the beginning of the SWSS 2001 conference. The completed forms will be collected and mailed to TDA. Continuing education hours from state agencies and CCA hours from the American Society of Agronomy will be processed.

During the week of December 6, 2001, letters will be sent to state agencies requesting their approval for the 2002 SWSS Conference.

The program for the 2002 SWSS Conference should again state that to obtain CEU credits, licensed pesticide applicators are to pick up a recertification form near the registration table. As last year, the forms are to be returned to the table at the end of the conference.

Recommendation or Request for Board Action: None

Finances (if any) Requested: None

Respectively submitted:
R. Rivera, Chairperson
D. Dippel, J. Snodgrass, A.C. York, R. Rivera

Section I : Weed Management in Agronomic Crops

Abstract & Paper Index

Section XII : Posters

General Session

MEETING THE CHALLENGE. L. L. Whatley, President, SWSS, Senior Registration Scientist, BASF Corporation, Research Triangle Park, NC 27709.

Good morning, ladies and gentlemen, guests, and members of the Southern Weed Science Society! It's great to be here today, on Mississippi's beautiful Gulf Coast. SWSS has not met in Mississippi for 18 years, and we were overdue to return. Please indulge me a bit as I reminisce....Mississippi is where I started my professional career in Weed Science, and it is a pleasure to be back in the Magnolia State. I also must confess that, after spending 16 years in exile north of the Mason-Dixon Line, I am glad to be back living in the South. It is good to be home.

At this time I'd like to thank some of the special people who have encouraged me and inspired me on my journey as a weed scientist: Doug Worsham, my major professor, and his colleagues at North Carolina State University; Euel Coats, Gene Wills, Bill Barrentine, Joe Street, Steve Duke, Walter Porter, and others in Mississippi; the current SWSS Board; Past-President Don Murray; the old American Cyanamid Company; and now BASF Corporation; and last, but certainly not least, my husband Tom. Each of you, and many more, has contributed to my growth, and I will always be in your debt. Thank you.

Many individuals have contributed to SWSS's growth and success through the years. Let's look around and see who is working hard for SWSS right now. Current SWSS Board, will you please stand and remain standing? Committee Chairs, please stand. Committee Members, please stand. Students presenting papers, please stand up. Those who participated in the summer weed contest, please stand. Endowment Fund contributors, please stand up. Look around you at the large group of contributors among us. Anyone seeking volunteers for an SWSS activity, take note of those who are seated! Now, those still seated, please stand. You are contributors too, for the meeting would not be the same without your presentations and participation in discussions. Everyone may be seated now, unless you especially want to remain standing. It should be clear from that exercise that we have a strong contingent of volunteers, an asset without measure. Please give yourself a hand.

Now that we've had a chance to stretch, it's time to take a thoughtful look at our Society. This year's meeting theme is "New Century, New Opportunities." What are the new opportunities facing SWSS? How will we meet the challenge of being a relevant, vibrant, professional society in the 21st Century?

For success in this new century, we will need to be as adaptable as the weeds we study and as diverse as a complex ecosystem. To expand on that premise: we need to encourage diversity, communication and "thinking outside the box."

Make Diversity a Priority

For continued success, SWSS needs to make diversity a priority. Twenty-five years ago SWSS rarely or never included professional women or people of color. We're making progress along those lines; just look around. You may not know that we rank among the most progressive scientific societies in that regard. Our members span about 50 years in age range and live in more than 13 different states, and that indicates diversity too. However, to prosper in the 21st century we need to look beyond the obvious visible and include subtler diversity: diversity of ideas and philosophy. For it is in diversity that we will maintain stability.

It may be helpful to use an ecosystem analogy when thinking about diversity. The simplest terrestrial ecosystem would probably be a rock. Over time, natural forces, such as freezing, thawing and wind action, would wear down the rock, resulting in soil. Mosses and lichens would grow on the rock and contribute to soil formation too. As the amount of soil increases, grasses and forbs would begin to grow, and would come to dominate the ecosystem. As the flora becomes more varied, more animal life would be supported, and the carrying capacity of the land would increase. The plant community would change to include woody plants. Without outside interference—such as a fire or tornado—eventually a climax community would become established. In the Western part of our region, the climax would be prairie; in the Eastern part, deciduous forest. The plant and animal life supported by the climax community is more diverse in both kind and number than the previous seral stages, and the community is more stable; it is self-perpetuating. Thus, by looking to nature we can see that diversity equals stability.

We can also look at the issue another way and consider an agricultural ecosystem. Think of the energy that we must expend to keep our crops healthy: tillage, fungicide sprays, irrigation, mulching, herbicide application, hoeing, cultivation, fertilizer application, etc. We intervene to keep the species diversity low, and that takes a lot of energy. Letting the ecosystem "go" takes much less effort, and the result is a more diverse field. In agriculture, a weedy, insect-laden, diseased field is more diverse than the healthy crops we typically like to see. Now, I'm not advocating that we plant our fields and then let them revert to the natural state! What I am trying to point out is the amount of energy we expend when we choose to limit diversity.

If we limit diversity, we need to be sure it is worth the energy expenditure. When cultivating food and fiber crops, the need to limit diversity is obvious. It is not obvious at all when considering our membership. It's useful to remember that weed science societies were founded primarily because established societies limited the diversity of their membership. If the established societies could have predicted what we have become, I don't believe the same decision would have been made.

What is the SWSS record of accomplishment in encouraging diverse ideas? Some years ago, Southern foresters became a part of the Southern Weed Science Society. It seems perfectly natural now, but at the time, some thought it a radical thing. These folks had some different ideas than scientists that specialized in weed control in vegetable crops, for example. However, we are richer for having them as a part of this Society—and I'm not referring to dollars. I hope the foresters also appreciate the benefits of being a part of the larger group. Including the forestry contingent is an example of how encouraged diversity has led us to become a more stable organization.

Now, to push that diversity thinking farther: who else should be invited to join SWSS? Or should SWSS be joining with some other group or groups? Should we hold joint meetings with other Societies? We should be asking questions like these as we look at our future. As we reach out to diverse groups, communication will be a vital skill.

Communication

One of the prime goals of this annual meeting is communication. Although we have a great newsletter and web site, plus e-mail, fax machines and telephones, we all appreciate having face-to-face contact. Sometimes we call this networking. A look in the hallways at virtually any time during this meeting should convince you that SWSS members are skilled in the art of networking!

Students, I have an aside for you at this point. Be sure to take every opportunity you can to meet other students when you are at this meeting. Make efforts to meet the teaching, research, and extension staff from other states, and industry representatives too. When you graduate and take a job in weed science, you are going to be working alongside these same people. Even if you relocate to another area of the country, you will be seeing these same folks, because our weed science community is relatively small. Cultivate these contacts. Network! Okay, end of aside.

As scientists, we know how to communicate with each other. For our research, we have a standard recipe for communicating. It's called a scientific paper, and whether it be written or presented orally, it has the same predictable parts; introduction, materials and methods, discussion, conclusion. This format has served us well and stood the test of time. For more informal communicating we don't have a standard recipe, but we do have standard language: ppm, psi, PPI, dpm, POST, ai, GMO, phi, standard deviation, C-14, acre foot, for example. We're generally comfortable using our standard recipe and language with each other. But when we try to discuss our research or communicate with people who don't know the recipe, things get complicated.

One of the complicating factors, aside from the language itself, has to do with listening. Mindful or active listening calls for focused attention, asking for clarification, and drawing mental parallels with our own experiences. When we actively listen to find out what an individual wants to know, and provide it in a form they understand, we have stepped away from what I call the "they just need education" mindset: "If _______ only understood ___________, they would agree with me." You can fill in the blanks any number of ways. For example, "If <u>organic gardeners</u> only understood <u>how impossible, not to mention expensive, it is to hire hoe hands,</u> they would agree that I need to use herbicides in my peanuts."

Giving our message in just one form and just to each other limits us. The diversity principle works in communicating too: more modes of communicating to more people equals more diversity, and therefore stability. But along with the practical considerations of encouraging diversity of ideas and broadening our scope of communication, we mustn't overlook the need to dream.

Dream: Dare to Think Outside the Box

In 1986, some scientists had a dream. In fact, they were weed scientists, Southern weed scientists. These individuals dreamed of a way to support the SWSS student program by establishing an Endowment Foundation. Did they dream small? Not at all! They dreamed of collecting enough money so the graduate student program could be completely supported from the interest income on the principal. And in just 15 years, the Endowment Fund has grown to around $218,000. Is the graduate student program self-sustaining? Not yet. But it will be, thanks to the dream of a few people, and the vision they shared with the rest of us.

"If you have built castles in the air, your work need not be lost; that is where they should be. Now put the foundations under them." Henry David Thoreau wrote those lines in his book <u>Walden</u>, which was first published in 1854. Clearly, Thoreau recognized the importance of dreaming and setting goals, and his words continue to inspire almost 150 years later.

Dream and dream big. Be open to the results. As we often find in science, the results may not be what we expected when we started.

I'd like to close our discussion with what may be a bit of a puzzle. Does anyone recognize this plant? It's native to Europe and Northern Asia, and has been naturalized in North America; it's common in the Southeast. If considered at all, most people would call it a weed, in the sense of it being an unwanted plant, but it's seldom, if ever, of economic importance. You may be able to guess that this is a member of the Brassicaceae Family. A winter annual, it's known as Mouse-ear Cress, or, more commonly, *Arabidopsis thaliana*, and it has been the subject of a "castle in the air."

Some scientists dreamed of completely mapping a plant's genetic code. It took an international effort and cost $70 million, but in December, the results of the dream were published in Nature: the complete 26,000-gene sequence that uniquely describes *Arabidopsis*. By the way, that's about twice the number of genes found in the fruit fly genome. This accomplishment makes rating a field trial with 20 treatments, 4 reps, and 5 weed species pale in comparison! This discovery will stimulate research for years, and not only in plant breeding. For example, researchers have already discovered that about 100 of the *Arabidopsis* genes are closely related to human disease genes. It is very likely that discoveries with *Arabidopsis* will have consequences for deafness, blindness and cancer.

Twenty years ago, would anyone have thought that keys to treating human disease might lie in a weed's genes? Maybe a few visionaries did. But whatever they thought, the scientists held on to their dream with tenacity, and unraveled those 26,000 genes. You know, it tickles me that the honor of being the first plant to reveal its genetic code fell to a weed.

Folks, it has truly been an honor serving as your president this past year. I look forward to being active in SWSS as we meet the challenge of maintaining our vibrancy and relevancy in this new century. With communication skills, encouraged diversity, and daring to think outside of the box, I know it will happen. Let's build some castles together!

SECTION I: WEED MANAGEMENT IN AGRONOMIC CROPS

POSTEMERGENCE WEED CONTROL IN COTTON WITH CGA 362622. B.J. Brecke, University of Florida, West Florida Research and Education Center, Jay, FL 32565; D.C. Bridges and T.L. Grey, University of Georgia, Griffin, GA 30223.

ABSTRACT

Studies were conducted during 1998, 1999 and 2000 at the University of Florida, West Florida Research and Education Center, Jay, FL and the University of Georgia, Plains, GA to evaluate CGA 362622 for postemergence weed control in cotton. Cotton (either DP 5414RR, DP 458RR, DP 541 BG/RR or ST 4892 BG/RR) was planted in mid-May to early-June in areas naturally infested with a broadspectrum of both annual grass and broadleaf weeds. Treatments were applied postemergence with either a Backpack CO_2 or tractor mounted compressed air sprayers operated at 20 psi to deliver 20 gpa spray volume. Plots were either 2 or 4 rows wide by 25 to 35 ft long. Crop damage and weed control were visually rated during the growing season using a scale of 0 to 100 (0 = no control or crop damage and 100 = complete control or crop death).

CGA 362622 applied at rates of 0.0045 to 0.018 lb a.i./A caused little crop damage and the cotton rapidly recovered from any injury observed. CGA 363622 provided good to excellent control of sicklepod (*Senna obtusifolia* (L.) Irwin and Barnaby), redweed (*Melochia corchorifolia* L.), purple nutsedge (*Cyperus rotundus* L.), and Florida beggarweed (*Desmodium tortuosum* (Sw.) DC.). Control of browntop millet (*Brachiaria ramosa* (L.) Stapf), large crabgrass (*Digitaria sanquinalis* (L.) Scop.), pitted morningglory (*Ipomoea lacunosa* L.), and redroot pigweed (*Amaranthus retroflexus* L.) ranged from fair to excellent depending on timing and rate of application. Generally the earlier timing and higher rates were required for effective control of these species. Wild poinsettia (*Euphorbia heterophylla* L.) control was inconsistent. Smallflower morningglory (*Jacquemontia tamnifolia* (L.) Griseb.) and prickly sida (*Sida spinosa* L.) were not controlled at any rate or timing of CGA 362622 application.

INFLUENCE OF RATES AND APPLICATION TIMINGS ON WEED CONTROL AND CROP SAFTEY WITH CGA 362622. J.W. Branson, K.L. Smith, R.C. Namenek. University of Arkansas, Southeast Research and Extension Center, Monticello

ABSTRACT

Field studies were established in the 2000 growing season at the Southeast Research and Extension Center at Rohwer, Arkansas to determine the influence of rates and application timings on weed control and crop safety following applications of CGA 362622 with rates ranging from 2.7 to 11 g ai/ha. In field studies DP 451 B/RR variety was planted on May 17-18, 2000 in conventional 96-cm rows. The experimental design was a randomized complete block with four replications. Cotton (*Gossypium hirsutum*) was grown under normal cultural practices and sprinkler irrigated as needed. Weeds evaluated included sicklepod (*Senna obtusifolia)*, hemp sesbania (*Sesabnia exaltata)*, pitted morningglory (*Ipomea lacunosa)*, prickly sida (*Sida spinosa)*, and Palmer amaranth (*Amaranthus palmeri)*. Preemergence and over-the-top applications were applied with a CO_2 backpack sprayer equipped with 8002 VS flat fan nozzles calibrated to deliver a 140 l/ha volume. Greenhouse studies were established on October 31, 2000 at the University of Arkansas Althiemer Lab at Fayetteville, AR to determine levels of injury from applications of CGA 362622 to cotton growing in soils with moisture levels at field capacity and saturated conditions. BXN variety was planted in 8x8.5-cm pots and watered as needed until 36h prior to treatment. When plants reached the 4 to 6 leaf stage all treatments were flooded, however when the soil was fully saturated the field capacity treatments were allowed to drain while saturated treatments remained flooded and sprayed 36h later and a flood was maintained in these treatments for 36h after applications. Before treatments were applied the soil in both moisture regimes was covered so that only foliar uptake of CGA 362622 occurred. All treatments were applied with a spray chamber calibrated to deliver a 140 l/ha. All evaluations were separated using analysis of variance.

In field studies weed control with preemergence applications of CGA 362622 was greater than 80% across all species evaluated at 14 DAT. At 28 DAT only the 11 g ai/ha treatments provided greater than 80% control of sicklepod, hemp sesbania, Palmer amaranth and pitted morningglory. Prickly sida control at 28 DAT had decreased to 60%. Injury from preemergence applications ranged from 13 to 43 % at 14 DAT, but dissipated to less than 10% at 28 DAT with all rates. Early post and mid post applications of CGA 362622 provided greater than 90% control of Palmer amaranth and pitted morningglory at all rates 14 DAT, however at 28 DAT control of Palmer amaranth with the low rate of 2.7 g ai/a had decreased to less than 70%. Following postemergence applications there were no significant differences in sesbania or prickly sida control between CGA 362622 rates, however sicklepod control with the low rate of 2.7 g ai/a did decrease at 28 DAT to less than 50%. There was no control of prickly sida with post emergence applications of CGA 362622.

In greenhouse trials, rates of CGA 362622 were applied ranging from 2.7 to 11 g ai/a to evaluate differences in visual injury symptomology and shoot dry weight after postemergence applications. A significant difference in shoot dry weight was observed between the treated and untreated plants; however there were no differences in dry weights between rates of CGA 362622. Visual injury did occur with all rates and did increase as rate increased.

COMPARISON OF CGA 362622, PYRITHIOBAC, AND GLYPHOSATE IN GLYPHOSATE-RESISTANT COTTON (*GOSSYPIUM HIRSUTUM*). A.S. Culpepper, Department of Crop and Soil Sciences, University of Georgia, Tifton, GA 31793 and A.C. York, Crop Science Department, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

Syngenta is developing a new herbicide (CGA 362622) to potentially be applied overtop of transgenic and non-transgenic cotton. Experiments were conducted to compare weed control and cotton tolerance of CGA 362622, pyrithiobac, and glyphosate applied overtop of glyphosate-resistant cotton.

In the first experiment, which was conducted at three GA locations, CGA 362622 (0.0047 lb ai/A), pyrithiobac (0.063lb ai/A), and glyphosate (0.7 lb ai/A) were applied to weeds in the 2-, 5-, and 10-inch stages of growth. A non-treated control was also included. Florida pusley *(Richardia scabra)*, pitted morningglory *(Ipomoea lacunosa)*, smallflower morningglory *(Jacquemontia tamnifolia)*, tropic croton *(Croton glandulosus)*, yellow nutsedge *(Cyperus esculentus)*, and wild poinsettia *(Euphorbia heterophylla)* were present. A nonionic surfactant was included with CGA 362622 and pyrithiobac. All treatments were applied at 14.8 GPA.

Two- and 5-inch weeds responded similarly; thus, weed control from the 5-inch stage is reported. Glyphosate and CGA 362622 controlled yellow nutsedge 70 to 80%; less control (56%) was noted with pyrithiobac. Glyphosate was 11 to 36% more effective than CGA 362622 or pyrithiobac in controlling wild poinsettia and tropic croton. Pyrithiobac and glyphosate controlled pitted morningglory 75 to 82% and smallflower morningglory 90 to 94%. CGA 362622 controlled pitted morningglory 12 to 19% more effectively than pyrithiobac or glyphosate but did not control smallflower morningglory (30%). Ten-inch weeds were harder to control. However, control of 10-inch weeds followed similar trends to those at the 5-inch stage except for smallflower morningglory: smallflower morningglory control was greatest with pyrithiobac (90%) followed by glyphosate (80%) and least with CGA 362622 (20%).

In the second experiment, preemergence (PRE) by postemergence (POST) herbicide options were arranged factorially at one GA and two NC locations. PRE herbicide options included pendimethalin (1.0 lb ai/A) alone or mixed with fluometuron (1.5 lb ai/A) applied at planting of PM 1560, DP 655, or ST 4892. POST herbicide options included CGA 362622 (0.0047 lb/A) alone or mixed with MSMA (0.75 lb ai/A), pyrithiobac (0.063 lb/A) alone or mixed with MSMA (0.75 lb/A), and glyphosate (1.0 lb/A). PRE and POST herbicides were applied at 14.8 GPA, and a nonionic surfactant was included with CGA 362622 and pyrithiobac. Prometryn (1.0 lb ai/A) plus MSMA (2.0 lb/A) was applied at layby in all herbicide systems. Two non-treated controls were also included. *Amaranthus* species (Palmer amaranth [*Amaranthus palmeri*] or smooth pigweed [*Amaranthus hybridus*]), entireleaf (*Ipomoea hederacea* var. *integriuscula*) or pitted morningglory, and annual grasses (broadleaf signalgrass [*Brachiaria platyphylla*], large crabgrass [*Digitaria sanguinalis*], and Texas panicum [*Panicum texanum*]) were present at all locations. Tall morningglory (*Ipomoea purpurea*) was also present at two locations while sicklepod (*Senna obtusifolia*) was only present at one location.

POST main effects were noted for cotton injury. Pooled over all locations and PRE treatments, CGA 362622, CGA 362622 plus MSMA, pyrithiobac, pyrithiobac plus MSMA, and glyphosate injured cotton 18, 22, 9, 13, and 0% at 5 days after treatment and 5, 7, 0, 2, and 0% at 17 days after treatment, respectively.

PRE main effects were noted only for sicklepod and annual grass control late in the season. Fluometuron added to pendimethalin improved sicklepod and grass control 15 and 7%, respectively. POST main effects were significant for control of all weeds and cotton yield. Pooled over PRE treatments, the system utilizing glyphosate was more effective in controlling *Amaranthus* and annual grasses (5 to 13%) compared to CGA 362622 or pyrithiobac systems. MSMA added to CGA 362622 or pyrithiobac reduced *Amaranthus* control 4% but improved annual grass control at least 6%. Entireleaf and pitted morningglory were controlled at least 98% late in the season by CGA 362622 or pyrithiobac systems, and control was greater than that by the glyphosate system. Tall morningglory and sicklepod control were similar and at least 95% in all systems except with pyrithiobac applied alone.

Seed cotton yields followed trends of annual grass control and cotton injury with at least 289 lb/A greater seed cotton in the glyphosate system as compared to CGA 362622 or pyrithiobac systems.

EFFECTIVENESS OF CGA 362622 AND PYRITHIOBAC SODIUM IN COTTON WEED CONTROL SYSTEMS. R.C. Namenek, K.L. Smith, J.W. Branson. University of Arkansas, Southeast Research and Extension Center, Monticello, AR 71656

ABSTRACT

Field trials were established in the 2000 growing season to compare the effectiveness of CGA 362622 and pyrithiobac sodium in cotton weed control systems. The experimental design for all experiments was a randomized complete block with four replications. The factors consisted of three CGA 362622 application rates (5.3,8.0,10.0 g ai/ha), two rates of pyrithiobac sodium (70.0, 98.0 g ai/ha) and one rate of glyphosate (0.84 kg ai/ha). Trials were planted with DP 451

B/RR at 14 kg/ha at 1.5-2.0 inch depth on May 17, 2000 in conventional 96-cm rows on a Hebert silt loam. Cotton (*Gossypium hirsutum*) was grown under normal cultural practices and sprinkler irrigated as needed. Weed species evaluated were pitted morningglory (*Ipomea lacunosa*), hemp sesbania (*Sesbania exaltata*), sicklepod (*Senna obtusifolia*), prickly sida (*Sida spinosa*), and Palmer amaranth (*Amaranthus palmeri*). Treatments were applied at preemergence, early postemergence, and mid-postemergence timings with a CO_2 backpack sprayer equipped with 8002 VS flat fan nozzles in a volume of 140 L/ha.

Control of all species was greater than 80% following preemergence applications of CGA 362622 at 8.0 g ai/ha and pyrithiobac at 70 g ai/ha 14 DAT. Visual injury exceeded 20% 14 DAT following preemergence applications of CGA 362622 which was greater than injury caused by pyrithiobac sodium. Prickly sida control was similar with CGA 362622 and pyrithiobac sodium when applied preemergence. Control of pigweed and morningglory following early postemergence applications was 95% or greater with CGA 362622 and pyrithiobac sodium with all rates 21 DAT. Control of morningglory, sesbania, sicklepod and pigweed following mid-postemergence applications was 90% or greater with both rates of CGA 362622 14 and 33 DAT. In all postemergence applications, CGA 362622 provided greater control of sickelpod and pryrithiobac sodium provided greater control of prickly sida. CGA 362622 and pyrithiobac sodium tankmixed provided 85% or greater control of morningglory, sesbania, and pigweed 50 DAT and greater than 70% control of all weed species. High rates of either CGA 362622 or pyrithiobac sodium alone provided little control of any species 50 DAT. Injury was greater with combinations of CGA 362622 and glyphosate than with pyrithiobac sodium and glyphosate when applied over-the-top to 2-4 leaf cotton.

ANALYSIS OF THE HERBICIDE APPLICATION AND DECISION SUPPORT SYSTEM (HADSS) IN CENTRAL TEXAS COTTON CULTURES. F.T. Moore, P.A. Baumann and L.M. Etheredge, Texas Agricultural Extension Service, College Station, TX 77843

ABSTRACT

A field study was conducted during the 2000 growing season to evaluate recommendations provided by the Herbicide Application and Decision Support System (HADSS) for weed control in cotton. This computer-based decision aid considers individual weed species, competitive indexes and populations per 100 sq. ft. before making recommendations for control. Recommendations are presented to the user based upon effectiveness of the control measure and also the expected net economic return. Returns are based largely on forecasts for cotton crop yields and price as well as the cost of the herbicide treatment. Postemergence treatment recommendations from the HADSS software were compared to weed control recommendations made by these researchers (experts) under several preplant and preemergence herbicide treatment scenarios. These scenarios included a PPI Treflan (1.5 pts/A) application, a PPI Treflan plus PRE Cotoran (3.2 pts/A) application and total POST treatment options. The study included Roundup Ready and BXN cotton systems.

In the field study, HADSS recommendations for johnsongrass (Sorghum halepense) and Palmer amaranth (Amaranthus palmeri) were equal or greater in effectiveness to expert recommendations in the BXN and Roundup Ready cotton systems. Cotton yields were equal to the hand-weeded check from all HADSS treatments except the total POST recommendation where johnsongrass and Palmer amaranth were not adequately controlled season-long by Staple or Assure II, causing significant yield decline. Yield comparisons between the HADSS and expert recommendations were equal. All treatments significantly out-yielded the untreated plots.

Early evaluation of the HADSS system has generated positive results when comparisons are drawn between HADSS recommendations and those of an expert. The HADSS decision aid also provides cotton growers easy access to a list of treatment options for a given weed complex. Most importantly, it promotes early weed scouting and management decisions that consider both effectiveness and overall economics.

IVYLEAF MORNINGGLORY (*IPOMOEA HEDERACEA* (L.) JACQ.) MANAGEMENT IN ROUNDUP READY COTTON. J.D. Everitt, J.W. Keeling, P.A. Dotray, and L.L. Lyon, Texas Agricultural Experiment Station, Texas Agricultural Extension Service, and Texas Tech University, Lubbock, TX

ABSTRACT

Field experiments were established in 2000 in Hale County, Texas to compare Roundup Ultra application timings and to evaluate postemergence-topical (PT) and postemergence-directed (PDIR) Roundup Ultra tank mixtures for ivyleaf morningglory (*Ipomoea hederacea* (L.) JACQ.) control in Roundup Ready cotton. The test area received a preplant incorporated (PPI) application of Prowl at 0.75 lb ai/A. Roundup Ultra application timings were compared to Prowl PPI and Prowl PPI followed by (fb) Caparol preemergence (PE) at 1.2 lb ai/A. The addition of Staple to Roundup Ultra PT and PDIR was evaluated also. Roundup Ultra PDIR alone was compared to Roundup Ultra tank mixtures with residual herbicides following Roundup Ultra PT. Weed control was evaluated at 7, 14, and 28 days after each application.

Roundup Ultra early PT fb two PDIR applications of Roundup Ultra controlled ivyleaf morningglory 90% late season compared to 80% ivyleaf morningglory control from two PT applications and one PDIR application. One PT and one PDIR application controlled ivyleaf morningglory 60%. One PT application of Roundup Ultra did not control ivyleaf

morningglory. A PT application of Roundup Ultra at 0.56 lb ae/A plus Staple at 0.032 lb ai/A fb either Roundup Ultra PDIR alone or Roundup Ultra (0.56 lb ae/A) plus Staple (0.032 lb/ai/A) PDIR resulted in 90 to 95% season-long ivyleaf morningglory control. Following a PT application of Roundup Ultra, a tank mixture of Roundup Ultra and Direx at 0.75 lb ai/A PDIR controlled morningglory 95% late season compared to 55% control with Roundup Ultra PDIR alone. Ivyleaf morningglory was controlled >90% with the addition of Direx at 0.5 lb ai/A to Roundup Ultra PDIR. Cotoran at 0.75 lb ai/A added to Roundup Ultra PDIR increased ivyleaf morningglory control to 85% and the addition of Caparol at 0.8 lb ai/A controlled ivyleaf morningglory 90%. Roundup Ultra plus Aim at 0.0018 and 0.0036 lb ai/A PDIR provided >90% control of ivyleaf morningglory 14 days after treatment (DAT), but control declined to <80% control late season. The addition of Goal at 0.2 lb ai/A to Roundup Ultra PDIR increased ivyleaf morningglory control to 95% when compared to Roundup Ultra alone 14 DAT, but late season ivyleaf morningglory control was <70%. Roundup Ultra plus FirstRate at 0.016 and 0.032 lb ai/A PDIR controlled ivyleaf morningglory 95% 14 DAT and control was maintained throughout the remainder of the season. Cotton injury was <10% 14 DAT from the addition of Cotoran, Goal, and both rates of FirstRate to Roundup Ultra PDIR, but injury was not apparent 28 DAT.

ROUNDUP ULTRA/RESIDUAL HERBICIDE TANK MIX COMBINATIONS IN ROUNDUP READY COTTON. J.W. Keeling, P.A. Dotray, J.D. Everitt, and L.L. Lyon, Texas Agricultural Experiment Station, Lubbock, TX

ABSTRACT

Roundup Ready cotton varieties have been planted extensively on the Texas High Plains since 1998. Effective control of most annual and many perennial weeds has been achieved with in-season Roundup Ultra applications in these varieties. Field experiments were established near Lubbock, TX to evaluate Roundup Ultra alone or in combination with Staple or Direx for Palmer amaranth (*Amaranthus palmeri*) and devil's-claw control (*Proboscidea louisianica*) control in Roundup Ready cotton (Paymaster 2326RR). Additional herbicides including Caparol, Cotoran, Goal, and Direx were applied in combination with and compared to Roundup Ultra for season-long Palmer amaranth and devil's-claw control without cultivation.

Effective early-season Palmer amaranth and devil's-claw control was achieved with Prowl fb Roundup Ultra or Prowl fb Roundup Ultra + Staple POST. Prowl fb Roundup Ultra or Prowl fb Roundup Ultra +Direx PDIR provided similar levels (95-97%) of Palmer amaranth control and devil's-claw control and were superior to residual herbicides alone (70-80%). Late-season Palmer amaranth and devil's-claw control was similar with Prowl fb Roundup Ultra POST followed by Roundup Ultra PDIR, Prowl fb Roundup Ultra + Staple POST fb Roundup Ultra PDIR, or Prowl fb Roundup Ultra POST fb Roundup Ultra + Direx PDIR. Lack of rainfall after July 15 limited additional Palmer amaranth germination and reduced the need for residual Palmer amaranth control. All plots receiving Roundup Ultra POST and PDIR with or without Staple or Direx produced higher yields that plots treated with soil-applied residual herbicides only.

All Roundup Ultra PDIR tank mix combinations improved Palmer amaranth control 14 DAT (92-100%) compared to Roundup Ultra alone (80%), due to the residual activity of these tank mix partners. All tank mix combinations improved Palmer amaranth control 35 DAT compared to Roundup Ultra alone. Because of limited late-season Palmer amaranth emergence, no differences in control existed between treatment combinations. Cotton lint yields were not different between treatments.

SUMMARY OF ROUNDUP READY COTTON TOLERANCE TO GLYPHOSATE ON THE TEXAS HIGH AND ROLLING PLAINS. G.G. Light, P.A. Dotray, J.W. Keeling, and T.A. Baughman, Texas Tech University and Texas Agricultural Experiment Station, Lubbock and Vernon.

ABSTRACT

Glyphosate (Roundup) is a broad spectrum, non-selective herbicide that has been labeled for postemergence-topical (PT) and postemergence-directed (PD) applications in transgenic cotton (*Gossypium hirsutum)* since 1997. However, fruit abscission has been observed with Roundup Ready picker cotton varieties in experiments performed in North Carolina, Arkansas, Georgia, and Mississippi. Lack of boll retention resulted in significant yield reductions in North Carolina and Georgia. It was hypothesized that stripper varieties (PM 2326RR and PM 2200RR) might also be susceptible to yield loss following applications of Roundup. Therefore, the objectives of this study were to apply Roundup at different rates and timings, in combinations of sequential timings, and at rates up to 4X to determine the effects on yield.

Field experiments were designed as randomized complete blocks and were subjected to an analysis of variance. Treatments in 1997 through 1999 on the Rolling Plains were made to PM 2326RR and were PT, except for the standard Roundup system. Treatments in 1997 on the Texas High Plains were made to PM 2326 RR at Halfway, TX and PM 2200RR at Lubbock, TX. All applications were made PT. Treatments were made on the Texas High Plains in 1998 to PM 2200RR and in 1999 to PM 2326RR. All applications beyond the 4-leaf stage were PD.

The only significant yield loss in experiments performed on the Texas Rolling Plains occurred in 1997 at Childress, TX, when Roundup was applied PT at 0.56 lbs ae/A at the 9^{th} or 12^{th} node or 0.75 lbs ae/A at the 9^{th} or 12^{th} node. In 1997

at Halfway, TX, yield loss was significant when Roundup was applied PT at 1.5 lbs ae/A mid-bloom. In 1997 at Lubbock, TX, yield loss was significant when Roundup was applied PT at 1.5 lbs ae/A mid-bloom or 0.75 lbs ae/A 6 nodes above white flower. There were no significant yield losses in 1998 or 1999 on the Texas High Plains when Roundup was applied at combinations of sequential timings at 0.84 or 1.13 lbs ae/A or up to 2.25 lbs ae/A at the 2 fb 4 fb 6 fb 8-leaf stages.

Overall, no significant yield losses were observed in PM 2326RR or PM 2200RR following applications made according to label recommendations. In 1997 only, significant yield losses were observed in these same varieties when applications were made outside the label recommendations.

WEED MANAGEMENT SYSTEMS IN GLUFOSINATE TOLERANT COTTON. P.A. Dotray*, J.W. Keeling, D.A. Peters, and J.A. Bond. Texas Agricultural Experiment Station, Texas Agricultural Extension Service, and Texas Tech University, Lubbock.

ABSTRACT

In previous research, glufosinate-tolerant cotton growth and yield was not affected by glufosinate applications made at different growth stages (cotyledon to 50% open boll), at various rates (0.36 to 2.88 lb ai/A), and in sequential applications (0-1, 3-4, 9-10, and 14-15 mainstem leaves). The objectives of this research were evaluate weed management systems in glufosinate-tolerant cotton, compare the glufosinate-tolerant cotton weed management system to glyphosate- and bromoxynil-tolerant cotton weed management systems, and confirm season-long cotton tolerance to glufosinate. Experiments were conducted in 2000 at the Texas Agricultural Experiment Station located near Lubbock on an Acuff clay loam soil with 0.8% organic matter and pH 7.8. Herbicides were applied using a backpack or tractor-mounted compressed air sprayer that delivered 10 GPA at 3 MPH using 80015 spray tips. In the weed control experiment, cotton was planted on 40-inch rows on May 8. Varieties included glufosinate-tolerant Coker 312, PM2326RR, and BXN47. Treatments within each variety included: trifluralin PPI at 0.75 lb ai/A followed by (fb) prometryn PRE at 1.2 lb ai/A fb cultivation, trifluralin PPI fb a POST herbicide as needed (ASN), prometryn PRE fb a POST herbicide ASN, trifluralin PPI fb prometryn PRE fb a POST herbicide ASN, and a POST herbicide only ASN. The POST herbicides used were glufosinate 0.36 lb ai/A in glufosinate-tolerant cotton, glyphosate at 0.75 lb ae/A in glyphosate-tolerant cotton, and bromoxynil at 0.5 lb ai/A in bromoxynil-tolerant cotton. Palmer amaranth (*Amaranthus palmeri*), devil's-claw (*Proboscidea louisianica*), and silverleaf nightshade (*Solanum elaeagnifolium*) control was evaluated throughout the growing season and dictated the POST ASN applications. In the tolerance test, trifluralin PPI at 0.75 lb ai/A was applied to control annual grasses and Palmer amaranth. Cotton was planted on 40-inch rows on June 6 and kept weed-free throughout the season. Glufosinate was applied to cotton at three growth stages (1 to 2 leaf, 4 leaf, and peak bloom), at 3 rates (0.36, 0.72, and 1.44 lb ai/A), and in individual or sequential applications.

In the glufosinate-tolerant cotton weed management systems, weed pressure on May 24 dictated a glufosinate application in the prometryn fb POST and POST only treatments. Weed pressure in all treatments dictated glufosinate applications on June 6 and June 21. On July 20 (73 DAP), the glufosinate only treatment controlled Palmer amaranth 79%, whereas all other treatments controlled Palmer amaranth 83 to 89%. At this same rating date, the glufosinate treatments controlled devil's-claw and silverleaf nightshade 81 to 85%, whereas the trifluralin fb prometryn fb cultivation treatment controlled devil's-claw 61% and silverleaf nightshade 75%. The trifluralin fb glufosinate and trifluralin fb prometryn fb glufosinate required 2 in-season applications, whereas the prometryn fb glufosinate and glufosinate only treatments required 3 in-season applications. Similar lint yields were produced from all glufosinate-treated plots. When compared to the POST only treatments in the other weed management systems, glufosinate controlled Palmer amaranth (79%), devil's-claw (81%), and silverleaf nightshade (81%) more effectively than the control achieved from the bromoxynil only treatment (54%, 73%, and 73% control for Palmer amaranth, devil's-claw, and silverleaf nightshade, respectively) and similar to the control achieved from the glyphosate only treatment (85%, 80%, and 80% control for Palmer amaranth, devil's-claw, and silverleaf nightshade, respectively). All POST only herbicide treatments were applied 3 times during the growing season, whereas the trifluralin fb POST ASN treatment required only 2 POST applications. Unlike previous years, slight visual injury (leaf necrosis) was observed 7 days after most glufosinate applications. Yields following all glufosinate applications did not differ from the untreated control.

These studies confirm season-long tolerance of glufosinate tolerant cotton. Palmer amaranth, devil's-claw, and silverleaf nightshade control was achieved using glufosinate POST in a glufosinate-tolerant cotton weed management system. Other cotton varieties containing the glufosinate tolerance gene will be tested in 2001 as well as work to further examine the use of glufosinate in a glufosinate-tolerant cotton weed management system.

THIPS INJURY AND EARLY-SEASON COTTON GROWTH: POTENTIAL INTERACTION OF PENDIMETHALIN INJURY AND SYSTEMIC INSECTICIDES. T.L. Grey, D.C. Bridges, G.D. Buntin, and P.M. Roberts*. Department of Crop and Soil Science and Entomology Department, The University of Georgia, Griffin, GA 30223-1797 and Tifton* GA.

ABSTRACT

Pendimethalin is applied preemergence (PRE) to approximately 30% of Georgia cotton. Pendimethalin is registered for PRE application up to 2 days after cotton has been planted. However, delayed application in combination with adequate moisture (rainfall or irrigation) can result in injury to seedling cotton. Pendimethalin's mode of action is through inhibition of cell division in developing root systems. Prowl injury to cotton seedling results in delayed hypocotyl development and can also result in abnormal root growth and development. Aldicarb and imidacloprid are systemic insecticides used for control of early-season thrips, aphids, and other insects. If damaging infestations are not controlled, early-season insect damage can reduce seedling vigor and result in delayed plant development.

In an effort to determine if early season pendimethalin injury to cotton would limit insecticide uptake and thus lead to increased thrips injury, a study was initiated during 2000 at Plains GA. Roundup Ready-Bolgard ST 4892 cotton was planted in a conventionally prepared seedbed with 4 rows per plot. The design was a 3x5 factorial arrangement of treatments with three insecticides (none, imidacloprid, and aldicarb) and five herbicides [none and pendimethalin 1.12 and 2.24 $kg \cdot ha^{-1}$ a.i. PRE and 2 days after planting PRE (2-DPRE)]. Pendimethalin was incorporated with irrigation on the day of application. Acephate was applied to all plots after June 21 to control other pest.
Thrips monitoring began by hand harvesting five consecutive plants four two weeks after planting and conducted consecutively for four weeks. Also beginning two weeks after planting, stand counts were taken and ten consecutive plants from each plot were excavated by hand and these samples used to determine leaf area, root and stem length, and dry weights for each of these variables. This entire plant sampling routine was conducted at two-week intervals for a total of three sampling dates.

Stand and yield was not significantly affected by any treatment. However, results from this field experiment indicate dramatic differences in early-season cotton growth relative to herbicide injury and lack of thrips control. Early season thrips injury was increased on cotton plots treated with 2-DPRE applications of pendimethalin. Adequate soil moisture led to rapid cotton hypocotyl development within 24 hours of planting, which was followed by the 2-DPRE application of pendimethalin. Pendimethalin injury to the cotton plants reduced root development, reducing the seedlings' ability to absorb soil residual insecticides. This decreased insecticide absorption resulted in cotton seedlings that were more susceptible to thrips injury. Upon seedling emergence, thrips damage on cotton seedlings that had received delayed pendimethalin application was noted. Further investigation noted that the developing roots of the thrips-injured plants exhibited pendimethalin injury symptoms. Analysis revealed that insecticide and herbicide did affect these variables, but the interaction of insecticide by herbicide did not statistically occur for stem length and dry weight, tap root length and dry weight, number of leaves, and leaf area and dry weight. This indicates that pendimethalin injury that leads to decreased insecticide absorption with resultant increased thrips injury may be an additive affect. Pendimethalin is commonly used for Georgia cotton production and could be reducing effectiveness of soil applied insecticides on a much larger scale than realized.

COMPARISON OF EFFICACY AND ROUNDUP READY CROP TOLERANCE TO VARIOUS EPSPS INHIBITING HERBICIDES. A. Rankins, Jr., W.F. Bloodworth, and D.B. Reynolds, Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Three field experiments were conducted in 2000 to evaluate Roundup Ready crop tolerance to various EPSPS inhibiting herbicides. Experiment one was conducted at the Blackbelt Branch Experiment Station near Brooksville, MS on a clay loam soil with a pH of 5.9 and 2% organic matter. On May 15, "Paymaster 1560 BG/RR" cotton (*Gossypium hirsutum* L.) was planted on 38-inch rows. The experimental design was a randomized complete block with 4 replicates. The plot size was 12.67 ft. x 40 ft., with 4 cotton rows in each plot. Products evaluated in this experiment were Glyphos, Glyphos Xtra, Glyphomax, Glyphosate Original, Roundup Dry, Roundup D-Pak, Roundup Original, Roundup Ultra, and Touchdown. Each product was applied at 0.75 lb ae/A and 0.25% v/v nonionic surfactant (NIS) was included with Glyphos, Glyphosate Original, Roundup D-Pak, Roundup Original, and Touchdown. Each product was applied as a postemergence broadcast application to 2-leaf cotton on June 1 followed by a sequential application to 4-leaf cotton on June 12. Applications were made with a tractor-mounted sprayer delivering 15 gpa at 4 mph. Parameters evaluated were weed control, cotton injury, and cotton yield.

Experiment two was conducted at the Plant Science Research Center near Starkville, MS on a loam soil with a pH of 6.9 and 1% organic matter. On May 5, "Paymaster 1560 BG/RR" cotton was planted on 38-inch rows. The experimental design was a randomized complete block with 4 replicates. The plot size was 12.67 ft. x 40 ft., with 4 cotton rows in each plot. Products evaluated in this experiment were Roundup Ultra, Roundup Ultra Max, Roundup Original, and Roundup D-Pak. Each product was applied at 0.75 and 1.5 lb ae/A. Roundup Ultra Max and Roundup Original were evaluated alone and with 0.5% v/v NIS; Roundup D-Pak was evaluated alone and with 1% v/v NIS. Each product was applied as a postemergence broadcast application to 2-leaf cotton on May 23 followed by a sequential application to 4-

leaf cotton on May 30. Also, post-directed applications were make to 6-leaf cotton on June 12 followed by a sequential post-directed application to 8-leaf cotton on June 19. Applications were made with a tractor-mounted sprayer delivering 15 gpa at 4 mph. Parameters evaluated were cotton injury, and cotton yield.

Experiment three was also conducted at the Plant Science Research Center near Starkville, MS on the same soil type in experiment 2. On April 13, "Delta King 686 RR" corn (*Zea mays* L.) was planted on 38-inch rows. The experimental design was a randomized complete block with 4 replicates. The plot size was 12.67 ft. x 40 ft., with 4 corn rows in each plot. Products evaluated in this experiment were Roundup Ultra and Touchdown. Each product was applied at 1 and 2 lb ai/A as a single application to 2-leaf corn on May 2, 4-leaf corn on May 9, and 6-leaf corn on May 23. Roundup and Touchdown were also evaluated at 1 lb ai/A as sequential treatments applied to 2-leaf followed by 8-leaf corn on May 30, 4-leaf followed by 8-leaf corn, and 6-leaf followed 8-leaf corn. Applications were made with a backpack sprayer delivering 15 gpa at 3 mph. Parameters evaluated were corn injury, and corn yield.

In experiment one, there were no differences in efficacy of large crabgrass (*Digitaria sanguinalis* (L.) Scop.), pitted morningglory (*Ipomoea lacunosa* L.), and sicklepod (*Senna obtusifolia* (L.) Irwin and Barnaby) across treatments. At 10 weeks after planting, each species was controlled at least 85%, regardless of treatment. No visual cotton injury was observed with any treatment and there were no differences in cotton yield, regardless of glyphosate product. Results were similar in experiment two. Again, no visual cotton injury was observed and yield did not differ among treatments. Also, in experiment three no corn injury was observed with any treatment and corn yield did not differ across treatments. These data suggests that there are minimal differences in crop tolerance among the various EPSPS inhibiting products evaluated in these experiments.

WEED CONTROL AND COTTON RESPONSE WITH FIRSTRATE AND FRONTROW POST-DIRECTED.
A.C. York, Crop Science Department, North Carolina State University, Raleigh; A.S. Culpepper, Department of Crop and Soil Sciences, University of Georgia, Tifton.

ABSTRACT

An experiment was conducted in 2000 in Goldsboro, NC and Moultrie, GA to evaluate weed control and cotton response to FirstRate and Frontrow postemergence-directed to 7- or 14-inch Roundup Ready cotton. Treatments directed to 7-inch cotton included FirstRate 84DF (cloransulam) 0.3 and 0.6 oz/A plus crop oil concentrate (COC) 1.2% (v/v), Frontrow (co-packaged combination of 84% cloransulam + 80% flumetsulam at 2.5-to-1 ratio) 0.42 and 0.84 oz/A plus COC, FirstRate 0.3 oz/A or Frontrow 0.42 oz/A plus MSMA 6.6L 2.4 pt/A plus COC, Caparol 4L (prometyrn) 1.3 pt/A plus MSMA 2.4 pt/A plus nonionic surfactant (NIS) 0.25%, Roundup Ultra 4L (glyphosate) 1.5 pt/A, and FirstRate 0.3 oz/A or Frontrow 0.42 oz/A plus Roundup Ultra 1.5 pt/A with and without COC. Each of these treatments was applied following Prowl (pendimethalin) preemergence and Roundup Ultra overtop 3-leaf cotton. Treatments directed to 14-inch cotton included FirstRate 0.3 and 0.6 oz/A plus COC, Frontrow 0.42 and 0.84 oz/A plus COC, and Bladex 4L (cyanazine) 1 qt/A plus NIS. The 14-inch treatments were preceded by Prowl preemergence, Roundup Ultra overtop 3-leaf cotton, and Caparol plus MSMA directed to 7-inch cotton.

FirstRate 0.3 and 0.6 oz/A and Frontrow 0.42 and 0.84 oz/A plus COC directed to 7-inch cotton injured the crop 17, 33, 52, and 76%, respectively, 13 days after treatment (DAT) while little to no injury was noted with Roundup or Caparol plus MSMA. Mixing either MSMA or Roundup Ultra with FirstRate did not alter the injury compared with FirstRate alone. However, COC increased injury with both FirstRate and Frontrow. Cotton recovered quickly from FirstRate injury, with 5 and 0% injury noted at 20 and 45 DAT, respectively, following application of 0.3 oz/A plus COC. Recovery from Frontrow injury was much slower, with 15 and 50% injury still present at 45 DAT with 0.42 and 0.84 oz/A, respectively.

Control of smooth pigweed (*Amaranthus hybridus*), sicklepod (*Senna obtusifolia*), Asiatic dayflower (*Commelina communis*), pitted morningglory (*Ipomoea lacunosa*), tall morningglory (*Ipomoea purpurea*), and redweed (*Melochia corchorifolia*) was similar with FirstRate and Frontrow. FirstRate 0.3 oz/A alone or mixed with MSMA or Roundup Ultra controlled both morningglory species, sicklepod, smooth pigweed, redweed, and Asiatic dayflower completely 13 DAT. Control by FirstRate was similar to or better than control by Caparol plus MSMA or Roundup Ultra. Late-season control ratings indicated similar residual control of sicklepod and redweed by FirstRate 0.3 oz/A and Caparol 1.3 pt/A. Caparol gave better late-season control of Asiatic dayflower while FirstRate was better on morningglory species and smooth pigweed. Yield of cotton receiving FirstRate 0.3 oz/A was similar to or greater than cotton receiving Roundup Ultra or Caparol plus MSMA. FirstRate 0.6 oz/A did not reduce yield in North Carolina but reduced yield in Georgia 18%. Frontrow 0.42 and 0.84 oz/A reduced yield 25 and 54% in North Carolina and 35 and 75% in Georgia.

Injury by FirstRate and Frontrow was less on 14-inch cotton than 7-inch cotton. However, injury by Frontrow, especially 0.84 oz/A, was excessive. Weed control by FirstRate, Frontrow, and Bladex was similar and excellent. Neither FirstRate nor Frontrow impacted yield in North Carolina. In Georgia, Frontrow 0.42 and 0.84 oz/A reduced yield 19 and 43%. The greater yield response to both 7- and 14-inch treatments in Georgia may have been related to an extremely dry growing season while conditions in North Carolina were near ideal.

WEED CONTROL AND COTTON TOLERANCE WITH FIRSTRATE AND FRONTROW. D.K. Miller, P.R. Vidrine, D.R. Lee and A.L. Perritt, Louisiana State University Agricultural Center, Baton Rouge, LA 70803.

ABSTRACT

Field studies were conducted in 2000 at the Northeast Research Station in St. Joseph, LA on a clay soil, pH 6.2. The experimental design was a randomized complete block with four replications. Herbicide treatments in study one consisted of Pendimax (pendimethalin) at 2 pt/A (0.83 lb ai/A) PRE followed by Roundup Ultra (glyphosate) at 1.5 pt/A (0.75 lb ai/A) EPOST followed by Caparol (prometryn) at 1 pt/A (0.5 lb ai/A) plus MSMA at 2.4 pt/A (2 lb ai/A) postemergence directed (PD) applied to all plots. The following layby treatments were compared in study one: Firstrate (cloransulam methyl) at 0.3 oz/A (0.016 lb ai/A), 0.45 oz/A (0.024 lb ai/A), and 0.6 oz/A (0.031 lb ai/A) alone or at 0.3 oz/A in combination with MSMA at 2.4 pt/A (2 lb ai/A), Firstrate at 0.3 oz/A in combination with Python (flumetsulam) at 0.12 oz/A (0.006 lb ai/A) alone or plus MSMA at 2.4 pt/A, and Firstrate at 0.6 oz/A in combination with Python at 0.24 oz/A (0.012 lb ai/A). The commercial standard of Bladex (cyanazine) at 2.4 pt/A (1.2 lb ai/A) and a nontreated check were included for comparison. In the second study, all plots received Pendimax PRE at 2 pt/A followed by Roundup Ultra EPOST at 1.5 pt/A. PD treatments evaluated included Firstrate at 0.3 oz/A alone or in combination with MSMA at 2.4 pt/A, Roundup Ultra at 1.5 pt/A, Python at 0.12 oz/A, or Python at 0.12 oz/A plus Roundup Ultra at 1.5 pt/A, and Firstrate at 0.6 oz/A alone and in combination with Python at 0.24 oz/A. A commercial standard of Caparol at 1 pt/A plus MSMA at 2.4 pt/A and a nontreated check were included for comparison. Herbicide treatments were applied at 15 GPA to all rows of each 13.33' x 40', four row plot. Weed control and crop response were visually rated at 14 and 45 days after treatment (DAT) at which time plant height was also measured. Node above white flower (NAWF) counts were also made mid-season to access possible maturity delays. Yield was determined by harvesting the center two rows of each plot.

In study one, at 14 DAT visual injury was no greater than 5%. Plant height ranged from 66 to 75cm with slight differences between treatments. Barnyardgrass (*Echinochloa crus-galli*), entireleaf morningglory (*Ipomoea hederacea),* and pitted morningglory (*Ipomoea lacunosa*) were controlled at least 95, 93, and 82% by all treatments. All layby treatments provided at least 85% control of prickly sida (*Sida spinosa*). At 45 DAT, visual injury was not evident for any treatment and plant height was equal to the nontreated check. All layby treatments resulted in 93 to 95, 85 to 95, 85 to 93, 93 to 95, and 82 to 95% control of barnyardgrass, johnsongrass (*Sorghum halepense*), pitted morningglory, entireleaf morningglory, and prickly sida, respectively. Hemp sesbania (*Sesbania exaltata*) control ranged from 72 to 85%. NAWF counts were equal for all treatments and the nontreated check. All layby treatments resulted in equal seedcotton yield ranging from 1437 to 1531 lb/A, which was greater than where no layby treatment was applied (1299 lb/A) and the nontreated check (ll71 lb/A).

In study two, visual injury ranged from 15 to 23% for the Firstrate/Python combinations, which was greater than all other treatments (<6%). Plant height was similar for all treatments ranging from 44 to 49 cm. All PD treatments resulted in 83 to 93 and 85 to 95% control of pitted morningglory and prickly sida, respectively. Hemp sesbania control was no greater than 83% by Caparol plus MSMA. At 45 DAT, injury with Firstrate at 0.6 oz/A plus Python at 0.24 oz/A and Firstrate at 0.3 oz/A plus Python at 0.12 oz/A in combination with Roundup Ultra was 8%, with no other treatment resulting in greater than 3% injury. Plant height ranged from 83 to 92 cm with no difference among treatments and the nontreated check. NAWF counts were equal to the nontreated check. Barnyardgrass, prickly sida and pitted and entireleaf morningglory were controlled 93 to 95, 92 to 95, 83 to 94%, and 87 to 95%, respectively, by all PD treatments. Hemp sesbania control was no greater than 78%. Seedcotton yield ranged from 1277 to 1582 lb/A for all treatments, which was not different from the nontreated check (1328 lb/A).

In conclusion, Firstrate alone and in combination with Python (Frontrow) resulted in weed control equal to the commercial standard. PD applications of Frontrow did result in significant early season injury, however it was not manifested in maturity delays or yield reduction.

HOW LATE IS TOO LATE TO SPRAY ROUNDUP ULTRA IN ROUNDUP READY CORN? G.N. Rhodes, Jr.*, G.K. Breeden, and T.C. Mueller, Univ. of Tennessee, Knoxville 37901; J.A. Kendig and G.A. Ohmes, Univ. of Missouri, Portageville 63873.

ABSTRACT

Roundup Ready weed management technology has been rapidly adopted by Midsouth cotton and soybean producers. During the years prior to and following registration of Roundup Ready cotton and soybeans, much research has been conducted relative to timing of overtop applications of Roundup and the use of residual herbicides in a Roundup Ready system. Roundup Ready corn, though it has not rapidly gained acreage in the Midsouth due primarily to lack of a wide choice of adapted hybrids, has shown great promise for use in systems for management of southern broadleaf and grass weeds. Numerous investigators in our region have conducted research similar to that previously conducted in the other Roundup Ready crops.

Field research was conducted during 2000 to determine the impact of timing of Roundup Ultra application and utility of a residual herbicide in a Roundup Ready corn weed management system. Systems utilizing a single overtop application of Roundup Ultra beginning at 2 weeks after planting (WAP) and continuing through 9 WAP were compared with and without atrazine PRE. In corollary studies, sequential applications of Roundup Ultra were compared beginning at 2 WAP and continuing through 9 WAP. The research was conducted at Portageville, MO and at Knoxville and Tellico Plains, TN. Roundup Ultra rates were 3 pt/A at Portageville and 2 pt/A at Knoxville and Tellico Plains. Atrazine, where used, was applied at 4 pt/A. Corn hybrids were Asgrow 794 RR at Portageville and DeKalb 626 RR at Knoxville and Tellico Plains. Each experiment was conducted as a randomized complete block design with 4 replications of treatments.

Without atrazine PRE, two applications of Roundup Ultra were required to maintain adequate control of most broadleaved weeds, and the optimum sequential timings appear to be at approximately 2 followed by 4, or 3 followed by 5, WAP as reflected in corn yields. Application of atrazine PRE tended to delay the need for overtop Roundup Ultra for broadleaf weed control until approximately 4 WAP. Optimum timing of Roundup Ultra for johnsongrass (*Sorghum halepense*) control was at 4 to 5 WAP. Earlier applications resulted in greater rhizome johnsongrass regrowth. Later applications tended to reduce yield.

COVER CROP MANAGEMENT IN NO-TILL DARK-FIRED AND BURLEY TOBACCO. R.L. Ellis, T.C. Mueller and B.D. Sims. University of Tennessee, Knoxville, TN 37901-1071.

ABSTRACT

Tobacco is an important crop in the southeastern United States. There were 63,000 acres of tobacco grown in Tennessee with a value of $240 million in 1999. Tobacco is normally grown in cultivated fields. Cultivation is primarily used to control weeds and improve soil tilth. Cultivation sometimes leads to increased soil erosion, which reduces long-term productivity of the land. Producers are also challenged with meeting conservation compliance regulations established by the government in order to remain eligible for the loan program. No-till systems would allow production on sloping fields while decreasing soil erosion and could reduce production costs.

Two studies were conducted in burley and dark-fired tobacco using a randomized complete block design with a split plot treatment arrangement on the Highland Rim Experiment Station in 1999 and 2000.The objective of the research was to evaluate the management of a wheat cover crop and different herbicide combinations in a no-till system. Main treatments consisted of a non-selective herbicide treatment applied at 30 days (early) and 15 days (late) prior to transplant and conventional handling of the wheat cover crop. Sub-plot treatments were Spartan 75DF (6.7 oz/A) + Prowl 3.3EC (2.0 pt/A), Spartan 75DF (6.7oz/A) + Command 3ME (1.5 pt/A), a hand weeded check, and a weedy check. Prowl was incorporated in the conventional plots and all other applications were applied preemergent.

Weed control for smooth pigweed, broadleaf signalgrass, and entireleaf morningglory was greater than 90% at 28 days after transplant (DAT) for both herbicide treatments in 1999. In 2000 smooth pigweed and entireleaf morningglory were 95% or greater at 56 DAT for both herbicide combinations. Broadleaf signalgrass control was 80% or greater for both herbicide combinations at 56 DAT. Yields in the no-till plots were significantly lower than in the conventional plots for both types of tobacco in 1999 and for burley in 2000. Dark-fired yield were not available at press time. There was no difference in quality among the treatments in either study in either year.

WEED CONTROL PROGRAMS IN ROUNDUP READY CORN. D.B. Reynolds, E.L. Sanders, and S.L. File. Mississippi State University, Mississippi State, MS.

ABSTRACT

Availability of transgenic corn (*Zea mays* L.) varieties that enable the use of postemergence applications of glyphosate has resulted in questions regarding the need for residual herbicides. Questions have also arisen regarding when residuals should be used if they are to be included in weed control programs.

Five experiments were conducted over a three year period at Brooksville and Starkville, Mississippi. All treatments were applied at 15 GPA. Treatments included a single 1.0 lb ai/A application of Roundup 4AS (glyphosate) applied early postemergence (EPOST); a sequential application of 1.0 lb/A Roundup EPOST followed by (fb) 0.75 lb/A applied late postemergence (LPOST); 1.88 lbs ai/A Bullet (1.17 + 0.71 lbs ai/A alachlor + atrazine) preemergence (PRE), which is one-half the recommended rate, fb 1.0 lb/A Roundup EPOST; 1.88 + 1.0 lbs/A Bullet + Roundup EPOST; 1.375 lbs ai/A Bicep II Magnum (0.78 + 0.60 lbs/A atrazine + metolachlor) PRE, which is one-half the recommended rate, fb 1.0 lb ai/A Roundup EPOST; 1.375 + 1.0 lb/A Bicep + Roundup EPOST; 2.75 lbs ai/A Bicep II Magnum (1.55 + 1.20 lbs ai/A atrazine + metolachlor) PRE fb 0.031 lbs ai/A Accent (nicosufuron) EPOST; and 1.0 + 2.0 lbs ai/A Prowl (pendimethalin) + Aatrex (atrazine) PRE fb 0.031 lb/A Accent EPOST. The Bicep II Magnum PRE fb Accent and Prowl + Aatrex PRE fb Accent were both local industry standards at the time the experiments were conducted.

Crabgrass (*Digitaria sanguinalis* L. Scop.) control 14 days after treatment (DAT) ranged from 90 to 95% among all treatments. Roundup alone EPOST and Bullet + Roundup EPOST gave 70 to 75% control 28 DAT, which was significantly lower than the 95 to 96% control provided by all other treatments containing Roundup. By 42 DAT,

Roundup EPOST and Bullet + Roundup EPOST gave only 60 to 66% control while all other treatments gave significantly better control ranging from 92 to 97%.

Pitted morningglory (*Ipomoea lacunosa* L.) control 14 DAT was similar among most treatments and ranged from 79 to 89%. Treatments containing a soil applied treatment of atrazine ranged from 88 to 92% while Roundup alone EPOST or treatments containing atrazine applied postemergence gave 66 to 78% control 28 DAT. By 42 DAT, Roundup alone EPOST gave 64 and 80% control, respectively, while control among other treatments ranged from 87 to 96%.

Sicklepod (*Cassia obtusifolia* (L.) Irwin and Barnaby) control 14 DAT was optimized where either Bullet or Bicep were applied EPOST in combination with Roundup. Control with these treatments was 92%, which was equivalent to the sequential treatment of Roundup or the current industry standards. By 28 DAT, Prowl + Aatrex PRE fb Accent EPOSTand Roundup EPOST controlled sicklepod 85 to 86% while all other treatments controlled sicklepod 90 to 95%. Roundup EPOST and Bullet + Roundup EPOST gave 80 to 82% control 42 DAT, while all other treatments gave 92 to 97%.

Minimal crop injury was observed with any treatment combination. Overall, yields ranged from 90 to 108 bu/A but did not differ among treatments.

In all instances the sequential application of Roundup resulted in control and yields equivalent to that obtained with the standard treatments included for comparison. These data indicate that residual herbicides may be replaced with multiple applications of Roundup without affecting efficacy, on the weeds evaluated, or yield.

DICLOFOP-RESISTANT RYEGRASS CONTROL WITH IMAZAMOX IN CLEARFIELD* WHEAT. L.T. Barber, L.R. Oliver, F.L. Baldwin, and R.C. Scott. University of Arkansas, Fayetteville, Arkansas Cooperative Extension Service, Little Rock, and BASF Corp., Jonesboro, AR.

ABSTRACT

Diclofop-resistant ryegrass has spread throughout Arkansas wheat production regions since 1996. With the increasing spread of diclofop (Hoelon)- resistant ryegrass across the state, alternative herbicide programs need to be utilized effectively to provide adequate control of ryegrass. Studies using an imidazolinone-tolerant (Clearfield)* wheat cultivar were conducted from 1998 through 2000 at Fayetteville and Willow Beach, AR, to evaluate diclofop-resistant ryegrass control with imidazolinone herbicides. A natural infestation of diclofop-resistant perennial ryegrass, which was resistant to 7.5 lb ai/A of diclofop, was present at the Willow Beach location, and seed stock from this location was planted at Fayetteville to establish a resistant ryegrass population.

Imazamox (Raptor) was evaluated for diclofop-resistant perennial ryegrass (*Lolium perenne*) control and compared to other imidazolinone herbicides: imazaquin (Scepter), imazethapyr (Pursuit), and imazapic (Cadre). Pendimethalin (Prowl) and diclofop (Hoelon) were also evaluated for ryegrass control. Each herbicide was evaluated preemergence (PRE) and postemergence (POST) at 2-to 3-leaf wheat. Soil textures were a clay loam and silt loam at Willow Beach and Fayetteville, respectively. An imidazolinone-tolerant wheat cultivar provided by BASF was drilled at a rate of 100 lb/A, with a row spacing of 7 in. The experimental design for both years at each location was a randomized complete block with a plot size of 5 by 24 ft and four replications. Treatments were sprayed with a backpack sprayer at 20 GPA. Visual ratings for ryegrass control were taken at 4, 6, 18 and 30 weeks after emergence (WAE). Wheat yield was reported as percent increase over the untreated check, due to an un-adapted wheat cultivar. Ratings and yield percentages were averaged over years and locations, and data were subjected to ANOVA with means separated by least significant difference (LSD) at the 0.05 level of significance.

PRE applications of imidazolinone herbicides controlled only 40 to 54% of the ryegrass at harvest. However, control increased to 76% when pendimethalin (Prowl) at 1lb ai/A was tank-mixed with imazamox, PRE. Imazamox, imazapic, and imazethapyr applied at 2- to 3-leaf wheat (POST) provided equal control (90%) at 6 WAE. However, by harvest (30WAE) imazapic gave the highest ryegrass control (81%) for any herbicide applied alone POST. Sequential applications of imidazolinone herbicides were needed to maintain higher control at harvest. Pendimethalin, PRE fb imazapic POST provided the highest ryegrass control (94% by harvest), but control did not differ from pendimethalin PRE fb imazamox POST which resulted in 92% control, or imazaquin PRE fb imazamox POST which gave 90% control. Wheat injury (34%) was observed with imazamox POST at 6 WAE. The injury decreased by harvest, and percent yield increase was equivalent to the highest yield increase for that application timing. Pendimethalin fb imazamox and pendimethalin fb imazapic provided for the highest yield increases of 77 and 85% respectively. Excellent ryegrass control and potentially no carryover problems to soybean indicate that pendimethalin and imazamox would be a viable option for controlling diclofop-resistant ryegrass.

WEED CONTROL IN CORN USING ZA1296 (MESOTRIONE). O.C. Sparks and L.R. Oliver, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72704.

ABSTRACT

Increasing environmental awareness and groundwater contamination by atrazine and its metabolites has led to questions about its safety. Studies were conducted in 1999 and 2000 at the Northeast Research and Extension Center, Keiser, AR, on a Sharkey silty clay and at the Main Experiment Station, Fayetteville, AR, on a Taloka silt loam to evaluate mesotrione (ZA1296) as a possible alternative to atrazine for controlling velvetleaf (*Abutilon theophrasti*), prickly sida (*Sida spinosa*), entireleaf morningglory (*Ipomoea hederacea var. integriuscula*), pitted morningglory (*Ipomoea lacunosa*), and broadleaf signalgrass (*Brachiaria platyphylla*) in field corn (*Zea mays*). Treatments consisted of preemergence (PRE)applications of mesotrione at 0.14 or 0.28 kg ai ha^{-1}, a package mix of mesotrione/acetochlor applied PRE at 2.2 or 2.4 kg ai ha^{-1}, and postemergence (POST) applications of mesotrione at 0.07 and 0.14 kg ha^{-1} applied alone or with atrazine at 0.28 kg ai ha^{-1}. A treatment of s-metolachlor plus atrazine at 1.6 and 1.4 kg ai ha^{-1}, respectively, applied PRE followed by (fb) atrazine at 1.4 kg ha^{-1} applied POST served as the competitive standard. There were no significant differences in crop injury with any treatment. Mesotrione applied PRE at 0.14 or 0.28 kg ha^{-1} and POST at 0.07 or 0.14 kg ha^{-1} was equal to or better than the competitive standard in providing season-long control of velvetleaf and prickly sida. Mesotrione applied PRE at 0.28 kg ha^{-1} and POST at 0.07 or 0.14 kg ha^{-1} also provided season-long control of entireleaf morningglory and pitted morningglory equal to the competitive standard. There was no advantage to adding atrazine at 0.25 kg ha^{-1} to postemergence applications of mesotrione at 0.07 and 0.14 kg ha^{-1} for control of any weed species evaluated; however, mesotrione applied PRE at 0.14 kg ha^{-1} will require additional herbicides for season-long control of entireleaf morningglory, pitted morningglory, and broadleaf signalgrass to equal control of the competitive standard. Mesotrione is an excellent herbicide option for atrazine.

WEED POPULATION CHANGES IN ROUNDUP READY AND CONVENTIONAL HERBICIDE SYSTEMS. S.G. Flint, J.C. Holloway, D.R. Shaw, R.M. Griffin, Mississippi State University, MS and Novartis Crop Protection Corp, Greenville, MS.

ABSTRACT

Field studies were conducted from 1998 through 2000 at the Novartis Crop Protection Delta Research Station, Greenville, MS, to monitor weed species shifts in Roundup Ready and conventional cotton (*Gossypium hirsutum* L.) and soybean [*Glycine max* (L.) Merr.]. Herbicides evaluated in soybean were glyphosate, flumetsulam + metolachlor, and CGA 277,476. These products were used at half and full label rates. Glyphosate was used at 1.1 kg ai/ha as a POST treatment following either flumetsulam + metolachlor in soybean or fluometuron + prometryn + metolachlor in cotton. Two applications of glyphosate were used in cotton and soybean as a comparison treatment. POST herbicides in conventional systems were pyrithiobac in cotton CGA 277,476 in soybean. Plot integrity was maintained each year to evaluate weed shifts over time. Plots were 12 x 40 m in cotton and 9 x 40 m in soybean.

In 1998 initial weed counts were taken in four 1-m quadrats per plot. The pitted mornningglory (*Ipomoea lacunosa* L.) population after treatment with high and low rates of fluometuron + prometryn + metolachlor fb glyphosate were 1.8 and and $0/m^2$ respectively, in 1998, and were 1.8 and $1.3/m^2$ respectively, in 1998 and were 0 and $0.9/m^2$, respectively, in 2000. Two applications of glyphosate resulted in a pitted morningglory population of $2.2/m^2$ in 1998 and $0.3/m^2$ in 2000. Hemp sesbania [*Sesbania exaltata* (Raf.) Rybd. Ex. A. W. Hill] populations in cotton with two glyphosate applications were $8.8/m^2$ in 1998 and decreased to $3.3/m^2$ in 2000. Broadleaf signalgrass [*Brachiaria platyphylla* (Griseb.) Nash] populations in cotton for treatments of glyphosate fb glyphosate were $0.0/m^2$ in 1998 and increased to $17.0/m^2$ in 2000.

In soybean, two glyphosate applications resulted in $11.1/m^2$ in 1998 to $3.9/m^2$ in 2000 for hemp sesbania. Flumetsulam + metolachlor at high and low rates followed by glyphosate resulted in pitted morningglory populations of $8.3/m^2$ in 1998 to $0.5/m^2$ in 2000. In comparison, population following flumetsulam + metolachlor followed by CGA 277,476 was $6.7/m^2$ in 1998 to $0.3/m^2$ in 2000. Broadleaf signalgrass populations in flumetsulam + metolachlor fb glyphosate was from 0.7 to $7.6/m^2$ in 1998 and 2000, respectively. Hemp sesbania population in soybean was $15.6/m^2$ and $7.7/m^2$ in 1998 and 2000, respectively, thus, weed populations overall showed a significant reduction, with the exception of broadleaf signalgrass which increased over the three years with both the Roundup Ready and conventional weed control systems, with notable differences between systems in the third year.

CGA-362622, A NEW OPTION FOR YELLOW NUTSEDGE (*CYPERUS ESCULENTUS*) CONTROL IN COTTON. R.J. Richardson, H.P. Wilson, and T.E. Hines. Eastern Shore Agricultural Research and Extension Center, Virginia Tech, Painter, VA 23420.

ABSTRACT

Nutsedge spp. rank as the most troublesome weeds of cotton in the southern U. S. and the fifth most common weeds. Current cotton (*Gossypium hirsutum* L.) herbicides suppress yellow (*Cyperus esculentus* L.) and purple nutsedge

(*Cyperus rotundus* L.), but rarely provide adequate control. As a result, field and greenhouse studies were conducted at and near the Eastern Shore Agriculture Research and Extension Center in Painter, VA, to evaluate yellow nutsedge response to POST applications of CGA-362622 alone and in combinations with other herbicides. Field studies were arranged as randomized complete block designs with three replications and consisted entirely of POST treatments. Plots were a minimum of 6 ft wide and contained two treated rows 20 ft in length. Data collected included cotton response at 7, 14, and 28 days after treatment (DAT) and yellow nutsedge control at 14, 28, and 56 DAT. Yellow nutsedge stand densities for the untreated checks were 31, 33, and 84 shoots/ft^2 in Painter, Eastville, and Bird's Nest, respectively. Greenhouse studies included PRE and POST treatments with a factorial treatment arrangement; data were subjected to ANOVA and regression analysis. A soil mixture was used for PRE studies while a highly organic potting soil mix was used for POST studies.

Yellow nutsedge control 56 DAT from metolachlor (0.96 lb ai/A), pyrithiobac (0.063 lb ai/A), and MSMA (O.96 lb ai/A) treatments did not exceed 60% at any location. However, CGA-362622 (0.0067 lb ai/A) controlled yellow nutsedge 68 to 92% over the three studies and CGA-362622 (0.0134 lb/A) controlled yellow nutsedge 95 and 85% at Eastville and Bird's Nest, respectively. Treatments of CGA-362622 (0.0067 lb/A) plus metolachlor (0.96 lb/A), pyrithiobac (0.015 or 0.031 lb/A), or MSMA (0.75 lb/A) provided 71 to 95% yellow nutsedge control over the three locations. Yellow nutsedge height (6 to 11 in and 10 to 18 in) at application did not affect response to CGA-362622 (0.0067 lb/A) at Painter, but control declined to 83% when yellow nutsedge height reached 12 to 24 in tall at application. At Bird's Nest, control was 69% when CGA-362622 (0.0067 lb/A) was applied to 4 to 8 in yellow nutsedge and 79% when applications were made to 6 to 12 in plants.

In the greenhouse, PRE applications of CGA-362622 at 0.0045 lb/A and higher reduced yellow nutsedge dry weight > 95% at 28 DAT. Yellow nutsedge regrowth was controlled > 80% from these treatments 56 DAT. Metolachlor PRE (0.96 lb/A) controlled yellow nutsedge growth 99% and regrowth was controlled 85%. POST applications of 0.0045 lb/A and greater controlled 2 to 4 in yellow nutsedge > 80% at 21 DAT. Control of 6 to 8 in yellow nutsedge was 50% and 71% with 0.0067 lb/A CGA-362622 POST. Control of yellow nutsedge regrowth from CGA-362622 (0.0067 lb/A) treatment POST to 2 to 4 in yellow nutsedge was 45 to 59% while CGA-362622 (0.0067 lb/A) provided no control of regrowth from 6 to 8 in tall yellow nutsedge.

RESPONSE OF LIBERTY RICE TO GLUFOSINATE APPLICATION TIMINGS. D.Y. Lanclos, E.P. Webster, and K.J. Pellerin, Department of Plant Pathology and Crop Physiology, Louisiana State University AgCenter, Baton Rouge, LA 70803.

ABSTRACT

A study was conducted in 1998 through 2000 at the Rice Research Station near Crowley, Louisiana to evaluate response of glufosinate-resistant rice (*Oryza sativa* L.) lines to glufosinate applications throughout the growing season. Glufosinate-resistant rice 'CPRS PB-13' (Cypress transformant) was drill-seeded in 1998 through 2000. 'BNGL HC-11' (Bengal transformant) was drill-seeded in 1998 and 'BNGL-62' was drill-seeded in 1999 and 2000, respectively. CPRS PB-13 will be referred to as Cypress and BNGL HC-11 and BNGL-62 as Bengal. The soil was a Crowley silt loam with pH 5.5, 1.4% OM, and a CEC of 19.1. Plot size was 4.5' x 20'. The experimental design was a randomized complete block with four replications. Glufosinate was applied at 0.75 lb ai/A in single applications starting 2d after emergence (DAE) and continuing through 56 DAE at 7 day intervals. Crop injury, days to 50% heading, plant height at harvest, and rice rough grain yield were evaluated. Following harvest, a 2 lb sample of rice was obtained from each plot to evaluate 100 count seed weights, germination, and seedling vigor.
Percent germination on harvested seed was determined at 14 days after placing 100 seed in petri dishes with moistened nontreated germination paper in a growth chamber at 13, 16, 19, 22, and 25 C. Seedling vigor was determined by placing 20 pregerminated seed in a growth chamber at 21 C for 12 days and shoot length was measured at termination. All data were subjected to ANOVA and means separated by Fisher's Protected LSD at the 0.05 level of probability. If treatment by year interaction did not occur, data were averaged across years.

At 14 days after treatment (DAT), there was a year by treatment interaction for rice injury with Cypress. In all years, injury was less than 10% for all treatments. Averaged over year, Cypress injury at 35 DAT was less than 5% for all treatments. Plant height, days to 50% heading, yield, 100 count seed weights, seed germination, and seedling vigor were averaged over year. No differences occurred for days to 50% heading and plant height expressed as percent of the nontreated. Yield was 4720 to 5490 lb/A for all treatments. Yield was not reduced for any treatment compared with the nontreated and when expressed as percent of the nontreated. Glufosinate application timing did not affect 100 count seed weights, seed germination, or seedling vigor.

The Bengal line had a treatment by year interaction for injury at 14 DAT. Injury was less than 10% in 1998 and 2000. In 1999, injury was 13% at the 49 DAE treatment; however, injury was less than 5% for all other treatments. Averaged over year, injury at 35 DAT was less than 3% for all treatments. Plant height, days to 50% heading, yield, 100 count seed weights, seed germination, and seedling vigor were averaged over year. There were no differences in days to 50% heading, plant height, and 100 count seed weights when expressed as percent of the nontreated. Bengal yield was 7350 to 8310 lb/A for all treatments. Yield was reduced at the 14, 42, 49, and 56 DAE application timings compared with the nontreated. Yield as expressed as percent of nontreated was reduced at the 14, 49, and 56 DAE timings. There were

no differences in percent germination when expressed as percent of nontreated at the 13, 16, 19, and 25 C. However, at 22 C the 49 DAE timing indicated a reduced rate of germination. No differences occurred for seedling vigor expressed as percent of nontreated.

In conclusion, application timing did adversely affect each glufosinate-resistant line. The Cypress line had no differences for days to 50% heading, plant height, yield, 100 count seed weights, germination, and seedling vigor regardless of glufosinate application timing when expressed as percent of nontreated. Injury did occur at 14 DAT; however, it was less than 10% for all treatments. For Bengal, days to 50% heading, plant height, 100 count seed weights, and seedling vigor had no differences when expressed as percent of nontreated. Bengal should not be sprayed at 14, 42, 49, and 56 DAE or yield can be reduced. A germination difference occurred for Bengal at 22 C. This research indicates for the Bengal line, glufosinate applications should be made from 21 to 42 DAE to minimize injury and maximize yield.

METOLACHLOR COMBINATIONS FOR YELLOW NUTSEDGE (*Cyperus esculentus* L.) MANAGEMENT IN WEST TEXAS PEANUT. B.L. Porter*, P.A. Dotray, J.W. Keeling, and T.A. Baughman. Texas Tech University, Texas Agricultural Experiment Station, Lubbock, and Texas Agricultural Extension Service, Vernon.

ABSTRACT

Field studies were conducted in Gaines County, Texas in 1999 and 2000 to evaluate yellow nutsedge (*Cyperus esculentus* L.) control and peanut response to metolachlor and metolachlor combinations. Metolachlor applied alone was evaluated preemergence (PRE), at ground crack (GC), and early postemergence (POST); followed by bentazon POST and pyridate POST at each application timing; with diclosulam PRE at each application timing; and with diclosulam PRE fb bentazon POST and pyridate POST at each application timing. Florunner peanut was planted near Loop, TX in 1999, and near Denver City, TX in 2000. Metolachlor at 1.27 lbs ai/A, diclosulam at 0.024 lbs ai/A, bentazon at 0.25 lbs ai/A, and pyridate at 0.94 lbs ai/A was applied using a tractor-mounted compressed air sprayer that delivered 10 gallons per acre at 24 psi. Yellow nutsedge control and peanut injury was evaluated 24, 39, and 51 days after planting (DAP) in 1999 and 31, 53 and 71 DAP in 2000.

Metolachlor PRE controlled yellow nutsedge > 78% at all rating dates. Diclosulam PRE provided similar control. Metolachlor GC and POST were less effective at all rating dates. The metolachlor timing/diclosulam PRE combinations controlled yellow nutsedge > 82% at all rating dates. Yellow nutsedge control was not improved when POST treatments were added to the metolachlor timing/diclosulam PRE combinations. Metolachlor GC controlled yellow nutsedge < 70%. Metolachlor GC fb pyridate POST controlled yellow nutsedge > 90% by midseason. Metolachlor GC fb bentazon POST controlled yellow nutsedge < 75%. Metolachlor POST controlled yellow nutsedge < 45%. Metolachlor POST + pyridate POST controlled yellow nutsedge 79% at 51 DAP in 1999, but only 43% at 71 DAP in 2000. Similarly, metolachlor POST + bentazon POST controlled yellow nutsedge 70% at 51 DAP in 1999, but only 43% at 71 DAP in 2000. Metolachlor PRE stunted plants < 13% in 2000, while stunting was observed in all diclosulam treated plots (2-15%). Peanut yields ranged from 726 to 1190 pounds per acre in 2000 and differences due to herbicide treatments were not detected.

ITALIAN RYEGRASS *(LOLIUM MULTIFORUM)* CONTROL IN NO-TILLAGE CORN. J.R. Martin, J.D. Green, and W.W. Witt, Department of Agronomy, University of Kentucky, Princeton, KY 42445.

ABSTRACT

Italian ryegrass has evolved as a significant problem weed in corn, particularly where no-tillage practices are utilized. Plants tend to be difficult to control once they have overwintered and recovered from the cold winter temperatures. Poor corn stands as well as early-season crop competition can occur where ryegrass is not controlled in no-tillage corn.

Studies were conducted at University of Kentucky Research and Education Center near Princeton, KY in 1997, 1998, and 2000 to compare and evaluate various burndown herbicide treatments in no-tillage corn. Gramoxone Extra applied at 1.5 pt/A alone provided 18 to 55% control of Italian ryegrass. Including atrazine 4L at 3 pt/A with Gramoxone Extra improved control over that achieved with Gramoxone Extra alone; however, the level of control was acceptable in only one out of three years. Corn yields tended to be a slightly greater when Gramoxone Extra was combined with atrazine than when Gramoxone Extra was applied alone.

Ryegrass control with a single application of Roundup Ultra at 2 pt/A combined with atrazine at 3 pt/A tended to be slightly greater compared with control from Gramoxone Extra plus atrazine. However, control was more consistent when the Roundup Ultra rate was increased to 3 pt/A. Corn yield tended to be greater with Roundup Ultra than with Gramoxone Extra.

Applying Gramoxone Extra at 1.5 pt/A as an early preplant treatment followed approximately two weeks later with Gramoxone Extra at 1.5 pt/A plus atrazine at 3 pt/A, provided at least 93 % control of Italian ryegrass across all three years. Similar results were achieved when Roundup Ultra at 2 pt/A was applied as the early preplant treatment followed by Gramoxone Extra plus atrazine at planting.

Research conducted during the 2000 season also evaluated postemergence herbicides for controlling Italian ryegrass plants that "escape" burndown treatments. Herbicide treatments in this study included Accent; Roundup Ultra applied only to Roundup Ready corn; Lightning applied only to Clearfield corn; and Liberty applied only to Liberty Link corn. The use of these postemergence herbicides as sequential sprays following a burndown program in no-till corn offered some control or suppression of Italian ryegrass. Delaying the application until significant regrowth of Italian ryegrass occurred was important to achieving optimum results with the postemergence treatments.

REFLECTANCE DYNAMICS OF COVER CROP RESIDUE AND TILLAGE IN SOYBEAN. T.H. Koger, D.R. Shaw, L.M. Bruce, and C.S. Bray, Department of Plant and Soil Sciences and 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

Cover crop residues and tillage systems such as no- and reduced-till are commonly used in crop production systems to reduce weed pressure, soil erosion, and conserve soil moisture. However, little is known about the impact that reflectance of cover crop residues have on weed detection capabilities with remote sensing technology, which has the potential to be a useful tool in detecting weeds growing in association with agronomic crops. The objective of this research was to evaluate the influence that cover crop residue and tillage have on weed detection capabilities with remote sensing technology.

One experiment was established in the fall of 1999 on a Dundee silt loam soil at the Southern Weed Science Research Unit, Stoneville, MS to evaluate the impact that reflectance patterns of tilled and non-tilled rye (*Secale cereale* L.) and no cover crop residue have on weed detection accuracy. Plots were 4.5 by 12 m and arranged in a split plot design with 4 replications of each treatment combination. The main plot factor was a combination of cover crop residue (no cover crop residue or rye cover crop residue) and tillage (till or no-till). 'Elbon' Rye was planted in half of the plots on 19-cm rows in the fall of 1999 and desiccated with paraquat (1100 g ai/ha) prior to planting soybean. Half of the plots were disked prior to soybean planting and the other half of the plots were not disked. The soybean cultivar 'DP 3588' was planted in 57-cm rows in May 2000. The subplot factor was level of weed control. Half of the plots were weed-free, receiving a PRE + POST treatment, and the other half of the plots received no herbicide all season. Hyperspectral reflectance classes for tilled and non-tilled rye residue, tilled and non-tilled soil, grassy weeds, and soybean were investigated several times during the 2000 growing season using a handheld hyperspectral sensor (300 to 2500 nm wavelength in 1.4-nm increments). Wavelet transformations were performed on spectral response plots for rye residue, grassy weeds, soybean, and soil classes taken from one collection date (July 4, 2000) using a HAAR mother wavelet transformation procedure. Pertinent features for each class (residue, grassy weeds, soybean and soil) were extracted and reduced to derive a linear function. The mean calculations for each observation class were tested for detection accuracy using Fisher's linear discriminant analysis and leave-one-out nearest means classification procedure.

Soil and rye cover crop residue were differentiated accurately 100% of the times tested. Spring tillage improved detection capability of grassy weeds, regardless of presence of cover crop residue. Small grasses were detected accurately 97 to 100% of the time in tilled treatments, compared to 86 to 94% in no-till treatments. Increased sample size improved detection accuracy. Correct detection of grass and soybean was 85% when the number of spectral response plots tested with the wavelet transformation event for grass and soybean was 44 and 77, respectively. When the sample size for grass and soybean was reduced by half, correct detection of grass and soybean decreased to 80 and 72%. In the future, hyperspectral classification data attained with the handheld sensor will be tested and compared to detection accuracy of features extracted from hyperspectral aerial imagery. This comparison of data sources will help in advancing the technology towards a commercial application, thus assisting growers in identifying weed populations in fields under different residue and tillage production systems.

UTILITY OF MESOTRIONE IN SOUTHERN CORN WEED MANAGEMENT SYSTEMS. G.K. Breeden, G.N. Rhodes, Jr., and T.C. Mueller, University of Tennessee.

ABSTRACT

Mesotrione (ZA-1296) is a new, low use rate herbicide for corn (*Zea mays*) weed management. Registration is pending. The herbicide, which may be applied PRE or POST, has a new mode of action for corn weed management. To determine the utility of mesotrione in southern corn weed management systems, field research was initiated to evaluate the performance of mesotrione PRE or POST on key broadleaf and grass weeds and to determine the potential for mesotrione to cause corn injury.

The research was conducted at Greenback and Spring Hill, TN in conventional tillage and at Knoxville and Tellico Plains, TN in no-tillage. All experiments were replicated 4 times utilizing a randomized complete block design. Experimental units were 10' wide by 30' long. A premixture of mesotrione + acetochlor applied PRE at 4.5 and 5 pt/A, with and without atrazine at 1 pt/A, was compared to a commercial standard of FulTime + atrazine (3 + 0.8 qt/A). Mesotrione was applied POST at 3 and 4 oz/A, with and without atrazine (0.5 pt/A). All POST plots received a PRE

application of TopNotch (4.5 pt/A) on the day of planting. In the no-till experiments, mesotrione + acetochlor was applied with Gramoxone Extra or Touchdown 5. Treatments were applied with either a CO_2 pressurized backpack or tractor mounted sprayer.

At 37 days after planting (DAP) at Greenback the mesotrione premix gave 78% or greater control of sicklepod (*Senna obtusifolia*) and 74% or greater control of entireleaf morningglory (*Ipomoea hederacea* var. *integriuscula*). At 80 DAP control had decreased to 71-81% for sicklepod and 67-89% for entireleaf morningglory. POST treatments of mesotrione without atrazine gave 79-80% control of sicklepod at 80 DAP. When atrazine was added control increased to 93-95%. POST treatments with and without atrazine gave 97% or greater control of entireleaf morningglory. At 40 DAP at Spring Hill, all PRE and POST treatments gave 99% control of common lambsquarters (*Chenopodium album*) and Pennsylvania smartweed (*Polygonum pensylvanicum*). PRE treatments gave 87% or greater control, and POST treatments gave 95% or greater control of entireleaf morningglory at 40 DAP. At Knoxville at 49 DAP, mesotrione + acetochlor applied with Touchdown 5 or Gramoxone Extra did not give commercial acceptable control of broadleaf signalgrass (*Brachiaria platyphylla*). At 28 DAP at Tellico Plains, sicklepod control was 80-90% with POST treatments and had decreased to 71-78% by 63 DAP. Pitted morningglory (*Ipomoea lacunosa*) control was 86-94% at 28 DAP and had decreased to 69-78% by 63 DAP.

This research indicates that mesotrione has excellent crop safety, and that it shows potential utility in corn weed management systems in the Midsouth. Mesotrione + acetochlor gave excellent control of common lambsquarters and Pennsylvania smartweed when applied PRE. Mesotrione applied POST also gave excellent control of common lambsquarters, Pennsylvania smartweed and entireleaf morningglory. Addition of a low rate of atrazine improved the control of sicklepod and pitted morningglory. Mesotrione + acetochlor applied PRE did not give commercially acceptable control of broadleaf signalgrass.

CGA362,622 ANTAGONIZES ANNUAL GRASS CONTROL WITH CLETHODIM. I.C. Burke, S.D. Askew, A.J. Price, and J.W. Wilcut, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

The effectiveness of CGA 362,622, a new sulfonylurea herbicide, on broadleaf weeds and clethodim on annual and perennial grass weeds make the use of these herbicides applied postemergence (POST) in mixture or sequentially, a likely option for broad spectrum weed control in cotton (*Gossypium hirsutum*). However, members of the sulfonylurea herbicide family, such as chlorimuron, have antagonized cyclohexanediones including clethodim, causing a reduction in grass control. Research was initiated in greenhouses and at the Rocky Mount and Clayton Research Stations in North Carolina to evaluate mixtures of clethodim and CGA 362,622 to determine whether antagonism occurs, and if so what would be the appropriate method of application for the two herbicides to reduce or overcome this antagonism. In each study, clethodim and CGA 362,622 were applied alone, in mixture, and sequentially. For sequential applications, an application of CGA 362,622 was followed by clethodim applications at 1, 3, 7, and 14 d intervals, or an application of clethodim was followed by CGA 362,622 applications at 1, 3, 7, and 14 d intervals. Each test included a nontreated control. In greenhouse studies clethodim was applied at 140 g ai/ha and 105 g ai/ha and CGA 362,622 was applied at 5 g ai/ha. In field studies, clethodim was applied at 140 g ai/ha and CGA 362,622 was applied at 5 g ai/ha. Crop oil concentrate at 1.0% (v/v) was included in all treatments.

The expected response for herbicide combinations and sequential treatments was calculated according to Colby's method. Expected and observed values were compared using the appropriate least significant difference (LSD) value at the 5% level. If the observed response for the herbicide combination or sequential treatment was either significantly less than or greater than the expected value, the treatment was declared either antagonistic or synergistic, respectively. Treatments were considered to be additive (i.e., no interaction) when differences between observed and expected responses were not significant.

In greenhouse studies, CGA 362,622 antagonized clethodim activity on 2-4 leaf and 2-3 tiller goosegrass [*Eleusine indica* (L.) Gaertn.]. Clethodim alone at 105 g ai/ha controlled 2-4 leaf and 2-3 tiller goosegrass at 100% and 89%, respectively, while CGA 362,622 had no activity on goosegrass. Clethodim and CGA 362,622 applied as a mixture controlled 2-4 leaf goosegrass at 57% and 2-3 tiller goosegrass at 27%. Clethodim applications preceding CGA 362,622 applications by one d or following CGA 362,622 within 3 d provided similar control as the tank mixture for the respective goosegrass sizes. When clethodim was applied 3 d before CGA 362,622, goosegrass control was 72% for the 2-4 leaf goosegrass and 42% for the 2-3 tiller goosegrass. Clethodim applied either 7 or more days before or after an application of CGA 362,622 provided >90% control of both sizes of goosegrass. Reducing the rate of clethodim to 105 g ai/ha when applied alone, in mixture, or sequentially with CGA 362,622 reduced control of both sizes of goosegrass and increased antagonism.

In the field studies, clethodim alone provided greater than 97% control of broadleaf signalgrass [*Brachiaria platyphylla* (Greisib.) Nash.], fall panicum [*Panicum dichotomiflorum* (L.)], large crabgrass [*Digitaria sanguinalis* (L.) Scop.], and goosegrass. Expected control values for the combination of the two herbicides were greater than 97% for these weeds. When CGA 362,622 and clethodim were applied in mixture, the effectiveness of the graminicide was decreased from the expected >97% to <31% control for all grass weeds. More antagonism of clethodim activity was observed on large

crabgrass, goosegrass, and fall panicum when clethodim was applied one d after CGA 362,622. This treatment provided <24% control of these weeds. Grass control was less than 54% if the clethodim was applied 1 d before or 3 d after the application of CGA 362,622. Clethodim applied 3 d before CGA 362,622 controlled grasses >71%, which was less than the control obtained by clethodim alone. Clethodim applied >7 d before or after an application of CGA 362,622 controlled broadleaf signalgrass, large crabgrass, goosegrass, and fall panicum >86%. Therefore, applying CGA 362,622 7 d before or after alleviated most antagonism of clethodim. However, when CGA 362,622 was applied first followed by clethodim at 14 d, antagonism was noted on goosegrass, fall panicum, and large crabgrass.

THE EVALUATION OF ANNUAL BLUEGRASS (*Poa annua* L.) CONTROL IN OVERSEEDED AND NON-OVERSEEDED BERMUDAGRASS. K.C. Hutto*, G.E. Coats, J.M. Taylor, and J.C. Arnold. Mississippi State University, Mississippi State 39762.

ABSTRACT

An experiment was initiated at the Plant Science Research Center at Mississippi State University on August 04, 1999 to evaluate the effect of dithiopyr application dates on overseeding safety, annual bluegrass control, and the residual effects of these fall applications on bermudagrass density and crabgrass control the following spring. Four replications in a randomized complete block design with a factorial arrangement of treatments were used. The overseeding cultivars used were ‘VIP’ perennial ryegrass at a rate of 8 lb/1000 ft^2 and ‘Sabre II’ roughstalk bluegrass at a rate of 3 lb/1000 ft^2. The rate of annual bluegrass used was 1.6 lb/1000 ft^2. The plot size used was 5 by 10 feet. Each plot contained separate strips of perennial ryegrass, roughstalk bluegrass, and annual bluegrass. The annual bluegrass was overseeded on August 4, and the cool season turfgrasses were seeded on November 11. Annual bluegrass density ratings were based on counts/ft^2, while density of the overseeding cultivars and bermudagrass were estimated visually. Southern crabgrass control ratings were based on a scale of 0-100% control where 0% is no control. The treatments were 0.5 lb (1 EC) and 0.5 lb ai/A dithiopyr on fertilizer (0.25 G) and 0.75 lb ai/A prodiamine (65 WG). All herbicides were applied as single treatments 12 weeks prior to overseeding [WPO (August 4)], 8 WPO (September 1), or 4 WPO (October 1).

Although the germination of annual bluegrass was extremely poor, no significant differences were observed for all treatments with annual bluegrass control compared to the untreated 5 months after overseeding (MAO). Dithiopyr (0.25 G) at 0.5 lb/A or 0.75 lb/A prodiamine applied 4 WPO significantly decreased perennial ryegrass density compared to the untreated 2 MAO. A decrease in roughstalk bluegrass density was also observed 2 MAO for all treatments applied 4 WPO compared to the untreated. The residual effects of all treatments applied 4 WPO significantly increased bermudagrass density compared to the untreated 42 weeks after initial treatment [WAIT (May 25, 2000)]. Also, the fall applications of 0.5 lb/A dithiopyr (0.25 G) as well as the 0.75 lb/A prodiamine applied 8 or 4 WPO controlled crabgrass 65 to 83% compared to 30 to 40% for the 12 WPO application 55 WAIT (August 25, 2000).

GRAIN SORGHUM WEED CONTROL WITH CARFENTRAZONE-ETHYL. B.W. Bean and M.W. Rowland, Texas Agricultural Extension Service, Amarillo, TX 79106.

ABSTRACT

Studies have been conducted since 1992 to determine the effectiveness of carfentrazone for weed control in the Texas Panhandle. The primary weed infesting grain sorghum in the Texas Panhandle is pigweed (*Palmer amaranth).* In 1999 and 2000 pigweed control with carfentrazone was examined at 0.004 and 0.008 lb ai/A, and applied with nonionic surfactant (NIS) or urea ammonium nitrate (UAN), and with different herbicide tank mixes.
Crop injury was also examined.

Pigweed control with carfentrazone was generally less than 60% when applied alone. Control was the same regardless of which adjuvant, NIS or UAN, was used. Best tank mixes were with atrazine and dicamba (Clarity). Control was improved to 75 to 85% when carfentrazone at 0.004 and 0.008 lb ai/A was applied with 0.125 lb ai/A dicamba. Atrazine at 1 lb ai/A improved control of both rates of carfentrazone to 80 to 95%. When atrazine was applied at 0.5 lb ai/A with carfentrazone improvement in control was not consistent. Tank mixing carfentrazone with 0.18 lb ai/A of prosulfuron generally did not increase pigweed control over carfentrazone alone.

Crop injury 3 days after treatment was as high as 26% with carfentrazone applied alone. The addition of 2,4-D LV at 0.25 lb ai/A increased injury to as high as 48%. When carfentrazone was applied alone or in tank mixes with dicamba, atrazine, or prosulfuron no significant yield reduction was observed. In most instances injury was no longer observable 14 days after treatment application.

EVALUATION OF HEXAZINONE / DIURON COMBINATIONS IN SUGARCANE. J.D. Siebert, J.L. Griffin, E.P. Castner, J.M. Ellis, and C.A. Jones. Louisiana State University Agricultural Center, Baton Rouge; and DuPont Agricultural Products, Lafayette, LA.

ABSTRACT

In Louisiana, three to five annual harvests of sugarcane are made from a single planting. Following the last harvest year when stands have declined and weed populations have increased, fields are fallowed and weeds are controlled with herbicides and tillage programs. This summer fallow period is extremely important in reducing infestations of perennial weeds prior to replanting sugarcane in August to September. Research in 2000 addressed hexazinone / diuron combinations as a potential weed control option fallowed fields and after planting. Treatments evaluated consisted of hexazinone at 0.5 and 1.0 lb ai/A, hexazinone plus diuron at 0.5 + 1.8 or 2.0 lb ai/A, diuron at 1.8 and 2.0 lb/A, pendimethalin plus diuron at 3.0 + 2.0 lb ai/A (fallow), pendimethalin plus atrazine at 3.0 + 3.0 lb ai/A (after planting), and azafenidin 0.63 lb ai/A. The experimental design was a randomized complete block with four replications.

Experiments were conducted in fallowed fields in Maurice, Henderson, St. Gabriel, and Donaldsonville, LA, to evaluate itchgrass [*Rottboellia cochinchinensis* (Lour.) Clayton] control and sugarcane response to various herbicide treatments applied preemergence (PRE) in late June to mid–July. Weed control ratings were made 18 and 32 days after treatment (DAT) and sugarcane was planted in late August to early September. Itchgrass control PRE with hexazinone at 1.0 lb/A 18 DAT was greater than 0.5 lb/A (98 vs. 75%). Hexazinone plus diuron controlled itchgrass 32 DAT greater than pendimethalin plus diuron or diuron alone. In a postemergence (POST) fallow experiment conducted in Maurice, LA, herbicide treatments were applied to itchgrass, ivyleaf morningglory [*Ipomoea hederacea* (L.) Jacq.], and smellmelon [*Cucumis melo* (L.)] at two to three leaf on June 22. At 32 DAT, itchgrass was controlled 85% with hexazinone at 0.5 lb/A and 65% with diuron at 2.0 lb/A. The hexazinone / diuron combination at the same rates controlled itchgrass 95%, better than either herbicide alone or pendimethalin plus atrazine (75%). More entireleaf morningglory was controlled with hexazinone and the hexazinone / diuron combination than with diuron alone. Differences in control of smellmelon were not observed among the herbicide treatments. Sugarcane planted in August or September following the summer fallow PRE or POST treatments was not significantly affected.

After planting PRE experiments were conducted in New Iberia, Jeanerette, Henderson, and Donaldsonville, LA, and treatments were applied in late August to mid-September. The hexazinone / diuron combination was effective on many summer and winter annual weeds and residual activity was excellent. Sugarcane injury was not significant when herbicide treatments were applied after planting. Observations will be made in the spring to determine potential long-term effect of the treatments.

Favorable weed control attributes and other factors such as safety of the odorless dry flowable formulation and less sensitivity to immediate rainfall needs for activation compared to other herbicides make the hexazinone / diuron combination a potential alternative in sugarcane weed control programs, especially during the fallow period.

INTERACTIONS OF PROHEXADIONE CALCIUM (BASELINE) WITH AGRICHEMICALS APPLIED IN PEANUT (*ARACHIS HYPOGAEA*). J.B. Beam, D.L. Jordan, A.C. York, J.E. Bailey, T.G. Isleib, and P.D. Johnson, Departments of Crop Science and Plant Pathology, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

A variety of pesticides, foliar fertilizers, and plant growth regulators can be applied to peanut. Defining the potential for interactions of these agrichemicals to occur is important when formulating pest management strategies. Research was conducted in North Carolina in 1999 and 2000 to evaluate interactions among the experimental plant growth regulator prohexadione calcium (140 g ai/ha) and commercially available fungicides, insecticides, herbicides, plant growth regulators, and foliar fertilizers applied at the manufacturer's suggested use rate. In one set of experiments, prohexadione calcium was applied alone or with clethodim, sethoxydim, acifluorfen + bentazon, bentazon, acifluorfen, pyridate, 2, 4-DB, carbaryl, acephate, malathion, lambda-cyhalothrin, fenpropathrin, propargite, chlorothalonil + propiconazole, or fluazinam. Prohexadione calcium was also applied with liquid and dry formulations of boron and manganese and the plant growth regulator Early Harvest. Agrichemicals were also applied without prohexadione calcium. Agrichemical mixtures were applied when peanut reached 50% row closure. A second application of prohexadione calcium was made 2 weeks later but without agrichemicals. Urea ammonium nitrate (28 % UAN) was applied with prohexadione calcium. Agrichemicals without prohexadione calcium were applied with adjuvant based on the manufacture's recommendation for the specific products. Visual estimates of percent peanut injury were recorded 7 and 14 days after application. Row visibility was determined approximately 4 weeks after application using a scale of 1 (peanut canopy was flat with no discernable rows) to 10 (well defined, triangular-shaped rows). In a second set of experiments ,pitted morningglory (*Ipomoea lacunosa*) and yellow nutsedge (*Cyperus esculentus*) control by imazapic + 2, 4-DB, acifluorfen + bentazon + 2, 4-DB, bentazon + 2, 4-DB, acifluorfen + 2, 4-DB, pyridate + 2,4-DB, and 2,4-DB, each applied alone or with prohexadione calcium, was evaluated. An additional experiment evaluated large crabgrass (*Digitaria sanguinalis*) by sethoxydim and clethodim, each applied alone or with prohexadione calcium. In both experiments visual estimates of percent weed control and peanut injury were recorded 2 weeks after treatment.

Interactions of fungicide, insecticide, and foliar fertilizers (including Early Harvest) with prohexadione calcium were not significant for visual injury to peanut, row visibility, or main stem height. However, the interaction of herbicide by prohexadione calcium was significant for peanut injury. Slightly higher injury by acifluorfen, acifluorfen + bentazon, bentazon, and pyridate applied with prohexadione calcium was most likely caused by the 28% UAN included in the mixture rather than the plant growth regulator active ingredient. Agrichemicals did not affect efficacy of prohexadione calcium in terms of increasing row visibility or causing main stems to be shorter. The interaction of prohexadione calcium by herbicide was not significant for pitted morningglory or yellow nutsedge control. However, main effects of herbicide (yellow nutsedge) and main effects of herbicide and prohexadione calcium (pitted morningglory) were significant. Minor increases in pitted morninwas gglory control were noted when herbicides were applied with prohexadione calcium. Enhanced pitted morningglory control most was likely from the presence of 28% UAN rather than prohexadione calcium. Prohexadione calcium did not affect efficacy of sethoxydim or clethodim. Collectively, these data suggest that prohexadione calcium and the majority of agrichemicals applied to peanut are compatible. However, the formulation of prohexadione calcium (Baseline) used in these studies most likely will not be marketed in peanut. The prohexadione calcium formulation Apogee most likely will be available. The later formulation contains nitrogen, and determining if other agrichemicals interact with this formulation needs to be investigated.

IMAZAPYR/DIURON COMBINATIONS IN FALLOWED FIELDS AND AFTER SUGARCANE PLANTING.
C.A. Jones, J.L. Griffin, and J.M. Ellis. Louisiana State University Agricultural Center, Baton Rouge, LA 70803.

ABSTRACT

Field experiments were conducted in 1999 at Henderson, Youngsville, New Roads, and Lakeland, LA, and in 2000 at St. Gabriel and Donaldsonville, LA, to evaluate weed control with Sahara in fallowed sugarcane fields. In 1999, herbicide treatments were Arsenal (imazapyr) at 0.25 and 0.50 lb ai/A and Sahara at 2.1 and 4.2 lb ai/A. In 2000, Direx (diuron) at 1.9 and 3.7 lb ai/A was also included. The specified rates of Arsenal and Direx are equivalent to those in the Sahara 1:8 imazapyr/diuron premix.

In 1999 and 2000 30 to 49 days after treatment (DAT), Sahara at 2.1 lb/A controlled itchgrass 64 to 95%, johnsongrass 65 to 100%, bermudagrass 82 to 86 %, morningglories 88 to 100%, and purple nutsedge 82 to 99%. Sahara controlled itchgrass, johnsongrass, and purple nutsedge better than Arsenal at 0.25 lb/A in two of three experiments. Morningglories were controlled better with Sahara than Arsenal at the same rates in three of five experiments and bermudagrass in both experiments conducted. Direx in 2000 applied alone controlled johnsongrass 5%, morningglories 45 and 95%, and purple nutsedge 40%.

In another experiment in 2000, herbicide treatments included Sahara at 2.1 and 4.2 lb/A, Direx at 1.2 lb/A, Sencor at 1.5 lb ai/A, atrazine at 2.0 lb ai/A, Prowl at 3.0 lb ai/A, and Prowl at 3.0 lb/A plus atrazine at 2.0 lb/A. At 37 DAT barnyardgrass, hemp sesbania, and pitted morningglory were controlled 77, 51, and 60%, respectively, with Sahara at 2.1 lb/A. Direx provided no more than 41% control of these weeds. Control of barnyardgrass was increased to 97% and hemp sesbania to 83% as the Sahara rate was increased. For comparison, the standard treatment used in sugarcane of Prowl plus atrazine controlled barnyardgrass and hemp sesbania 97% and pitted morningglory 88%.

To evaluate crop response to herbicides applied during the fallow period, Sahara at 2.1 lb/A, Arsenal at 0.5 lb/A, and Lexone at 1.5 lb ai/A were applied 15, 30, and 45 days before planting ‘LCP 85-38’ sugarcane. Shoot populations 58 and 72 days after planting were equivalent for all treatments. Additional research has evaluated Sahara PRE after planting of sugarcane in August and September. Excellent crop safety and winter weed control were observed with this application. Sugarcane emergence in spring will be monitored to further assess possible long-term residual effects of the herbicide. Indications are that Sahara will have a place in fallow weed control programs in sugarcane and may have potential also as an after planting treatment.

DIMETHIPIN COMBINATIONS FOR RESIDUAL WEED CONTROL IN ROUNDUP READY™ COTTON.
C.W. Swann, Tidewater Agricultural Research and Extension Center, Suffolk, VA 23437-9588.

ABSTRACT

A two year study was conducted at the Tidewater AREC, Suffolk, VA to evaluate the potential for use of directed sprays of dimethipin and various tank mixtures containing dimethipin for potential to provide extended residual weed control in Roundup Ready™ cotton. Cotton cultivars used were DP 5415 RR (1999) and DP 436 RR (2000). All herbicide treated plots received either trifluralin (0.5 lb ai/A PPI, 1999) or pendimethalin (0.83 lb ai/A PRE, 2000) and a sequential treatment of glyphosate (1.0 lb ai/A) applied over-the-top of 3 to 4 leaf cotton (1999 and 2000). In 1999 directed spray treatments evaluated were glyphosate (1.0 lb ai/A), glyphosate + MSMA (1.0 + 2.0 lb ai/A), glyphosate + dimethipin (1.0 + 0.23 lb ai/A), dimethipin + MSMA (0.23 + 2.0 lb ai/A), dimethipin + prometryn (0.23 + 0.65 lb ai/A), MSMA (2.0 lb ai/A), MSMA + prometryn (0.23 + 0.65 lb ai/A) and prometryn + NIS (0.65 lb ai/A + 0.25% v/v). In 2000 directed spray treatments evaluated were dimethipin + prometryn (0.23 + 0.65 lb ai/A), dimethipin + fluometuron (0.23 + 0.3 lb ai/A), dimethipin + MSMA (0.4 + 2.0 lb ai/A), glyphosate + dimethipin (1.0 + 0.4 lb ai/A), MSMA + prometryn

(2.0 + 0.65 lb ai/A), glyphosate (1.0 lb ai/A) and duiron + MSMA (0.3 + 2.0 lb ai/A). In both 1999 and 2000 treatments which included dimethipin were applied with 1 pt/A crop oil concentrate.

Major weed species present in 1999 were tall morningglory (Ipomoea purpurea), ivyleaf morningglory (Ipomoea hederacea) and yellow nutsedge (cyperus esculentus). In 2000 the major weed species present were ivyleaf morningglory (Ipomoea hederacea) and pitted morningglory (Ipomoea lacunosa). Percent weed control and percent crop injury were visually estimated in both years. Cotton lint yield was determined in 1999.

A single over-the-top application of glyphosate did not provide satisfactory control of tall morningglory (60%, 1999), ivyleaf morningglory (72% and 67%, 1999 and 2000 respectively) or yellow nutsedge (77%, 1999). Glyphosate (1.0 lb ai/A) applied over-the-top of 3 to 4 leaf cotton and followed by all directed spray herbicides or herbicide combinations provided good to excellent control of ivyleaf morninggglory (92% control or greater in both years), pitted morningglory (87% control or greater, 1999) and yellow nutsedge (95% control or greater, 1999). In 1999 control of tall morningglory with directed spray treatments was somewhat variable ranging from a low of 78% (dimethipin + glyphosate) to a high of 93% (dimethipin + MSMA and prometryn + COC). Directed sprays of tank mixtures of dimethipin + glyphosate, MSMA or prometryn did not detrimentally effect cotton lint yield in 1999. Directed sprays of herbicide mixtures containing dimethipin appear to offer good potential for extending residual weed control when used as sequential treatments following over-the-top applications of glyphosate in Roundup Ready cotton.

COTTON HADSS: A TWO-YEAR VALIDATION ON THE TEXAS SOUTHERN HIGH PLAINS. L.L. Lyon, J.W. Keeling, and P.A. Dotray, Texas Agricultural Experiment Station, Lubbock, TX 79403 and Texas Tech University, Lubbock, TX 79409.

ABSTRACT

Field experiments were initiated in 1999 and continued in 2000 at the Texas Agricultural Experiment Station (TAES) near Lubbock to evaluate the Cotton HADSS program in Texas Southern High Plains cotton production. This region differs from other areas that have adopted the Herbicide Application Decision Support System (HADSS) because of its unique growing conditions, cultural practices, weed species, and weed control programs. The experimental design was a randomized block with a split-plot arrangement and four replications. Plot size was 27 by 50 feet. Treatments were evaluated in a natural infestation of Palmer amaranth (*Amaranthus palmeri* S. Wats) and devil's-claw [*Proboscidea louisianica* (Mill.) Thellung]. Treatments included: 1) trifluralin preplant incorporated (PPI) at 0.75 lb ai/A followed by (fb) postemergence HADSS recommendations (PPI fb POST HADSS); 2) postemergence HADSS recommendations alone (POST HADSS); 3) TAES recommendations for the Texas Southern High Plains; 4) weed-free check; and 5) untreated check. All treatments were evaluated in glyphosate-tolerant, bromoxynil-tolerant, and conventional cotton varieties. Weed density was determined and applications were made at the 2- to 3-leaf, 6- to 8-leaf, and 10- to 12-leaf cotton growth stages. Weed control was evaluated 14 days after each treatment and at harvest. Cotton lint yields and net returns over weed control costs were determined for each treatment.

HADSS recommendations paralleled TAES recommendations in the glyphosate-tolerant system in both years. In the glyphosate-tolerant system, Palmer amaranth was controlled >98% in the PPI fb POST HADSS treatments and the TAES recommended treatments, whereas control with POST HADSS was ≤85%. Season-long devil's-claw control was >95% for all three treatments in both years. Palmer amaranth control in the bromoxynil-tolerant system with PPI fb POST HADSS and the TAES recommendations was >88%, which was more effective than POST HADSS (55% in 1999 and 5% in 2000). Devil's-claw was controlled at least 95% with PPI fb POST HADSS recommendations and the TAES treatments. POST HADSS controlled devil's-claw 88% in 1999, but was not effective in 2000. In the conventional system, late-season Palmer amaranth was controlled 98% with the TAES recommendations. This control was superior to the PPI fb POST HADSS recommendations (92%) and POST HADSS recommendations (65%). However, in 2000, both PPI fb POST HADSS and TAES recommendations controlled Palmer amaranth >95%. Devil's-claw was controlled 95% with the TAES recommendations and PPI fb POST HADSS, which was superior to POST HADSS (88%). HADSS recommendations differed from TAES recommendations in the bromoxynil-tolerant and conventional systems both years.

In 1999, the three herbicide treatments produced similar yields within each variety. Net returns over weed control costs increased compared to hand-hoeing and cultivation alone in the glyphosate-tolerant and conventional systems. No differences were seen in net returns between the three treatments in either the glyphosate-tolerant or the conventional systems. In the bromoxynil-tolerant system, higher net returns were produced with the TAES recommendations compared to the two HADSS recommendation treatments and hand-hoeing and cultivation.

In 2000, the TAES recommendations produced yields equal to the weed-free check and greater than both HADSS treatments in the glyphosate-tolerant system. In the bromoxynil-tolerant system, the TAES recommendations produced yields greater than the PPI fb POST HADSS recommendations, which were higher than the POST HADSS. The TAES recommendations produced yields similar to the weed-free check. In the conventional system, no differences in yield were seen between the PPI fb POST HADSS, TAES recommendations, and the weed-free check, which were all greater than the POST HADSS. The TAES recommendation produced higher net returns over weed control costs in the glyphosate-tolerant system than either HADSS treatment. The TAES recommendations in the bromoxynil-tolerant

system produced the only positive net returns. In the conventional system, net returns for the PPI fb POST HADSS and TAES recommendations were similar, and the POST HADSS program produced negative net returns over weed control costs. Additional information is needed on the competitiveness of weeds unique to the Texas Southern High Plains and on herbicide efficacy on those weeds for the HADSS program to be effective in all cotton varieties in the region.

SPECTRAL RESPONSE OF CROPS DUE TO INTERFERENCE FROM PURPLE AND YELLOW NUTSEDGE. C.T. Leon, D.R. Shaw, C.E. Watson, L.M. Bruce, and T.H. Koger, Mississippi State University, Mississippi State, MS.

ABSTRACT

Greenhouse experiments were conducted to evaluate interference of purple and yellow nutsedge on the growth, development, and spectral response of cotton and soybean. The growth parameters measured included shoot number, height, tuber number, and tuber weight for purple and yellow nutsedge, and height, stem diameter, total nodes and fresh weight for cotton and soybean. Cotton, soybean, purple nutsedge, and yellow nutsedge growth data were analyzed using analysis of variance, testing for all main effects and interactions between experiment, replicate, and treatment for cotton. Stepwise regression was used to identify the growth variables that provided the best model for crop response. Generally, purple and yellow nutsedge fresh weight was a good indicator of cotton and soybean response. Therefore, classes were created using the nutsedge fresh weight as the variable to incorporate and analyze the reflectance data. The classes created using purple and yellow nutsedge fresh weight were for samples containing more than 40 g fresh weight pot^{-1}, more than 60 g fresh weight pot^{-1}, and more than 80 g fresh weight pot^{-1}.

Reflectance measurements were collected 24 to 26 days after emergence using a portable spectroradiometer with an external integrating sphere. Reflectance measurements were made from 400 to 1100 nm in 2 nm increments for a total of 350 bands. An attached leaf was placed in the external integrating sphere, and its reflectance was measured. The external integrating sphere allowed only the reflectance of the desired cotton or soybean leaf to be collected and minimized differences due to changes in the environment. Leaf reflectance was obtained by collecting one standard reference scan of $BaSO_4$ to account for background, and one leaf reflectance measurement per leaf. Two leaf reflectance samples were obtained per pot from different plants using the second true leaf of cotton and the center leaflet of the first soybean trifoliolate.

Cotton fresh weight reductions ranged from 17 to 38% when grown with yellow nutsedge and 19 to 44% in the presence of purple nutsedge. Soybean fresh weight reductions ranged from 27 to 60% when grown with yellow nutsedge. Fresh weight reduction of soybean was 30 to 35% when grown with purple nutsedge. Reflectance data were analyzed using wavelet transformation techniques. Nine features were extracted from each cotton and soybean leaf reflectance measurements using the HAAR mother wavelet. The extracted features were used to classify single-leaf cotton and soybean reflectance measurements in order to predict whether cotton or soybean were growing weed-free or in the presence of purple and yellow nutsedge. After training the system, the ability to separate leaf reflectance measurements growing weed-free from those growing in the presence of purple and yellow nutsedge was tested using leave-one-out cross-validation with the nearest mean classifier. Cross-validation accuracy results for cotton ranged from 67 to 82% and 49 to 70% for purple and yellow nutsedge, respectively. Cross-validation accuracy results for soybean and yellow nutsedge were ranged from 60 to 71%. Features extracted from the soybean reflectance measurements were not as effective at classifying soybean leaf reflectance measurements based on the presence or absence of purple nutsedge. A decrease in accuracy was observed from the more than 40 g to more than 60 g purple nutsedge fresh weight categories. Overall, the system correctly classified soybean leaf reflectance measurements taken from soybean plants growing with purple nutsedge 58 to 74%.

FIELD VALIDATION OF BEST MANAGEMENT PRACTICES IN TEXAS CORN CULTURES. P.A. Baumann, M.C. Dozier, F.T. Moore and L.M. Etheredge. Texas Agricultural Extension Service, College Station, TX 77843

ABSTRACT

Trace amounts of atrazine and other herbicides have been found in some Texas surface waters prompting concern from the general public and response from regulatory and service agencies. Publications were written to alleviate concerns and outline Best Management Practices for implementation in urban and production agriculture sectors wherever atrazine is used as a weed management tool. Recommendations (BMPs) for the use of atrazine in corn production systems included several application and treatment alternatives. Our objective in 1999 and 2000 field trials was to explore the effectiveness of alternative atrazine applications and other products for weed control and atrazine runoff reduction (in 2000).

Field studies were employed during both years on a Houston Black Clay soil near Thrall, Texas. Treatments included atrazine applied pre-plant incorporated (2.0 lb ai/A), preemergence broadcast (2.0 lb ai/A), preemergence banded (0.66 lb ai/A) and postemergence at 2.0 lb ai/A. Combinations with metolachlor were also applied PPI, PRE and PRE-banded. Banded applications were followed by timely cultivation. Alternative treatments included nicosulfuron + dicamba, glyphosate, and cultivation only.

The 1999 field trials showed that good-excellent Palmer amaranth control could be obtained from all treatments in the study with cultivation providing the least control (82%). High levels (>85%) of johnsongrass control were provided only by the atrazine POST, atrazine plus metolachlor band plus cultivation, cultivation only, glyphosate and dicamba + nicosulfuron treatments. Corn yields were reflective of johnsongrass control. In the 2000 field trial, similar results were shown for Palmer amaranth control. As in 1999, all PPI and PRE treatments provided less than 85% johnsongrass control. Postemergence applications of dicamba + nicosulfuron, glyphosate + acetochlor, or treatments employing cultivation were required to achieve high levels of johnsongrass control. Preliminary results from runoff collections in atrazine treated plots indicate a significant reduction in runoff where atrazine was incorporated or banded, compared to standard preemergence broadcast treatments.

These studies showed that PPI and banded atrazine applications will provide corn growers with adequate Palmer amaranth and seedling johnsongrass control when followed by cultivation. These practices should result in a dramatic decrease in atrazine runoff potential. This study also found excellent alternatives to atrazine or atrazine combinations for managing Palmer amaranth and seedling johnsongrass, although these alternatives would likely increase production costs.

A TWO YEAR SUMMARY DESCRIBING THE EFFICACY OF GLUFOSINATE AND TOLERANCE IN LIBERTY LINK COTTON. L.L. Somerville, R.H. Walker and J. Belcher, Ala. Agric. Exp. Stn., Auburn University., AL 36849-5412.

ABSTRACT

Field experiments were conducted in 1999 and 2000 at the Plant Breeding Unit (Lucedale fine sandy loam) in Tallassee, Alabama and Tennessee Valley Substation (Decatur silt loam), Belle Mina, Alabama to evaluate glufosinate weed control systems and tolerance in Liberty Link cotton. Glufosinate was applied postemergence over-the-top (POST) at (a) 0.27, 0.36, 0.54 lb ai/A to 2-and 4-leaf (2- and 4-L) cotton (b) or 0.27 lb ai/A to 4-and 8-leaf (4- and 8-L) cotton following preemergence (PRE) applications of either fluometuron, norflurazon or pendimethalin applied at 1.25, 1.25 and 0.75 lb ai/A respectively. Weed species evaluated in east central Alabama were broadleaf signalgrass, entireleaf and pitted morningglories, prickly sida, spiny pigweed, and sicklepod. Species evaluated in North Alabama were goosegrass, entireleaf and pitted morningglories, prickly sida and spiny pigweed.

A separate cotton tolerance trial was also carried out at both locations. All plots were maintained weed free by applying pendimethalin PRE at 0.75 lb ai/A followed by cultivation and hoeing. POST applications of glufosinate included (a) single applications at 0.36 and 0.72 lb ai/A to 2-, 4-, 8-L and first bloom (FB) cotton, (b) double applications at 0.36 lb ai/A to 2- and 4-L, 4-and 8-L cotton (c) triple applications at 0.24 lb ai/A applied to either 2-, 4-, 8-L or 4-, 8-L, FB cotton.

Results varied with location. At Tallassee, single applications of Liberty at 0.27 lb ai/A to 2- and 4-L cotton provided weed control greater than 86 % for all species and treatments except for spiny pigweed, with 82% control. Increasing the rate to 0.36 lb ai/A improved overall weed control, with spiny pigweed control increasing to 94%. Control of all weeds was greater than 91% with either fluometuron or norflurazon applied PRE followed by glufosinate at 0.27 lb ai/A at 4- and 8-L stage. Pendimethalin applied PRE provided less overall weed control ranging from 83-88% for all species.

At Belle Mina, single applications of Liberty at 0.27 lb ai/A to 2- and 4-L cotton provided weed control greater than 85 % for all species except for prickly sida, with 81% control. Increasing the rate to 0.36 or 0.54 lb ai/A improved prickly sida control to 86 and 89% respectively. Furthermore morningglory control improved from 86% control to 92 and 93% with the higher rates. Increasing the rate only marginally improved control of other species. Single applications of either fluometuron, norflurazon or prowl PRE followed by glufosinate at 0.27 lb ai/A at 4- and 8-L stage provided greater than 93% control of all species.

Results from the tolerance study at both locations showed that seed cotton yield was not adversely affected by glufosinate at any application rate or stage of application. Single, double and/or triple applications of glufosinate totaling 0.72 lb ai/A applied at various stages as late as FB did not reduce yield.

ON-FARM EXPERIENCES WITH ROUNDUP READY COTTON IN LOUISIANA AND FUTURE LSU AGCENTER RECOMMENDATIONS. S.T. Kelly and J.W. Barnett. Louisiana State University AgCenter, Scott Research, Extension, and Education Center, Winnsboro, LA 71295.

ABSTRACT

Roundup Ready cotton acreage in Louisiana increased dramatically in 2000. Cotton acreage in 1999 was 609,885, of which 10%, or 60,989 acres, was Roundup Ready. In 2000, cotton acreage increased slightly to 690,123. However, the percent of Roundup Ready cotton increased greatly (60%) accounting for 413,400 acres. This large increase caused concern among Agricultural Extension Service personnel, since very few producers were intimately familiar with the Roundup Ready system. Our primary concern was that producers may not be able to treat their Roundup Ready acreage

in a timely manner and that weed control would be less than desirable and yields would not be maximized. As the season progressed, weed control on Roundup Ready acreage was acceptable.

Although weed control was achieved with relative ease, problems were observed later in the season. Many producers noticed missing fruit and in some cases very little fruit was present. In many of these cases producers had applied glyphosate over the top of the cotton well past the 5 leaf growth stage. Further investigation revealed that there was some confusion in this and many other cases where glyphosate was applied at non-labeled growth stages.

On other farm visits, several other misconceptions about Roundup Ready cotton were noted. Many times growers were advised to apply non-labeled formulations or post-direct applications were made too high on the cotton plant.

The LSU AgCenter has responded to these issues by producing several publications to aid producers in answering questions as they arise. Also, a massive educational effort will be mounted in the spring of 2001. Producers, consultants and dealers will be targeted for these programs. It is clear that Louisiana producers have adopted the use of this technology, but educational programs need to be more focused in order to help producers maximize profits with this system.

GRAMINICIDES IN PROGRAMS FOR BROAD-SPECTRUM WEED CONTROL IN RICE. N.W. Buehring, F.L. Baldwin, R.E. Talbert, E.F. Scherder, and M.L. Lovelace. University of Arkansas Cooperative Extension Service, Little Rock, AR, and Department of Crop, Soil and Environmental Sciences, University of Arkansas, Fayetteville, AR.

ABSTRACT

Three new ACCase inhibiting herbicides, fenoxaprop + isoxadifen (Ricestar), cyhalofop (Clincher), and clefoxydim (Aura) are currently being developed for grass control in rice (*Oryza sativa*). Since these are graminicides, they have a selective mode of action for grass control only. Other herbicides will have to be included in programs to achieve broadleaf and sedge control. A trial was established in Lonoke, AR, to determine effective options for broad-spectrum weed control with these graminicides. Rice injury, barnyardgrass (*Echinochloa crus-galli*), broadleaf signalgrass (*Brachiaria platyphylla*), hemp sesbania (*Sesbania exaltata*), and rice flatsedge (*Cyperus iria*) control was evaluated. Treatments included: graminicides (fenoxaprop + isoxadifen at 68 + 74 g ai/ha, cyhalofop at 210 g/ha, and clefoxydim at 75 g/ha) applied alone (2- to 3-leaf) or in combination with either quinclorac at 210 g/ha (2- to 3-leaf), quinclorac at 140 g/ha (2- to 3-leaf) followed by propanil at 4480 g/ha (pre-flood), or pendimethalin at 1120 g/ha (2- to 3-leaf) followed by propanil at 4480 g/ha (pre-flood). Also, propanil at 3360 g/ha (2- to 3-leaf) was applied alone or followed by these graminicides (pre-flood). Treatments in this experiment were arranged in a randomized complete block with four replications

Rice injury was rated 7 days after the pre-flood application. Significant rice injury (50%) resulted when clefoxydim was applied with pendimethalin followed by propanil (pre-flood). Slight rice injury (18%) occurred when clefoxydim was applied alone or tank-mixed with quinclorac.

Weed control ratings were taken 60 days after the pre-flood treatment. The application of quinclorac with these graminicides at the 2- to 3-leaf timing provided effective control of barnyardgrass ($\geq$ 91%). Also, effective control ($\geq$ 94%) was achieved when these graminicides were applied with quinclorac or pendimethalin followed by propanil. Fenoxaprop + isoxadifen also provided effective control of barnyardgrass (94%). However, when propanil was applied at the 2- to 3-leaf timing then followed by the graminicides at the pre-flood timing, barnyardgrass control was not as effective (71% to 80%) due to the single application of propanil, which provided poor control (43%).

Broadleaf signalgrass control was excellent ($\geq$ 93%) with the following treatments: all graminicides applied with quinclorac; all graminicides applied with quinclorac or pendimethalin then followed by propanil; and propanil followed by all of the graminicides. All of the treatments except the graminicides applied alone provided effective control ($\geq$ 90%) of hemp sesbania. Any of the treatment combinations that included propanil provided excellent control (98%) of rice flatsedge.

Due to effective broad-spectrum weed control, rice yields were generally high with the graminicides applied early postemergence with quinclorac, or when the graminicides were applied with quinclorac or pendimethalin early postemergence then followed by propanil pre-flood.

A 20-YEAR OVERVIEW OF SOUTHERN WEED CONTEST. L.R. Oliver, D.H. Teem, R.H. Walker, D.R. Shaw, and E.P. Webster. University of Arkansas, Fayetteville; Auburn University, Auburn, AL; Mississippi State University, Mississippi State, MS; and Louisiana State University, Baton Rouge, LA.

ABSTRACT

For the past 20 years, weed science students have gathered for one of the most beneficial, practical, and educational experiences of their graduate programs, the Southern Weed Contest. The first contest was the Deep South Weed Meet

sponsored by Eli Lilly in 1980, which brought Auburn University, University of Georgia, and University of Florida teams of four graduate students each and two graduate students from Clemson University to Albany, GA. By 1981 the initial idea of David Teem was sanctioned by the Southern Weed Science Society, and for the next 19 years university and industry personnel have worked together to make the Southern Weed Contest a most difficult, enjoyable, and competitive contest. Over the past 20 years, 15 universities have entered a graduate team, and three universities have entered undergraduate teams, to compete for the Broken Hoe Trophy. An average of eight teams have entered each year since 1981. University of Arkansas and North Carolina State University have entered 19 and 17 teams, respectively. Teams can be four or three students plus alternates. A three-student Texas A&M University team won in 1996. The contest has evolved into a five-event one-day experience. The events are weed and seed identification (100 points), crop and weed response to herbicides (100 points), calibration (100 points), crop/weed situation and recommendations (100 points), and a mystery problem (15 to 20 points). The weed and seed identification event has increased from 49 to 122 weeds that must be identified by common and scientific names and spelled correctly. Only six students have ever scored 100%. The 1990 Arkansas team scored the highest average, 99.5%. The herbicide identification event is the best predictor (85% of the time) of which team will win the overall contest. The highest team score (98.3%) for this event was Texas A&M in 1996, and the lowest winning team score for the event was 51.25% for Florida in 1981. Andy King and Rex Wichert from Arkansas and Todd Baughman from Mississippi State University had perfect papers twice. The calibration event has ranged from backpack sprayer calibration plus team problems (1980 to 1982), backpack and granular application calibration plus team problems for both sprayers (1983 to 1987), to backpack sprayer calibration with problem sets for each individual team member (1988 to present). Since 1988, the highest scoring team (96.98%) was Georgia in 1988. The winning team has won the calibration event only 11 of 20 years. The role-play field problem solving and recommendation event was changed from one to two problems in 1988 to improve the fairness for scoring high individual winners. Only six students in 20 years have made 100%. The winning team has won the role-play event only 35% of the time. North Carolina State and University of Tennessee in 1999 are the only teams to make perfect scores in the nine years of the mystery event. Arkansas has won the Southern Weed Contest 14 of 20 years and Florida has won twice. No other team has more than one win. The longest consecutive team winning streaks have been nine first places for Arkansas (1983 to 1991), Georgia three second places (1987 to 1989), and North Carolina State with four third places (1985 to 1988). The highest scoring teams were Arkansas in 1990 and 1989 averaging 91.8 and 91.73%, respectively. Arkansas in 1997 was the only team to win all events. The greatest margin of victory was 44.1 points/student between Arkansas and Georgia in 1987, and the closest contest was 2.5 points/student between Auburn and Florida in 1980. Nilda Burgos of Arkansas was the most decorated individual by placing first in 1988 and 1990 and finishing second in 1989. Eight Arkansas students have been on a winning team all three years of eligibility.

HISTORY

Each summer since 1980, weed science students have gathered for one of the most beneficial, practical, and educational experiences of their graduate programs, the Southern Weed Contest. The first contest originated from David Teem's (Florida) idea, with assistance from Wayne Currey (Florida), Phil Banks (Georgia), Harold Walker (Auburn), Ray Cooper (Eli Lilly), and others. The first contest was hosted by the Eli Lilly Research Farm at Albany, GA, in late May 1980 (1, 2, 3). Auburn, Georgia, and Florida were the first university teams to participate. Two graduate students from Clemson participated in the individual competition. The team contest was won by Auburn (Table 1). After the contest, Ray Cooper stated that this type of competition measures the relative abilities of both undergraduate and graduate weed science students (2). He also stated that Eli Lilly hoped other companies would react favorably to the concept and help sponsor future contests. As you will note, everyone has stepped to the plate to make the Southern Weed Contest a truly great educational event.

In June 1981, eight teams participated in a spirited 2-day competition. By this time the Southern Weed Science Society (SWSS) had sanctioned the contest and established contest rules, and the contest had been finalized into a one-day event. The purpose of the contest is to provide an educational experience from which students can broaden their applied skills in weed science. The contest provides an opportunity for students to meet and interact with each other and weed scientists from other universities and industry and to apply what they have learned in a contest that measures their capabilities. It is also hoped that the contest will increase the visibility of weed science and intensify the interest level.

Over the past 20 years, 15 universities have entered graduate teams, and Murray State University (1998 and 1999), University of Kentucky (1996), and North Carolina State (1999) have entered undergraduate teams to compete in the graduate contest (Table 2). Arkansas has brought a team 19 years in a row with North Carolina State bringing a team 17 years. The entry by teams over the years has been directly correlated to faculty interest, faculty changing positions, number of faculty at university, and student members. So some universities have come and gone and returned in the 20 years. Teams are generally four persons plus alternates (two alternates until 1998 and now three), but three-person teams can be entered, and scores are adjusted to three-person teams. The winning team was determined from three students in 1993 through 1997, with Texas A & M winning in 1996. The contest has averaged eight teams participating per year since 1981.

The contest originally had four events (1) weed and seed identification (100 points), (2) crop and weed response to herbicides (100 points), (3) calibration (100 points), and (4) crop/weed situation and recommendations (100 points) for a 400 point total. That first year, however, a special problem (an added field problem worth an additional 60 points) was added as an afterthought. With David Teem and Wayne Currey's Florida team ahead until that point, the added event allowed Harold Walker's Auburn team to win the contest. That set the stage for the high level of competition and excellence that has distinguished the contest since then. In 1991, a 15- to 20-point mystery event was added to give even more excitement and challenge to the contest.

EVENTS

Weed and Seed Identification. In the plant and seed identification event, weeds are grown to various stages in a field weed nursery or greenhouse prior to the contest. Individual rows or pots of plants and jars or vials for seeds are numbered and prepared for identification. The student must identify the species, and if the common and scientific names are not spelled correctly, no points are given. The first year, 49 weeds were on the potential weed list. Today, the list has 122 weeds and 100 seeds. The number of potential plants has remained fairly constant since 1985. Generally, there are 50 species to identify. However, in 1987 at the ICI Americas Research Farm in Goldsboro, NC, the plant specimens were so excellent, the host decided to put 75 items in the contest to identify within an hour. The highest team average in the weed and seed identification event was the Arkansas team, 99.4% in 1990, while the lowest winning team average was 79.25% by Florida in 1981. During the past 20 years the contest-winning team has won the identification event 60% of the time. Only six students have ever scored 100% in weed identification in the history of the contest (Table 3). When the contest rules say *all* stages of growth, it really means *all* stages, including seedlings.

Crop and Weed Response to Herbicides. This is one of the most challenging sections of the contest, and the team winning the herbicide identification event has won the contest 85% of the time. The complexity of the herbicide identification event varies considerably with the environmental conditions, growth stage, and soil texture at the contest site. From the first time Arkansas took a team in 1981 and we wandered around in the plots trying to tell a preemergence from a postemergence treatment and the Florida team beat everyone by 14 points/student, I decided that to be competitive, a team must be able to identify herbicide injury. The number of herbicides has ranged from 18 to 32. Until 1993, the contest required identification of the herbicide by family or by the common name when the herbicide is a member of the miscellaneous family of herbicides. Now, both the common and family names must be given, and the common name must be spelled correctly. The contest requires that at least six crops and six weeds be present in the herbicide identification plots. This was not so for the first seven years of the contest, which made identification even more difficult. For each herbicide to be identified, a labeled rate and one-half and twice the labeled rate are applied within each plot so that injury symptoms will more likely be manifested.

The highest team score for the herbicide identification event was Texas A & M, 98.33% in 1996, and the lowest winning-team score for the event was 51.25% for Florida in 1981. In 11 of 20 years, at least one student has scored 100% in the event and in 1990, nine students scored 100% at the Monsanto Research Station in Loxley, AL (Table 4). Note that no one scored a perfect score from 1980 to 1985. It was not that the event was easier in years with perfect scores, but the combination of environmental conditions and soil texture made for more nearly perfect symptomatology. Four students in 1991 and 1996 made perfect scores; remember, this is out of 32 to 50 students. Three students, Andy King and Rex Wichert from Arkansas and Todd Baughman from Mississippi State, have had perfect papers twice. In fact, Rex Wichert had the highest overall individual total score (96%) in the history of the contest in 1990.

Calibration. The event has ranged from backpack sprayer calibration plus team problems (1980 to 1987), backpack and granular application calibration plus team problems for both sprayers (1983 to 1987), to backpack sprayer calibration with problem sets for each individual team member (1988 to present). For the backpack sprayer, each team is expected to select a matched set of spray tips and determine the appropriate speed, pressure, and amount of herbicide for accurate calibration and application. It has not been uncommon to find an assortment of nozzle parts in a coffee can from which to choose, some of which may be defective. Granular calibration requires the team to set the correct orifice size and catch the correct amount of granules over a given distance.

The calibration event was oriented toward speed and teamwork until 1993. Scoring was based on accuracy, elapsed time, application technique, uniformity, and calibration problem set. A team lost three points for each minute it was slower than the fastest team. The 1981 Auburn team calibrated the backpack sprayer and worked problems in 1 min and 30 sec. It was not uncommon for a team to calibrate within ± 10% of the calculated output, work the problems correctly, and still score zero out of 50 possible points due to the time factor. Since 1994 each team has had 10 minutes to calibrate a sprayer within ± 3% accuracy, and each individual works a 50-point problem set. From 1988 to 1993 the individual problem set was to be worked in 20 minutes. Eight students twice scored perfect on individual problem sets from 1988 to 1991 (Table 5). Individual perfect scores were numerous, with 8, 17, and 26 in 1988, 1990, and 1991, respectively. After 1993, the problem set was given an hour and, since the rules changed in 1994, the highest total calibration score has been 96.98% by Georgia in 1988, the lowest winning-team calibration score was 75.6% by Mississippi State in 1993, and only seven individuals have made perfect scores. The Arkansas team in 1990 has been the only team to make a perfect score on the individual problem set. Auburn (1981 and 1982) and Florida (1980) scored 100% on backpack calibration while Arkansas, Florida, and North Carolina State scored 100% on the backpack and granular applications and problem sets in 1985. The calibration portion of the contest predicts the winning team only 11 of 20 times.

Problem Solving and Recommendations. The problem solving event is the most difficult of all events because the problems cannot be anticipated and studied for specifically, even though a list of eight crops is voted on each year by the Weed Contest Committee. Instead, students must rely on their knowledge and experience in solving similar or hypothetical problems. Ph.D students have an advantage over M.S. or undergraduate students, and a practical background with field experience is also helpful. For this event, luck may be better than knowledge.

The problem-solving event requires each student to define, analyze, and solve a real on-site crop production problem in a role-play situation in which the student assumes the role of an extension specialist, salesman, or research person. A weed contest official poses as a producer. The problem is scored by the "producer" and another judge. The student must solve the problem, whether a herbicide or general production problem, and must recommend the best solution from accepted agricultural practices and herbicide label recommendations within 12 to 13 minutes. Only approximately half of the time has the problem been caused by herbicides, with other problems dealing with planting problems, weather, etc. The student is scored as follows: (a) 10 points - proper approach to farmer, (b) 40 points - understanding and solving problem, (c) 25 points - recommendations for this year's crop, and (d) 25 points - recommendations for next year's crop. When two problems were required, the scoring for each problem was half of the previous scoring system.

Initially, students were assigned at random to one of four field problems, but in 1984 each team member was assigned by the host to a different problem. It has been difficult to ensure problems of equal difficulty so that individual scores are fair for deciding the high-point individual. High-point individuals after three events often are not among the final top three scorers after completing the problem solving event. A classic example was Andy King of Arkansas in 1987 who went from first to sixth. This has happened because, even though a student may have had the high score for the problem he or she was assigned, that problem was more difficult than others or judges graded harder than other judges. In 1988 the rules changed so the same two problems must be solved by each student in a 30-minute period. This has solved the problem of unequal difficulty and grading. The highest team score for one and two problems has been 95.5% for Florida in 1981 and 95% for Louisiana State University (LSU) in 1999, respectively. The winning team has won the field problem event only seven times in 20 years (35%). Perfect scores on field problems have been extremely difficult. Only 12 students in 20 years have scored perfectly, and only three students since 1988, when two problems had to be solved, have had perfect scores and that was 12 years after the change (Table 6).

Mystery Event. The event is always an agronomic problem, but contestants are not advised on the area to study prior to contest. The problem has been an individual or team event, although the rules state it should be an individual event. The first mystery event in 1991 was putting a golf ball on a golf green after donning the correct protective clothing for the herbicide to be sprayed. Since then the event has ranged from hoeing a row of cotton to determining the amount of herbicide to apply to a pond. North Carolina State and Tennessee in 1999 were the first teams to post a perfect score. The lowest winning-team score for the event was 3 points/student by Arkansas in 1993. Only 33% of the time has the contest winning team won the mystery event.

AWARDS AND HOSTS

Awards. Currently, at the Awards Banquet following the contest, the winning team receives the traveling Broken Hoe Trophy, $500, and a plaque for each team member; second place receives $300 and individual plaques; and third place receives $200 and individual plaques. The high individuals receive $400, $250, $100, $75, and $50 for first, second, third, fourth, and fifth place, respectively, and plaques. Prior to 1992 the prize money was $400, $200, and $100 for teams and $100, $50, and $25 for individuals in the top three positions.

Arkansas has won 14 of the 20 team titles followed by Florida with two (Table 7). North Carolina State has the most second- (four) and third-place (five) finishes. The longest consecutive team winning streaks have been Arkansas with nine first-place wins from 1983 to 1991, Georgia with three second-place finishes between 1987 to 1989, and North Carolina State with four-third place finishes from 1985 to 1988. The most competitive years were probably the 1987 to 1989 battles between Georgia and Arkansas, and then Phil Banks left Georgia and went into consulting. The Arkansas team has finished in the top three teams for 19 consecutive years. The highest team average score was by Arkansas (91.8% in 1990) followed by the 1989 Arkansas team with an average of 91.73% (Table 1). Over the 20 years the average winning-team average has been 83.26%.

It would be extremely difficult to determine the best team over the 20 years because of different locations for contests, which had different contest rules, hosts, and environmental and soil texture components. I would place the 1981 Florida, 1993 Mississippi State, and many Arkansas teams as the best. The 1990, 1994, and 1997 Arkansas teams won the top four individual awards. In fact, the 1990 team placed all team members and alternates in the top six, but the only team ever to win all events was the 1997 team. The 1990 and 1989 Arkansas teams were the highest scoring teams with 91.8% and 91.73%, respectively. If one looks at the greatest margin of victory, it was the 1987 Arkansas team, which scored 44.1 points/person higher than the Georgia team. The closest margin of victory occurred at the first contest in which Auburn scored 2.5 points/person more than the Florida team. From my perspective the 1981 Florida team is still at the top of my list, because when our rag-tag bunch pulled up behind the Florida van and saw them get out wearing matching shirts and belt kits, we knew the contest was over, and it was!

The individual winners have been all those students who have competed in the Southern Weed Contest the past 20 years. A review of the past high individual winners indicates the excellence of the graduate students in the Southern Weed Science Society (Table 1). The high individuals over the past 20 years have averaged 88.38%, and many times the top individuals have been separated only a few points. In fact, in 1984 the top three individuals were separated by 1.5 points. Nilda Burgos of Arkansas is the most decorated individual with first-place finishes in 1992 and 1994 plus a second-place finish in 1993. Bob Starke of Arkansas is the second most decorated, with a first in 1997 and two second-place finishes in 1995 and 1996. Rex Leibl of North Carolina State in 1983 and Nilda Burgos of Arkansas in 1992 are the only high individuals not on the winning team, and Dale Monks of Arkansas in 1984 is the only alternate to win high-point individual. That is not a sign of good coaching!

The contest rules state that an individual can compete as a team member for only three years during their graduate program regardless of which university they attend. Thus, only eight students have been on a winning team during their three years of eligibility (Table 8). Guess what! They are all from Arkansas.

Host: The weed contests have been hosted or sponsored by industry and universities (Table 1). Only twice (1994 and 1997) has the contest been held at a university site, which prevented that university from competing. It would have been much better if this hosting problem could have been avoided. With company mergers, present-day companies that have hosted or sponsored the contest multiple times are: Dow AgroSciences (Eli Lilly-1980 and 1981, Dow 1988, and DowElanco-1994); Syngenta (ICI Americas-1987, Sandoz-1989, Ciba-Geigy-1992, and Novartis-1999); BASF-1985 and 1993 (American Cyanamid-1998); Aventis (Union Carbide-1983 and Rhone Poulenc-1991); and Valent 1996 (Chevron-1986). Without the support of industry, both by hosting and providing financial and technical support, the Southern Weed Contest would not have become as successful as it has during the past 20 years. Thanks to the monetary support from industry, the Southern Weed Contest has been self-supporting. Until 1995, the host financed the contest and the Weed Contest Committee utilized industry funds to provide the prize money. Presently, the Weed Contest Committee has a two-year operating budget and funds the contest whether the contest is held at an industry or university site. A special thanks must go to Ray Cooper and Eli Lilly for hosting the first weed contest 20 years ago. The willingness of industry and academic personnel to assist the host in conducting the contest and to share their talents and experience with our future weed scientists is commendable (4).

If you or others at your university have not been participating in a weed contest, I would encourage you to do so in the future. The 2001 Southern Weed Contest will be August 7 at the Northeast Research Station, Winnsboro, LA.

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Table 1. Southern Weed Contest winning team and score; high individual, university, and score; host, and contest site from 1980 through 1999.

Year	First place team	Score	High individual	University	Score	Host	Contest site
		(%)			(%)		
1980	Auburn	75.4	Eddie Jolley	Auburn	78.3	Eli Lilly	Albany, GA
1981	Florida	79.0	Jerry Hulbert	Florida	79.7	Eli Lilly	Albany, GA
1982	Florida	81.5	Holland Jordan	Florida	82.3	Delta Branch Exp. Station	Stoneville, MS
1983	Arkansas	81.4	Rex Liebl	N. Carolina State	81.4	Union Carbide	Clayton, NC
1984	Arkansas	83.8	Dale Monks (alt.)*	Arkansas	86.8	PeeDee Exp. Station	Florence, SC
1985	Arkansas	85.0	Mark Risley	Arkansas	90.5	BASF	Greenville, MS
1986	Arkansas	89.4	Robert Bozsa	Arkansas	93.9	Chevron	Greenville, MS
1987	Arkansas	81.6	Dan Westberg	Arkansas	94.5	ICI Americas	Goldsboro, NC
1988	Arkansas	84.0	Rex Wichert	Arkansas		Dow	Greenville, MS
1989	Arkansas	91.8	Tracy Klingaman	Arkansas	93.3	Sandoz	Memphis, TN
1990	Arkansas	91.7	Rex Wichert	Arkansas	96.0	Monsanto	Loxley, AL
1991	Arkansas	80.4	David Johnson	Arkansas	85.6	Rhone-Poulenc	Clayton, NC
1992	N. Carolina State	79.9	Nilda Burgos	Arkansas	93.1	Ciba-Geigy	Greenville, MS
1993	Mississippi State	86.1	Todd Baughman	Mississippi State	89.6	BASF & Univ. of GA**	Tifton, GA
1994	Arkansas	81.7	Nilda Burgos	Arkansas	81.9	Dow Elanco & Miss. St**	Starkeville, MS
1995	Arkansas	80.0	Tim Strebe	Arkansas	81.4	Southeast Res. & Ext. Ctr.	Rohwer, AR
1996	Texas A&M	78.6	Eric Prostko	Texas A&M	92.1	Valent	Greenville, MS
1997	Arkansas	81.4	Bob Starke	Arkansas	90.8	Univ. Tennessee	Knoxville, TN
1998	Arkansas	82.6	Jason Norsworthy	Arkansas	89.3	American Cyanamid	Memphis, TN
1999	Arkansas	90.0	Mike Lovelace	Arkansas	94.4	Novartis	Greenville, MS

* Alternate on team.
** Sponsor and host, respectively.

Table 2. Teams competing, years completed, and year initially participated for past 20 years.

TEAM*	YEARS	INITIAL
Arkansas	19	1981
North Carolina State	17	1982
Florida	15	1980
Mississippi State	15	1981
Tennessee	13	1981
Louisiana State	12	1983
Georgia	10	1980
Virginia Tech	10	1981
Texas A&M	10	1988
Auburn	8	1980
Clemson	8	1982

* others Kentucky - 2 (1996), Texas Tech - 2 (1995), Oklahoma State - 1 (1992), and New Mexico State - 1 (1988).

Table 3. Year, individual, and team name for perfect weed identification scores from 1980 through 1999.

Year	Name	Team
1980	Braddock, Richard	Florida
	Hulbert, Jerry	Florida
	Jolley, Ed	Auburn
1990	Ruff, David	Arkansas
	Van Gessel, Mark	North Carolina State
	Wichert, Rex	Arkansas

Table 4. Year, individual, and team name of perfect scores on herbicide identification from 1980 through 1999.

Year	Name	Team
1986	Kelly, Terry (alt.)*	Arkansas
	King, Andy	Arkansas
1987	King, Andy	Arkansas
1988	Ruff, David (alt.)	Arkansas
	Wichert, Rex	Arkansas
1989	Kendig, Andy (alt.)	Arkansas
	Klingaman, Tracy	Arkansas
1990	Holshouser, David	North Carolina State
	Myers, Paul	North Carolina State
	Johnson, Bill	Arkansas
	O'Bryan, Keith	Florida
	Klingaman, Tracy	Arkansas
	Stapleton, Gregg	Clemson
	Van Gessel, Mark	North Carolina State
	Wichert, Rex	Arkansas
	Wixsom, Marshall	Mississippi State
1991	Carey, Frank	Arkansas
	Fishel, Fred	Mississippi State
	Johnson, David	Arkansas
	Mahnken, Gail	North Carolina State
1992	Baughman, Todd	Mississippi State
1993	Baughman, Todd	Mississippi State
1994	Bararpour, Mohammad	Arkansas
	Burgos, Nilda	Arkansas
	Costello, Richard (alt.)	Arkansas
	Gander, Jody	Arkansas
1996	Jost, Phil	Texas A&M
	Prostko, Eric	Texas A&M
	Smith, Cade	Mississippi State
	Swantek, Jason	Arkansas
1999	Sparks, Oscar (alt.)	Arkansas

* Alternate on team.

Table 5. Individual, team name, and year that the individual scored two perfect individual calibration problem sets from 1988 through 1999.

Name	Team	Year
Brown, Blake	Tennessee	1990 and 1991
Everson, Butch	Texas A&M	1990 and 1991
Kendig, Andy	Arkansas	1990 and 1991
McDonald, Greg	Florida	1990 and 1991
Ruff, David	Arkansas	1988 and 1990
Simpson, David	Texas A&M	1990 and 1991
Thompson, Angela	Tennessee	1990 and 1991
Van Gessel, Mark	N. Carolina State	1990 and 1991

Table 6. Number of problems, year, individual, and team name of perfect field problem scores from 1980 through 1999.

Problem number	Year	Name	Team
One	1985	Allen, Ralph (alt.)*	Mississippi State
		Colvin, Danny	Florida
		Risley, Mark	Arkansas
	1987	Bozsa, Robert	Arkansas
		Kendig, Andy (alt.)	Arkansas
		Jordan, David (alt.)	N. Carolina State
		Walker, Lewis	Virginia Tech
		Vencill, Bill (alt.)	Virginia Tech
		Monks, Dale	Georgia
Two	1999	Askew, Shawn (alt.)	N. Carolina State
		Lovelace, Mike	Arkansas
		Matocha, Mark	Texas A & M

* Alternate on team

Table 7. Top three teams over the first 20 years.

Team	**Placement**			**Total**
	First	**Second**	**Third**	
Arkansas	14	2	3	19
North Carolina State	1	4	5	10
Mississippi State	1	3	3	7
Florida	2	2	2	6
Texas A & M	1	1	3	5
Georgia	0	3	1	4
Louisiana State	0	2	2	4
Auburn	1	2	0	3
Clemson	0	1	1	2

Table 8. Individual and team names and years competed in Southern Weed Contest in which their team won first place.

Name	Team	Years
Barnes, Jeff	Arkansas	1997-1999
Bozsa, Robert	Arkansas	1985-1987
Johnson, David	Arkansas	1985, 1987, and 1991
Klingaman, Tracy	Arkansas	1988-1990
King, Andy	Arkansas	1986-1988
Lovelace, Mike	Arkansas	1997-1999
Payne, Scott	Arkansas	1998-2000
Wichert, Rex	Arkansas	1988-1990

EFFECT OF DICLOSULAM AND FLUMIOXAZIN ON THREE RUNNER-TYPE PEANUT VARIETIES. C.L. Main, J.A. Tredaway, and G.E. MacDonald, University of Florida, Gainesville, FL.

ABSTRACT

Peanut requires a long growing season, approximately 140 to 160 days depending on variety, which can lead to reduced weed control late season. Diclosulam and flumioxazin are two possible herbicide solutions to weed problems in southeastern U.S. peanut. Diclosulam can be applied either PPI or PRE to control several broadleaf weeds including bristly starbur (*Acanthospermum hispidum*), tropic croton (*Croton glandulosus var. septentrionalis*) common lambsquarters (*Chenopodium album*), prickly sida (*Sida spinosa*), and multiple morningglory (*Ipomoea spp.)* and pigweed (*Amaranthus spp.*) species. Flumioxazin is applied PRE and provides 4 to 6 weeks residual control of several broadleaf weeds in peanut including Florida beggarweed (*Desmodium tortuosum*), morningglories, and prickly sida.

Increased importance for peanut varieties with disease resistance due to increased incidences of leaf spot and Tomato Spotted Wilt Virus has led to many breeding lines being selected for multiple disease resistance. Varietal responses to herbicides have occurred in parent varieties which leads to the possibility of a response to diclosulam and flumioxazin in descendant varieties. It is hypothesised that new varieties will not show differential response to applications of diclosulam and flumioxazin.

Experiments were conducted in 1999 and 2000 to determine varietal tolerance of some runner peanut varieties to diclosulam and flumioxazin. The runner varieties evaluated were Georgia Green, MDR-98, and C-99R. Ethalfluralin was applied at 841 g ai/ha PPI to all plots for small seeded broadleaf and annual grass control. Plots were maintained weed free by mechanical cultivation and hand hoeing to eliminate possible confounding of peanut yields by weed interference. Conventionally tilled peanuts were planted at a seeding rate of 112 kg/ha. A strip-split plot with correlation experimental design was utilized. Diclosulam treatments were applied PPI at 0, 18, 27, and 54 g ai/ha. Flumioxazin treatments were applied PRE at 0, 71, 105, and 211 g ai/ha. All herbicides were applied with a backpack sprayer at 187 L/ha. Data collected included crop injury, canopy diameters, yields, and grades. Visual evaluations were recorded 14, 28, 56, and 112 DAP on a scale of 0 to 100% with 0 = no injury and 100 = crop death. Grade analysis was determined from a random 200 g sample free of foreign material and splits due to harvesting according to the United States standard grades guidelines.

No injury occurred on any variety with diclosulam applications, regardless of rate. Canopy width, yield and grades were affected only by variety, except at Gainesville in 2000 where no yield differences occurred. Early season injury and canopy diameter reduction occurred in 1999 at Marianna with flumioxazin at 105 and 211 g ai/ha. Canopy width remained significant for rate and variety but no yield differences were seen. All other locations and years displayed no injury from applications of flumioxazin. Canopy width, yield and grades were affected only by variety except at Marianna, 1999.

WEED POPULATION DYNAMICS IN A ROUNDUP READY COTTON PRODUCTION SYSTEM. E.W. Palmer, T.B. Scroggins, R.B. Westerman, and D.S. Murray. Department of Plant and Soil Sciences, Oklahoma State University, Stillwater, OK 74078.

ABSTRACT

A 3-year experiment with Roundup Ready cotton was initiated in 1998 at the South Central Research Station near Chickasha, OK to measure weed population shifts in a Roundup Ready production system as well as a standard herbicide system. The experimental design was a randomized complete block with 4 replications. Plot size was 12 m x 30 m. Sixteen treatments were included in this experiment with 10 containing glyphosate applied over-the-top. Johnsongrass [*Sorghum halepense* (L.) Pers.], silverleaf nightshade (*Solanum elaeagnifolium* Cav.), devil's-claw [*Proboscidea louisianica* (Mill.) Thellung], and common cocklebur (*Xanthium strumarium* L.) were the predominant species. Other

species counted were Palmer amaranth (*Amaranthus palmeri* S. Wats.), pitted morningglory (*Ipomoea lacunosa* L.), yellow nutsedge (*Cyperus esculentus* L.), and common lambsquarters (*Chenopodium album* L.). Weed counts, visual weed control ratings, and cotton yield data were collected from all plots.

All herbicides were applied at the recommended rate in this study. Herbicides included: (PPI) pendimethalin, (PRE) prometryn, pyrithiobac, or prometryn + pyrithiobac , and (POST) glyphosate, quizalofop, or pyrithiobac. Palmer amaranth was controlled at least 90% 10 weeks after planting (WAP) in plots treated with pendimethalin PPI or glyphosate POST-1. Treatment with pendimethalin PPI + prometryn PRE followed by quizalofop POST reduced johnsongrass counts in 1999 and 2000; however, common cocklebur counts increased in these same plots from 250 plants per plot in 1998 to 2,700 plants per plot in 2000. Pitted morningglory and yellow nutsedge numbers also increased in plots treated with pendimethalin followed by glyphosate. In the untreated checks, the predominant weed species in 1998 was johnsongrass; however, in 2000 the predominant weed species was Palmer amaranth.

Cotton treated with glyphosate or pyrithiobac POST yielded at least 112 kg/ha more than cotton treated with the standard herbicide treatment pendimethalin PPI + prometryn PRE followed by quizalofop POST in 1998, 1999, and 2000.

WEED CONTROL AND NET RETURNS WITH TRANSGENIC COTTON USING DSS AND HUMAN RECOMMENDATIONS. S.W. Murdock, D.S. Murray, and J.W. Moore. Oklahoma State University. Stillwater, OK.

ABSTRACT

Oklahoma State University adapted a DSS (HADSS) to Oklahoma cotton production in 1999. Changes were made to the weed list, herbicide list, herbicide treatments, control efficacies, and competitive indices. The changes were made based on research data and experience of weed science specialists at Oklahoma State University.

In 1999, there were four experiments, at two locations, conducted to evaluate the adapted DSS. Transgenic cotton varieties, Paymaster 1220 BG/RR and Stoneville BXN 47, were used. The experiments were performed to determine if the adapted DSS gave appropriate postemergent herbicide recommendations. The DSS recommendations and results were compared to recommendations made by an OSU weed science faculty member. The results showed that minor changes needed to be made to some herbicide efficacies and some additional treatments needed to be added.

The changes were made and three experiments were conducted in 2000, two at Chickasha, OK and one at Perkins, OK, with Roundup Ready and BXN tolerant cotton varieties. The plots were again, 10 by 50 ft with four replications. Each experiment received a PPI application of trifluralin, at the labeled rate, and half of the area received a PRE application of prometryn, also at the labeled rate for the soil type. There were ten treatments. The DSS was used in four treatments, to recommend the postemergent herbicide applications, and an Oklahoma State University weed science specialist recommended the postemergent applications for four treatments. There was also a weed free check and a weedy check in each experiment.

The results from the 2000 experiments were evaluated by weed control and net return. The experiment at Perkins, with a Roundup Ready variety, resulted in comparable weed control and net returns between the DSS and OSU recommended treatments. Weed control from the DSS recommended treatments were below 85% control in only one treatment and for only one weed species. The DSS recommended treatments, for most weed species, had weed control ratings that were the same or better than the OSU recommended treatments. The net return for the DSS recommended treatments, were the same as three of the OSU recommended treatments and higher than the fourth and the weedy check. The Chickasha experiment, with BXN tolerant cotton, resulted in no differences in weed control in three of the DSS recommended treatments and all of the OSU recommended treatments, while one DSS recommended treatment had lower weed control. There was no difference in net return between the DSS recommended treatments and the OSU recommended treatments, and all had a greater return than the weed free check. The Roundup Ready cotton variety experiment, at Chickasha, showed no differences in weed control between the DSS and OSU recommended treatments. Net return was the same for most of the treatments, but two of the DSS recommended treatments were lower than the highest OSU recommended treatments. This reduced net return was due to a late application of MSMA, which lowered the yield for the two DSS treatments.

Weed control and net return by the DSS and OSU recommended treatments were similar for the three experiments. The results of these experiments, as well as the 1999 experiments, will be further evaluated to determine if any changes need to be made to the DSS. Warnings of potential crop injury, rotational issues, and label restrictions will be added to the appropriate treatments in the DSS. The updated DSS will be released for use on large scale sites by a select few extension personnel, commodity specialist, and/or key producers in the 2001 growing season.

REAL-TIME SITE-SPECIFIC WEED MANAGEMENT IN GLYPHOSATE-RESISTANT COTTON. S.D. Askew, S.B. Clewis, and J.W. Wilcut, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

Cotton (*Gossypium hirsutum*) requires more herbicide inputs than other U.S. crops. Although selective herbicide technology has improved over the last 50 years (kg ai ha^{-1} to g ai ha^{-1}), little advance has been made in spray-application technology. Weed-sensing sprayers apply pesticide only where it is needed and avoid requirements for interpreting numerous data. The sprayer used in these studies was developed by Patchen, Inc. Sensors emit a light source and then detects the ratio of red to near infrared light reflecting back from the ground and surrounding vegetation. Where green vegetation exists, less red light is reflected thus altering the ratio. Plastic hoods must be used in row crops to exclude crop plants from the detection area. Rather than band herbicides over the crop plants between the plastic hoods, the following studies attempt to utilize information gained between rows to trigger weed control measures over the crop row (drill). In theory, weeds grow in patchy patterns. By automatically triggering spray application over the crop plants only when weeds are detected in the adjacent row middles, herbicide application can be reduced in the area over the crop plants. Information on economic return of weed management systems that utilize weed-sensing sprayers is needed. The objectives of these studies were to determine the feasibility of weed management with a sensor sprayer in cotton as compared to conventional standards and postemergence herbicides systems selected by computer software (HADSS, "Herbicide Application Decision Support System"). Additional objectives were to assess spray reduction and weed management cost from the various herbicide systems and to assess the feasibility of on-the-drill application based on weed detection between the rows.

Studies were conducted in 1999 and 2000 at Kinston, NC. A randomized complete block design was replicated five times. Plots were 7.7-m wide by 30.5-m long and contained eight 0.96-m crop rows. Preemergence (PRE) herbicides included pendimethalin at 1.1 kg ai ha^{-1} plus fluometuron at 1.1 kg ai ha^{-1}. The last herbicide treatment (LAYBY) consisted of prometryn at 0.9 kg ai ha^{-1} plus MSMA at 2.2 kg ai ha^{-1} with 0.25% (v/v) nonionic surfactant. The study included the following six herbicide systems: 1) PRE herbicides followed by (fb) glyphosate at 0.8 kg ai ha^{-1} early postemergence (POST) and late POST-directed fb LAYBY; 2) the previous system with HADSS-recommended POST herbicides; 3) PRE herbicides applied to the crop drill in a band consisting of 50% of the row width (46 cm) fb early and late glyphosate applications with the weed-sensing sprayer and HADSS deciding the herbicide to use banded 25 cm over the drill; 4) the previous system except without PRE herbicides; 5) the previous system except the weed sensor triggers weed control in the crop drill; and 6) a weed-free control.

Cotton stunting occurred due to early-season weed interference in systems that did not included PRE herbicides both years. Weed-sensor systems reduced the amount of POST herbicide sprayed compared to broadcast application in all instances. At the first POST application, these reductions averaged 55% regardless of PRE herbicides or years. However, slowed crop growth allowed more weed emergence in plots that did not contain PRE herbicides and spray reductions late in the season averaged 60% compared to 75% in the system that had PRE herbicides applied in a band. All herbicide systems controlled carpetweed (*Mollugo verticillata*), common lambsquarters (*Chenopodium album*), entireleaf morningglory (*Ipomoea hederacea* var. *integriuscula*), goosegrass (*Eleusine indica*), ivyleaf morningglory (*Ipomoea hederacea*), Palmer amaranth (*Amaranthus palmeri*), sicklepod (*Senna obtusifolia*), and slender amaranth (*Amaranthus gracilis*) at least 97% late in the season. Cotton lint yields averaged 600 kg lint ha^{-1} in 1999 with no differences. In 2000, yield potential was greater due to better growing conditions and significant yield reduction occurred were PRE herbicides were not used. These reductions in yield are likely due to slowed cotton growth following early-season weed interference. Net returns mirrored trends in yield. Although herbicide systems that used weed-sensors and no PRE herbicides were the cheapest (\$25.00 ha^{-1}), these systems returned less money due to yield reductions. However, the weed-sensor system that included banded PRE herbicides had equivalent returns compared to standard herbicide systems but cost \$75.00 ha^{-1} less at \$50.00 ha^{-1}. Using the weed-sensing sprayer to trigger weed control in the drill seems viable since weed control and yields were equivalent to similar systems that used banded herbicides over the drill. Excluding PRE herbicides can save money, but will likely require more and earlier POST applications to avoid yield loss.

COMPARISON OF NEW PREPLANT BURNDOWN OPTIONS FOR COTTON PRODUCTION. M.W. Shankle, K.M. Bloodworth, and D.B. Reynolds. Pontotoc Ridge-Flatwoods Branch Experiment Station, Pontotoc MS, 38863 and Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Preplant herbicide control of winter and early spring vegetation is essential for stand establishment and plant vigor in conservation tillage practices. Field research was conducted at the Black Belt Experiment Station, Brooksville, MS and the Plant Science Research Center, Starkville, MS in 2000 to evaluate preplant herbicide burndown options. One application of 1 lb ai/A Roundup Ultra, 1 lb ai/A Touchdown, and 0.625 lb ai/A Gramoxone Extra were applied alone and tank-mixed with 0.25 lb ai/A Clarity, 0.20 lb ai/A Goal, 0.33 oz ai/A Harmony Extra, 0.71 lb ai/A 2,4-D Amine, 0.008 lb ai/A Aim, and 0.25 lb ai/A Clarity.

At 3 WAT, henbit (*Lamium amplexicaule*) and cutleaf eveningprimrose (*Oenothera laciniata*) control was 98% following Roundup Ultra plus Harmony Extra or Aim and Touchdown plus Goal. Roundup Ultra and Touchdown control alone was 91 and 90%. Gramoxone Extra controlled henbit 56% and cutleaf eveningprimrose 53%, but control was 89 and 81%, respectively, with the addition of Goal. Common chickweed (*Stellaria media*) control was 96 and 90% with Roundup Ultra and Touchdown, respectively. Gramoxone control was 78% alone and 91% when tank-mixed with Goal. Tank-mixing Harmony Extra, Goal or 2,4-D with Roundup or Touchdown controlled corn buttercup (*Ranunculus arvensis*) at least 92% compared to 86 and 80% with Roundup Ultra and Touchdown alone, respectively. But, control with Gramoxone Extra was 95% and the addition of a tank-mix partner was not beneficial. Control of annual bluegrass (*Poa annua*) and horseweed (*Conyza canadensis*) was at least 94% with Roundup Ultra, Touchdown, or Gramoxone Extra. These results suggest that the appropriate tank-mix combination can enhance burndown and may provide residual control of certain weed species.

COTTON LAYBY WEED CONTROL OPTIONS IN ABSENCE OF BLADEX. J.D. Beaty, K.L. Smith, and J.W. Branson, University of Arkansas, Southeast Research and Extension Center, Monticello, AR 71656.

ABSTRACT

Cyanazine has been recognized as a standard in weed control programs with approximately 40 percent of the Arkansas cotton acres receiving at least one application per year. Regulatory issues have dictated Cyanazine use will be discontinued after the 2001 growing season. Six trials were established in 1999 and 2000 at Rohwer, Arkansas to evaluate labeled and non-labeled herbicides as replacements for cyanazine in cotton weed control programs. All trials were conducted on a hebert silt loam in RCBD with 4 replications utilizing conventional small plot research techniches. All postemergence directed applications were made using a 4 row tractor mounted sprayer calibrated to 10 or 15 gpa total volume. Trials were conducted utilizing best management practices for the area with furrow irrigation in 1999 and sprinkler irrigation in 2000.

In study 1, dimethipin with and without prometryn, fluometuron, and diuron was evaluated for effectivness when applied as layby applications. Treatments included dimethipin at 0.25 and 0.40 lb ai/A in combination with prometryn at 0.5, fluometuron at 0.8, and diuron at 1.6 lb ai/A. Dimethipin + fluometuron gave 95% pitted morningglory (Ipomoea lacunosa L.) control and was equal to dimethipin + diuron and dimethipin + MSMA and dimethipin + prometryn provided greater control of pitted morningglory. Adding dimethipin to tankmixes of prometryn, fluometuron, or diuron with MSMA did not improve control of pitted morningglory or prickly sida (Sida spinosa L.). In study 2, dimethipin was evaluated in combination with glyphosate, carfentrazone-ethyl, and MSMA for control of pitted morniggl ory and prickly sida. Treatments include dimethipin at 0.25 or 0.40 lb ai/A + glyphosate at 0.75 or 1.0 lb ai/A with crop oil concentrate. Dimethipin at 0.25 and 0.40 lb ai/A + glyphosate at 0.75 lb ai/A or glyphosate at 0.75 lb ai/A alone. Dimethipin at 0.25 lb ai/A + MSMA at 1.9 lb ai/A and carfentrazone-ethyl at 0.008 lb ai/A + glyphosate at 0.75 lb ai/A. Tankmixes with dimethipin did not improve pitted morningglory or prickly sida control over glyphosate alone.

In study 3, glyphosate was evaluted for pitted morningglory control. Treatments include, fluometuron at 1.0 lb ai/A applied preemergence, glyphosate at 1.0 lb ai/A applied to 2-4 leaf growth stage cotton, and, fluometuron applied preemergence followed by glyphosate. All treatments include pendimethalin at 1.0 lb ai/A applied preplant incorporated. Significantly greater pitted morningglory control was achieved with fluometuron applied preemergence followed by glyphosate at the 2-4 leaf growth stage.

In study 4, treatments include carfentrazone at 0.015, 0.024 lb ai/A, pyrithiobac at 0.0625 lb at/A, flumioxazin at 0.063 lb ai/A, carfentrazone at 0.015 lb ai/A in combination with fluometuron at 0.75, pyrithiobac at 0.0625, bromoxynil at 0.375, and MSMA at 2.0 lb ai/A. Carfentrazone + pyrithiobac and flumioxazin alone provided greater pitted morningglory and prickly sida control than carfentrazone + MSMA or pyrithiobac alone. Carfentrazone + fluometuron combinations provided greater prickly sida control and similar control of pitted morningglory compared to carfentrazone alone.

In study 5, clomazone at different rates and timings in combination with glyphosate at 0.75 lb ai/A was evaluated for control of barnyard grass (Echinochloa crus-galli (L.) P. Beauv.) and pitted morningglory. Treatments include clomazone at 0.5 lb ai/A and glyphosate at 0.75 lb ai/A applied at 4th node growth stage of cotton, glyphosate applied at 4th node followed by clomazone + glyphosate at 6th node, glyphosate applied at 4th node followed by glyphosate at 6th node followed by glyphosate + clomazone at 8th node, glyphosate applied at 4th node followed by glyphosate at 6th node followed by glyphosate at 8th node followed by glyphosate + clomazone at 10th node. Glyphosate + clomazone applied at the 6th and 10th node provided greater barnyard grass control than 4th and 8th node applications. Pitted morningglory control was improved as the number of glyphosate applications was increased. In study 6, flumioxazin alone and in combination with glyphosate and MSMA was compared to cyanazine + MSMA and glyphosate alone for control of red root pigweeed (Amaranthus retroflexus L.) and barnyard grass. Treatments applied to 6-8 leaf cotton include flumioxazin at 0.063 lb ai/A with non ionic surfactant or crop oil concentrate, and flumioxazin at 0.063 + MSMA at 2.0 lb ai/A + non-ironic surfactant. Treatments applied at layby include glyphosate at 1.0 lb ai/A, flumioxazin at 0.063 + glyphosate at 1.0 lb ai/A, flumioxazin at 0.063 + MSMA at 2.0 lb ai/A + non-ironic surfactant. Flumioxazin + glyphosate and cyanazine + MSMA was better on red root pigweed than glyphosate alone or flumioxazin + MSMA. Glyphosate, flumioxazin + glyphosate, and cyanazine + MSMA provided greater barnyard grass control than flumioxazin + MSMA.

WEED CONTROL AND CROP SAFETY AS AFFECTED BY REFLEX RATES AND APPLICATION TIMING IN COTTON. F.E. Groves, K.L. Smith, and J.W. Branson, University of Arkansas, Southeast Research and Extension Center, Monticello, AR.

ABSTRACT

Tests were conducted in 1999 and 2000 in Rohwer, AR on a Hebert silt loam to evaluate the efficacy and crop safety of fomesafen in cotton. Plots were 4 rows X 35 feet long arranged in randomized complete block design with 4 replications. The seeding rate was 12 lb/A of DP 5415 in 1999 and DP 454B/RR in 2000 planted on conventional till 38" rows. The studies were irrigated as needed by furrow irrigation in 1999 and sprinkler irrigation in 2000. Rainfall and temperatures were similar between the two years. The soil organic matter was 2.2% and <1% on the 1999 and 2000 locations, respectively. Treatments included trifluralin @ 0.75 lb ai/A PPI, fomesafen @ 0.25 to 0.5 lb ai/A + trifluralin @ 0.75 lb ai/A PPI, fomesafen @ 0.25 to 0.5 lb ai/A PRE following trifluralin PPI, fomesafen @ 0.25 to 0.5 lb ai/A + fluometuron @ 1.5 lb ai/A PRE following trifluralin PPI and fomesafen @ 0.25 to 0.5 lb ai/A + pyrithiobac sodium @ 0.047 lb ai/A PRE following trifluralin PPI. Weed control and crop safety evaluations were made.

In 1999, the addition of fomesafen PRE or PPI at 0.25 to 0.5 lb ai/A to trifluralin offered increased control of barnyardgrass [*Echinochloa crus-galli*], broadleaf signalgrass [*Brachiaria platyphylla*], pitted morningglory [*Ipomoea lacunose*] and prickly sida [*Sida spinosa*] over trifluralin PPI. No increase in control of any species was observed with the addition of fomesafen to fluometuron or pyrithiobac sodium PRE following trifluralin. No injury was noted with any herbicide or combination of herbicides in 1999.

In 2000, fomesafen @ 0.25 to 0.5 lb ai/A PRE following trifluralin PPI increased control of redroot pigweed [*Amaranthus retroflexus*], pitted morningglory [*Ipomoea lacunose*] and prickly sida [*Sida spinosa*] over that provided by trifluralin alone. When fomesafen was combined with fluometuron or pyrithiobac sodium and applied preemergence following trifluralin PPI, there was no increase in weed control or yield compared to the same herbicide combinations without fomesafen. Injury levels of 15 to 30% were common among the treatments containing fomesafen in 2000.

MANAGEMENT STRATEGIES FOR MORNINGGLORY CONTROL IN OKLAHOMA. T.S. Osborne and J.C. Banks, Oklahoma State University

ABSTRACT

Despite recent technological advances with regard to herbicide tolerant cotton varieties, morningglories continue to be some of the most troublesome weeds cotton producers experience. Two independent field experiments in 2000 were conducted near Altus in southwestern Oklahoma focusing on pitted (*Ipomoea lacunosa* L.) and entireleaf (*Ipomoea hederacea var. integriuscula* Gray) morningglory. These experiments evaluated weed control utilizing both Roundup Ready and BXN cotton production systems. The treatments observed in the first experiment included Roundup Ultra (glyphosate) applied either once or twice early postemergence-topical (EP) at 1 qt/A followed by (fb) Roundup Ultra applied postemergence-directed (PD) at 1 qt/A alone or tankmixed with two different rates(1 or 1.5 pt/A) of Direx (diuron) at the 6-8 leaf or 10-12 leaf cotton stage. The second experiment focused on evaluating the benefits of Caparol (prometryn) applied preemergence (PRE) and Staple (pyrithiobac) applied postemergence (POST) in a BXN system. These treatments included Buctril applied POST alone at 1 pt/A,. Caparol applied PRE at 3.2 pt/A fb Buctril applied POST at 1 pt/A, Buctril at 1 pt/A plus Staple at 0.6 oz/A applied POST, and Caparol PRE at 3.2 pt/A fb Buctril at 1 pt/A plus Staple at 0.6 oz/A applied POST. All POST treatments in the BXN trial were intended to be applied on an "as needed" basis. A blanket application of Treflan was applied preplant incorporated over both trial locations at 0.75 lb ai/A.

Results from the first trial indicated that the addition of Direx to Roundup Ultra applied early PD did not increase early season pitted morningglory control compared to Roundup Ultra alone. However, late-season observations indicated that an EP application of Roundup Ultra fb Direx plus Roundup Ultra applied PD controlled pitted morningglory 80-93%, which was more effective than Roundup Ultra EP fb Roundup Ultra PD alone (67-68%). No difference in pitted morningglory control was observed when the rate of Direx was increased from 1pt/A to 1.5 pt/A.

Results of the BXN trial indicated that Caparol applied PRE fb Buctril applied POST controlled entireleaf morningglory 93% which was similar to no PRE fb Buctril plus Staple applied POST early in the season. Late season evaluation revealed that three applications of Buctril applied POST alone with or without Caparol applied PRE controlled entireleaf morningglory 68-75% which was less effective compared to two applications of Buctril plus Staple applied POST which controlled entireleaf morningglory 85%.

These results indicate that the addition of residual herbicides to either Roundup Ultra or Buctril increased late season morningglory control in both herbicide-tolerant cotton systems. Tankmixing with either Direx or Staple resulted in increased weed control and a potential reduction in the total number of Roundup Ultra and Buctril applications within each system.

UTILIZATION OF SPECTRAL IMAGES AND COTMAN TO OPTIMIZE COTTON DEFOLIATION TIMING. J.C. Sanders, L.M. Bruce, and D.B. Reynolds. Mississippi State University, Mississippi State, MS.

ABSTRACT

Cotton is a perennial plant with a natural mechanism for shedding leaves. Mechanical harvesters helped to make chemical defoliation a common agricultural practice. The defoliation process is now a common cultural practice to aid in mechanical harvest. Chemical defoliation allows one to control defoliation timing and thus harvest timing, but can be the most unpredictable process in cotton production. Harvest-aid application now encompasses not only defoliation but also regrowth, boll opening, and weed desiccation. The timing of harvest-aid application optimizes yield and fiber quality by not sacrificing older bolls, while maturing as many young bolls as possible. There are many techniques used to determine cotton maturity and thus harvest-aid application timing. Some of the more common techniques include percent open bolls, nodes above cracked boll (NACB), days after planting, visual inspection, and a computer-aided expert system (COTMAN). Using heat unit accumulation after physiological cutout, COTMAN can predict cotton maturity.

An experiment was conducted at the Plant Science Research Center, Starkville, MS to determine if remotely sensed crop data could be correlated to cotton maturity and to evaluate harvest-aid efficacy in respect to defoliation and boll opening. Plots were 40' x 26' and the cotton variety used was Paymaster 1560 BG/RR. Data collected included handheld ASD readings, NAWF, percent open bolls, visual ratings for defoliation, yield, and fiber quality. Treatments were initiated according to the previously mentioned timing techniques.

Data suggest that classification of spectral data with percent open bolls decreased from 100% to 69% from the beginning of the evaluation period until harvest. This indicates that more bolls naturally opened with time and that differences among treatments had decreased thus classification decreased. When percent crop defoliation was classified utilizing spectral data it was correctly classified 100% of the time. These data indicate that percent open bolls and visual defoliation ratings can be correlated with some application timing techniques such as COTMAN.

COTTON RESPONSE TO CADRE RESIDUALS FOLLOWING PEANUT. B.A. Besler, W.J. Grichar, E.P. Prostko, C.W. Bednarz, A.S. Culpepper, T.L. Grey, R.G. Lemon, and K.D. Brewer. Texas Agricultural Experiment Station, Yoakum, TX; Univerisity of Georgia, Tifton and Plains, GA; and Texas Agricultural Extension Service, College Station, TX.

ABSTRACT

Field trials were conducted at the Texas Agricultural Experiment Station at Yoakum, Plains, Georgia and Tifton, Georgia to determine the response of cotton (*Gossypium hirsutum*) when exposed to varying simulated residue levels of the ALS inhibitor Cadre, a herbicide commonly used in peanut. Cadre currently has an eighteen-month plant back restriction for cotton. Therefore, it becomes important to determine the level of Cadre residue in the soil that has the greatest potential to cause injury to cotton. Cadre was applied PPI at Yoakum and Tifton and PRE at Plains at rates of 0.032 lb ai/A (16 ppb), 0.016 lb ai/A (8 ppb), 0.008 lb ai/A (4 ppb), 0.004 lb ai/A (2 ppb), 0.002 lb ai /A (1 ppb) and 0.001 lb ai/A (0.5 ppb). The labeled rate for Cadre is 0.063 lb ai/A. Cotton varieties included DP436RR, FM958, ST4892RRBG, ST4691BG, SG501BG/RR and DB33B. Data collected included plant height, plant emergence yield and fiber quality (length, uniformity, SFI, strength, ELG and micronaire). Factorial analysis revealed no significant variety x herbicide interactions. No significant differences were seen with fiber quality for all factors.

At Yoakum, significant reductions in plant heights resulted with Cadre at 0.032 lb ai/A and 0.016 lb ai/A while plant emergence was significantly reduced at 0.032 lb ai/A, 0.016 lb ai/A and 0.008 lb ai/A. Cotton yields were significantly reduced with Cadre at the 0.032 lb ai/A and 0.016 lb ai/A rate. At Plains, all rates of Cadre except the 0.001 lb ai/A rate significantly reduced both plant stand and height. Cotton yields were significantly reduced at rates of 0.032 lb ai/A, 0.016 lb ai/A, and 0.008 lb ai/A. Initial cotton emergence at Tifton revealed no significant reduction. However, later evaluations indicated that Cadre at 0.032 and 0.016 lb ai/A caused significant stand reductions. Cotton plant heights were reduced by the 0.032 lb ai/A, 0.016 lb ai/A and 0.008 lb ai/A rates of Cadre. Cotton yields were significantly reduced by the 0.032 and 0.016 lb ai/A rates of Cadre. It is apparent from this study that Cadre is relatively safe on cotton when simulated residue levels are at rates of 0.004 lb ai/A (2 ppb) or lower.

WEED MANAGEMENT IN STRIP- AND CONVENTIONAL-TILLAGE PEANUTS WITH DICLOSULAM AND FLUMIOXAZIN. S.B. Clewis, S.D. Askew, I.C. Burke, S.C. Troxler, 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 cover crop at Rocky Mount in 1999 and corn and cotton stubble at Lewiston in 1999 and 2000, respectively. Roundup (glyphosate) at 1.12 kg ai/ha was applied three to four weeks before planting to control emerged vegetation. Two new preemergence (PRE) herbicides strongarm (diclosulam) and valor (flumioxazin) were evaluated along with standard PRE and postemergence herbicide systems. The PRE herbicide options included: 1) frontier (dimethenamid) alone (1.4 kg ai/ha), 2) frontier plus strongarm (0.027 kg ai/ha), 3) frontier plus valor (0.071 kg ai/ha), and 4) nothing. The postemergence herbicide options included: 1) basagran (bentazon) (0.28 kg ai/ha early postemergence [EPOST]) plus gramoxone (paraquat) (0.14 kg ai/ha EPOST) followed by blazer (acifluorfen) (0.28 kg ai/ha) plus basagran (0.56 kg ai/ha) (postemergence [POST]), 2) paraquat EPOST followed by blazer plus basagran POST, and 3) 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/ha plus NIS for burndown of emerged vegetation. The experimental design was a split plot with a factorial treatment arrangement and 3 replications.

Only strongarm systems controlled yellow nutsedge (*Cyperus esculentus*) greater than 90% late season. Strongarm systems were the most consistent for purple nutsedge (*Cyperus rotundus*) control (minimum control = 85%). Grass control was not adequate and required select (clethodim) for full season control, regardless of tillage system. Frontier plus strongarm or valor (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 but blazer plus basagran was required for >90% control. Frontier plus strongarm or valor 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 frontier 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 strongarm or valor to frontier PRE improved weed control compared to frontier alone.

WEED MANAGEMENT IN PEANUTS WITH REDUCED RATES OF DICLOSULAM, FLUMIOXAZIN AND IMAZAPIC. S.C. Troxler, J.A. Treadaway, D.L. Jordan, B.J. Brecke, S.D. Askew, and J.W. Wilcut. North Carolina State University, Raleigh, NC 27695.

ABSTRACT

Field studies were conducted in 2000 at Rocky Mount and Lewiston, NC and Marianna and Jay, FL to evaluate weed control, peanut tolerance, and peanut yield using reduced rates of diclosulam, flumioxazin, and imazapic. The treatment structure was a 8 X 2 factorial consisting of eight PRE soil-applied herbicide options 1) diclosulam at 0.012 lb ai/acre (½ X), 2) diclosulam at 0.024 lb/acre (X) 3) flumioxazin at 0.047 lb ai/acre (½ X), 4) flumioxazin at 0.094 lb/acre (X), 5) diclosulam at 0.012 lb/acre (½ X) plus flumioxazin at 0.047 lb/acre (½ X), 6) diclosulam at 0.012 lb/acre (½ X) plus flumioxazin at 0.094 lb/acre (X), 7) diclosulam at 0.024 lb/acre (X) plus flumioxazin at 0.047 lb/acre (½ X), and 8) diclosulam at 0.024 lb/acre (X) plus flumioxazin at 0.094 lb/acre (X); and two POST options 1)imazapic at 0.032 lb ai/acre (½ X) and 2) no POST herbicide. Rocky Mount and Lewiston, NC received clethodim at 0.125 lb ai/acre POST plus COC for supplemental annual grass control. Imazapic was applied with a NIS at 0.25% (v/v). The studies also included a nontreated control and a regional standard herbicide management system for comparison. Regional standards included 1) ethalfluralin at 0.75 lb ai/acre PPI fb metolachlor at 1.5 lb ai/acre PRE, paraquat at 0.125 lb ai/acre plus bentazon at 0.25 lb ai/acre plus NIS at 0.25% (v/v) EPOST fb. bentazon at 0.50 lb ai/acre plus acifluorfen at 0.25 lb ai/acre plus NIS at 0.25% (v/v) POST, and 2) pendimethalin at 0.85 lb ai/acre PPI fb. metolachlor at 1.5 lb/acre PRE fb. bentazon 0.50 lb/acre at plus acifluorfen at 0.25 lb/acre plus 2,4-DB at 0.125 lb ai/acre plus NIS at 0.25% (v/v) POST in North Carolina; and paraquat at 0.125 lb/acre plus bentazon at 0.50 lb/acre AC fb imazapic at 0.063 lb/acre EPOST in Florida.

Weed control was based on late season control of common lambsquarters (*Chenopodium album*), Florida beggarweed (*Desmodium tortuosum*), pitted morningglory (*Ipomoea lacunosa*), sicklepod (*Senna obtusifolia*), and yellow nutsedge (*Cyperus esculentus*). Diclosulam at 0.012 lb/acre controlled Florida beggarweed, sicklepod, and yellow nutsedge equal to diclosulam at 0.024 lb/acre. Flumioxazin at 0.047 lb/acre controlled all weeds evaluated as well as flumioxazin at 0.094lb/acre. Imazapic was required to control pitted morningglory, yellow nutsedge, and sicklepod greater than 88%, regardless of soil-applied program. There was no added weed control when using ½ X rate tank mixtures of diclosulam plus flumioxazin. Diclosulam at ½ X or flumioxazin at ½ X rates PRE fb. imazapic POST at 0.032 lb/acre provided similar weed control to the regional standards. Flumioxazin alone at a ½ X rate provided low yields due to inadequate sicklepod and pitted morningglory control. All other herbicide management systems evaluated produced similar yields.

This research indicates that growers should use the PRE herbicide most appropriate for their present weed problems and follow with imazapic POST if needed. Reduced rates of diclosulam, flumioxazin, and imazapic provide adequate weed control and yields compared to full rates and regional standards. Potential reduction in herbicide costs to growers is distinct a possibility.

DICLOSULAM PERFORMANCE IN TEXAS HIGH PLAINS PEANUT. J.R. Karnei, P.A. Dotray, J.W. Keeling, and T.A. Baughman. Texas Agricultural Experiment Station and Texas Tech University, Lubbock and Texas Agricultural Extension Service, Vernon.

ABSTRACT

Field studies were conducted in 2000 to evaluate weed control and peanut response to diclosulam (Strongarm). Trials were established in Brownfield and Union, TX to evaluate purple nutsedge (*Cyperus rotundus* L.), golden crownbeard (*Verbesina encelioides* L.), and shining tickseed (*Corispermum nitidum* L.) control with diclosulam. Diclosulam applied PPI and PRE at 0.016, 0.024, or 0.048 lb ai/A and imazapic (Cadre) was applied POST at 0.063 lbs ai/A at all locations. The Union location had a blanket application of pendimethalin (Prowl) at 0.62 lb ai/A, PPI and an additional PRE treatment of flumioxazin (Valor) at 0.094 lb ai/A.

Strongarm at 0.048 lb ai/A applied PPI or PRE controlled purple nutsedge 70-72% 21 days after planting (DAP). Strongarm PPI or PRE at 0.024 lb ai/A controlled purple nutsedge 57% 21 DAP. Mid and late season control with Cadre was at least 90%. Strongarm applied PRE at 0.016, 0.024, and 0.048 lb/A controlled purple nutsedge 50, 70, and 80%, respectively. Late season control by Strongarm applied PPI increased from 28 to 80% as rate increased.

Strongarm controlled golden crownbeard and shining tickseed > 88% 53 and 83 DAP. Late season control of golden crownbeard was 100% by Valor and 88-95% by Strongarm applied PRE. Strongarm applied at 0.016, 0.024, and 0.048 lb ai/A provided 50, 60, and 86% golden crownbeard control late season. Shining tickseed was controlled 100% late season by Cadre and Valor. PPI treatments of Strongarm controlled shining tickseed 60-70% late season.

Peanut growth and yield response to Strongarm was observed at Lamesa, TX. Strongarm was applied PPI and PRE at 0.016, 0.024, and 0.048 lb ai/A. Cadre, Valor, and an untreated were used for comparison. All plots were kept weed-free season long. At 14 DAP, 0.048 lb ai/A Strongarm applied PPI or PRE injured peanut 50%. Strongarm at 0.024 lb ai/A PPI or PRE injured peanut 28% and Strongarm at 0.016 lb ai/A PPI or PRE injured peanut 10-12%. No peanut injury was recorded from Valor PRE at 0.094 lb ai/A. Peanut injury was 35% and 45% from Strongarm at 0.048 lb ai/A applied PRE and PPI, respectively, and 10% and 20% from Strongarm at 0.024 applied PPI and PRE at 85 DAP. Cadre injured peanut 7% 85 DAP. At the end of the season, 8% to 10% peanut injury was observed from Strongarm at 0.048 lb ai/A. All other Strongarm treatments had < 3% injury at the end of season. Yields were taken from the Union and Lamesa locations. At Union no Strongarm treatment yielded higher than the Prowl only check. The Strongarm PPI treatment showed a yield decrease of 480 lb/A when the 0.048 lb ai/A rate was compared to the 0.016 lb ai/A rate. Peanut yield from both Valor and the untreated control plot yielded >3100 lb/A. Strongarm applied 0.024 lb ai/A PPI produced 2400 lb/A, while the 0.024 lb ai/A PRE yielded 2600 lb/A.

SULFENTRAZONE PERFORMANCE IN UNIVERSITY AND GROWER FIELD TRIALS. H.G. Hancock, FMC AgProducts Group, Hamilton, GA

ABSTRACT

The strategy to reduce sulfentrazone (F6285) application rates in peanuts (*Arachis hypogaea* L.) was successful in the previous season. This work demonstrated in the lighter soils across the southeast, at-plant, soil application rates could be based on weed spectra. In the southwest, where more alkaline soils tend to increase the solubility of sulfentrazone, rates could also be decreased proportionally without loss of weed control.

This research was continued in 2000 with several objectives established in university and in-house programs. Key among these objectives was the continued evaluation of soil applied sulfentrazone rates of 0.15, 0.2 and 0.25 lb ai/a in the southeast and, in the southwest, rates of 0.125, 0.1 and 0.075 lb ai/a (decreasing with increasing soil pH). The southeastern rate range was also evaluated in combination with pendimethalin (0.75-1.0 lb ai/a, PPI) or metolachlor (1.0 –1.5 lb ai/a, PRE). Similar trials were conducted to evaluate total weed management programs with various POST applications of chlorimuron, paraquat or 2,4-DB for at-plant herbicide escapes. All field programs included appropriate comparative treatments of imazapic (0.063 lb ai/a, ePOST), flumioxazin (0.079 lb ai/a, PRE) and diclosulam (0.023 lb ai/a, PPI).

Another important element of the 2000 program was the establishment of 19, 1-acre grower-applied sulfentrazone plots. In this crop destruct program, peanut growers were asked to apply sulfentrazone (Spartan O 4F) according to the proposed use pattern. These plots were established beside peanuts treated with their 'standard peanut herbicide' for comparison using a simple, subjective assessment of sulfentrazone efficacy. This assessment recorded whether sulfentrazone performance was better than, equal to or less than their 'standard' for crop response and efficacy on the specific weeds present.

As a result of drought conditions across the southeast, virtually all trials received early, substantial irrigation. Conversely, the southwest received frequent and often heavy rains. Under these conditions , herbicides were well activated. In most instances, post–plant escapes were few, not requiring additional treatment.

In university and in-house trials, mean crop response tended to increase with sulfentrazone application rate. However, the responses were generally insignificant with no specific symptomology (e.g. stand loss, stunting, etc.) exceeding 5-10%. There were slight trends of increased crop response with PRE v. PPI application methods. These effects were minor and short-lived as well. Greater response was observed in a few trials where applications were made outside the proposed use pattern. Among grower applied plots, crop responses were <5% in the majority of locations across the region. Indeed, 13 of the 19 trials reported no sulfentrazone-induced response. Low level crop response was also reported for most of the comparative herbicide treatments in university, in-house and grower field trials.

Sulfentrazone weed efficacy was generally good to excellent. Among university and in-house trials, Florida beggarweed (*Desmodium tortuosum* (Swartz)DC) and yellow nutsedge (*Cyperus esculentus* L.) were controlled, 93 and 89%, respectively, at application rates between 0.2 and 0.25 lb. ai/a. Palmer amaranth (*Amaranthus palmeri* S. Wats) and devil's-claw (*Proboscides louisianica* (Mill.) Thellung) were controlled (>90%) at 0.075 lb ai/a in the southwest. Control of smallflower (*Jacquemontia tamnifolia* (L) Griseb.)and ivyleaf (*Ipomoea hederacea* (L.) Jacq.) morningglories was 90 and 83% at 0.15 and 0.25 lb ai/a, respectively. Wild poinsettia (*Euphorbia heterophylla* L.) and Virginia copperleaf (*Acalypha virginica* L.) exhibited >90% control at 0.15 lb ai/a. Similar trends were noted among these weed species treated with sulfentrazone + pendimethalin or metolachlor. Lambsquarters (*Chenopodium album* L.), prickly sida (*Sida spinosa* L.), common ragweed (*Ambrosia artemisifolia* L.) , bristly starbur (*Acanthospermum hispidum* DC.) and Florida pusley, (*Richardia scabra* L.) were controlled (85-99%) with sulfentrazone rates of 0.15-0.2 lb ai/a when applied in combination with the 'grass' herbicides. In grower trials, sulfentrazone efficacy generally exceeded that of the 'standards' across the spectrum of key, economic weeds in peanuts. This research, overall, has shown that the two sulfentrazone application rate ranges will work very well in peanuts.

RESPONSE OF GEORGIA GREEN PEANUT TO POSTEMERGENCE HERBICIDES UNDER WEED-FREE CONDITIONS. C.A. Gerngross and W.J. Grichar, Texas Agricultural Experiment Station, Yoakum; and S.A. Senseman. Texas Agricultural Experiment Station, College Station.

ABSTRACT

Field trials were conducted in 1999 and 2000 to evaluate the response of Georgia green peanut (*Arachis hypogaea*) to different postemergence herbicides. Peanut was grown in weed-free conditions to ensure maximum effect of the herbicides. Herbicide treatments and rates were as follows: imazapic at 0.063 lb a.i./A; acifluorfen at 0.25 lb/A and at 0.5 lb/A; bentazon at 1 lb/A; paraquat at 0.25 lb/A; a tank mix of paraquat at 0.25 lb/A and bentazon at 0.5 lb/A; imazethapyr at 0.063 lb/A; acifluorfen + bentazon at 0.75 lb/A; and clethodim at 0.094 lb/A. All treatments were made approximately one month after planting. Percent injury, peanut height, peanut width, final yield and grade were measured during the growing season and compared to an untreated check.

In 2000, peanut height was significantly decreased by the paraquat treatment at 3 weeks after treatment (WAT). At 7 WAT peanut height was significantly decreased in the paraquat, acifluorfen at 0.5 lb/A, and acifluorfen + bentazon treatments. Peanut width was significantly decreased in 1999 by both acifluorfen at 0.5 lb/A and paraquat. This same trend was seen in 2000. However, acifluorfen + bentazon, paraquat + bentazon, and bentazon alone also significantly decreased peanut width in 2000. Yield was not effected in 2000 but was significantly decreased in 1999 by the paraquat treatment. In 1999, total grade (% Sound Mature Kernels + % Sound Split) was not effected, although acifluorfen at 0.5 lb/A significantly lowered peanut grade in 2000. Thus, it can be concluded that paraquat, acifluorfen + bentazon and acifluorfen at 0.5 lb/A can reduce peanut width and height during the growing season. Furthermore, these postemergence herbicides can potentially lower peanut yield and grade.

PEANUT (*ARACHIS HYPOGAEA*) RESPONSE TO HERBICIDES APPLIED UNDER WEED-FREE CONDITIONS. D.L. Jordan, J.B. Beam, P.D. Johnson, and J.F. Spears. Department of Crop Science, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

Three studies were conducted in North Carolina to evaluate peanut response to postemergence herbicides applied under relatively weed-free conditions. In one set of experiments conducted at two locations in 1999 and one in 2000, Storm (acifluorfen + bentazon) at 1.5 pints/acre or Storm + Butyrac 200 (2,4-DB) at 1.5 pints/acre + 0.5 pint/acre were applied alone or with Dual Magnum (metolachlor) at 0.88 pint/acre, Frontier (dimethenamid) at 22 oz. product/acre, Valor (flumioxazin) at 0.45 oz. product/acre, or Strongarm (diclosulam) 30 to 40 days after peanut emergence. Residual herbicides also were applied alone. In a second set of experiments, Butyrac 200 at 1.0 pint/acre was applied to peanut in early August, late August, or early September. In a final experiment, Weedar 64 (2,4-D amine) at 1.5 pints/acre was applied 4, 3, 2, 1 weeks and 0 days before planting in strip-tillage and no-tillage peanut. Weedar 64 was also applied immediately after planting. Visual estimates of percent peanut injury, pod yield, and market grade factors were determined.

Valor, either alone or with contact herbicides, injured peanut and reduced yield in all experiments. The other residual herbicides did not affect peanut regardless of the c ontact herbicide treatment. Storm reduced peanut yield in one of

three experiments regardless of residual herbicide. Butyrac 200 affected pod yield, market grade factors, and seed germination in only one of 7 experiments regardless of timing of application. Weedar 64 applied the day of planting or sooner did not injure peanut or affect pod yield.

BELTWIDE SUMMARY OF SELECTIVE POSTEMERGENCE GRAMINICIDES IN RICE J.A. Kendig, M.E. Kurtz, and K.L. Smith, University of Missouri Delta Center, Portageville, MO 63873, Mississippi State University Delta Center, Stoneville, MS 38756, and University of Arkansas Southeast Research and Extension Center, Monticello, AR

ABSTRACT

Four new barnyardgrass herbicides are under investigation in rice. Three are ACCase-inhibiting graminicides (Aura (BAS 625H), Clincher (cyhalofop), and Ricestar (fenoxaprop + safener)). Regiment (bispyribac) is an ALS inhibitor which controls selected grass and broadleaf weeds. Preliminary research with these compounds is showing that grass must be small and consistency has been fair. Data were collected from studies in Mississippi, Arkansas and Missouri.

During 2000, at Rohwer, Arkansas, Ricestar, Regiment, Aura, and Clincher were applied in two programs: 1) A sequential application, early postemergence (EPOST) followed by a second application before establishment of a permanent flood (PREFLD) and 2) an EPOST application of Stam (propanil) followed by the respective graminicide. Aura was applied at 0.06 lb ai/A + 1% v/v crop oil concentrate (COC), Clincher was applied at 0.25 lb ai/A + 2.5% v/v COC, Regiment was applied at 0.02 lb ai/A + 0.125% v/v Kinetic silicone adjuvant and Ricestar was applied at 0.05 lb ai/A EPOST and 0.066 lb ai/A PREFLD with no adjuvant and Stam 4EC was applied at 4 lb ai/A. Growing conditions and weed size were reported as ideal. A sequential application of Aura provided 94% barnyardgrass (*Echinochloa crus-galli)* control; however; all other programs provided 59% or less control.

During 2000, at Stoneville MS, Ricestar, Regiment, Aura and Clincher were applied sequentially as in Arkansas, but were also applied EPOST in a tank mixture with Command (clomazone), Prowl (pendimethalin), and Facet (quinclorac). Aura was applied at 0.065 lb ai/A + 1% v/v COC, Clincher was applied at 0.187 lb ai/A + 2.5% v/v COC, Regiment was applied at 0.02 lb ai/A + 0.125%v/v Kinetic silicone adjuvant, Ricestar was applied at 0.045 lb ai/A EPOST and 0.067 lb ai/A PREFLD, Command was applied at 0.5 lb ai/A, Prowl was applied at 1 lb ai/A, and Facet was applied at 0.38 lb ai/A. Growing conditions and weed size were reported as ideal. Clincher alone and in tank mixtures provided 60 to 95% weed late in the season. Barnyardgrass control from other herbicides and their combinations was 87% or greater.

During 1999, at Portageville, MO, Whip 360 (the unsafened version of fenoxaprop), Ricestar, Aura, Clincher and Regiment were applied at low and high rates to 2- to 3-leaf, 4- to 5-leaf, 6- to 8-leaf and 10- to 14-leaf barnyardgrass. Aura was applied at 0.067 and 0.094 lb ai/A + 1% v/v COC, Clincher was applied at 0.125 and 0.188 lb ai/A + 2.5% v/v COC, Regiment was applied at 0.15 and 0.2 lb ai/A + 0.125% v/v Kinetic silicone adjuvant, Ricestar was applied at 0.12 and 0.16 lb ai/A and Whip 360 was applied at 0.06 and 0.08 lb ai/A. During 1999 and 2000, Ricestar, Aura and Clincher were applied alone and in tank mixtures with Basagran (bentazon) at 1 lb ai/A, Blazer (acifluorfen) at 0.5 lb ai/A, Grandstand (triclopyr) at 0.375 lb ai/A, Londax (bensulfuron) at 0.0375, Permit (halosulfuron) at 0.063 lb ai/A, Aim (carfentrazone) at 0.02 lb ai/A and Stam (EC propanil) at 4 lb ai/A. Crop oil was used with all tank mixtures except Stam mixtures. Growing conditions were slightly stressed in 1999, but conditions and weed size were ideal for the 2000 antagonism test. Whip 360 usually provided the greatest barnyardgrass control. Ricestar provided 2 to 20% less control than Whip 360. Regiment or Ricestar usually provided the second best grass control. Aura usually provided the fourth best weed control and in five of 8 instances, Clincher provided the least barnyardgrass control. During 1999, tank mixtures of bentazon, halosulfuron, and carfentrazone appeared to be antagonistic to Ricestar. Halosulfuron appeared to be antagonistic to Clincher and bentazon may have been antagonistic to Aura. During 2000, Tank mixtures of propanil appeared to antagonize Ricestar and Aura.

In several instances, barnyardgrass control was inadequate. The manufacturers of the selective graminicides seem to be correctly targeting these materials as preplanned programs for control of small barnyardgrass and other annual grasses common to rice. Growers routinely apply Whip 360 for salvage control and may be expecting these herbicides (especially Ricestar which is often described as "Safened Whip") to control larger grass.

WEED CONTROL PROGRAMS IN HERBICIDE-TOLERANT RICE. E.F. Scherder, R.E. Talbert, M.L. Lovelace, and N.W. Buehring. University of Arkansas, Fayetteville, Arkansas

ABSTRACT

Two experiments were conducted in 2000 on a broad spectrum of weeds to evaluate the performance of herbicide programs involving glufosinate on glufosinate-tolerant rice and imazethapyr on imazethapyr-tolerant rice. Field experiments were conducted at the Rice Research and Extension Center at Stuttgart, Arkansas, on a Dewitt silt loam. Each experiment was conducted as a randomized complete block. Rows of propanil-resistant and -susceptible barnyardgrass (*Echinochloa crus-galli*), broadleaf signalgrass (*Brachiaria platyphylla,*) pitted morningglory (*Ipomoea lacunosa*), tall morningglory (*Ipomoea purpurea*), hemp sesbania (*Sesbania exaltata*), and northern jointvetch (*Aeschynomene virginica*) were evaluated as well as a natural infestation of barnyardgrass.

In experiment one, glufosinate and comparison programs included: glufosinate at 0.20 kg ai/ha early postemergence (EPOST) followed by (fb) 0.20 kg/ha preflood (PREFLD), glufosinate at 0.35 kg/ha EPOST fb 0.25 kg/ha PREFLD, glufosinate at 0.35 kg/ha EPOST fb 0.30 kg/ha PREFLD, glufosinate at 0.40 kg/ha EPOST fb 0.20 kg/ha PREFLD, glufosinate at 0.40 kg/ha EPOST fb 0.40 kg/ha PREFLD, glufosinate at 0.35 kg/ha + molinate at 3.0 kg ai/ha + propanil at 3.0 kg ai/ha EPOST, and clomazone at 0.45 kg ai/ha preemergence (PRE) fb glufosinate at 0.35 kg/ha PREFLD. In experiment two, imazethapyr-based programs included: imazethapyr at 0.07 kg ai/ha PRE, imazethapyr at 0.07 kg/ha PRE fb imazethapyr at 0.07 kg/ha midpostemergence (MPOST), imazethapyr at 0.07 kg/ha PRE fb propanil at 4.48 kg/ha MPOST, imazethapyr at 0.07 kg/ha PRE fb propanil at 4.48 kg/ha + quinclorac at 0.28 kg ai/ha MPOST, imazethapyr at 0.07 kg/ha PRE fb propanil at 4.48 kg/ha + pendimethalin at 1.12 kg/ha MPOST, with comparison treatments of propanil at 4.48 kg/ha + quinclorac at 0.28 kg/ha MPOST, propanil at 4.48 kg/ha + pendimethalin at 1.12 kg/ha MPOST, and propanil at 4.48 kg/ha EPOST fb propanil at 4.48 kg/ha MPOST.

In experiment one, only the programs of glufosinate + propanil + molinate applied EPOST and clomazone applied PRE controlled (>85%) propanil-resistant and -susceptible barnyardgrass and broadleaf signalgrass at 14 day after EPOST applications. None of the programs were effective for the control of pitted and tall morningglory and northern jointvetch 14 days after EPOST applications; however, hemp sesbania control was achieved with all glufosinate rates applied, with > 93% control 14 days after EPOST applications. Following the second application of glufosinate PREFLD, all programs gave > 98% control for all weed species evaluated. These findings demonstrate the importance of a sequential program for broad spectrum control.

In experiment two, imazethapyr controlled propanil-resistant and -susceptible barnyardgrass along with broadleaf signalgrass when applied PRE giving > 97% control at the end of the season. All imazethapyr-based programs gave > 95% control of pitted morningglory at the end of the season. For northern jointvetch control, quinclorac was needed with imazethapyr. For control of hemp sesbania, propanil or quinclorac was needed with imazethapyr in the herbicide program.

TANK-MIXING COMMAND WITH POSTEMERGENCE APPLIED HERBICIDES FOR EXTENDED BARNYARDGRASS CONTROL. M.E. Kurtz, Delta Research and Extension Center, Stoneville, MS.

ABSTRACT

A field study was conducted in 2000 at the Delta Research and Extension Center, Stoneville, MS, to evaluate the clomazone 3 ME formulation of Command applied postemergence in combination with other grass killing herbicides for control of barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.]. Command 3 ME (clomazone) at 0.5 lb ai/A was tank-mixed with Stam 80 EDF (propanil) at 3.0 lb ai/A plus Agri-Dex at 1 % v/v; or Super Wham 4 EC (propanil) at 3.0 lb ai/A; or Duet 80 EDF (propanil + bensulfuron) at 3 lb ai/A plus Agri-Dex at 1 % v/v; Arrosolo 6 EC (propanil + molinate) at 4.5 lb ai/A; Facet 75 DF (quinclorac) at 0.38 lb ai/A; or Regiment 80 WP (bispyribac-sodium) at 9 g ai/A plus Kinetic at 0.125% v/v; and applied early post. The treatments containing Command were compared to the tank-mix partner applied early post followed by a late post application. These treatments were: Stam 3 lb fb Stam 4 lb; Super Wham 3 lb fb Super Wham 4 lb; Duet 3 lb fb Duet 4 lb; Arrosolo 4.5 lb fb 6 lb; Facet 0.38 lb (early post only); Regiment 9 g fb Regiment 9 g. An untreated control served as the control. Rice (Priscilla) was drill seeded on May 15, 2000 into a Sharkey clay soil. Herbicides were applied early post (May 31, 2000) and late post (June 19, 2000) using a CO2 charged backpack sprayer calibrated to deliver 20 gal/A at 38 psi. and treatments were arranged in a randomized complete block design with 4 replications. Barnyardgrass control was evaluated 12, 33 and 54 days after the early post treatment. Data were subjected to ANOVA and means were separated using Waller-Duncan k=100 at p=.05.

By 12 days after early post treatment (DAEPOST) the tank-mix combinations of Command with Stam, Arrosolo, Facet, or Duet, resulted in significantly greater barnyardgrass control than the early post applications without Command. Single applications of Super Wham or Regiment were equal to the tankmix treatment. By 33 DAEPOST (15 days after late post, DALPOST), the tank-mix combinations of Command with Stam or Facet resulted in significantly greater barnyardgrass control than the sequential early and late post treatments without Command. This held true for the late rating at 54 DAEPOST (35 DALPOST). Command tank-mixed with each of these herbicides provided control equal to or greater than the sequential applications without Command and did it with only one application.

In every case, barnyardgrass control with the Command tank-mix, was equal to or greater than it's tank-mix partner applied alone sequentially. The cost per acre for barnyardgrass control with the Command tank-mix (in every case) was less than for the sequential treatments without Command. This difference in cost reflects the cost of applying the sequential treatments by air compared to the ground application of the Command tank-mix.

COMMAND 3ME / AIM 40DF: WEED CONTROL IN DRY SEEDED RICE. H.R. Mitchell, T.C. Crumby, and J.D. Johnson. FMC Corporation. Louisville, MS; Bolton, MS; and West Monroe. LA.

ABSTRACT

Command 3ME (clomozone) and Aim 40DF(carfentrazone-ethyl) are two new herbicides in development by FMC Corporation for weed control in dry seeded rice. Both have been evaluated in private and university rice weed management research programs during the past five years for crop tolerance, weed efficacy and subsequent effects on yield.

Command has been evaluated in dry seeded rice when applied preemergence (PRE) and delayed preemergence (DPRE, 5-7 days after planting but prior to rice emergence) at rates of 0.4, 0.5 and 0.6 lb ai/A. Command applied PRE to a clay soil at rates up to 0.6 lb ai/A or silt loam at 0.4 lb ai/A resulted in less than 10% bleaching at 15 days after emergence. Greater bleaching was observed when Command was applied PRE at the 0.5 and 0.6 lb ai/A rates on silt loam soil. However, by 21 days after emergence, bleaching at these rates was less than 10% demonstrating the rapid green-up of rice to initial clomazone bleaching.

Command has provided excellent control (92-100%) of propanil resistant and non-resistant barnyardgrass (*Echinochloa crusgalli*), broadleaf signalgrass (*Brachiaria platuphylla*), fall panicum (*Panicum dichotomiflorum*), large crabgrass (*Digitaria sanguinalis*) and sprangletop (*Leptochloa spp.*) at approximately 30 days after planting. Differences in efficacy among rates and application methods were negligible. All Command treatments resulted in significantly greater yields compared to the untreated check and were equal or superior to those of the standard grass herbicides evaluated.

Aim has been evaluated early postemergence (EPOST) at rates of 0.01, 0.02 and 0.03 lb ai/A with a nonionic surfactant at 0.25% v/v. No stand reduction or stunting was observed with any rate evaluated. At 7 days after treatment (DAT), Aim resulted in 3-8% discoloration (necrosis). By 15 DAT, rice plants had recovered from their initial discoloration. Aim at 0.025 lb ai/A has demonstrated excellent control (>90% at 15 DAT) of several morningglory species (*Ipomoea spp.*), hemp sesbania (*Sesbania exaltata*), jointvetch (*Aeschynomene spp.*), Pennsylvania smartweed (*Polygonum pensylvanicum*), common purslane (*Portulaca oleracea*), redweed (*Melochia corchorifolia*) and texasweed (*Caperonia palustris*) with minimal significant activity to common grass weeds of rice.

These data support acceptable dry seeded rice tolerance to Command and Aim. Command applied PRE or DPRE has demonstrated excellent annual grass control. Aim applied preflood postemergence has demonstrated excellent control of the major broadleaf weeds of dry seeded rice. Aim has an excellent fit with a Command preemergence program to control the escape broadleaf weeds and is an effective tank-mix partner with other rice herbicides (propanil, Permit, Londax, Facet) to broaden their performance.

Federal registration for the use of both Command 3ME and Aim 40DF on rice was received in 2000.

CROP SAFETY WITH COMMAND APPLIED PREPLANT, PREEMERGENCE, AND PREEMERGENCE TO OPEN SEED FURROWS IN RICE. K.L. Smith, C.E. Wilson, J.W. Branson, and L.D. Earnest. University of Arkansas, Southeast Research and Extension Center, Monticello, AR

ABSTRACT

Clomazone has recently gained wide acceptance as an effective tool to control annual grasses in dry seeded rice. Clomazone is an oxazalodinone herbicide that inhibits chlorophyll formation in plants. It is common for rice seedlings to exhibit some chlorosis when growing in clomazone treated soil. Close observation of grower fields indicated that rice seedlings germinating in a seed furrow that was not completely closed often turned white and died within a few days. It was hypothesized that higher concentrations of herbicide were reaching the germinating seed and causing phytotoxicity. To test this hypothesis, studies were established in 1999 and 2000 to evaluate crop safety following various application timings of clomazone in opened and closed seed furrows. Both studies were conducted on a Sharky Clay soil in a randomized complete block design. Conventional small plot research techniques were followed as well as best management practices for the area.

Treatments included clomazone rates of 0.0, 0.3, 0.4, 0.6, 0.8, and 1.2 lbs ai/A. In 1999, all rates were applied preplant incorporated (PPI), preemergence at planting to a closed seed furrow (PRE) and preemergence at planting to an open seed furrow(POF). In 2000, all rates were applied preplant to soil surface (PP), preemergence at planting to closed seed furrow and preemergence to an open seed furrow. Jefferson variety was planted in 1999 and Cocodrie variety was planted in 2000. All plots were irrigated immediately after planting.

Stand reductions 20 DAT ranged from 45 – 75% in the POF treatments in 1999. Only the 1.2 lb ai/A rate resulted in significantly more stand reduction than the 0.0 rate POF. The 1.2 lb ai/A rate applied PPI resulted in a stand reduction of 15% at 20 DAT. At 40 DAT, stand reductions of up to 30% following PPI treatments, and 75% in POF treatments was noted. Stand reductions in the PPI treatments followed clomazone rates with the higher rates causing greater reductions. The use rates of 0.6 and lower caused less than 10% reduction following PPI and PRE applications.

However, at 40 DAT, stand reductions following the POF treatments ranged from 40 – 70% with the 0.0 rate causing 50% stand reduction and the 1.2 lb ai/A rate causing 70% reduction.

Stand reductions in 2000 were less than in 1999 with all application timings. Reductions of 15% were caused by the 1.2 lb ai/A rate in both PP and PRE applications 20 DAT. Reductions were greater following the POF treatments than following PP or PRE treatments with all rates of clomazone 20 DAT. Reductions ranged from 18 to 30% with all POF treatments with the 0.0 rate exhibiting 20% stand reduction. At 40 DAT, only the 1.2 lb ai/A rate applied PP or POF caused greater than 15% stand reduction.

Bleaching was rate responsive and similar between application timing and years. POF treatments yielded less than PPI and PRE treatments in 1999, but similar to PP and PRE treatments in 2000. POF treatments also resulted in fewer tillers at harvest in 2000 than PP and PRE treatments.

EVALUATION OF POSTEMERGENCE APPLICATIONS OF COMMAND PLUS STAM TANKMIXES IN DRILL SEEDED RICE. G.A. Ohmes, J.A. Kendig, R.L. Barham, and P.M. Ezell. University of Missouri Delta Center, Portageville, MO 63873.

ABSTRACT

Like other preemergence rice herbicides, a Command postemergence, tank-mix label would be beneficial to producers for added residual control. Weed control from preemergence applications of Command (clomazone) has been evaluated in University trials for several years. In 2000, Command received a Section 18 which many producers took advantage of for grass control. Upon receiving a Section 3 label, many more producers will have access to Command. With this in mind, Command plus Stam (propanil) tank-mixes were evaluated on drill seeded rice for injury potential and grass control.

Studies were conducted on silt loam and clay soils near Portageville, MO in 1999 and 2000. A randomized block design with four replications was utilized. Standard Weed Science methods were used to apply treatments. One- and two-pass programs were evaluated. One-pass programs were applied to 2- to 3-leaf barnyardgrass and included: 1) Stam at 3 lb ai/A plus Command at 0.5 and 1.0 (2000 only) lb ai/A; 2) Stam plus Facet (quinclorac) at 0.25 and 0.375 (2000 only) lb ai/A; and 3) Stam + Prowl at 1 lb ai/A (1999 only). Two-pass programs were applied to 2- to 3-leaf barnyardgrass followed by preflood and included: 1) sequential applications of Stam at 3 lb ai/A; 2) Prowl (pendimethalin) delayed-PRE at 1 lb ai/A followed by Grandstand (triclopyr) at 0.25 (1999) and 0.375 (2000) lb ai/A or Regiment at 0.0198 lb ai/A; 3) Command PRE at 0.5 lb ai/A followed by Grandstand or Regiment; and 4) Clincher at 0.188 lb ai/A followed by Clincher at 0.188 lb ai/A + Grandstand at 0.25 lb ai/A. Two more treatments were added in 2000 which focused on rice injury under weed free conditions. They were 0.375 lb ai/A of Facet PRE followed by Stam at 3 lb ai/A plus Command at 0.5 and 1.0 lb ai/A.

In 1999, no injury was observed on the clay soil and only 5% injury was observed on the silt loam. No injury was observed from Command treatments on the clay soil. However, on the silt loam soil, Command at 21 oz/A caused 30% injury 13 days after the 2- to 3-leaf barnyardgrass application. Twenty-six days later, that injury was reduced to 18% in the plot treated with Facet PRE and 8% in the plot without Facet PRE. Injury from the high rate of Command was 50% early in the season and did not decline over time. Command + Stam POST provided 100% barnyardgrass control at the silt loam location both years. This control was equivalent to that from other one-pass tank-mixes as well as two-pass programs. Hemp sesbania control was above 85% both years 18 days after the preflood application. Within label rates, POST applications of Command + Stam may cause visual injury early on, however, rice tends to recover. Early season injury did not negatively influence yield. Yield from Command + Stam treatment was equivalent to yield from other treatments.

In conclusion, a POST application tank-mix of Command + Stam can provide as good weed control as other labeled tank-mixes. Injury may be present early in the season, however, rice tends to recover and produce yields comparable to other programs.

NEWPATH APPLIED ALONE OR IN COMBINATION WITH OTHER HERBICIDES IN RICE. K.J. Pellerin, E.P. Webster, D.Y. Lanclos, and W. Zhang. Louisiana State University AgCenter, Baton Rouge, LA.

ABSTRACT

Two field studies were conducted in 2000 at the Rice Research Station located in Crowley, LA to evaluate weed control with NewPath (imazethapyr) applied alone or in combination with other herbicides. The experimental design for the first study was a randomized complete block. Treatments included preplant incorporated (PPI) or preemergence (PRE) at 0, 0.032, 0.047, 0.063, 0.078, 0.094, and 0.125 lb ai/A followed by (fb) an early postemergence (EPOST) or late POST (LPOST) application of the NewPath applied at 0.125, 0.094, 0.078, 0.063, 0.047, 0.032, and 0 lb/A, respectively. The second study was a randomized complete block with a factorial arrangement of treatments with four replications. Factor A consisted of a soil application of NewPath at 0.078 lb/A PPI, PRE, or no soil application, and factor B was a mid-

POST (MPOST) application of NewPath at 0.047 lb/A in a tank-mix with one of the following herbicides: 0.6 oz/A Londax (bensulfuron), 0.25 lb/A Grandstand (triclopyr), 3 lb/A Arrosolo (propanil + molinate), 0.025 lb/A Aim (carfentrazone), 0.75 pt/A Storm (bentazon + aciflurofen), 0.047 oz/A Permit (halosulfuron), 9 g/A Regiment (bispyriobac-sodium). Barnyardgrass [*Echinochloa crus-galli* (L.) Beauv], hemp sesbania [*Sesbania exaltata* (Raf.) Cory], and Indian jointvetch (*Aeschynomene indica* L.) control and crop injury were visually evaluated for both studies with the addition of redweed (*Melochia corchorifolia* L.) and spreading dayflower [*Commelina diffusa* (Brum.) f.] in the second study.

In the first study, barnyardgrass control was above 80% with NewPath applied PPI fb EPOST regardless of rate combination. Single applications of NewPath EPOST or LPOST controlled barnyardgrass 50 to 70% and 50 to 90%, respectively. Hemp sesbania control never exceeded 65%, and Indian jointvetch was controlled below 75% with all treatments.

In the second study, acceptable control of barnyardgrass was obtained only with a soil application of NewPath in a overall weed control program. Barnyardgrass control was above 85% when NewPath was soil applied fb all tank-mix partners except Grandstand. NewPath PPI or PRE fb a MPOST tank-mix of NewPath plus Arrosolo, Permit, or Regiment controlled barnyardgrass 90 to 94%. Hemp sesbania and Indian jointvetch control was below 10% without a MPOST application. However, an application of NewPath PPI or PRE fb a MPOST tank-mix of Arrosolo, Aim, Storm, or Regiment, controlled hemp sesbania 90 to 93%. Indian jointvetch control was 90 to 95% with Regiment plus NewPath MPOST regardless of a soil application of NewPath. Redweed control was greater than 90% when NewPath was applied PPI or PRE fb a MPOST application of Arrosolo, Permit, or Regiment plus NewPath. Spreading dayflower control was above 85% for all treatments containing a soil application of NewPath.

In conclusion, NewPath applied PPI or PRE at 0.047 or 0.078 lb/A, fb 0.078 or 0.047 lb/A NewPath EPOST, respectively, resulted in the most consistent control of barnyardgrass, hemp sesbania, and Indian jointvetch. However, if broadleaf weeds are present in a Clearfield production system, a herbicide with broadleaf activity will be needed. A soil application of NewPath fb NewPath plus Permit or Regiment MPOST, controlled barnyardgrass, hemp sesbania, Indian jointvetch, redweed, and spreading dayflower greater than 89%. In conclusion, the most effective weed control program in Clearfield rice was a soil application of NewPath fb a MPOST of NewPath tank-mixed with Permit or Regiment. This research indicates that when broadleaf weeds are present a herbicide with activity on these weeds will be needed in a Clearfield production rice system.

WEED CONTROL PROGRAMS IN IMIDAZOLINONE TOLERANT RICE. T.L. Dillon, F.L. Baldwin University of Arkansas Cooperative Extension Service and R.E. Talbert University of Arkansas Dept. of Agronomy.

ABSTRACT

Grower surveys rank weeds as the number one production problem in rice. Among the most difficult to control are red rice, propanil resistant barnyardgrass and yellow nutsedge. Previously, herbicide selectivity to allow red rice to be controlled in dry seeded rice did not exist. Other control options are needed for propanil resistant barnyardgrass, and the use of ground equipment to apply residual herbicides prior to flooding. Rice that is tolerant to the imidazolinone herbicides (imi-tolerant rice) has shown promise for controlling difficult weeds such as red rice and providing excellent residual control.

In 1998, ten field studies were conducted at Lonoke, Stuttgart and Lodge Corner, Arkansas, to evaluate Pursuit applied alone and in programs with other herbicides for weed control in rice. In general, imazethapyr 'Pursuit' applied preplant incorporated (PPI) provided better weed control than when applied preemergence or delayed preemergence. Imazethapyr applied early postemergence (2-3 leaf rice) provided better control than when applied preflood or postflood. Imazethapyr applied ppi provided excellent control of barnyardgrass, propanil-resistant barnyardgrass, broadleaf signalgrass and rice flatsedge. It provided good control of red rice, yellow nutsedge, ducksalad and purple ammannia. It also provided good suppression of morningglories and eclipta. Weeds not controlled included hemp sesbania, northern jointvetch, pink ammannia and water hyssop. Early postemergence treatments provided excellent control of the grasses and good control of red rice.

The objective in a red rice control program is to achieve 100% control. Sequential treatments of imazethapyr applied PPI plus early postemergence or preflood were required. The sequential programs also provided excellent control of most weeds listed above. Other herbicides applied either in tank mixtures or as sequential treatments with imazethapyr, usually did not improve the control of most weed species. However, programs with other herbicides will be required for control of some species such as hemp sesbania and northern jointvetch.

Imazethapyr applied to imi-tolerant rice has excellent potential for controlling a broad spectrum of weeds in Arkansas, including difficult to control species such as red rice. It can also provide full season control and should be well suited to both ground and aerial application. The ability to control red rice in dry seeded rice can allow for increased profit and expansion of the rice acreage by growers in Arkansas.

NEWPATH 3 + 3- POSTEMERGENCE SEQUENTIAL IMAZETHAPYR APPLICATIONS IN IMAZETHAPYR-RESISTANT RICE. J.A. Kendig, G.A. Ohmes, P.M. Ezell, and R.L. Barham, University of Missouri Delta Center, Portageville, MO 63873.

ABSTRACT

Preliminary reports indicate that good to excellent control of red rice (*Oryza sativa*), barnyardgrass (*Echinochloa crus-galli*), and other common annual grasses can be obtained with a soil application of imazethapyr followed by a postemergence application shortly before flood establishment (PREFLD). Preemergence-surface (PRE) and preplant incorporated (PPI) applications may be made, but PPI is preferred on silty soils because of activation and preferred injury. Early postemergence (EPOST) applications have often caused injury to current imazethapyr-resistant (or Clearfield) rice. However, research in Missouri has contrasted with soil applications providing very poor control and PREFLD applications providing limited control of large grass which escaped PPI or PRE applications. However, postemergence sequential (EPOST followed by PREFLD) applications have generally provided good to excellent control of red rice, barnyardgrass and other annual grasses.

Imazethapyr treatments were applied in a 3 by 3 factorial arrangement of 35, 53 and 70 g/ha EPOST followed by PREFLD. Also applied were: Nicosulfuron at 40 g/ha was also applied sequentially and propanil (3.36 kg/ha) + quinclorac (0.42 kg/ha) to serve as an "untreated control" for red rice. Imazethapyr and nicosulfuron were applied with nonionic surfactant (0.25% v/v) and the PREFLD application also included 280 g/ha of acifluorfen for control of hemp sesbania (*Sesbania exaltata)* Studies were conducted on a Crowley silt loam and a Portageville (Sharkey series) clay. Standard, small-plot Weed Science methods were used. Studies were randomized complete blocks with 4 replications, treatments were applied with CO_2 backpack sprayers using DG11002 tips at 24 PSI and a 20 gpa application volume. The rice cultivar was 95AS3510

Higher rates of imazethapyr generally provided better barnyardgrass and red rice control as compared to lower rates and it appears that 70 g/ha followed by 70g/ha may be the best approach, especially since near perfect control is desirable for management of the outcrossing of herbicide tolerance from the commercial cultivar to red rice. Nicosulfuron provided control similar to that from imazethapyr. No crop injury was observed from any treatment.

IMPACT OF GIBBERELLIC ACID ON CROP TOLERANCE OF IMIDAZOLINONE TOLERANT RICE. R.T. Dunand, E.P. Webster, S.D. Linscombe, and J.A. Masson; Louisiana State University Agricultural Center, Crowley and Baton Rouge, LA.

ABSTRACT

Rice tolerant to the imidazolinone class of herbicides is currently under development in Louisiana. The germplasm base for the imidazolinone tolerant rice has a semidwarf plant type. Gibberellic acid, a plant growth regulator, is labeled for seed and foliar application to promote seedling vigor in semidwarf rice. A study was conducted to determine the impact of seed and foliar treatment with gibberellic acid on the tolerance of imidazolinone tolerant rice to imazethapyr.

An early season experimental line, 98IM0121, was drill-seeded on 8-inch rows at 100 lb/A. Plot size was 5x20 ft. Soil type was Crowley silt loam. Standard agricultural chemicals were applied as recommended for insect and disease control. Gibberellic acid (Release, Valent BioScience Corp., Libertyville, IL) seed treatment was applied at 10 g/cwt. On the day of planting, imazethapyr (Pursuit, BASF Corp., Research Triangle Park, NC) was applied at 0.0625 lb/A. At the 2- to 3-leaf and 3- to 4-leaf stages, applications of gibberellic acid (1.5 g/A), imazethapyr (0.0625 lb/A), and propanil (4 lb/A, Stam M4, Rohm and Haas Co., Philadelphia, PA) were made. All foliar applications were made with a CO_2 driven backpack sprayer and a delivery rate of 15 gal/A. All imazethapyr treatments included a postplant application and one postemergence application. Experimental design was a randomized complete block with four replications. There was a factorial arrangement of two foliar times of application and six herbicide/gibberellic acid treatments (1-imazethapyr, 2-propanil, 3-imazethapyr and gibberellic acid seed treatment, 4-propanil and gibberellic acid seed treatment, 5-imazethapyr and gibberellic acid foliar application, and 6-imazethapy and gibberellic acid seed and foliar application).

Plant population and crop injury and growth were evaluated to determine the impact of Pursuit, Release, RyzUp, and Stam M4 on early to midseason crop development. Stand density was unaffected by Pursuit and varied between 20 and 25 plants/ft^2. Optimum stands in rice range between 10 and 30 plants/ft^2. Injury to rice seedlings by Pursuit ranged between 60 and 70%, and injury was slightly higher at the earlier timing (2- to 3-leaf compared with 3- to 4-leaf). Injury continued into midseason, and at 50 days after the seedling applications, plant height was 10 to 15 cm shorter in treatments with Pursuit compared with Stam M4. In addition, applications of Pursuit at the earlier timing resulted in plants that were 6 cm shorter on averaged compared with applications at the later timing. There were no interactions between Pursuit and gibberellic acid.

At harvest, crop stature, maturity, and production were affected primarily by Pursuit and, to a lesser degree, by gibberellic acid. Mature plant height ranged between 117 and 119 cm with Stam M4 and Pursuit alone. Pursuit applied after planting seed treated with Release and Pursuit+RyzUp during the seedling stages shortened mature plant height

to 114 and 116 cm, respectively. Time to heading was delayed 3 to 8 days by Pursuit, and the longest delays (6 to 8 days) occurred with the earlier timing. Similarly, grain moisture was 1.5 to 2% higher with Pursuit. Treatments with Stam M4 had grain moistures ranging between 21.2 and 21.5%, and treatments with Pursuit had grain moistures ranging between 23 and 24%. On average, grain moisture was 1% higher with the earlier timing. Grain yield was relatively unaffected by most treatments and ranged between 7,000 and 7,500 lb/A. The exception was Pursuit+RyzUp applied at the 2- to 3-leaf stage, which produced 6,500 lb/A.

Pursuit caused injury in imidazolinone tolerant rice during the seedling stages of growth, and the injury continued into midseason, resulting in a dramatic reduction in plant height. Pursuit had a noticeable impact on the advanced stages of crop development and caused a significant delay in crop maturity and reduction in mature plant height. The only interaction between Pursuit and gibberellic acid occurred with grain yield. Pursuit and RyzUp applied during the 2- to 3-leaf stage of growth reduced grain yield.

WEED CONTROL SPECTRUM OF NEW POSTEMERGENCE RICE HERBICIDES. M.L. Lovelace, R.E. Talbert, N.W. Buehring, and E.F. Scherder. University of Arkansas, Fayetteville, Arkansas.

ABSTRACT

Many new herbicides are currently under development for use in rice. Extensive research has been conducted evaluating how these new herbicides fit into weed control programs in Arkansas rice production, but still, data is limited on the overall spectrum of control for each of these herbicides. A study was conducted in 2000 at the Main Experiment Station, Fayetteville, AR, in order to fill voids in our current databank about the activity of herbicides on specific weeds. The trial was conducted as a randomized complete block with four replications. Graminicides evaluated consisted of Aura (clefoxydim) applied at 0.09 lb ai/ac, Clincher (cyhalofop) at 0.25 lb ai/ac, and Ricestar (fenoxyprop + isoxadifen) at 0.08 lb ai/ac. Aim (carfentrazone) applied at 0.025 lb ai/ac and Grandstand (triclopyr) at 0.25 lb ai/ac were broadleaf herbicides assessed. Permit (halosulfuron) applied at 0.032 lb ai/ac and Regiment (bispyribac) at 0.02 lb ai/ac was also evaluated. Herbicides in herbicide-tolerant rice included CGA-362622 at 0.01 lb ai/ac, Liberty (glufosinate) at 0.31 lb ai/ac, and Pusuit (imazethapyr) at 0.063 lb ai/ac. All treatments were compared to the standard rice herbicides, Stam (propanil) applied at 4 lb ai/ac and Facet (quinclorac) at 0.375 lb ai/ac. Grass species evaluated consisted of amazon sprangletop (*Leptochloa panicoides*), barnyardgrass (*Echinochloa crus-galli*), broadleaf signalgrass (*Brachiaria platyphylla*), fall panicum (*Panicum dichotomiflorum*), giant foxtail (*Setaria faberi*), goosegrass (*Eleusine indica*), johnsongrass (*Sorghum halepense*), and large crabgrass (*Digitaria sanguinalis*). Broadleaf species were hemp sesbania (*Sesbania exaltata*), Palmer amaranth (*Amaranthus palmeri*), pitted morningglory (*Ipomoea lacunosa*), prickly sida (*Sida spinosa*), and sicklepod (*Senna obtusifolia*).

Aura provided only 75, 78, and 64% control of barnyardgrass, broadleaf signalgrass, and large crabgrass, respectively, and control of other grass species was greater than 90%. Clincher control was similar to Aura, but was weaker on amazon sprangletop (69%), giant foxtail (64%), and large crabgrass (26%). Ricestar control of barnyardgrass (50%), fall panicum (55%), giant foxtail (51%), and large crabgrass (77%) was inadequate, but greater than 90% for all other grass species. Grass species were approximately 5 to 6 leaf when applications were made, which may have contributed to lower than expected control of some grass species.

Aim provided 70 to 76% control of all broadleaf species except sicklepod, where no control was observed. Grandstand gave 83% control of hemp sesbania and 88% control of pitted morningglory, but gave less than 70% control of all other broadleaf species.

Barnyardgrass, hemp sesbania, and Palmer amaranth control was greater than 85% with Regiment, while johnsongrass control was 75%. Control of all other species evaluated was less than 45%. Permit control spectrum was very similar to that of Regiment with the exception of barnyardgrass control (0%)

CGA-362622 is a compound currently under evaluation in cotton, but may have potential for use in imidazolinone-resistant rice (Clearfield Rice). Control of amazon sprangletop, fall panicum, barnyardgrass, and johnsongrass was greater than 70% with CGA-362622. Control of all other grass species was less than 30%. Control of all broadleaf species with CGA-362622 exceeded 85% control with the exception of prickly sida (20%). Liberty provided greater than 85% control of all grass species except goosegrass and large crabgrass, in which control was less than 65%. Control of prickly sida and sicklepod was only 65% with Liberty, but control of the other broadleaf species was greater than 85%. The spectrum of grass weed species control with Pursuit was the same as that of Liberty. Pursuit provided greater than 90% control of Palmer amaranth and pitted morningglory, 60% control of prickly sida, and no control of hemp sesbania and sicklepod.

Stam and Facet were also applied for comparative reasons. Stam provided 80 to 90% controlled broadleaf signalgrass, fall panicum, goosegrass, and large crabgrass, 69% control of barnyardgrass, 66% control of amazon sprangletop, and less than 40% control of johnsongrass and giant foxtail. Control of hemp sesbania was 94%, Palmer amaranth was 70%, and sicklepod was 73%, and control of the other broadleaf species was less than 40%. Quinclorac provided greater than 75% control of barnyardgrass, broadleaf signalgrass, and fall panicum, hemp sesbania and pitted morningglory, but control of all other species less than 50%.

ANNUAL WEED CONTROL IN DRY-SEEDED RICE WITH HALOSULFURON. B.J. Williams, A.B. Burns, and R.S. Crigler. Northeast Research Station, Louisiana State University AgCenter, St. Joseph, LA, 71366.

ABSTRACT

Reduced rates of halosulfuron tank-mixed with bispyribac, triclopyr and carfentrazone were evaluated for annual weed control in dry seeded rice (*Oryza sativa*). The study was conducted in 2000 at the Northeast Research Station near St. Joseph, LA on a Sharkey clay soil. Rice 'Cocodrie' was drill-seeded at 140 kg/ha in rows19 cm apart. Permanent flood was established 31 days 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 2 by 4.5 m. Treatments consisted of tank-mixtures of 0.022 kg ai/A bispyribac, 0.21 kg ai/A triclopyr, 0.28 kg ai/ha triclopyr or 0.022 kg ai/ha carfentrazone with 0.071, 0.052, 0.036, 0.018 or 0.009 kg ai/ha halosulfuron applied three days prior to permanent flood. Each treatment followed 0.45 kg ai/ha clomazone applied preemergence. Weeds escaping or not controlled by clomazone included barnyardgrass (*Echinochloa crus-galli*), yellow nutsedge (*Cyperus esculentus*), annual sedge (*Cyperus iria*) and hemp sesbania (*Sesbania exaltata*), which were 4-5 leaf, 8 inches tall, 4 inches tall and 6 inches tall at the time of the three days prior to flood application, respectively. The experimental design was a randomized complete block with a factorial arrangement of treatments replicated three times. Weed control and rice injury ratings were subjected to analysis of variance. Means were separated using Fisher's Protected LSD at the 5% level.

Barnyardgrass control from clomazone 4 and 8 weeks after permanent flood (WAF) was 94 and 84 percent, respectively. Treatments containing bispyribac were the only treatments that maintained barnyardgrass control at 94% 8 WAF. Halosulfuron did not influence barnyardgrass control. Bispyribac tank-mixtures with 0.032 kg/ha or more halosulfuron controlled yellow nutsedge at least 90%. However, bispyribac tank-mixed with the lowest (0.009 kg/ha) halosulfuron rate controlled yellow nutsedge 95% 8 WAF. Regiment plus halosulfuron, regardless of halosulfuron rate, controlled annual sedge and hemp sesbania 95% or better 4 and 8 WAF. On average, yellow nutsedge and annual sedge control was slightly higher (5 to 10%) with 0.21 kg/ha compared to 0.28 kg/ha triclopyr when tank-mixed with halosulfuron. Triclopyr at 0.21 kg/ha plus 0.052 kg/ha or more halosulfuron controlled yellow nutsedge and annual sedge at least 90% 4 WAF. At 8 WAF 0.21 kg/ha triclopyr plus 0.018 kg/ha halosulfuron controlled yellow nutsedge and annual sedge 93%. Unlike yellow nutsedge and annual sedge, hemp sesbania control was slightly higher (5 to 10%) with 0.28 kg/ha compared to 0.21kg/ha triclopyr when tank-mixed with halosulfuron. Halosulfuron rates above 0.036 kg/ha were required to control hemp sesbania 90% with 0.21 kg/ha triclopyr 4 WAF. Halosulfuron as low as 0.009 kg/ha resulted in 90% hemp sesbania control 4 WAF when tank-mixed with 0.28 kg/ha triclopyr. However, 0.018 kg/ha or more halosulfuron plus 0.28 kg/ha triclopyr controlled hemp sesbania 95% 4 WAF. By 8 WAF only 0.052 and 0.071 kg/ha halosulfuron plus 0.21 or 0.28 kg/ha triclopyr controlled hemp sesbania 90%. Carfentrazone at 0.022 kg/ha plus 0.052 or 0.071 kg/ha halosulfuron controlled yellow nutsedge 95% 4 and 8WAF. Annual sedge control was at least 95% when carfentrazone was tank-mixed with halosulfuron at any rate. Hemp sesbania control with carfentrazone was at least 90% 4 WAF, regardless of the halosulfuron rate. Hemp sesbania control 8 WAF with carfentrazone generally increased from 80 to 90% as halosulfuron rates were reduced.

This research indicates that reduced rates of halosulfuron improve yellow nutsedge and annual sedge control when mixed with other herbicides. However, it appears that reducing halosulfuron rates below 0.032 kg/ha is risky when the tank-mix partner has very little activity on the target sedge species. Furthermore, it does not appear that halosulfuron rates below 0.052 kg/ha will improve hemp sesbania control. In fact, halosulfuron rates below 0.047 kg/ha reduced hemp sesbania control when tank-mixed with triclopyr. More research on the effects of reduced halosulfuron rates on broadleaf weed control is needed before reduced rates of halosulfuron for sedge control are recommended.

A COMPARISON OF BENSULFURON, HALOSULFURON, AND MIXTURES FOR YELLOW NUTSEDGE AND BROADLEAF WEED CONTROL IN RICE. F.L. Baldwin, K.L. Smith and T.L. Dillon, Cooperative Extension Service, Little Rock, AR 72203

ABSTRACT

The grower acceptance of quinclorac as a standard herbicide for grass control in Arkansas rice production was accompanied by a rapid increase in yellow nutsedge as a weed problem. In 1999 and 2000, growers quickly accepted clomazone as a standard practice through Section 18 programs. Clomazone provides excellent grass control but releases yellow nutsedge, rice flatsedge and several broadleaf weed species including hemp sesbania, Northern jointvetch and morningglory species.

Bensulfuron and tank mixtures of bensulfuron plus propanil were the grower standard treatments for yellow nutsedge control. In addition to controlling yellow nutsedge, the bensulfuron treatments also provided good control of several broadleaf and aquatic weed species.

Halosulfuron was registered for use in rice in 1999 and growers quickly learned than halosulfuron provided better yellow nutsedge control that bensulfuron. However, little was known about the broadleaf and aquatic activity of this herbicide.

Currently, the primary grower question is in regards to what is the best treatment to follow clomazone for control of escaped grasses, yellow nutsedge rice flatsedge and broadleaf weeds.

Two studies were conducted near Lodge Corner, Arkansas to compare bensulfuron and halosulfuron alone and in mixtures with propanil, and reduced rates of halosulfuron added to bensulfuron or propanil + bensulfuron for control of sedges and broadleaf weeds. Typical small plot techniques were used. Rice, Wells variety, was drill seeded and the primary weed species were yellow nutsedge and hemp sesbania. A third study was conducted at the Rice Research and Extension Center near Stuttgart, Arkansas to compare halosulfuron and bensulfuron alone and tank mixed with propanil for control of spreading dayflower, Northern jointvetch and rice flatsedge. This study was not planted to rice. However, treatments were timed and flood water was managed as it would be for normal rice production. Bensulfuron rates of 0.75 to 1.0 oz a/a, alone or tank mixed with propanil provided yellow nutsedge and spreading dayflower control in the 70 to 80% range. Similar rates of halosulfuron or propanil + halosulfuron provided 95 to 100% control of the same two species. Little difference in control was noted comparing halosulfuron and bensulfuron for hemp sesbania, Northern jointvetch, and rice flatsedge. Both provided good control alone and outstanding control when mixed with propanil. Adding rates of halosulfuron as low as 0.125 oz a/a to 0.75 oz a/a bensulfuron, alone or tank mixed with propanil, provided 100% yellow nutsedge control in both studies. It was felt by the authors that the entire bensulfuron market in Arkansas would switch to halosulfuron in 1999 and 2000. However, a propanil + bensulfuron premix (Duet) was sold at a price comparable to other brands of propanil alone in 2000. This was an extremely popular grower treatment. Based upon this research and current market trends, it appears that if halosulfuron or bensulfuron will be used for yellow nutsedge/broadleaf weed complexes, the best two treatments will be propanil plus a labeled rate of halosulfuron or propanil plus a label rate of bensulfuron (or Duet) plus 0.125 to 0.25 oz a/a of halosulfuron.

EVALUATION OF BISPYRIBAC-SODIUM IN WEED CONTROL SYSTEMS FOR RICE. E.F. Scherder, R.E. Talbert, M.L. Lovelace, N.W. Buehring. University of Arkansas, Fayetteville, Arkansas.

ABSTRACT

Two experiments were conducted in 2000 to evaluate the performance of bispyribac-sodium. These field experiments were conducted at the Rice Research and Extension Center at Stuttgart, Arkansas, on a Dewitt silt loam. Each experiment was conducted as a randomized complete block. Natural barnyardgrass infestations were evaluated as well as planted rows of propanil-resistant and -susceptible barnyardgrass (*Echinochloa crus-galli*), broadleaf signalgrass (*Brachiaria platyphylla,*) pitted morningglory (*Ipomoea lacunosa*), tall morningglory (*Ipomoea purpurea*), hemp sesbania (*Sesbania exaltata*), and northern jointvetch (*Aeschynomene virginica*).

Treatments for experiment one: clomazone at 0.3 lb ai/A preemergence (PRE) followed by (fb) bispyribac-sodium at 9.0 g ai/A + Kinetic at 0.125% V/V at a mid-postemergence timing (MPOST), preflood (PREFLD), or postflood (POSTFLD); thiobencarb at 3.0 lb ai/A delayed preemergence (DPRE) fb bispyribac-sodium at 9.0 g/A + Kinetic at 0.125% V/V MPOST, PREFLD, or POSTFLD; with comparison treatments of clomazone at 0.3 lb/A fb propanil at 4.0 lb ai/A MPOST or propanil at 2.25 lb/A + molinate at 2.25 lb ai/A PREFLD. Treatments for experiment two: bispyribac-sodium at 9.0 g/A + Kinetic 0.125% V/V or RH-149109 at 0.053 lb ai/A were applied in combination with quinclorac at 0.25 lb ai/A, pendimethalin at 1.0 lb ai/A, or thiobencarb at 3.0 lb/A at MIDPOST. Each combination received either a second application of bispyribac-sodium or RH-149109 at 9.0 g/A or 0.053 lb/A, respectively, PREFLD; bispyribac-sodium at 18 g/A + Kinetic at 0.125% V/V + pendimethalin MPOST fb bispyribac-sodium at 18 g/A PREFLD; and RH-149109 at 0.071 lb/A + pendimethalin MPOST fb RH-149109 at 0.071 lb/A PREFLD.

In experiment one, 100% control of propanil-resistant and -susceptible barnyardgrass was attained with either clomazone or thiobencarb combinations when bispyribac-sodium was used PREFLD or POSTFLD (>98%). Broadleaf signalgrass control was attained only with clomazone programs (100%). Pitted and tall morningglory control were not controlled by any of the programs evaluated (<30%). Northen jointvetch control (>87%) was achieved with all programs except clomazone fb propanil (45%) and thiobencarb fb bispryibac-sodium MPOST (42%). Hemp sesbania control, however, was limited to programs of clomazone fb propanil, clomazone fb bispyribac-sodium applied MPOST or PREFLD, and thiobencarb fb bispyribac-sodium PREFLD.

In experiment two, >89% control of propanil-resistant and -susceptible barnyardgrass was attained with all programs. Broadleaf signalgrass control was generally less than 70%. Pitted and tall morningglory control was limited to programs of quinclorac. Northern jointvetch and hemp sesbania control was achieved with all programs evaluated. A two-day delay in heading was observed with either compound when used in combination with pendimethalin. Root pruning with RH-149109 ranged from 41 to 70% and with bispyribac-sodium from 18 to 48%. However, this pruning did not correlate to a yield decrease, and no differences in rice yield were observed.

DIFFERENCES IN NATURAL BARNYARDGRASS (*ECHINOCHLOA CRUS-GALLI*) SUPPRESSION AMONG COMMERCIAL AND FOREIGN DRILL-SEEDED RICE (*ORYZA SATIVA*) LINES. D.R. Gealy and R.H. Didlay. USDA-ARS, Dale Bumpers National Rice Research Center, Stuttgart, AR 72160.

ABSTRACT

As part of an ongoing effort, 57 rice cultivars were evaluated in a drill-seeded rice system at Stuttgart, AR in 2000 to determine their abilities to suppress barnyardgrass (BYG) and to maintain optimum yields in the presence of BYG. Foreign rice lines previously determined to be weed-suppressive were compared to domestic and foreign commercial cultivars and various advanced breeding lines, crosses, and hybrids. Visual BYG control ranged from 41 to 81% across all rice lines. Several commercial cultivars and advanced breeding lines (including ‘Drew’, ‘LaGrue’, and the advanced line RU9901127) suppressed BYG about as well as did the weed-suppressive group. Other cultivars and breeding lines (including ‘Lemont’, ‘Lacassine’, and RU9601096) were among the least suppressive to BYG. Semi-dwarf mutants were poor weed competitors. The rice entries that provided the greatest visual control of BYG often were able to maintain near optimum yields (relative to weed-free) under those conditions. However, some of these rice lines produced extremely low actual yields. Rice yields in BYG-infested plots ranged from 35 to 96% of the weed-free optimum and from 1540 to 6600 kg/ha. In a separate, 1998 field study, mixed root samples of rice (C_3 species) and BYG (C_4 species) extracted from soil were analyzed using ^{13}C discrimination analysis to determine the distribution of roots of each species within and between rice rows. The weed-suppressive rice line, PI 312777, produced relatively greater root mass than did the commercial cultivar, ‘Lemont’. Within the row, ‘Lemont’ and PI 312777 root masses were three and ten times, respectively, that of BYG. Between rows, ‘Lemont’ produced only one third the root mass of BYG, whereas PI 312777 and BYG root masses were equal. PI 312777 roots expanded into the soil profile much more aggressively than did ‘Lemont’, which may be a key to its greater weed suppression. Overall, these results can be useful in identifying rice lines with BYG-suppressive properties and may supplement breeding efforts to develop ‘pest’ tolerant cultivars.

FLORIDA PUSLEY (*RICHARDIA SCABRA*) CONTROL IN SOYBEANS WITH GLYPHOSATE, SULFOSATE, AND GLUFOSINATE. E.C. Murdock* and R.F. Graham. Clemson University, Pee Dee Research and Education Center, Florence, SC.

ABSTRACT

Florida pusley control with glyphosate (1 qt/ac), sulfosate (1 qt/ac), and glufosinate (28 oz/ac) was evaluated in 2000 at an on-farm site in Horry County, SC. Ammonium sulfate @ 3 lb/ac was included with all POST herbicides. POST herbicides were applied 15, 20, 28, and 37 days after planting (DAP), when Florida pusley seedlings were 1, 2, 4, and 7 inches tall, respectively. Southern crabgrass was 6, 12, 13, and 18 inches tall at these respective dates. Florida pusley control 6 weeks after planting (WAP) ranged from 78 to 92% when glyphosate and sulfosate were applied at the three earliest timings. When applied to 7-inch Florida pusley, control 6 WAP was 28 to 32%. Glufosinate controlled Florida pusley 92 to 94% 6 WAP when applied to 1- to 2-inch seedlings; control when applied at the 4- and 7-inch stage of growth was 62 and 20%, respectively. Glyphosate and sulfosate controlled southern crabgrass 87 to 100% 6 WAP. Southern crabgrass control 6 WAP with glufosinate ranged from 43 to 80%. Soybean seed yield ranged from 26 to 32 bu/ac when glyphosate and sulfosate were applied within 4 WAP. When glyphosate and sulfosate were applied 37 DAP, soybean yields were 21 and 24 bu/ac, respectively. When glufosinate was applied 15 and 20 DAP, respectively, soybean seed yields were 21 and 20 bu/ac. When glufosinate was applied at the later timings, soybean seed yield ranged from 7 to 9 bu/ac. When a “standard” herbicide program (pendimethalin @ 2.4 pt + chlorimuron +metribuzin @ 8 oz/ac PRE followed by fomesafen @ 1.5 pt/ac + surfactant @ 0.25% v/v POST) was used, soybean seed yields with the Roundup Ready and Liberty Link cultivars were 22 and 15 bu/ac, respectively.

WEED CONTROL ALTERNATIVES FOR MATURITY GROUP III SOYBEANS GROWN IN MISSISSIPPI. D.H. Poston, D.R. Shaw, C. Smith, and R.M. Griffin. Delta Research and Extension Center, Stoneville, and Mississippi State University, Mississippi State, MS.

ABSTRACT

Field studies were conducted to evaluate the efficacy and profitability of several herbicide programs and to evaluate the economics of harvest aids to control late season weeds in maturity group (MG) III soybeans (*Glycine max* (L.) Merr.) grown in Mississippi. Despite a severe drought, Dekalb® CX367cRR soybeans seeded into 7.5 in rows May 3, 2000 yielded 23 to 29 bu/A depending on herbicide treatment. Herbicide treatments and rates in lb ai/A were: 1) untreated control, 2) glyphosate @ 1.0, 3) glyphosate @ 0.75 fb glyphosate @ 0.5, 4) glyphosate @ 0.75 fb glyphosate @ 0.5 fb glyphosate @ 0.5, 5) glyphosate @ 0.5 + cloransulam-methyl @ 0.008 + acifluorfen @ 0.063, 6) glyphosate @ 0.5 + cloransulam-methyl @ 0.008 + acifluorfen @ 0.063 fb glyphosate @ 0.5, 7) glyphosate @ 0.75 fb glyphosate @ 0.5 + cloransulam-methyl @ 0.008 + acifluorfen @ 0.063, 8) pendimethalin @ 1.0 + sulfentrazone @ 0.2 + chlorimuron @ 0.04, 9) pendimethalin @ 1.0 + sulfentrazone @ 0.2 + chlorimuron @ 0.04 fb glyphosate @ 0.5, 10) pendimethalin @ 1.0 + sulfentrazone @ 0.2 + chlorimuron @ 0.04 fb chlorimuron @ 0.008 + non-ionic surfactant (NIS) @ 0.25 % v/v, 11) pendimethalin @ 1.0 + sulfentrazone @ 0.2 + chlorimuron @ 0.04 fb chlorimuron @ 0.008 + NIS @ 0.25 % v/v + dimethenamid @ 1.5, 12) glyphosate @ 0.75 + dimethenamid @ 1.5, 13) glyphosate @ 0.5 fb glyphosate @ 0.75 +

dimethenamid @ 1.5, 14) chlorimuron @ 0.008 + clethodim @ 0.15 + crop oil concentrate (COC) @ 1.0 % v/v, and 15) chlorimuron @ 0.008 + clethodim @ 0.15 + COC @ 1.0 % v/v + dimethenamid @ 1.5. Pendimethalin @ 1.0 + sulfentrazone @ 0.2 + chlorimuron @ 0.04 was applied preemergence (PRE). All other treatments were applied postemergence (POST).

Soybean injury from conventional herbicides was still apparent 7 wk after planting (WAP) with visual injury ratings ranging from 13 to 43 %. In contrast, injury from POST glyphosate alone or tank mixed with conventional herbicides ranged from 4 to 12 %.

Hemp sesbania (*Sesbania exaltata* (Raf.) Rydb. ex. A. W. Hill) control at harvest was 88% or greater with all herbicide treatments. PRE herbicides alone or single POST applications of glyphosate or conventional herbicides provided only 71 to 83 % morningglory (*Ipomoea* sp.) control at harvest. In contrast, morningglory control with sequential glyphosate applications or PRE herbicides fb glyphosate or conventional herbicides ranged from 87 to 96 %. Johnsongrass (*Sorghum halepense* (L.) Pers.) control at harvest was generally 90 % or greater when POST glyphosate or clethodim applications were included in herbicide programs. Excellent (90% or greater) prickly sida (*Sida spinosa* L.) control was observed with all herbicide treatments except chlorimuron @ 0.008 + clethodim @ 0.15 + COC @ 1.0 % v/v and chlorimuron @ 0.008 + clethodim @ 0.15 + COC @ 1.0 % v/v + dimethenamid @ 1.5 which provided essentially no control.

Soybean yields and net returns were generally higher with Roundup Ready compared to conventional weed control programs. Averaged across treatments, soybean yields were 3.6 bu/A higher with Roundup Ready programs than with conventional herbicide programs; and net returns above weed management and seed costs were $21/A higher with weed management programs that included glyphosate than with conventional herbicide programs. Harvest aids improved soybean harvestability, but were generally not considered economical.

EHANCEMENT OF GLYPHOSATE EFFICACY WITH LOW CONCENTRATIONS OF GROWTH REGULATORS. S.A. Payne, N.R. Burgos, and L.R. Oliver, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville 72701.

ABSTRACT

Studies were conducted to examine the effects of the addition of low concentrations of growth regulator-type herbicides on glyphosate efficacy and soybean (*Glycine max*) injury. A 1999 field study consisted of glyphosate applied alone at 0.5 or 1 lb ai/A or glyphosate applied at 0.5 lb/A with a growth regulator herbicide applied at 1/10 its labeled rate. Labeled rates were 2,4-D, 1 lb ai/A; dicamba, 0.5 lb ai/A; and quinclorac or triclopyr, 0.25 lb ai/A. A 2000 field study included a similar treatment structure with labeled rates being 2,4-D, 0.5 lb ai/A; clopyralid, 0.188 lb ai/A; picloram, 0.125 lb ai/A; dicamba, quinclorac, or triclopyr, 0.25 lb ai/A. Visual weed control ratings were taken 4 weeks after treatment (WAT) for entireleaf morningglory (*Ipomoea hederacea* var. *integriuscula*), hemp sesbania (*Sesbania exaltata*), and velvetleaf (*Abutilon theophrasti*).

The addition of dicamba, quinclorac, and 2,4-D to 0.5 lb/A glyphosate improved glyphosate activity on entireleaf morningglory in 1999. Such combinations resulted in morningglory control equal to or greater than control with 1 lb/A glyphosate applied alone (86%). Entireleaf morningglory control by 1 lb/A glyphosate was lower in 2000 (53%) and all combinations except glyphosate plus clopyralid or triclopyr gave higher control. Hemp sesbania control by glyphosate was improved in 1999 by the addition of 2,4-D or dicamba from 80 to 97% and 94%, respectively. In 2000, all combinations gave control equivalent to 1 lb/A glyphosate (92%). Only dicamba as an additive improved control of velvetleaf over that by 0.5 lb/A glyphosate alone in 1999. Velvetleaf control in 2000 by all combinations except glyphosate plus clopyralid was equivalent to that by 1 lb/A glyphosate.

A greenhouse study was conducted using a factorial arrangement of treatments that included a growth regulator herbicide at 1/10 or 1/100 the labeled rate applied alone or with 0.5 lb/A glyphosate. Growth regulators and their respective labeled rates included 2,4-DB (0.031 lb/A) and clopyralid (0.188 lb/A) in addition to those used in the 1999 field study. Soybean ‘Asgrow 5601 RR’ and weed species previously mentioned were grown in 10-cm pots and were harvested for dry weight at 2 WAT.

The addition of dicamba to glyphosate resulted in 33% soybean dry weight reduction, but 2,4-DB or quinclorac plus glyphosate had no effect. Biomass reduction of entireleaf morningglory by glyphosate + 2,4-D at either rate or by quinclorac or triclopyr at 1/10 the labeled rate increased control over that by glyphosate alone (about 70% as compared to 55%). Clopyralid or quinclorac at 1/10 the labeled rate plus glyphosate were among the treatments that caused the highest hemp sesbania dry weight reduction at 72 and 57%, respectively. No growth regulator plus glyphosate combination caused greater dry weight reduction of velvetleaf or prickly sida as compared to glyphosate alone.

VALIDATING A HERBICIDE DECISION AID FOR THE SOUTHERN US. A.C. Bennett and G.G. Wilkerson, Crop Science Department, NC State University, Raleigh, NC 27695.

ABSTRACT

A USDA-funded regional project to validate and implement the use of HADSS (Herbicide Application Decision Support System) was initiated in 1999. HADSS is an economic threshold model, using weed populations, weed competitiveness, herbicide efficacy, and herbicide cost information to generate a list of appropriate herbicides or tank-mixtures. States with cooperating weed scientists include Alabama, Arkansas, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas. Data summarized compares weed control and yields obtained using the recommendations generated by HADSS, those of experts (weed scientists involved in validation), grower standards, or weed free controls. Comparisons of weed control ratings are from the season-ending rating of the respective study, and an individual comparison of weed control represents control of an individual weed species. Most studies had several comparisons, based on recommendations following different soil-applied herbicides, or using different herbicide-tolerant crop cultivars.

Alabama, Georgia, Oklahoma, Tennessee, and Texas compared HADSS recommendations for cotton to expert or standard recommendations. Weed control following HADSS recommendations was equivalent to or greater than following the expert or standard recommendations in 65 of 68 comparisons. Yields following HADSS recommendations were equivalent to those following expert or standard recommendations in 21 of 26 comparisons. In 5 of 6 instances where yield was reduced, late applications of MSMA were recommended by HADSS, suggesting this treatment alternative should be modified or removed. Tests in Mississippi compared the top two HADSS recommendations with a weed-free. Weed control following HADSS recommendations was equivalent to the weed-free in 18 of 34 comparisons. Weed control was reduced following HADSS compared to weed free in 16 of 34 comparisons, but was still above 80% except for one comparison. Yields from HADSS recommendations were equivalent to the weed free yields across all Mississippi studies.

Peanut studies were conducted in Oklahoma and Alabama. In Alabama, HADSS recommendations were compared to multiple standards, while in Oklahoma, HADSS recommendations were compared to the recommendations of an expert. Weed control following HADSS recommendations was equivalent or greater than that obtained from the standards or expert recommendations in 36 of 36 comparisons. Yield following HADSS recommendations was greater in 1 of 7 comparisons, and equivalent in 7 of 8 comparisons to that obtained from the standard or expert recommendations.

Arkansas, Louisiana, and Tennessee conducted soybean validations trials. In the Tennessee study, HADSS recommendations for several scenarios (conventional and Roundup Ready soybean with and without a PRE) were compared to a Roundup standard treatment. Weed control obtained using HADSS recommendations was equivalent to the standard in 11 of 16 comparisons. Yield following HADSS recommendations was equivalent to the standard in 3 of 4 comparisons. In 1 of 4 comparisons, yield was reduced, however, this was comparing a total post conventional system recommended by HADSS to a Roundup Ready system. In a study conducted in Arkansas, there were no differences in weed control (15 comparisons) or yield (3 comparisons) when HADSS utilizing a database developed in Arkansas was compared to an expert, the original HADSS database, or SWC (a decision aid developed in Arkansas). Studies in Louisiana evaluated the effect of initial application timing (14, 21, or 28 days after emergence) on the effectiveness of HADSS recommendations. Control generally decreased as the time of initial application was delayed compared to either a season long weed-free (4 studies) or expert recommendation (1 study). Yields following HADSS recommendations were equivalent or greater than those following weed free or expert recommendations in 23 of 30 comparisons. The yield reductions observed following HADSS recommendations occurred when applications were delayed to 21 or 28 days after emergence in 6 of 7 instances.

A corn study was conducted in Tennessee. In this study, HADSS recommendations for several scenarios (Roundup Ready corn, conventional corn, with and without PRE herbicides) were compared to a Roundup standard treatment. Weed control obtained using HADSS recommendations was equivalent to the standard in 15 of 16 comparisons. Yield following HADSS recommendations was equivalent to the standard in 4 of 4 comparisons

POSTEMERGENCE CONTROL OF TEXASWEED IN SOYBEAN. R.M. Griffin, D.H. Poston, D.R. Shaw, M.A. Blaine, and S.G. Flint, 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).

In the first study, the efficacy of glyphosate was compared to conventional herbicides. Herbicide treatments and rates were: 1.1 kg ai ha^{-1} glyphosate, 18 g ai ha^{-1} cloransulam, 9 g ai ha^{-1} chlorimuron, 400 g ai ha^{-1} fomesafen, 560 g ai ha^{-1} bentazon + 280 g ai ha^{-1} acifluorfen, 420 g ha^{-1} acifluorfen, 420 g ha^{-1} acifluorfen + 35 g ae ha^{-1} 2,4-DB, 15 g ha^{-1} cloransulam + 6 g ai ha^{-1} flumetsulam, 35 g ai ha^{-1} imazamox, 140 g ai ha^{-1} imazaquin, 70 g ai ha^{-1} imazethapyr, and 220 g ai ha^{-1} lactofen. Texasweed control with glyphosate, fomesafen, bentazon + acifluorfen, acifluorfen, acifluorfen + 2,4-DB, and lactofen was 87% or more 2 WAA. Control ranged from 58 to 81% with other herbicide treatments. Glyphosate, fomesafen, and lactofen were the most efficacious herbicide treatments 5 WAA, with control ranging from 84 to 88%. However, soybean injury 5 WAA was 18 and 21% with fomesafen and lactofen, respectively, compared to 1% with glyphosate. Control 5 WAA with bentazon + acifluorfen, acifluorfen, and acifluorfen + 2,4-DB was 80, 76, and 72%, respectively. Control 5 WAA with all other treatments was only 41 to 58%.

In the second study, glyphosate was applied alone and in combination with fomesafen. Glyphosate rates were 0.56 and 0.84 kg ha^{-1}. Fomesafen rates were 0, 130, 200, and 260 g ha^{-1}. Glyphosate at 1.1 kg ha^{-1}, 1.1 kg ha^{-1} glyphosate fb 0.84 kg ha^{-1} glyphosate, 560 g ha^{-1} bentazon + 280 g ha^{-1} acifluorfen and 400 g ha^{-1} fomesafen were included for comparison treatments. Texasweed control with 560 or 840 g ha^{-1} glyphosate was not improved by the addition of fomesafen. Glyphosate at 1.1 kg ha^{-1}, 1.1 kg ha^{-1} glyphosate fb 0.84 kg ha^{-1} glyphosate, and 400 g ha^{-1} fomesafen were the most efficacious treatments, providing 91, 98, and 92% control 5 WAA, respectively. Control with other treatments ranged from 82 to 89%.

In the third study, 0.84 kg ha^{-1} glyphosate was tank mixed with 9 g ha^{-1} cloransulam, 9 g ha^{-1} cloransulam + 70 g ha^{-1} acifluorfen, 4.5 g ha^{-1} chlorimuron, 130 g ha^{-1} fomesafen, 700 g ha^{-1} imazaquin, 35 g ha^{-1} imazethapyr, 18 g ha^{-1} imazamox, and 22 g ai ha^{-1} flumiclorac. Tank-mixing 0.84 kg ha^{-1} glyphosate with conventional herbicides did not improve Texasweed control above 1.1 kg ha^{-1} glyphosate applied alone.

PREEMERGENCE WEED CONTROL WITH FIRSTRATE. J.W. Barnes and L.R. Oliver, Department of Crop, Soil, and Environmental Sciences, Fayetteville, 72701.

ABSTRACT

FirstRate (cloransulam-methyl) has been utilized for postemergence (POST) control of morningglories (*Ipomoea* sp.), velvetleaf (*Abutilon theophrasti*), and common cocklebur (*Xanthium strumarium*) in soybean but has not been used as a soil-applied herbicide in the Southern region because of its short soil half-life. Preliminary weed spectrum experiments indicated that FirstRate had a broader weed spectrum when applied as a preemergence (PRE) herbicide than when applied POST. Experiments were conducted to determine what benefit FirstRate PRE would provide in a PRE followed by POST weed management program. Trials were conducted at Keiser, AR, on a Sharkey clay in 1999 and 2000 and at Pine Tree, AR, on a Calloway silt loam in 2000. The treatments were arranged in a randomized complete block design with four replications, and data were combined over years at Keiser. PRE treatments consisted of FirstRate applied at rates of 0.016, 0.032, and 0.039 lb ai/A and FirstRate at 0.032 + Sencor (metribuzin) at 0.25 lb ai/A. The PRE treatments of FirstRate 0.016 and 0.032 lb ai/A and FirstRate + Sencor were applied alone and followed by POST treatments of Typhoon (fomesafen + fluazifop) at 0.564 lb ai/A + COC 1% v/v and Roundup Ultra (glyphosate) at 0.5 lb ai/A. The POST treatments were applied 21 to 28 days after emergence and were targeted to 3- to 4- inch weeds in the PRE-treated plots. All PRE treatments and Typhoon were applied at 20 GPA while Roundup Ultra was applied at 10 GPA. The weeds evaluated at both locations were prickly sida (*Sida spinosa*), pitted morningglory (*Ipomoea lacunosa*), and hemp sesbania (*Sesbania exaltata*). The weed densities at Keiser ranged from 7 to 18 plants/m for each of these weeds, while densities at Pine Tree were much lower at 2 to 5 plants/m. The dominant grass species at Keiser was barnyardgrass (*Echinochloa crus-galli*) at a density of 15 plants/m while broadleaf signalgrass (*Brachiaria platyphylla*) at densities greater than 40 plants/m was the predominant grass at Pine Tree. Weed control was evaluated 4, 6, 8, and 10 weeks after emergence (WAE), and soybean yield was determined from the center two rows of the four row plots.

Soil texture was a more significant factor in weed control with FirstRate PRE than was application rate. Control of all species with FirstRate PRE with no POST treatment was less than 50% 10 WAE for all weed species except prickly sida on the Sharkey clay at Keiser. Control was much better at Pine Tree, with FirstRate rates of 0.032 and 0.039 lb ai/A providing at least 70% control of all weed species. The addition of Sencor to FirstRate PRE improved control of all species at Keiser but improved control only of hemp sesbania at Pine Tree. Soybean yields reflected weed control ratings at both locations, with FirstRate + Sencor providing better soybean yields at Keiser but not Pine Tree. In general, the reduced rate (0.016 lb ai/A) of FirstRate did not control weeds as well as the higher rates but the reduced control resulted in reduced yields only at Keiser.

At 10 WAE, POST treatments of Roundup Ultra that did not follow a PRE herbicide failed to provide greater than 80% control of pitted morningglory at both locations, hemp sesbania at Keiser, and prickly sida at Pine Tree. Control of pitted morningglory and hemp sesbania was more stable (<80%) from Typhoon at both locations, but control of prickly sida and broadleaf signalgrass was poor (>60%). When either Roundup Ultra or Typhoon followed FirstRate at 0.032 lb ai/A or FirstRate + Sencor, control of poorly controlled species was improved to greater than 80%. This stabilization of weed control across species resulted in higher soybean yields with FirstRate at 0.032 or Firstrate + Sencor PRE followed by POST herbicides compared to single applications of either a PRE or POST herbicide.

CANOPY XL WEED CONTROL PROGRAMS IN SOYBEAN. J.A. Bond, L.R. Oliver, and J.W. Barnes. Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville 72701

ABSTRACT

Canopy XL is a package mix of the herbicides sulfentrazone and chlorimuron (5:1 ratio) and is used preemergence in soybean (*Glycine max*) at rates of 0.16 to 0.24 lb ai/A for grass and broadleaf weed control. Field studies were conducted from 1997 to 2000 at the Northeast Research and Extension Center near Keiser, AR, and the Pine Tree Branch Station near Pine Tree, AR, to evaluate the efficacy of different rates of Canopy XL followed by (fb) postemergence (POST) combinations containing glyphosate (Roundup Ultra) on problem weed species and to compare weed control programs containing preemergence (PRE) applications of Canopy XL to total POST systems.

PRE herbicide treatments in 1999 and 2000 included Canopy XL at 0.12, 0.16, or 0.24 lb/A. PRE fb POST weed control programs varied each year, but all included Canopy XL at 0.16 or 0.24 lb/A PRE fb POST treatments containing combinations of Roundup Ultra, chlorimuron (Classic), sulfosate (Touchdown), or quizalofop (Assure II). The experimental design in each year was a randomized complete block with four replications. Preemergence treatments were applied the day of planting, first POST treatments were applied approximately 4 weeks after planting, and second POST treatments were applied 2 weeks after the first POST application. A tractor-mounted compressed air sprayer calibrated to deliver 20 gallons/A of spray solution was used to apply all herbicide treatments. Data collected included weed control the day of the first POST application and 6 weeks following the last POST application and soybean yield. Data were subjected to analysis of variance, and means were separated using Fisher's Least Significant Difference (LSD) ($p = 0.05$).

No differences among rates of Canopy XL were observed for PRE control of hemp sesbania (*Sesbania exaltata*). PRE control of pitted morningglory (*Ipomoea lacunosa*) and barnyardgrass (*Echinochloa crus-galli*) was higher in 2000 for all rates of Canopy XL, but prickly sida (*Sida spinosa*) control was greater in the second year only for the 0.12 lb/A rate. Control of prickly sida, pitted morningglory, and barnyardgrass increased when the Canopy XL rate increased from 0.12 to 0.16 lb/A, but not when the rate was further increased to 0.24 lb/A. If adequate rainfall is received for activation of PRE treatments, the rate of Canopy XL can be reduced to 0.12 lb/A for PRE control.

Canopy XL can be applied at 0.16 lb/A and followed with a POST application of Roundup Ultra + Classic (0.75 + 0.004 lb ai/A) for full-season control of hemp sesbania, barnyardgrass, and pitted morningglory. Following Canopy XL (0.24 lb/A) PRE with one application of Roundup Ultra (0.75 lb/A) POST improved control of hemp sesbania, but the two applications of Roundup Ultra (0.75 lb/A) increased control of both hemp sesbania and barnyardgrass compared with Canopy XL alone. Canopy XL alone is not sufficient for season-long weed control. Weed control programs containing Canopy XL are equivalent to Roundup Ultra sequential or pendimethalin + imazaquin (Squadron) fb Roundup Ultra programs.

ROTATIONAL CROP RESPONSE TO SINGLE OR REPEATED APPLICATIONS OF MON 37500. J.P. Kelley and T.F. Peeper, Department of Plant and Soil Sciences, Oklahoma State University, Stillwater, OK 74078.

ABSTRACT

MON 37500 is a new developed sulfonylurea herbicide for selective weed control in wheat. It was first available to Oklahoma producers in 1998 under an emergency use permit. A full label was received in 1999. In Oklahoma, target weed species will include cheat, downy brome, and numerous broadleaf weeds. The current label specifies that only wheat may be planted for one year after an application of MON 37500. After one year, a bioassay should be performed to evaluate whether rotational crops other than wheat will be injured. The objectives of this research were to evaluate the sensitivity of cotton, corn, and cotton to residual MON 37500 and to determine if rotational crop injury is more severe from a single application or repeated annual applications of MON 37500.

Field experiments were conducted at Altus, in southwest Oklahoma, Carrier, in north central Oklahoma, and Goodwell, in the Oklahoma panhandle. At Altus, soil texture was a clay loam with a pH=7.0, at Carrier, soil texture was a silt loam with a pH=5.0, and Goodwell had a clay loam soil with a pH=7.8. Plot size ranged from 20 to 40 ft by 30 ft. MON 37500 was applied to wheat at 0.031 lb ai/acre in 20 GPA of water carrier plus 0.5% v/v non ionic surfactant in December of 1996, 1997, and 1998. In April of 1997, 1998, and 1999 plots where rotational crops were to be planted were sprayed with Roundup Ultra. All rotational crops were planted no-till with 30-inch row spacing. After each rotational crop harvest, all plots were lightly tilled and wheat seeded into all plots.

At Carrier, no cotton injury was seen from single or repeated annual applications of MON 37500. Corn was injured from residual MON 37500 that was applied four months prior to corn seeding. Injury was not more severe where two or three annual applications had been made. Grain sorghum was injured from MON 37500 that had been applied five months prior to planting and injury was not more severe from a single application compared to repeated annual applications. At Altus, no cotton injury was seen. Grain sorghum was injured when planted 6 MAT and injury was similar when single or repeated annual applications of MON 37500 had been made. At Goodwell, grain sorghum was severely injured

when planted 5 MAT. Injury was greater in plots that had been treated in 1996 and 1997 compared to only 1997. Corn was severely injured when seeded 5 MAT and injury was more severe when three annual applications were made compared to a single application, indicating that at pH =7.8, with low rainfall, the herbicide persisted more than one season.

MIX-SEEDED SOYBEAN AS A WEED MANAGEMENT TOOL IN ROUNDUP READY SOYBEAN. J.K. Norsworthy; Clemson University, Blackville, SC 29817.

ABSTRACT

Glyphosate-resistant soybeans were planted on the majority of the southern U.S. soybean acreage in 2000, with two glyphosate applications recommended for adequate weed control. Due to the extensive use of glyphosate in soybeans, integrated weed management strategies are needed to minimize the number of in-crop glyphosate applications while still maintaining effective and economical weed control. A field study was conducted at the Edisto Research and Education Center in Blackville, SC, to evaluate the effectiveness of an integrated weed management system utilizing a broadcast glyphosate-resistant/conventional soybean mix under varied planting dates and cultivar maturity groups on a loamy sand soil. The glyphosate-resistant cultivars 'Pioneer 95B41', 'DP 6880 RR', 'Hartz 7550 RR', and 'Hartz 8001 RR' were seeded at 494,000 seed/ha in combination with 494,000 seed/ha of the conventional cultivar 'Musen' in late-May, mid-June, and early-July. A single pass with a field cultivator was utilized to incorporate the seed into the soil. Glyphosate at 0.84 kg ae/ha was applied at the V4 to V6 soybean growth stage to remove all weeds and conventional soybeans. Weed and soybean densities, biomass, soybean groundcover, and weed control were determined on the day in which glyphosate was applied, with weed control also assessed late in the growing season. Palmer amaranth and morningglory spp. were the major weeds infesting the test area. At soybean maturity, soybean height and seed yield were determined.

Success with the broadcast mix-seeding technique was highly contingent on early-season rainfall. Rainfall differences among planting dates most influenced soybean growth, weed management, and seed yield. Dry conditions in late-May and mid-June delayed soybean emergence, but did little to prevent Palmer amaranth and morningglory spp. emergence. Although soybean emergence was delayed for the first two planting dates, soybean populations at treatment with glyphosate were similar among planting dates. Lack of early-season rainfall resulted in minimal soybean canopy formation causing Palmer amaranth density to vary among planting dates; however, morningglory spp. density did not vary prior to treatment. Late-season control of Palmer amaranth and morningglory spp. was at least 85% when soybean was seeded in early-July, a period of sufficient rainfall. Weed control was directly dependent on early-season soybean groundcover. Suppressed soybean yields were attributed to Palmer amaranth emergence and interference following the glyphosate application, regrowth of uncontrolled morningglory spp., and the lack of early-season rainfall. At the planting dates evaluated in this study, choice of cultivar had little effect on weed management and no effect on soybean seed yield. Under conditions of adequate rainfall and soil moisture, the mix-seeded broadcast planting technique appeared to be an effective integrated weed management strategy on the loamy sand soils of the Southeast.

CONTROL OF VOLUNTEER GLYPHOSATE-RESISTANT COTTON IN GLYPHOSATE-RESISTANT SOYBEAN. K.C. Clemmer and A.C. York, Crop Science Department, North Carolina State University, Raleigh, NC 27695-7620; and A.S. Culpepper, Department of Crop and Soil Sciences, University of Georgia, Tifton, GA 31793.

ABSTRACT

Cotton acreage in the southeastern United States has increased dramatically in the past two decades. Much of this increase can be attributed to lower production costs resulting from eradication of the boll weevil. In the fall of 1999, volunteer glyphosate-resistant cotton was found growing in glyphosate-resistant soybean fields in South Carolina and Georgia. Soybean fields are not monitored for boll weevils, hence volunteer cotton in soybean fields could provide a site for reproduction of reintroduced weevils.

An experiment was conducted at two sites in eastern North Carolina in 2000 to evaluate control of glyphosate-resistant cotton in glyphosate-resistant soybean. Glyphosate-resistant soybean was planted in 30-inch rows in June. Plots were five rows by 30 feet. Glyphosate-resistant cotton was planted between soybean rows. Each plot had approximately 200 cotton plants. Soybean was treated with Roundup Ultra 4 L (glyphosate, isopropylamine salt) at 1 qt/A when in the 2- to 4-trifoliate and 6- to 7-trifoliate stages to control weeds. Treatments included PRE, POST, and PRE followed by POST herbicides. PRE herbicides were Canopy 75 DF (metribuzin + chlorimuron) at 8 oz/A, Canopy XL 56.3 DF (sulfentrazone + chlorimuron) at 5.1 oz/A, Python 80 DF (flumetsulam) at 0.8 oz/A, Scepter 70 DG (imazaquin) at 2.8 oz/A, and Sencor 75 DF (metribuzin) at 8 oz/A. POST herbicides included Classic 25 DF (chlorimuron) at 0.33 and 0.67 oz/A, FirstRate 84 DF (cloransulam-methyl) at 0.2 and 0.3 oz/A, Reflex 2 EC (fomesafen) at 12 and 24 fl oz/A, Resource 0.86 EC (flumiclorac pentyl ester) at 4 fl oz/A, and 2,4-DB (2 L) at 2 fl oz/A. PRE plus POST treatments consisted of Canopy at 8 oz/A PRE followed by Classic at 0.33 oz/A, FirstRate at 0.2 oz/A, Reflex at 12 fl oz/A, Resource at 4 fl oz/A, and 2,4-D at 2 fl oz/A. The POST herbicides were mixed with the first application of glyphosate and applied when cotton had 2 to 3 true leaves. A nonionic surfactant at 0.25% (v/v) was mixed with all POST herbicides except Roundup Ultra alone (which was the check). Cotton control was estimated visually 21 days after PRE or POST herbicide

application and late in the season. Cotton stands and number of fruit (bolls, squares, blooms) produced were recorded in mid-August and again in mid-November. Soybean yield also was recorded.

Cotton was controlled 97, 92, 89, 72, and 53% late in the season by Scepter, Python, Canopy, Canopy XL, and Sencor applied PRE, respectively. Cotton fruit production was reduced 93, 89, 97, 78, and 50%, respectively, by these same PRE treatments. Cotton was controlled 99, 98, 97, 94, 93, 83, 40, and 32% late in the season by Resource, 2,4-DB, Classic 0.67 oz, Reflex 24 fl oz, Classic 0.33 oz, Reflex 12 fl oz, FirstRate 0.3 oz, and FirstRate 0.2 oz, respectively, applied POST. Cotton fruit production was reduced 100, 100, 99, 97, 96, 96, 65, and 45%, respectively, by these POST herbicides. Overall, PRE followed by POST herbicides were the most effective on cotton. Canopy PRE followed by Classic, Resource, Reflex, 2,4-DB, and FirstRate POST controlled cotton 100, 100, 99, 99, and 98%, respectively, late in the season. Each PRE followed by POST treatment reduced cotton fruit production 100%.

The cotton in check plots reduced soybean yield 20% at one location and 12% at the second location. Each PRE herbicide increased yield compared with the check, but differences among the PRE herbicides were minor. All POST herbicides except FirstRate increased soybean yield.

This research demonstrates that volunteer glyphosate-resistant cotton can be effectively controlled in glyphosate-resistant soybean. Canopy PRE followed by Roundup Ultra plus Resource, Classic, Reflex, or 2,4-DB totally eliminated fruit production on volunteer cotton. Among the PRE herbicides evaluated, Canopy was most effective but it alone did not totally eliminate cotton fruit production. Resource was the most effective POST herbicide for eliminating cotton fruit production, but excellent results were also obtained with Classic at 0.33 or 0.67 oz, Reflex at 12 or 24 fl oz, and 2,4-DB at 2 fl oz. Although 2,4-DB did not adversely affect soybean yield in this experiment, other research in North Carolina has shown that mixtures of Roundup and 2,4-DB can reduce yield of glyphosate-resistant soybean.

CROP ROTATION AND HERBICIDE-RESISTANT CROPS FOR WEED MANAGEMENT. N.R. Burgos, Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville; M.M. Anders, Rice Research and Extension Center, Stuttgart, AR; and L.R. Oliver, Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville 72704.

ABSTRACT

Herbicide-resistant crops, if coupled with herbicide and crop rotation schemes, is an excellent tool for managing difficult weed problems. If used indiscriminately, however, it could foster a shift in weed population and accelerate the development of resistant weeds. A field study was initiated in 1999 to evaluate the change in weed composition in response to cropping systems involving herbicide-resistant crops. Crop rotation treatments, intended for four seasons, were: (1) monoculture Liberty Link (LL) 'Bengal' rice, (2) monoculture nontransgenic 'Bengal', (3) monoculture Liberty Link soybean, (4) monoculture nontransgenic soybean, (5) 'Bengal' LL / soybean LL, (6) nontransgenic 'Bengal'/ nontransgenic soybean, (7) 'Bengal' LL / nontransgenic soybean, and (8) nontransgenic 'Bengal'/ soybean LL. Soybean cultivars used were A5944 in 1999 and A5547 in 2000. Weed control program for transgenic crops consisted of two applications of glufosinate (LIBERTY) at 0.40 kg ai ha^{-1}. Conventional rice was treated with quinclorac (FACET), 0.42 kg ai ha^{-1}, plus propanil, 3.36 kg ai ha^{-1}, at the one- to three-leaf stage, followed by propanil as needed. Conventional soybean was treated with a premix of imazaquin plus pendimethalin (SQUADRON), 0.98 kg ai ha^{-1}, preemergence; followed by fomesafen (REFLEX), 0.20 kg ai ha^{-1} and fluazifop (FUSILADE), 0.20 kg ai ha^{-1}, postemergence. Plot size was 9 by 9 m, separated by levees. The experiment was conducted in a randomized complete block design with four replications. Weed counts were taken from two 1- by 1-m^{-2} areas in each plot. Weed control ratings and yield data were recorded. Treatments were placed in the same spot every year. Information presented here represents two cropping seasons.

In the first year of establishment (1999), the dominant weed species were prickly sida, *Sida spinosa* (192 m^{-2}); barnyardgrass, *Echinochloa crus-galli* (51 m^{-2}); rice flatsedge, *Cyperus iria* (30 m^{-2}); hemp sesbania, *Sesbania exaltata* (12 m^{-2}); and Palmer amaranth, *Amaranthus palmeri* (10 m^{-2}). Prickly sida population declined in the second year in all treatments. The highest density was found in plots previously planted to soybean LL. Barnyardgrass population increased in plots following soybean LL, 'Bengal' LL, and nontransgenic 'Bengal'. Density of Palmer amaranth increased following nontransgenic soybean, which indicated that Squadron and Reflex did not provide season-long control of Palmer amaranth. Monoculture soybean LL may not be a good program for Palmer amaranth control, with time, because density of Palmer amaranth was also high in this system. At the end of the second season, in monoculture soybean LL, prickly sida continued to be a problem as it was in the first year (78% control); barnyardgrass, bermudagrass (*Cynodon dactylon*), and Palmer amaranth were also among the weeds to watch. The conventional soybean herbicide program did not completely control bermudagrass, Palmer amaranth, and sicklepod. Soybean yield was higher when following rice than when grown in monoculture. There was no yield difference between Liberty Link and conventional soybean nor between Liberty Link and conventional 'Bengal' rice.

EFFICACY, PHYTOTOXICITY, AND COVER CROP RESPONSE OF HERBICIDE COMBINATIONS IN DARK FIRE CURED TOBACCO. W.T. Willian, T.D. Kelley, and R.A. Gilfillen, Western Kentucky University, Bowling Green, Kentucky.

ABSTRACT

A field experiment was established at the Agricultural Research and Education Complex of Western Kentucky University to evaluate efficacy, phytotoxicity, and wheat (*Triticum aestivum*) cover crop response to preemergence herbicide combinations in dark fire cured tobacco (*Nicotiana tabacum*). A randomized complete block design was utilized with nine treatments replicated three times. Hydroponic tobacco transplants (c.v. 'TN D950') were established on May 20 in a conventionally tilled system on a Pembroke silt loam (Mollic Paleudalf) with a pH of 5.8 and an organic matter content of 1.2%.

Herbicide treatments were applied on May 19 with a CO_2 backpack sprayer delivering 15 gallons per acre. Sulfentrazone was applied in all nine treatments at a rate of 6.7 oz/A of Spartan 75 DF. Six of the nine treatments included addition of clomazone (Command 3 ME) at rates of 0.5 to 3.0 pt/A in 0.5 pt/A increments. Two of the nine treatments included addition of napropamide at rates of 1 # and 2 #/A of Devrinol 50 DF. Visual evaluation of crop phytotoxicity was recorded 21 days after treatment (DAT). Ivyleaf morningglory (*Ipomoea hederacea*) smooth pigweed (*Amaranthus hybridus*) and goosegrass (*Eleusine indica*) control was visually evaluated 21, 29, 44, and 58 DAT.

Following crop removal, two types of tillage were performed to examine wheat injury effects due to tillage. One subplot was moldboard plowed and disked while the other subplot was only disked. Following tillage operations, winter wheat was planted on October 30. Visual wheat chlorosis was recorded at 25 and 41 days after wheat planting (DAP). Stand counts were recorded 41 and 55 DAP to examine stand loss due to treatment and tillage effects. Wheat aboveground biomass was harvested from two 1 ft^2 areas of each subplot 77 DAP to evaluate treatment and tillage effects on wheat growth.

No phytotoxicity occurred during the course of the experiment. Sulfentrazone alone provided > 66% control of goosegrass, > 90% control of ivyleaf morningglory and > 88% control of smooth pigweed at all evaluation dates. Addition of $ 1.5 pt/A Command 3 ME improved goosegrass control 58 DAT. Addition of either clomazone or napropamide did not improve control of either smooth pigweed or ivyleaf morningglory 58 DAT.

No treatment by tillage interactions were significant; therefore, treatment effects were analyzed separately from tillage effects. Sulfentrazone alone resulted in < 5% visual injury which was not greater than treatments including napropamide. All sulfentrazone + clomazone tankmixes increased wheat injury. All sulfentrazone + clomazone combinations with the exception of sulfentrazone + 0.5 pt/A Command 3 ME resulted in > 35% wheat chlorosis 25 DAP. Drought conditions during the months following herbicide application may have contributed to the amount of observed chlorosis. Addition of either clomazone or napropamide decreased stand count 41 DAP. Deep tillage (moldboard plowing) prior to wheat establishment reduced wheat chlorosis 25 and 41 DAP; however, moldboard plowed subplots exhibited > 30% chlorosis at both evaluation dates. Deep tillage did not influence stand count or above ground biomass.

ECONOMICS OF ROTATIONAL CROPPING SYSTEMS TO REDUCE CHEAT DENSITIES. J.C. Stone, T.F. Peeper, E.G. Krenzer, J.R. Sholar, and R.D. Gribble, Oklahoma State University, Stillwater, OK 74078.

ABSTRACT

In Oklahoma, producers of winter wheat are seeking alternative methods of controlling *Bromus* species and improving economic returns. Experiments were established in North Central Oklahoma at three locations to determine the effect on *Bromus* densities of three crop rotations, each under no tillage and conventional tillage, with various herbicide treatments in each systems. The economics of each system were determined. The cropping systems included continuous wheat; wheat, double-crop grain sorghum, soybeans, double-crop wheat; and wheat, double crop soybeans, soybeans, double-crop wheat. These experiments were initiated following wheat harvest of in June 1999.

In the continuous wheat prior to applications of selective *Bromus* control herbicides in the fall of 1999, conventional tillage plots had lower cheat densities than no tillage plots. Selective *Bromus* control herbicide and simulated grazing treatments were applied to wheat in the fall of 1999 and spring of 2000. In the following winter wheat crop, cheat densities were lower in conventional tillage than no tillage at one site. Spring applied selective *Bromus* control herbicides and simulated grazing reduced cheat densities in the subsequent wheat crop at one of three sites. No differences between conventional tillage and no-tillage were found in wheat yields. Wheat returns were higher in conventional tillage than no tillage at one location.

Following double-crop soybeans cheat densities were lower in conventional tillage than no tillage. There were no differences in cheat densities between tillage systems and herbicide treatments after full season soybeans following double crop soybeans. Yields of double-crop soybeans were similar in conventional tillage and no tillage plots at two of three sites, with higher yields in conventional tillage at the third site. However returns from no-tillage for double-crop

soybeans were higher than conventional tillage at two of three sites. Full season soybean yields and returns following double-crop soybeans were higher in conventional tillage than no tillage at two sites.

Cheat densities following double crop grain sorghum were lower in conventional tillage than no tillage at two of the three sites. There were no difference in cheat densities between tillage and herbicide treatments following double crop grain sorghum and full season soybeans. Yields of double crop grain sorghum were similar in conventional tillage and no tillage plots at two of the three sites with higher yield in conventional tillage at the third location. Yields of full season soybeans following double crop grain sorghum were higher in conventional tillage than no-tillage at one location. Both double crop rotations, in conventional and no tillage reduced cheat densities when compared to continuous wheat production.

EFFECT OF CONVENTIONAL AND NO-TILL WHEAT-SOYBEAN CROPPING SYSTEMS ON ITALAIN RYEGRASS (*LOLIUM MULTIFLORUM* LAM.). C.S. Trusler and T.F. Peeper; Department of Plant and Soil Sciences, Oklahoma State University, Stillwater 74078.

ABSTRACT

Oklahoma wheat producers are searching for alternative methods of controlling Italain ryegrass. Three experiments were established in Central Oklahoma to compare herbicide and grazing treatments in continuous wheat with rotating out of wheat for one growing season on I. ryegrass density in the final wheat crop of each cropping system. In the system where wheat was not grown for one year, the missed wheat crop was replaced with double-cropped soybeans followed by full season soybeans after which the final wheat crop in the system was seeded. Both cropping systems were evaluated under no-tillage and conventional tillage. The experiments were established in June 1999 following wheat harvest.

I. ryegrass control with Hoelon at 1.0 lb ai/ac applied in 1999 ranged from 86 to 98% in no-tillage and 90 to 99% in conventional tillage. Maverick at 0.031 lb ai/ac + NIS at 0.5% v/v applied in 1999 controlled I. ryegrass 13 to 69% in no-tillage and 40 to 99% in conventional tillage. Achieve at 0.24 lb ai/ac + Supercharge at 0.5% v/v applied in 1999 controlled I. ryegrass 24 to 71% in no-tillage and 38 to 98% in conventional tillage.

In the continuous wheat system, I. ryegrass control in the 1999 crop reduced I. ryegrass present when the 2000 wheat crop was seeded in most treatments. Hoelon applied in 1999 reduced I. ryegrass in 2000 by 99 to 48% in no-tillage, but the carryover effect varied from a 78% reduction to a 44% increase in conventional tillage. Maverick + NIS applied in 1999 reduced I. ryegrass density in 2000 by 99 to 16% in no-tillage, but the carryover effect varied from a 55% reduction to a 32% increase in conventional tillage. Achieve + Supercharge applied in 1999 reduced I. ryegrass density in 2000 by 48 to 28% in no-tillage, but the carryover effect varied from a 48% reduction to a 40% increase in conventional tillage.

Since Oklahoma wheat growers often graze infested wheat late into the spring and forfeit the grain crop to control I. ryegrass, one of our treatments simulated this strategy. The grazing treatment was simulated during the 1999 wheat crop using a rotary mower three times, keeping the wheat and I. ryegrass plants at a height of two inches through May 2000. This grazing treatment applied to the 1999 wheat crop, reduced I. ryegrass density in the 2000 wheat crop by 99 to 41% in no-tillage, but the carryover effect varied from a 31% reduction to a 70% increase in conventional tillage.

The wheat-soybean-soybean-wheat rotation reduced I. ryegrass density by 99 to 47% in no-tillage, but the carryover effect varied from an 85% reduction to a 27% increase in conventional tillage as compared to the I. ryegrass density count prior to planting of the 1999 wheat crop. None of the treatments in either cropping system eliminated the I. ryegrass infestation.

SUNFLOWER TOLERANCE TO SOIL-APPLIED AND POSTEMERGENCE HERBICIDES. E.C. Murdock* and R.F. Graham. Clemson University, Pee Dee Research and Education Center, Florence, SC.

ABSTRACT

Sunflower tolerance to soil-applied and POST herbicides was evaluated in field and greenhouse experiments in 2000. The field tests were conducted on a Nansemond loamy sand with 1.7% organic matter and a cation exchange capacity of 3.21. Pendimethalin (1.8 pt/ac), trifluralin (1.5 pt/ac), and EPTC (2.5 pt/ac) applied PPI and S-metolachlor (1.5 pt/ac), alachlor (2 qt/ac), dimethenamid (20 oz/ac), fluometuron (1.5 qt/ac), and sulfentrazone (0.5 pt/ac) applied PRE did not reduce plant populations or cause unacceptable injury. Fomesafen (1.5 pt/ac), chlorimuron + sulfentrazone (5.1 oz/ac), imazaquin (2.8 oz/ac), imazethapyr (1.44 oz/ac), and pyrithiobac (1.2 oz/ac) applied PRE reduced sunflower population by 44 to 100% and caused 40 to 100% crop injury. In the greenhouse, pendimethalin @ 1.8 and 2.4 pt/ac applied PRE did not affect plant population or dry weight. S-metolachlor @ 2.0 and 2.67 pt/ac applied PRE did not affect plant population, but reduced dry weight/plant 31 and 56%, respectively. In contrast to the field results, fluometuron @ 1.5, 3, 4.5 and 6 pt/ac reduced sunflower populations and dry weight/plant 40 to 60% and 31 to 56%, respectively. Sulfentrazone @ 0.25 to 1.5 pt/ac reduced populations and dry weight 40 to 80% and 6 to 81%, respectively. Nicosulfuron (0.67 oz/ac), primisulfuron (0.76 oz/ac), pyrithiobac (1.2 oz/ac), chlorimuron (0.5 oz/ac), cloransulam (0.3

oz/ac), MSMA (1.33 and 2.67 pt/ac), fomesafen (1.5 pt/ac), lactofen (12.5 oz/ac), and bentazon (1 qt/ac) applied POST, when sunflower plants were 11 to 15 inches tall, caused 91 to 100% injury in the field trial. In the greenhouse, chlorimuron, nicosulfuron, MSMA @ 1.33 pt/ac, acifluorfen, and fomesafen did not affect population, but reduced dry weight/plant 19 to 48%. MSMA @ 2.67 pt/ac, bentazon, lactofen, cloransulam, and pyrithiobac reduced plant population and dry weight/plant 20 to 100% and 33 to 100%, respectively.

SECTION II: WEED MANAGEMENT IN TURF, PASTURE, AND RANGELAND

LATERAL RECOVERY OF CREEPING BENTGRASS IN RESPONSE TO PLANT GROWTH REGULATORS AND PREEMERGENCE HERBICIDES. H.D. Cummings, F.H. Yelverton, D.C. Bowman, and T.W. Rufty Jr., North Carolina State University, Raleigh, NC 27695-7620

ABSTRACT

Maximum root growth of creeping bentgrass (*Agrostis palustris* Huds.) in North Carolina occurs in the spring and fall. The majority of creeping bentgrass roots die during the summer months in the transition zone. Preemergence (PRE) herbicides like dithiopyr and bensulide + oxadiazon may be applied in the spring to control goosegrass (*Eleusine indica*) and crabgrass (*Digitaria sp.*). Plant growth regulators (PGRs) like paclobutrazol and paclobutrazol + cyproconazole (fungicide with PGR properties) may be applied in the spring and fall to control annual bluegrass (*Poa annua ssp. annua*). Trinexapac-ethyl is a PGR which may be applied in the spring and fall for creeping bentgrass growth management. Using PRE herbicides, which inhibit cell division at the growing points, or PGRs, which inhibit cell division and cell elongation, may impact creeping bentgrass lateral growth during its maximum growth period. If lateral growth is inhibited, the open areas may be susceptible to colonization by weeds. The objective of this experiment was to determine the relative effects of PGRs and PRE herbicides on lateral recovery of creeping bentgrass. The experiment was conducted using a randomized complete block design with 4 replications on established ‘Penncross’ creeping bentgrass, maintained at 4 mm at the Sandhills Research Station near Pinehurst, NC. The PRE herbicides were applied using a shaker can or CO_2 backpack sprayer on April 8, 1998, April 10, 1999, and again on April 3, 2000 at the following rates: dithiopyr (1 EC) at 0.6 kg ai/ha and bensulide + oxadiazon (6.56 G) at 6.7 and 1.7 kg ai/ha, respectively. PGRs were applied using a CO_2 backpack sprayer once a month for 27 months beginning on April 8, 1998 at the following rates: trinexapac-ethyl (1 EC) at 0.06 kg ai/ha or at 0.1 kg ai/ha, paclobutrazol (2 SC) at 0.3 kg ai/ha, and paclobutrazol (2 SC) + cyproconazole (40 WG) at 0.3 kg ai/ha + 1.0 kg ai/ha, respectively. Cyproconazole was applied two weeks after paclobutrazol. Applying PGRs every month, instead of the just fall and spring months, sets up a worst case scenario. Every month, two soil cores (10 cm in diameter x 15 cm in length) were collected from each plot using a standard golf cup cutter, and sand was added as needed to keep the holes filled. Lateral growth of the creeping bentgrass into each cup cutting was measured with a 12 cm ruler every two weeks until complete closure. Diameter measurements were made in three directions from crown to crown (growing point to growing point). The results of lateral recovery measurements indicated that while neither preemergence herbicides nor trinexapac-ethyl neither inhibited nor accelerated the ability of ‘Penncross’ creeping bentgrass to spread laterally during the summer months, paclobutrazol + cyproconazole did inhibit this form of growth. Paclobutrazol, compared to trinexapac-ethyl at 0.1 kg ai/ha, also inhibited the ability of ‘Penncross’ creeping bentgrass to spread laterally during the summer months; however, neither of these treatments were significantly different from the non-treated.

EFFECTS OF LIGHT INTENSITY ON “PENCROSS’ CREEPING BENTGRASS AND SILVERY THREAD MOSS. K.D. Burnell, F.H. Yelverton, J.F. Thomas, and R. Wells. North Carolina State Univeristy, Raleigh, NC 27695.

ABSTRACT

Silvery thread moss is increasing across the United States and has become a problematic weed on golf course putting greens. Reasons maybe be due to the lost of mercury-based fungicides and increased emphasis on aggressive cultural inputs. The unique biology of moss makes traditional weed control difficult and control strategies need to be developed. Experiments were initiated at the Southeastern Plant Environment Lab (Phytotron) during the summer of 2000 and ran for eight weeks. Plots were 25.6 cm^2 and arranged in a split plot design with whole plot factors being light intensities and subplot factors being species with eight replications. Four (1.11 M^2) growth chambers set to operate at a 12 hours photoperiod with day/night temperatures of $22/15^0$C. Light intensities of 325, 235, 180, and 80 : mol m^{-2} s^{-1} of Photosynthetically Active Radiation (PAR) were used. No changes in light intensities were found at termination of the experiment. ‘Penncross’ creeping bentgrass was mowed at 6 mm three times weekly and fertilized at four weeks with 1/6th strength Hoglands solution. All pots were subirrigated as needed.

Bimonthly bentgrass oven dried clipping weights and chlorophyll a, b, and total chlorophyll (TC) contents were taken for bentgrass. Leaf width, root length, and root weight were also taken for bentgrass at termination of the experiment. Bimonthly chlorophyll a, b, and TC were also taken for moss, along with oven-dried biomass of moss were taken at termination of the experiment. Bentgrass clipping weights increased linearly with each increase in light intensity at the sixth week of observation. Significant differences in chlorophyll a, b, and TC were seen between species and light intensities at all bimonthly intervals. When TC was averaged over weeks TC was significantly when bentgrass compared to moss. Bentgrass TC was two to three times higher than that of moss. Mean leaf width and root length for bentgrass increased linearly while root weight increased exponentially with each increase in light intensity. No significant differences were also found in moss oven dry biomass. Overall, as expected, moss responds better to decreasing light when compared to bentgrass, thus shifting the competitive edge to moss.

FLUROXYPYR FOR BROADLEAF WEED CONTROL IN WARM-SEASON TURF. J.T. Staples and R.H. Walker, Ala. Agric. Exp. Stn., Auburn University. AL 36849-5412.

ABSTRACT

Virginia buttonweed (*Diodia virginiana*), old world diamond-flower (*Hedyotis corymbosa*), spotted spurge (*Euphorbia maculata*), doveweed (*Murdannia nudiflora*) and shiny cudweed (*Gnaphalium spicatum*) are problematic in warm-season turfgrasses. It has been suggested that continuous use of the phenoxy and benzoic acid herbicides has contributed to this problem. Improved control of some species has occurred with the more recent introduction of picolinic acid/pyridine herbicides; triclopyr, clopyralid, and soon fluroxypyr. Potential for improved weed efficacy and warm-season turfgrass tolerance for fluroxypyr has not been fully determined.

Five experiments were conducted at the Auburn University Turfgrass Research facility to evaluate selected treatments for POST control of Virginia buttonweed, shiny cudweed, old world diamond-flower, and spotted spurge. Turfgrass species evaluated included 'Tifway' bermudagrass, 'Palmetto' St. Augustinegrass, 'Meyer' zoysiagrass, and 'Tennessee Tuff' centipedegrass. Four treatments were included: 1) clopyralid 2) fluroxypyr 3) clopyralid + fluroxypyr, and 4) dicamba. All herbicides were applied at 0.25 lb ae/A. A Foley, AL location was included to evaluate doveweed control in only Tifway bermudagrass, and atrazine at 1.5 lb ai/A replaced dicamba. EF-1154 at 0.87 lb ae/A was included in 2 studies at Auburn and the Foley location. EF-1154 is a prepackaged admixture of clopyralid, fluroxypyr and MCPA (1:2:10 ratio). Non-ionic surfactant was included at 0.25% v/v in all treatments. Percent weed control and turfgrass injury was visually rated 3 and/or 6 weeks after treatment (WAT).

Auburn: Control (6 WAT) of Virginia buttonweed and old world diamond-flower averaged 80 and 60% with fluroxypyr alone, but 88 and 82%, respectively with fluroxypyr + clopyralid. Fluroxypyr and fluroxypyr + clopyralid provided poor (46 and 66% 3 WAT) control of spotted spurge but averaged 90% with EF-1154. Shiny cudweed control ranged from 83% (clopyralid) to 89% (fluroxypyr + clopyralid) for all treatments 3 WAT. No injury was observed for any treatment to the four turfgrass species.

Foley: Atrazine and EF-1154 provided 90 and 87% control of doveweed 6 WAT, respectively. Fluroxypyr (68%), clopyralid (5%), and fluroxypyr + clopyralid (37%) were ineffective for doveweed control. Bermudagrass injury ranged from 35 to 40% with atrazine applied POST. Turf injury was slight (10 or less) and transient with all other treatments.

BIOLOGY OF *POA ANNUA* L. AND RESPONSE TO FENARIMOL. J.S. McElroy, R.H. Walker, G.R. Wehtje and E. van Santen. Alabama Agric. Exp. Stn., Auburn University, AL 36849-5412.

ABSTRACT

Poa annua L. is known to exist as both an annual, var. *annua* and a perennial, var. *reptans*. In addition, environmentally-induced ecotypes of *P. annua* are also thought to exist. These ecotypes differ with respect to their preferred environment. As a result, this is believed to be reflected in such characteristics as the degree of seed production, requirements for seed germination, and acquired herbicide resistance. These ecotypic differences may transcend across both the perennial and annual varieties. Recent research on the control of *P. annua* in turfgrass has failed to take into account the varietal and/or ecotypic diversity that exists within the species. Eight ecotypes were evaluated for their biological characteristics and response to preemergence-applied fenarimol in order to evaluate varietal and ecotypic variation. The 8 ecotypes selected were a known perennial from Birmingham, AL ("Birmingham"), a known annual from Auburn, AL ("Auburn"), four unknown varieties from Augusta, GA ("Augusta 4", "Augusta 8", "Augusta 14" and "Augusta 17"), and one unknown variety from both Columbia, SC ("Columbia") and Fresno, CA ("Purchased"). Birmingham and Auburn served as the varietal standards by which all other ecotypes were compared.

Biology. A field study was conducted to evaluate biological characteristics of the 8 ecotypes. Eighty, 25 cm diameter plastic pots were filled with a 70% sand, 30% reed-sedge peat soil medium. Pots were placed in the ground, with the top of each pot remaining 5 cm above the soil surface. Ten pots were allotted per ecotype. All ecotypes were established from seed September 15, 1999. Significant differences were detected in 4 of the 10 measured characteristics. Those characteristics were: number of days until the 11th seedling, number of days until the 1st panicle, flagleaf length and total number of panicles on April 15, 2000. Auburn and Birmingham were significantly different in all four characteristics. On average, Auburn germinated 17.1 d after planting, first produced panicles 6 wk after emergence, developed a 32.3 mm flagleaf, and produced >100 panicles per plant 7 mo after planting. In contrast, Birmingham germinated 7.3 d after planting, first produced panicles 10 wk after emergence, developed a 21.3 mm flagleaf, and produced 45.8 panicles per plant 7 mo after planting. None of the other ecotypes could be consistently correlated with either of the varietal standards.

Response to fenarimol. In a laboratory study, germinating seeds of all ecotypes were exposed to fenarimol at concentration of 0 to 4 ppm carried in an acrylamide copolymer growth medium. Seedling root and shoot lengths were measured after 2 wk. Regression analysis revealed root and shoot length decreased linearly in response to fenarimol concentration. Analysis of slopes revealed that root length response was equivalent across all ecotypes. However,

ecotypic differences were detected with shoot length. Further analysis of ecotype shoot lengths revealed Columbia to be the most resistant to fenarimol, requiring 2.9 ppm to reduce shoot growth by 50%. Conversely, all other ecotypes required 1.4 to 2.2 ppm to reduce shoot growth 50%.

NEW ALTERNATIVES FOR PREEMERGENCE *Poa annua* CONTROL ON OVERSEEDED TURF. I.R. Rodriguez, J.K. Higingbottom, and L.B. McCarty. Clemson University, Clemson, SC 29634.

ABSTRACT

Annual bluegrass (*Poa annua*) is a bunch type winter annual weed in turf with an off-yellow color which disrupts turf uniformity. This weed germinates throughout winter and is difficult to selectively control in cool-season turf. Demethylation inhibitor (DMI) fungicides have shown control on *Poa annua*, but little is known on their effects on roughstalk bluegrass (*Poa trivialis*), a grass commonly used for winter overseeding on golf greens. The objectives of this study were to selectively control *Poa annua* and allow establishment of *Poa trivialis* on a golf green following pesticide use.

A study was conducted in 1999 and 2000 on a *Poa annua* infested hybrid Bermudagrass (*Cynodon dactylon* × *C. transvaalensis*) green in Batesburg, SC overseeded on 5 Oct. with *Poa trivialis*. Experimental design was a randomized complete block with 3 replications of 15 treatments. Plot size was 10ft. × 10ft. Treatments consisted of Kerb 50WP (pronamide) at 2lb ai A^{-1} applied 45d before overseeding (DBO), Rubigan 1AS (fenarimol) at 2.04 + 2.04 + 0.68lb ai A^{-1} applied at 45 DBO + 30 DBO + Dec., respectively, Ronstar 2G (oxadiazon) at 2lb ai A^{-1} applied 60 DBO, Ronstar 2G at 1lb ai A^{-1} applied 30 days after overseeding (DAO), Ronstar 2G at 1lb ai A^{-1} applied 60 DBO + 30 DAO, Prograss 1.5EC (ethofumesate) at 1lb ai A^{-1} applied in Nov. + Dec., Dimension 1EC (dithiopyr) at 0.25lb ai A^{-1} applied 30 DBO + Feb., Dimension 1EC at 0.25lb ai A^{-1} applied 30 DBO + Nov. + Dec., Dimension 1EC at 0.38lb ai A^{-1} applied 30 DBO + Feb., Dimension 1EC at 0.5lb ai A^{-1} applied 30 DBO + Feb., Eagle 40WP (myclobutanil) at 1.8 + 1.8 + 1.2lb ai A^{-1} applied 45 DBO + 30 DBO + Dec, respectively, Sentinel 40WG (cyproconazole) at 1.1 + 1.1 + 0.36lb ai A^{-1} applied 45 DBO + 30 DBO + Dec., respectively, Patchwork .008G (fenarimol) at 1.74 + 1.74 + 0.70lb ai A^{-1} applied 45 DBO + 30 DBO + Dec., respectively, Banner 1.1EC (propiconazole) at 2.24 + 2.24 + 0.75lb ai A^{-1} applied 45 DBO + 30 DBO + Dec., respectively, and an untreated. Data collected included *Poa trivialis* cover and *Poa annua* control rated separately on scales of 0 to 100% with 100% representing complete coverage or control. Mean separations were performed using Duncan's New Multiple Range Test (P=0.05).

Treatments resulting in best (80%) *Poa annua* control and *Poa trivialis* establishment comparable to the untreated included Ronstar at 2lb ai A^{-1}, Dimension applied twice at 0.25, 0.38, and 0.5lb ai A^{-1}, Rubigan, Patchwork, Sentinel, and Banner. Dimension applied three times at 0.25lb ai A^{-1} and Prograss provided *Poa annua* control, but prevented *Poa trivialis* establishment. Eagle treatments did not affect *Poa trivialis* establishment, but did not control *Poa annua* at rates and timings used. Future research will include long-term pre and postemergence control of Poa annua with DMI or other potential herbicides or plant growth regulators.

FLUROXYPYR ALONE AND IN MIXTURES WITH OTHER HERBICIDES FOR THE CONTROL OF SERICEA LESPEDEZA (*Lespedeza cuneata*) IN GRASSLANDS. D.C. Cummings, J.F. Stritzke, and J.A. Nelson, Department of Plant and Soil Sciences, Oklahoma State University, Stillwater, OK 74078, and Dow Agrosciences, Cedar Park, TX.

ABSTRACT

Sericea lespedeza (*Lespedeza cuneata*) is an allelopathic, long-lived perennial legume introduced into the southeastern U.S. for erosion control. Due to its aggressive population dynamics, sericea is now considered a weed and can become the dominant grassland species if not managed properly. Altom and Stritzke (1989) and Fick (1990) reported that triclopyr resulted in greater than 90% control on sericea, while control with picloram, dicamba, and 2,4-D was less than 50%. In addition, Altom and Stritzke (1990) reported greater than 95% sericea stem reduction with fluroxypyr at 0.5 lb ae/A, 1 year after treatment (YAT). The objectives of this research were: 1) to compare sericea lespedeza control with fluroxypyr and triclopyr at three application timings, and 2) to evaluate sericea control by fluroxypyr alone and in combination with other herbicides. All herbicide applications were made with a pressurized CO_2 backpack sprayer, 20 gallons per acre spray volume. All herbicide treatments had 0.25 % v/v non-ionic surfactant added to the spray mixture.

In 1995, two experiments were established in central Oklahoma on bermudagrass pasture to compare sericea control with triclopyr (0.5 and 0.75 lb ae/A) and fluroxypyr (0.188 and 0.5 lb ae/A) at three application timings. Herbicides were applied in June, July, and September. All herbicide treatments significantly reduced ($P<0.05$) established stems of sericea compared to the untreated check 4 YAT. Both rates of triclopyr and fluroxypyr provided good control 4 YAT when applied in June or July (<0.2 stems/ft^2 remaining when treated with herbicide vs. 1.1 stems/ft^2 in the untreated). September applications were generally not as effective as June and July applications.

A third experiment was established in central Oklahoma in 1998, on bermudagrass pasture to evaluate rate responses of herbicides applied in June. Herbicide treatments included: triclopyr (0.25, 0.5 and 0.75 lb ae/A), fluroxypyr (0.09,

0.188, 0.28 lb ae/A) and a 1:1 mixture of picloram + fluroxypyr (0.17, 0.25 and 0.33 lb total ae/A). Established stems of sericea were significantly reduced by all herbicide treatments at 1 and 2 YAT. There were no significant differences in sericea stem densities among herbicide treatments 1 YAT. However, by 2 YAT there were significantly more ($P<0.05$) sericea stems in the low rates of fluroxypyr alone and in a mixture with picloram, than in the other seven herbicide treatments. With these seven herbicide treatments, stem densities of established plants were less than 3.3 stems/ft^2 compared to 7.8 in the untreated check.

A fourth experiment was established in north central Oklahoma in 1999, on a tallgrass prairie site to compare first year sericea lespedeza brownout and stem reduction 1 YAT. Herbicide treatments included: triclopyr (0.5 lb ae/A), triclopyr + fluroxypyr (amine) in a 3:1 ratio (0.36 and 0.5 lb ae/A), fluroxypyr alone (0.188 and 0.28 lb ae/A) and triclopyr + fluroxypyr (ester) in a 3:1 ratio (0.34 lb ae/A). Sericea lespedeza control (brownout) 1 month after treatment (MAT) was greater than 90 % with all treatments except the triclopyr + fluroxypyr (amine) at 0.36 lb ae/A (only 72 % control). One YAT there was a significant reduction ($P<0.05$) of established sericea with the herbicide treatments (<1.2 stems/ft^2 with the herbicide treatments compared to 28 stems/ft^2 in the no herbicide check). There were no significant differences in sericea stem densities among herbicide treatments 1 YAT. Sericea forage production 1 YAT was significantly reduced by all herbicide treatments. Less than 400 lb/A of sericea forage was produced in the herbicide treated plots compared to 3500 lb sericea/A in the unsprayed check. Native tallgrass forage production was decreased by > 2000 lb/A in the no herbicide treatment, due to the abundance of sericea.

In these experiments, fluroxypyr was approximately three times more active on sericea lespedeza than triclopyr. Fluroxypyr at 0.188 lb ae/A controlled sericea 2 YAT as consistently as triclopyr at 0.5 lb ae/A. In addition, pre-mixes of triclopyr or picloram, with fluroxypyr did not enhance the sericea control in the year of application or in the following years, but did provide similar suppression at lower fluroxypyr rates up to 1 YAT.

RESPONSE OF OKS 91-11 BERMUDAGRASS TO VARYING RATES OF PRIMO LIQUID (TRINEXAPAC-ETHYL). T.B. Scroggins,* D.L. Martin, D.S. Murray, G.E. Bell, and C.J. Gray. Oklahoma State University, Stillwater, OK.

ABSTRACT

Plant growth regulators (PGRs) have become an important component of many turf management programs. They reduce mowing frequency and maintenance cost. For PGRs to be effective, they must reduce the shoot growth without causing an unacceptable level of injury to the plant.

Field experiments conducted in 1999 and 2000 at the Oklahoma State University Turf Research Center near Stillwater, OK evaluated the response of OKS 91-11, a new seeded bermudagrass cultivar, to Primo Liquid (trinexapac ethyl). This research was a combination of two separate studies that included two different management practices on the OKS 91-11 bermudagrass cultivar. The first study was conducted on a golf course simulated fairway using a 1.3 cm mowing height and the second study was on a simulated lawn using a 3.8 cm mowing height. The experimental areas were an established stand of OKS 91-11. The experimental design was a randomized complete block with three replications of treatment. Plot size was 1.4 x 3.0 m. The soil type was a sandy loam soil containing 2.2% organic matter and having a pH of 6.7. Primo Liquid treatments for each study were applied using an air pressurized bicycle sprayer on 12 July, 1999 and on 7 July, 2000. Treatments used in the fairway simulated study were: untreated check, 0.05 kg ha^{-1}, 0.10 kg ha^{-1}, 0.15 kg ha^{-1}, and 0.20 kg ha^{-1} with 0.10 kg ha^{-1} being the labeled rate. Treatments used in the lawn simulated study were: untreated check, 0.1 kg ha^{-1}, 0.2 kg ha^{-1}, 0.3 kg ha^{-1}, 0.4 kg ha^{-1}, and 0.5 kg ha^{-1} with 0.3 kg ha^{-1} being the labeled rate of Primo. Plots were visually rated for color, quality, and phytotoxicity on a weekly basis for 8 week after treatment (WAT). Shoot counts were taken on a bi-weekly basis. Clippings were collected weekly for 8 WAT and measured for wet and dry mass as well as a wet mass volume. A walk behind reel mower with catcher was used to collect the clippings that were taken from the middle of each plot in an area 0.5 m wide by 3.0 m long.

Turf visual quality initially decreased at the labeled rate and higher rates in both years of each study. Treatments showed little difference in quality after 3 WAT. Turf in each study showed phytotoxicity effects due to the application of Primo Liquid. Phytotoxicity was observed more often on the lawn-simulated study than on the fairway-simulated study, and the higher the rate applied, the more phytotoxicity seen. The clipping weight reduction effect was highly significant during both years and on both studies, when the labeled rate and higher rates of Primo Liquid were applied. When comparing the labeled rate to the higher rates applied, a even lower reduction in clipping weight was not seen. In the lawn-simulated study, clipping yields were reduced for a longer time than in the fairway-simulated study. This was likely due to higher use rates in the lawn-simulated study.

Results of this research suggest that close attention must be paid when selecting a use rate for Primo Liquid, and that the user must closely consider the individual cultivar within species as well as the turf cutting height when deciding upon the use rate. Addition use rate research is needed on a number of new bermudagrasses that have recently entered the market place. Finally, it is important to note that a new formulation of (trinexapac-ethyl), Primo Maxx, was released in 2000. Research is needed to determine bermudagrass cultivar sensitivity to this new formulation.

EVALUATION OF 23 HERBICIDES FOR CONTROL OF COGONGRASS (*Imperata cylindrica*). J.W. Barnett*, Jr., J.D. Byrd, Jr., D.B. Mask. Department of Plant and Soil Sciences. Mississippi State University, Mississippi State, MS 39762

ABSTRACT

Field studies were conducted in 1999 near Preston, MS and near Poplarville, MS, to determine the efficacy of selected herbicides on cogongrass. In 2000 these studies were duplicated in Lucedale, MS. Treatments included Contain 1AS at 16 & 32 fl oz/A, V10029 80WP at 0.63 oz/A, Asulox 3.34SL at 128 & 192 fl oz/A, Accent 70DG at 0.67 & 1.34 oz/A, Beacon 75WG at 0.76 & 1.52 oz/A, Finale 1SL at 43 & 86 fl oz/A, Escort 60DF at 0.5 & 1 oz/A, Oust 75DG at 2.5 & 5 oz/A, Touchdown 5SL at 37.3 & 74.6 fl oz/A, Roundup Pro 4SL at 160 fl oz/A, Sencor 75DF + MSMA 6L at 8 + 38.4 oz/A, Facet 75DF at 10.7 & 21.4 oz/A, Bladex 4L at 64 & 128 fl oz/A, Diuron 80DF at 20 & 40 oz/A, Bicep 6L at 80 & 160 fl oz/A, Krovar I 80DF at 64 oz/A, MON 37500 75DF at 1.33 oz/A, Telar 75DF at 1 & 2 oz/A, Velpar 2L at 96 & 192 fl oz/A, Hyvar 2SL At 9 & 12 gal/A, Sahara 70WG at 264 oz/A, and Plateau 2SL at 10 fl oz/A. Kinetic at .25% v/v was used with all treatments except Roundup, Krovar I, and Hyvar. Plot sizes were 6 ft x 20 ft, and the application volume was 40 gallons per acre (GPA) at all locations. Plots were visually rated at 21, 42, 84, and 365 days after treatment (DAT) in the Preston and Poplarville sites, and 21, 42, and 84 DAT in the two Lucedale locations. Contain at 32 oz/A, Touchdown 5 at 75 oz/A, Roundup Pro at 160 oz/A, Sahara at 264 oz/A and Hyvar at 9 and 12 gal/A provided between 70 and 100% control of cogongrass up to one year after application.

A second field trial conducted in 2000 at Lucedale, and Poplarville looked at an application timing with four herbicides for control of cogongrass. Treatments include Arsenal 2 AS at 2, 4, 8, and 16 oz/A, Plateau 2 SL at 10 oz/A, Roundup Pro 4 SL at 160 oz/A, and Asulox 3.34 SL at 192 oz/A. Each treatment was sprayed once each month starting in April and ending in September. Ratings were taken at 1 month after treatment (MAT) and again just before dormancy. Kinetic at .25% v/v was used will all treatments except Roundup. Plot sizes were 6 ft x 20 ft, and the application volume was 40 GPA. Arsenal at 16 oz/A showed low 1MAT ratings, pre-dormancy ratings showed a steady climb in rating with treatment applied in April reaching close to 60% control. This indicates that early season applications of Arsenal may be better for cogongrass control than late season applications. Asulox at 192 oz/A showed 85 to 95% control at the 1 MAT rating, but began to decline at dormancy. Therefore, late season applications of Asulox may injure the cogongrass enough that shoot numbers may be substantially reduced at spring green-up. Roundup at 160 oz/A provide good year round control of cogongrass with ratings between 80 and 90%. A third rating at green-up will allow for better evaluation.

WILL POSTEMERGENT GRAMINICIDES AND MOWING CONTROL COGONGRASS (*Imperata cylindrica*)? D.B. Mask, J.D. Byrd, Jr. and J.W. Barnett, Jr. Department of Plant & Soil Sciences, Mississippi State University. Mississippi State, MS 39762.

ABSTRACT

Four field studies conducted in Mississippi during the summers of 1999 and 2000 evaluated postemergence graminicides for cogongrass control. Studies were located at Camp Shelby, Preston, Oswalt, and Hurley. Four postemergent graminicides were evaulated at two rates with either nonionic surfactant or crop oil concentrate and with either single or sequential applications. These included: Assure 0.8EC at 20 or 40 fl oz/A, Poast HC 3.5EC at 18 or 36 fl oz/A, Fusilade DX 2EC at 16 or 32 fl oz/A, and Select at 2EC at 8 or 16 fl oz/A. Two additional graminicides were applied once at two rates with nonionic surfactant: Acclaim 1EC at 39 or 78 fl oz/A and Illoxan 3EC at 43 or 85 fl oz/A. The application volume was 13 gallons per acre, and the plot sizes ranged from 6' X 20' at Oswalt, Hurley, and Preston to 7' X 30' at Camp Shelby. Plots were visually rated at 21, 42, 84, and 365 days after treatment. The plots at Oswalt were burned February 24, 2000 and were sprayed on March 3, 2000, and plots at Hurley were mowed June 15, 2000 and sprayed on June 28, 2000. At the other two locations, plots were left untouched. At 21 days after treatment (DAT), Select @ 16 fl oz/A + crop oil concentrate and Poast HC at 36 fl oz/A with sequential applications gave 62% and 65% control, respectively, at Oswalt. However, at all other locations all treatments provided only 22% control or less. At 42 DAT, all of the treatments provided 68% or greater control and at all other locations Select at 16 fl oz/A + crop oil concentrate applied once or twice provided the best control at 10% to 30 %. At 84 DAT, all treatments at Oswalt provided 40% to 63% control, but for the other locations, Select at 16 fl oz/A + crop oil concentrate provided the best control at 6% to 25%. All treatments at Camp Shelby and Preston provided 0% control, at 365 DAT.

A second field trial was conducted at Oswalt and Waynesboro, to evaluate application timing and number of applications of graminicides for cogongrass control. The plot sizes were 6'X20' at Oswalt and 6'X15' at Waynesboro. The site at Oswalt was burned February 24, 2000 and the site at Waynesboro was burned May 5, 2000. At each of the locations, the last treatment was applied September 20, 2000. Treatments were applied once each month from March at Oswalt or May at Waynesboro through September. In an adjacent area, Select at 16 fl oz/A + coc at 1qt/A was applied sequentially each month from March at Oswalt or May at Waynesboro through September repeated each month. The application volume of these treatments was 40 gallons per acre. The results of this experiment are that Select at 16 fl oz/A + crop oil concentrate applied multiple times, starting early in the summer, provided the best control at the predormancy rating. These plots provided 65% and 38% at 1 month after treatment but control increased to 90% and 90% control at Oswalt and Waynesboro, respectively. However the treatments applied only one time provide control around 30 to 40% at one month after treatment and then drop to 0% control at the predormancy rating.

A mowing study was also conducted during the summer of 2000, to evaluate mowing as a possible control tatic for cogongrass. The mowing frequency included: weekly, biweekly, monthly, bimonthly or no mowing. Two locations was used for this experiment, one near Sturgis and the other in Preston. Plot sizes were 10'X10' at both locations. At both locations, initial plant densities averaged 85 plants/ft^2, but dropped to 22 plants/ft^2 for plots mowed weekly and 36 plants/ft^2 for plots mowed biweekly. With all of these experiments, except the 1999 experiments, a 365 DAT rating and plant densities will be collected to determine, if these experiments will control cogongrass for up to one year.

WEED CONTROL USING A MOWER-HERBICIDE APPLICATOR. J.J. Mullahey, West Florida Research and Education Center, Milton, FL 32571.

ABSTRACT

Melaleuca (*Melaleuca quinquenervia*) is an invasive non-native plant that has become a serious weed problem in natural areas throughout southern Florida. Melaleuca displaces native vegetation resulting in lower biodiversity. Chemical control consists of aerial applications for extensive acreage while treating individual trees controls satellite populations. With chemical control, repeated applications are needed to control escape plants and new plants from seed.

Wax myrtle (*Myrica cerifera)* is a native shrub that invades into south Florida pasture, especially on wet soils where they can form dense monocultures and eliminate bahiagrass production (Kalmbacher and Egar, 1989). Wax myrtle is contained through mowing, chopping, and burning when myrtles are 4-6 feet tall (2-4 years). Chemical control using Remedy (1qt/a) applied in August resulted in 71% control of myrtles greater than 2 feet tall (Kalmabacher and Egar, 1989). Treating myrtles during the late summer months provided the best control. A mower-herbicide applicator combines two weed management practices into one application. Two studies were conducted to evaluate the effect of selected herbicides applied using a Burch Wet Blade (BWB) mower-herbicide applicator on the control of Melaleuca and Wax Myrtle. Both studies were a split plot design with 4 replications conducted in 1998 and repeated in 1999.

Wax myrtle that averaged 3 ft tall was treated in September with selected herbicides (Arsenal 1 pt/a + Garlon 3A 2 qt/a; Vanquish 1 qt/a + 2 qt/a; Garlon 3A at 0.5, 1.0, and 1.5 lb/a; Vanquish 2 qt/a; Arsenal 1 qt/a; and mowing without herbicide) using the BWB or as a broadcast spray application. Wax myrtle control was calculated based on the number of plants per plot and plant height was measured at 3, 6, and 12 MAT. Plant height at 12 MAT was consistently shorter when the herbicides were applied using the BWB compared to the broadcast spray application. For the BWB method, all herbicide treated plants were lower in height than the mow only treatment (2.35 ft). Chemical control of wax myrtle was generally higher when the herbicides were sprayed compared to the BWB method. For the broadcast spray application, the highest control (81%) resulted from the highest rate of Garlon 3A followed by the Vanquish + Garlon 3A mix (78%). Highest control with the BWB was from the Arsenal 1 qt/a treatment (64%) followed by Vanquish 2 qt/a (51%) compared to mowing alone (14%). Regardless of treatment method, repeated herbicide applications will be necessary to control wax myrtle. However, the BWB does have the added advantage of removing (mowing) the standing plant material resulting in faster regrowth from the bahiagrass which results in more grazing time.

Melaleuca (6-9 ft tall) sapling trees were treated in October with five rates of Arsenal (0, 2.5%, 5%, 10%, and 20%) using the BWB mower (2.5 gallons/a) or as a cut stem method. Melaleuca control was measured by visually comparing the control from each herbicide treated plot to the mow only plots at 6 and 12 MAT. Chemical control of Melaleuca was consistently higher when applied using the BWB mower. Control values increased with higher rates of Arsenal. For the BWB mower, 90-100% control resulted when using an Arsenal rate of 5% or higher. With the cut stem method, similar control to the BWB occurred from the different rates of Arsenal but only in 1999. The cut stem method is labor intensive and not practical for controlling young Melaleuca trees in natural areas. A 5% Arsenal solution (1 pt/a) applied using the BWB mower should be considered by land managers for successful control of young Melaleuca trees.

Kalmbacher, R.S. and J. Egar. 1989. Herbicides Can Control Myrtles. The Florida Cattleman and Livestock Journal. August. Kissimmee, Fla.

BERMUDAGRASS RESPONSE TO OASIS®. D.C. Bridges*, T.R. Murphy, and T.L. Grey, Department of Crop & Soil Sciences, The University of Georgia, Griffin, GA 30223, and F.H. Yelverton, Crop Science Department, N.C. State University, Raleigh, NC, 27695.

ABSTRACT

Imazapic is registered for weed control in peanut, native grass and wildflower establishment, conservation reserve programs (CRP), and turfgrass. It suppresses bahiagrass (*Paspalum notatum* Fluegge) at low rates and controls weeds in bermudagrass [*Cynodon dactylon* (L.) Pers.] at higher rates. Recent research and development focuses on using imazapic in combination with 2,4-D for weed control in bermudagrass hay. This combination could provide control of annual grasses, Paspalum spp., nutsedge species, dicot species, Johsongrass [(*Sorghum halepense* (L.)], and possibly smutgrass [*Sporobolis indicus* (L.) R.Br.]. Few options exist for control of grasses in bermudagrass hay with little ability to renovate and improve bermudagrass hayfields that are infested with competing grasses. Some earlier research

indicated injury of bermudagrass on turf and rights-of-way sites with imazapic that may be ubacceptable to hay producers.

The objective was to determine tolerance of common and hybrid bermudagrasses to Oasis®, a premix of imazapic and an ester formulation of 2,4-D. Seven (7) trials were initiated during 2000, five (5) in Georgia (GA) and two (2) in North Carolina (NC) to measure bermudagrass response to post-greenup applications of Oasis®. GA trials included common bermudagrass and four hybrid cultivars: 'Coastal', 'Tift 85', 'Tift 44', and 'Russell'; NC trials included 'Tift 44' and 'Coastal' hybrid bermudagrass. The 'Russell' trial received minimum irrigation. All other trials were non-irrigated. All trials were conducted on established bermudagrass stands. Herbicides were applied to bermudagrass after full greenup, with applications on 27 April 2000 to all trials in GA, except 'Russell', which was applied 13 June 2000. The NC 'Tift 44' trial was sprayed 23 May 2000 and the NC 'Coastal' trial was sprayed 14 August 2000.

Experimental design for each GA trial was a RCB with three reps and included an untreated check and Oasis at 4, 8, and 12 fl. oz/acre, giving (0.063 + 0.125), (0.125 + 0.25), and (0.187 + 0.375) lb ae of imazapic + 2,4-D per acre, respectively. Bermudagrass injury was recorded 21 and 60 days after treatment (DAT), hay yield was measured from two cuttings from each site, and forage quality is yet to be determined from samples collected at each cutting. Bermudagrass injury exceeded 25% for all Oasis treatments 21 DAT in all GA trials. Rate response was observed with 'Coastal', 'Tift 44', and 'Russell'. Injury was approximately 50% with 12 fl. oz of Oasis with 'Coastal', 'Tift 85', and 'Russell'. Approximately 50% injury was observed regardless of Oasis rate with 'Tift 85'. Bermudagrass did not recover by 60 DAT. In fact, in most cases injury was worse 60 DAT than at 21 DAT. Extreme drought and heat conditions persisted from the time of application until well after 60 DAT such that bermudagrass growth was severely limited. Injury 60 DAT ranged from 50 to 90% depending on rate and cultivar. Little injury was observed with 'Russell' 60 DAT, but this trial was established later, did receive some rainfall, and was minimally irrigated. In GA trials, averaged across cultivars bermuda injury 21 DAT was approximately 35, 40, and 50% for Oasis at 4, 8, and 12 fl. oz/acre, respectively; 60 DAT injury was approximately 50, 60, and 70% for the same treatments. First-cutting hay yields were generally reduced with Oasis rates of 8 and 12 fl. oz/acre. Second-cutting hay yields were generally unaffected. Total hay yield was reduced from 15 to 40% with 8 and 12 fl. oz rates, depending on cultivar. These data indicate that Oasis injury to bermudagrass may be severe and persistent under drought stress, but that recovery can be expected under normal growing conditions.

The NC 'Tift 44' trial was an RCBD with 3 reps and included an untreated check and Oasis at 3, 4, 5, and 6 fl.oz/acre. Injury was rated at 1, 2, and 4 weeks after treatment (WAT) and hay was harvested at 4, 9, and 19 WAT. Little rate response was observed 1 and 2 WAT, with injury near 30% for all treatments. Injury 4 WAT was 6, 11, 18, and 23% for 3, 4, 5, and 6 fl.oz rates, respectively. First-cutting yields were dramatically reduced. Yields were 3400, 1100, 900, 900, and 800 lb/a for untreated, 3, 4, 5, and 6 fl. oz rates, respectively. Subsequent cuttings were unaffected. Total hay yields were reduced by approximately one third by Oasis treatment. Similar results were observed in the NC 'Coastal' trial with injury ranging from 20-50%, depending on rate and first-cutting hay yield reductions of approximately 30 and 45% compared to untreated and fertilized checks, respectively.

These data indicate that injury to bermudagrass can be severe during the first four WAT and that first-cutting hay yields will be compromised. Bermudagrass usually recovers with subsequent cuttings unaffected, but recovery may be very slow under adverse conditions.

BERMUDAGRASS CONTROL WITH IMAZAPYR. J.W. Boyd and B.N. Rodgers, University of Arkansas, Little Rock, AR 72203.

ABSTRACT

Experiments were conducted during 1998-1999 and 1999-2000 to evaluate imazapyr for bermudagrass control. A single application of imazapyr at 0.25, 0.5 and 1.0 lb/ai/a alone and tank mixed with 1.5 lb/ai/a of glyphosate was made in May of each year. Additional treatments included a single May application of imazapyr + glufosinate at 0.5 + 1.0 lb/ai/a and three applications (May, July, September) of 1.5 lb/ai/a of glyphosate. Bermudagrass control was evaluated at one year after treatment. 'Meyer' zoysiagrass, was planted in the treated areas after the 1998 study and 'Meyer' zoysiagrass, 'Cavalier' zoysiagrass, centipedegrass, 'Tifway' bermudagrass and St. Augustinegrass were planted in the treated areas the year after the 1999-2000 study.

In both years, imazapyr at 1.0 lb/ai/a provided 100% control of bermudagrass one year after treatment while imazapyr + glyphosate at 1.0 + 1.5 lb/ai/a and three applications of glyphosate at 1.5 lb/ai/a provided >90% control. Mixing glufosinate with imazapyr significantly reduced (40 to 60%) bermudagrass control compared to the same rate of imazapyr alone.

'Meyer' zoysiagrass, 'Cavalier' zoysiagrass, centipedegrass, 'Tifway' bermudagrass, and St. Augustinegrass were successfully established in the areas treated with the 1.0 lb/ai/a rate of imazapyr the year after treatment. Zoysiagrass and St. Augustinegrass exhibited greater tolerance for imazapyr than bermudagrass and centipedegrass.

CENTIPEDEDGRASS TOLERANCE TO PRE AND POST HERBICIDE AND PGR TREATMENTS. T.W. Gannon and F.H. Yelverton. North Carolina State University, Raleigh, NC 27695-7620

ABSTRACT

North Carolina Department of Transportion (NC DOT) currently maintains over 330,000 acres of roadside turf. Of that acreage, 65% is comprised of either Kentucky 31 tall fescue or bahiagrass, species with unsightly foliar growth and seedheads. This excessive growth and seedhead production is also responsible for many accidents due to reduced visibility.

In an effort to reduce the annual operating budget, NC DOT is transitioning new and existing roadsides to alternative species. These species include centipedegrass (*Eremochloa ophiuroides*) and zoysiagrass (*Zoysia japonica*) which possess lower foliar and seedhead heights. With increased use of these species into existing roadsides, herbicide and plant growth regulator (PGR) tolerance is uncertain.

Trials were initiated to investigate the tolerance of centipedegrass at various timings. The trials were conducted using a randomized complete block design over several timings including PRE seeding, at planting, and early post treatments. Products evaluated included atrazine (Aatrex), mefluidide (Embark), clethodim (Envoy), metsulfuron (Escort), sulfometuron (Oust), imazapic (Plateau), simazine (Princep), chlorsulfuron (Telar), and sethoxydim (Vantage).

Applied prior to planting of centipedegrass, sulfometuron (0.5 and 1 oz) were the only treatments to produce significant phytotoxicity. When applied at planting of centipedegrass, imazapic (6 oz), sulfometuron (0.5 oz), metsulfuron (0.5 & 1 oz), and chlorsulfuron (0.125 oz) + mefluidide (0.5 pt) caused a reduction in cover. Applied early post to 1 leaf to 1 tiller centipedegrass, chlorsulfuron (0.125 oz) + mefluidide (0.5 pt), sulfometuron (0.5 &1 oz), and metsulfuron (0.5 & 1 oz) produced phytotoxicity at 24 DAT, however all treatments with the exception of metsulfuron (1 oz) grew out of this injury by 69 DAT.

OASIS FOR PASTURE WEED MANAGEMENT IN FLORIDA AND MISSISSIPPI. J.A. Tredaway Ducar, J.W. Barnett, Jr., D.B. Mask, and J.D. Byrd, Jr., University of Florida, Gainesville, FL and Mississippi State University, Starkville, Mississippi.

ABSTRACT

Smutgrass (*porobolus pyrabilus*)and vaseygrass (*Paspalum urvillei*) are problem weeds in pastures of Florida and Mississippi. Currently, no herbicides are available that will selectively control these weeds. Oasis, a BASF herbicide, is a mixture of 2,4-D ester + imazapic and may have activity on these problem weeds.

Experiments were conducted in four Florida locations and six Mississippi locations to evaluate Oasis for controlling smutgrass and vaseygrass and to determine crop tolerance in bahiagrass (*Paspalum notatum*) and bermudagrass (*Cynodon dactylon*) pastures. Treatments were applied using a CO2 sprayer at 19 or 20gpa. A nonionic surfactant was applied at 0.25% v/v. Varieties of bahiagrass evaluated included Argentine, Pensicola, and common in Florida and in common bermudagrass and bahiagrass in Mississippi. Oasis was evaluated at 4, 5, 6, and 8 oz/A in Florida trials and at 4, 6, 8, 10, and 12 oz/A in Mississippi. Velpar (3 pt/A) was included as the standard treatment in Mississippi. Treatments were applied pre and postbloom in Mississippi. An untreated check was included in all trials.

Smutgrass was controlled > 80% 4 WAT at one Florida location in North Florida regardless of rate applied. Control was <70% at 8 WAT with all treatments in the same location. Smutgrass was controlled 75% at other North Florida location with rates of 4, 5, and 6 oz/A at 4 WAT but reduced to <30% control at 8 WAT. In Central Florida, smutgrass was controlled 80 and 90% at 6 and 8 oz/A, respectively, 6 WAT but declined to <30% control 10 WAT with all rates. Following a rainfall, smutgrass was increased to 50% at the 8 oz/A rate. Smutgrass control was <60% regardless of rate when applied prebloom at 4 locations in Mississippi 8 WAT. However, it was controlled 60, 70, and 80% at the 8, 10, and 12 oz/A rates respectively, when applied postbloom. Control was maintained above 60% at the 12 oz/A rate for the prebloom treatments but decreased to <40% with all postbloom treatments at 17 WAT. Velpar control was 60% prebloom and 40% postbloom 60 DAT and 50 and 30% postbloom at 120 DAT.

Vaseygrass was controlled >80% with all rates in Florida except at 4 and 6 oz/A at 4 WAT in North Florida. Control was maintained at 80% with all rates at all locations except for the 4 oz/A rate. Vaseygrass control exceeded 80% prebloom and 70% postbloom 4 WAT in Mississippi regardless of rate while Velpar provided 50 and 70% pre- and postbloom. Control was maintained at 8 WAT with all pre- and postbloom applications regardless of rate. Velpar remained at 70% for both application timings. Prebloom control was maintained at >80% at 17 WAT with all Oasis rates while Velpar provided 60% control.

All varieties of bahiagrass were injured <20% 4 WAT but increased to >60% by 8 WAT in all Florida locations. All rates of Oasis injured bermudagrass <30% at 4 WAT regardless of timing with the exception of the 10 and 12 oz/A rates. Injury at the 10 and 12 oz/A rate was 32 and 43%, respectively when applied postbloom. Bermudagrass injury did not exceed 30% with Velpar applications regardless of timing. Bermudagrass hay protein content remained between 10 and

15% regardless of treatment and ADF was >30%. Yields were not different with Oasis or Velpar treatments except when applied at the 12 oz/A rate.

In summary, Oasis has activity on several problem weeds including smutgrass and vaseygrass. Control is decreased throughout the season and is largely dependent on soil moisture. Bahiagrass, regardless of variety, is not tolerant to higher rates of Oasis. Bermudagrass injury increased and yield and ADF decreased with all treatments. Vaseygrass displayed greater control with Oasis applications when compared to Velpar. The optimal rate for Oasis was 6 oz/A. Smutgrass control was comparable with Oasis and Velpar applications with the optimal rate being 10 oz/A. Postbloom Oasis applications provided better control than prebloom.

PREEMERGENCE CRABGRASS (*Digitaria spp.*) CONTROL IN TURF. B.T. Bunnell*, J.K. Higingbottom, and L.B. McCarty. Clemson University, Department of Horticulture Clemson, SC. 29634-0375.

ABSTRACT

Preemergence crabgrass (*Digitaria spp.)* control in turf is annually performed with a variety of chemicals at various application timings and rates. The crabgrass species is a spring and summer annual which invades uniform turf areas with its coarse texture, off green color, and prostrate growth habit. The objective of this research was to observe the efficacy of various herbicides at various rates and timings for preemergence control of crabgrass in turf-type tall fescue (*Festuca arundinaceae*) and common bermudagrass (*Cynodon dactylon*).

Two studies were performed the spring and summer of 2000. The turf-type tall fescue study was performed on Clemson University's irrigated research plots. The common bermudagrass study was performed on a non-irrigated golf course rough near Clemson, SC. Treatments included single and sequential applications of Barricade 65 WG (prodiamine) and Dimension 1 EC (dithiopyr) at 0.5 lbs ai/A and 0.38 lbs ai/A followed by (fb) 0.38 lbs ai/A. Single and sequential rates of Pendulum 60 WG (pendimethalin), Ronstar 2 G (oxidiazon), Surflan 4L (oryzalin), and Team Pro 0.86 G (benefin + trifluralin + 19-3-7) were applied at 3.0 lbs ai/A and 1.5 lbs ai/A fb 1.5 lbs ai/A. The bermudagrass study did not include treatments of Ronstar and Team Pro. Initial applications for both studies were made on March 6, 2000 and sequential applications followed 2 months after initial treatment (MAIT) on May 4, 2000. Crabgrass control was visually rated on a 0-100% scale with 100=complete control. Visual turf injury was rated on a 0-100% scale with 30=maximum level of acceptable injury.

The turf-type tall fescue study showed excellent ($95%) crabgrass control with single and sequential applications of Barricade and Team Pro at 4 MAIT. Good control (85 to 95%) followed single and sequential applications of Pendulum and Ronstar and sequential applications of Dimension and Surflan. All other treatments provided 70 to 80% control of crabgrass at 4 MAIT. By 5 MAIT, acceptable control ($70%) followed single and sequential applications of Barricade and Team Pro, a single application of Ronstar, and a sequential application of Surflan. Both applications of Team Pro and sequential applications of Barricade provided greater than 90% control. All other treatments did not provide acceptable crabgrass control beyond 4 MAIT. No significant fescue injury was observed

The common bermudagrass study showed excellent ($95%) control with all treatments except the single application of Dimension at 5 MAIT. By 6 MAIT, excellent control followed single and double applications of Surflan. Good control (85 to 95%) control followed single and double applications of Barricade and double applications of Pendulum and Dimension. No common bermudagrass injury was observed.

In summary, best crabgrass control in tall fescue followed single and sequential applications of Team Pro and sequential applications of Barricade. In bermudagrass, best crabgrass control options include single and sequential applications of Surflan and sequential applications of Barricade and Dimension. Future research will continue with preemergence herbicides for crabgrass and other grassy weed control. Adjustments in application timings, rates, and fertilizer formulation may improve herbicide efficacy.

BROADLEAF WEED CONTROL IN BERMUDAGRASS TURF. J.M. Taylor, G.E. Coats, J.C. Arnold, and K.C. Hutto. Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Studies were conducted at the Plant Science Research Center at Mississippi State University to evaluate the pyridine herbicides, clopyralid and fluroxypyr, and the effect of the synergist diflufenzopyr on dicamba and quinclorac for broadleaf weed control in dormant bermudagrass turf.

In the first two experiments, the treatments were 0.25 lb ae/A clopyralid, 0.28 lb ae/A fluroxypyr, 0.25 + 0.28 lb/A clopyralid + fluroxypyr, 0.12 followed by (fb) 0.12 lb/A clopyralid 30 days after initial treatment (DAIT), 0.14 fb 0.14 lb/A fluroxypyr 30 DAIT, and 0.12 + 0.14 lb/A clopyralid + fluroxypyr fb 0.12 + 0.14 lb/A clopyralid + fluroxypyr 30 DAIT. These treatments were compared to a standard treatment of 0.76 + 0.4 + 0.08 lb ae/A 2,4-D + MCPP + dicamba. In the first experiment the treatments were applied in a spray volume of 40 gallons per acre (GPA) to dormant

bermudagrass infested with buckhorn plantain (15 to 20-lf), Carolina geranium (8-lf), and field madder (8-node) on March 2, 2000. The single application of clopyralid controlled buckhorn plantain 83% at 28 or 67 DAIT. This was higher than the split application of clopyralid (63 to 75%) or the single or split applications of fluroxypyr (20% or less) and was equal to a single application of clopyralid + fluroxypyr or 2,4-D + MCPP + dicamba (76 to 88%). Fluroxypyr as a single or split application controlled Carolina geranium 18% or less at 28 or 67 DAIT. The highest control of Carolina geranium at 67 DAIT was with the split application of clopyralid + fluroxypyr (88%) or 2,4-D + MCPP + dicamba (87%). Comparable Carolina geranium control was observed with fluroxypyr + clopyralid (74%) or clopyralid (68%). All treatments controlled common vetch 90% at 28 or 67 DAIT. Field madder control was 78 to 81% with any treatment containing fluroxypyr compared to 60% or less with other treatments. The greatest increase in bermudagrass density observed at 112 DAIT was following the single application of clopyralid + fluroxypyr. The average density of this treatment was 70% compared to 23% for the untreated. Fluroxypyr applied alone as a single or split application did not increase bermudagrass density compared to the untreated.

These same treatments were applied to Virginia buttonweed with treatments being initiated on July 17, 2000. The approximate coverage of Virginia buttonweed was 50 to 70% and plants were flowering. The best control of Virginia buttonweed at 42 DAIT were the single or split application combinations of clopyralid + fluroxypyr (83 to 90%) compared to 60% control with 2,4-D + MCPP + dicamba.

In a third experiment, 0.05 lb ai/A diflufenzopyr was tank-mixed with 0.3 lb ae/A dicamba or 0.75 lb ai/A quiclorac. The application date and weed stage at treatment were the same as the first experiment. With the exception of Carolina geranium control at 67 days after treatment (DAT), where control with quinclorac was equal to the combination of quinclorac + diflufenzopyr, synergy was observed with combinations of diflufenzopyr plus either dicamba or quinclorac. Synergism was calculated using Colby's formula plus the calculated LSD. At 28 DAT, diflufenzopyr + dicamba or quinclorac controlled of buckhorn plantain 74 to 88% compared to 20% or less with any of these products alone. Carolina geranium control at 28 DAT was 75 to 80% with the combinations compared to 35% or less with the products applied alone. Field madder control was 70 to 80% with the tank-mixes compared to 45% or less with the products applied alone.

BERMUDAGRASS GROWTH SUPPRESSION WITH PACLOBUTRAZOL AND TRINEXAPAC-ETHYL.
F.H. Yelverton, J.D. Hinton, T.W. Gannon, and L.S. Warren. North Carolina State University, Raleigh, NC 27695-7620

ABSTRACT

With the development of existing and new plant growth regulators (PGRs), the turf industry is beginning to rely on them for reasons such as seedhead suppression, reduced mowing frequency, etc. Trinexapac-ethyl and paclobutrazol are commonly used in high maintenance turf areas by professionals because of their effectiveness in reducing biomass production and also enhancing turf quality. These PGRs also reduce internode lengths resulting in a more dense turf canopy that is desirable among the turf industry.

Bermudagrass growth suppression with various PGRs has been well documented. Field trials were conducted in 1998, 1999, and 2000 using randomized complete block designs evaluating different rates and timings of trinexapac-ethyl, paclobutrazol, and others to determine optimum results. Plots were maintained as a fairway (0.5 inch) and clippings were caught on a weekly basis beginning 1 wk after treatment. Clippings were oven-dried and biomass was recorded. Data were subjected to analysis of variance and means were separated according to LSD (P=0.05).

Trinexapac-ethyl, with repeat applications at 12 – 16 oz/a, was more consistent at suppressing bermudagrass growth than was paclobutrazol at 24 – 32 oz/a along with other PGRs tested. Growth suppression was observed with trinexapac-ethyl through 9 wk after initial treatment. Although more effective, quality reductions with trinexapac-ethyl may occur with repeat applications.

POSTEMERGENCE CONTROL OF DALLISGRASS (*PASPALUM DILATATUM*) IN BERMUDAGRASS FAIRWAYS. F.C. Waltz Jr.*, J.K. Higingbottom, and L.B. McCarty. Clemson University, Clemson, SC 29634.

ABSTRACT

Weedy grass species like dallisgrass (*Paspalum dilatatum*), a clumped warm season perennial that reproduces by seed and short rhizomes, are difficult to selectively control in bermudagrass (*Cynodon* sp.) turf. Dallisgrass is common in the Southeastern United Sates and due to its coarse texture and unsightly seedheads, disrupts the aesthetics of golf course fairways. Two field experiments were initiated to evaluate various rates and tank mix combinations of Plateau (imazameth) for dallisgrass control and bermudagrass tolerance.

For both studies, plots were established on a common bermudagrass driving range and maintained by the staff of Boscobel Golf Club in Pendelton, South Carolina. In study 1, plots were 3 m x 3 m in a randomized complete block design with 3 replications. Using a CO_2 backpack sprayer set to deliver 187 l ha^{-1}, postemergence treatments were applied on May 10, 2000 with a reapplication on June 23, 2000 (7 weeks after initial treatment). Treatments included

Plateau at 0.05, 0.07, 0.09, and 0.11 kg ai ha^{-1}, and MSMA at 2.24 kg ai ha^{-1}. Methylated seed oil at 1.875% v/v was tank mixed with all treatments.

In study 2, plots were 1 m x 2 m in a randomized complete block design with 3 replications. A single postemergence treatment was applied on August 14, 2000 using a CO_2 backpack sprayer set to deliver 187 l ha^{-1}. Treatments included Plateau (0.07 kg ai ha^{-1}), Drive (quinclorac) (0.84 kg ai ha^{-1}), MSMA (2.24 kg ai ha^{-1}), Plateau + Drive (0.07 + 0.84 kg ai ha^{-1}), Plateau + MSMA (0.07 + 0.84 kg ai ha^{-1}), Plateau + Turflon ester (triclopyr) (0.07 + 1.12 kg ai ha^{-1}), Plateau + Drive + MSMA (0.07 + 0.84 + 2.24 kg ai ha^{-1}), Plateau + MSMA + Turflon ester (0.07 + 2.24 + 1.12 kg ai ha^{-1}), and Drive + MSMA + Turflon ester (0.84 + 2.24 + 1.12 kg ai ha^{-1}). Methylated seed oil was not added.

For both studies, an untreated control was included and ratings for visual dallisgrass control ratings were made on a 0% to 100% scale, 0%= no control, and 100%= complete control, 70% control was considered minimally acceptable. Also, bermudagrass injury was rated on a 0% to 100% scale, 0%= no visible injury or discoloration and 100%= brown dead turfgrass, 30% was considered the maximum allowable injury.

In study 1, good (> 80%) dallisgrass control was observed 12 weeks after initial treatment (WAIT) in plots treated with the highest rate of Plateau (0.11 kg ai ha^{-1}) and MSMA. Bermudagrass injury at this rating date was greater for all the Plateau treatments (15% to 40%) than for plots treated with MSMA (0% injury). These two treatments continued to provide acceptable (> 70%) control at 14 WAIT with no visible bermudagrass injury.

In study 2, only the treatments which contained Plateau and MSMA (Plateau + MSMA, Plateau + Drive + MSMA, and Plateau + MSMA + Turflon ester) provided acceptable (> 70%) control at 6 WAIT. At 2 WAIT, unacceptable (> 30%) bermudagrass injury was observed with treatments containing Plateau. However, at 4 WAIT bermudagrass injury was minimal (< 5%) for all treatments except Plateau + Turflon ester and Plateau + MSMA + Turflon ester which had injury rating exceeding 40%.

From these studies, it appears for effective control of dallisgrass, multiple applications will be necessary and MSMA is needed for acceptable, long-term control. Unacceptable bermudagrass injury can be expected within the first couple of weeks following treatments containing the tested rates of Plateau. Further research involving herbicide rates and combinations, effects on various species of bermudagrass, and various biotypes of dallisgrass are needed.

CGA 362622 FOR PERENNIAL WEED MANAGEMENT IN WARM SEASON TURFGRASSES. T.C. Teuton, B.J. Brecke, J.B. Unruh, G.E. MacDonald, and J.A. Tredaway. University of Florida, Gainesville, FL 32611, University of Florida, West Florida Research and Education Center, Jay, FL 32565.

ABSTRACT

Experiments were conducted during 1998, 1999, and 2000 at the University of Florida, West Florida Research and Education Center for perennial weed management in warm season turfgrasses with the experimental compound CGA 362622. Perennial control was evaluated in established bermudagrass (*Cynodon spp.*) varieties Tifway 419 and Floratex were treated with CGA 362622 at .022 to 066 lb a.i./A in single and multiple applications. Efficacy ratings were taken for torpedograss (*Panicum repens* L.), purple nutsedge (*Cyperus rotundus* L.), yellow nutsedge (*Cyperus esculentus* L.), and green kyllinga (*Cyperus brevifolius* (Rottb.) Hassk.). TifEagle bermudagrass and Bitterblue, Delmar, Floratam, Palmetto and Raleigh St. Augustinegrass' (*Stenotaphrum secondatum* (Walt.) Kuntze) were also evaluated for tolerance to CGA 362622 at 0.022 to 0.066 lb a.i./A in single and multiple applications. Treatments were applied using a CO_2 backpack sprayer set at 20 psi and calibrated to deliver 20 gpa spray volume. Plots were 5 feet wide and 5 to 10 feet long. Turfgrass damage was rated on a scale of 0-9 (0= death, 9= no damage) and weed control was measured on a scale of 0-100 (0= no control, 100= complete control).

Multiple applications of CGA 362622 applied at 0.044 lb a.i./A 6 weeks apart provided excellent control of torpedograss. Single applications of CGA 362622 applied at 0.044 lb a.i./A provided good to excellent control of purple nutsedge, yellow nutsedge, and green kyllinga. TifEagle bermudagrass had excellent tolerance to multiple rates and applications of CGA 362622. All St. Augustinegrass varieties exhibited tolerance to one applications of CGA 362622 at 0.044 lb a.i./A, while only Floratam was tolerant to multiple applications 4 weeks apart at this rate. Bitterblue, Delmar, and Floratam were tolerant to one application of CGA 362622 at 0.066 lb a.i./A, but Palmetto and Raleigh were not tolerant. Bitterblue, Floratam, and Raleigh were tolerant to multiple applications 4 weeks apart of CGA 362622 at 0.022 lb a.i./A, while Delmar and Palmetto exhibited no tolerance at these application rates.

ALTERNATIVE CRABGRASS (DIGITARIA SPP.) CONTROL STRATEGIES FOR SOUTHERN LAWNS UTILIZING QUINCLORAC AND SEVERAL PREEMERGENT HERBICIDES. M.G. Prinster and R.D. McQueen, TruGreen ChemLawn, Douglasville, GA 30134

ABSTRACT

Crabgrass is an aggressive annual weed that thrives in home lawns in the southern United States. Sequential applications of preemergent herbicides are commonly used by lawn care operators (LCOs) to control crabgrass in warm and cool season lawns. Quinclorac is a new herbicide that has postemergent activity on crabgrass. These studies were designed to evaluate the use of quinclorac in combination with several preemergent herbicides to determine if alternative, more flexible application strategies would provide a desirable level of crabgrass control – especially for accounts sold late in the season.

Two field experiments were conducted in 1999 in Douglasville, GA on ‘K-31’ tall fescue and common bermudagrass. The sites chosen for these studies historically had a very high population of smooth (*Digitaria ischaemum*) and southern (*Digitaria ciliaris*) crabgrass. Three treatment strategies were evaluated on these turfs: **Strategy 1** - standard sequential preemergence applications made on March 13 + May 10. Herbicides and rates (lb ai/A) were: pendimethalin 1.5 + 1.5, prodiamine 0.38 + 0.38, dithiopyr 0.25 + 0.25 and quinclorac 0.75 + 0.75. **Strategy 2** – a pre- postemergent herbicide mix applied on May 10 at 2-3 leaf stage of crabgrass followed by a postemergence application on July 14. Treatments included pendimethalin 1.5 + quinclorac 0.75 followed by quinclorac 0.75 alone, prodiamine 0.38 + quinclorac 0.75 followed by quinclorac 0.75 alone and dithiopyr 0.25 + quinclorac 0.75 followed by quinclorac 0.75 alone. **Strategy 3** – a one-time pre- postemergence application made on May 10. These treatments included pendimethalin 2.0 + quinclorac 0.75, prodiamine 0.5 + quinclorac 0.75, and dithiopyr 0.38 + quinclorac 0.75. Treatments were applied with a CO_2 pressurized sprayer equipped with TeeJet 8004 LP flat fan nozzles calibrated to deliver 87 GPA. Turf injury was observed for several weeks following each application and crabgrass control was rated in July, August and September.

<u>Tall Fescue Results</u>:
Pendimethalin, prodiamine and dithiopyr caused no injury to tall fescue, however the May and July applications of quinclorac caused some degree of turf injury. Generally, the warmer the soil temperature the greater the injury to tall fescue. The July application caused marginally unacceptable turf injury (>30%). Injury was expressed as a slight chlorosis and an overall limp appearance of the turf.

At the July 13 crabgrass control rating all sequentially applied preemergence herbicides (Strategy 1) gave commercially acceptable crabgrass control (>80%) but by Aug. 6 prodiamine was the only product that provided acceptable results. By Sept. 1 none of these Strategy 1 treatments gave commercially acceptable crabgrass control. Summer stresses caused a gradual decline in the tall fescue canopy and an overall reduction in competition to the crabgrass. All Strategy 2 pre-postemergence applications (May 10) that were followed by a July 14 application of quinclorac gave excellent season-long results regardless of the preemergence herbicide used. All one-time pre- postemergence applications (Strategy 3) failed to provide acceptable crabgrass control through August.

<u>Bermudagrass Results:</u>
Common bermudagrass was quite tolerant to pendimethalin, prodiamine and dithiopyr but was injured by all quinclorac applications. Bermudagrass initially turned chlorotic followed by purple leaf banding 1 – 2 weeks later. Injury was considered unacceptable (>40%) at the May and July application timing.

All three application strategies provided excellent crabgrass control (>90%) in common bermudagrass regardless of the preemergence herbicide that was used. Pendimethalin, prodiamine and dithiopyr provided similar results whether sequentially applied alone or in combination with quinclorac. Sequential applications of quinclorac also gave acceptable results. Bermudagrass was very aggressive during summer months and once the initial population of crabgrass was eliminated, turf competition helped to prevent a secondary infestation.

EFFICACY OF PREEMERGENCE AND POSTEMERGENCE HERBICIDES IN CENTIPEDEGRASS SOD PRODUCTION. T.R. Murphy, The University of Georgia, Griffin.

ABSTRACT

In Georgia, centipedegrass is produced on an estimated 7,000 acres. Additionally, centipedegrass seed is produced on approximately 2,500 acres. In both sod and seed production fields centipedegrass is usually established by direct seeding. Weeds are the number one production problem during establishment. Typical weed control programs in established sod fields include repeated mowing, the use of atrazine applied POST for broadleaf weed control, and sethoxydim for annual grass control. However, it would be desirable to use preemergence herbicides applied immediately after seeding as intense rainfall and/or irrigation regimes often makes timely mowing difficult.

Experiments were conducted in Macon County, Georgia in 2000 to: a) determine the tolerance of direct-seeded centipedegrass to preemergence herbicides and, b) determine the tolerance of centipedegrass regrowing from 4 inch ribbons from a previous sod harvest to postemergence herbicides. ‘TifBlair’ centipedegrass was drilled 0.25 in. deep

at a rate of 20 lbs./acre on May 13, 2000. The site was rolled with a water-filled roller immediately after seeding. The soil type was a loamy sand with a pH of 1.9. Selected preemergence herbicides were applied immediately after seeding. At another site, selected postemergence herbicides were applied on July 13, 2000 to centipedegrass that had 2 to 12 in. stolons regrowing from a 4 in wide ribbon left by a previous sod harvest. In both experiments herbicides were applied at 25 gpa. Plot size was 5 ft. wide by 15 or 20 ft. in length. Treatments were replicated four times and arranged in a randomized complete block design.

Direct-Seeded Experiment. At 44 and 56 days after treatment (DAT) imazapic at 0.063 and 0.094 lbs. ai/acre reduced seeded centipedegrass density 31 to 54%. Imazapic at 0.032, and imazethapyr at 0.032, 0.063 and 0.094 lbs. ai/acre did not reduce seeded centipedegrass density. Similarly, no density reductions were observed with atrazine and simazine at 1.0 and 2.0 lbs. ai/acre. Seeded centipedegrass density reductions with sulfometuron at 0.047 and 0.094 lbs. ai/acre ranged from 43 to 81% at 44 and 56 DAT. At 170 DAT only sulfometuron suppressed centipedegrass seedhead emergence. Suppression for sulfometuron at 0.047 and 0.94 lbs. ai/acre was 71 and 83%, respectively.

Regrowth Experiment. Postemergence herbicides evaluated were: imazapic at 0.032, 0.063 and 0.094 lbs. ai/acre; imazethapyr at 0.032, 0.063 and 0.094 lbs. ai/acre; sulfometuron at 0.047 and 0.094 lbs. ai/acre; metsulfuron at 0.009 and 0.018 lbs./acre; atrazine at 1.0 and 2.0 lbs. ai/acre and triclopyr + clopyralid at 0.375 and 0.75 lbs. ai/acre. Nonionic surfactant at 0.25% v/v was included with all herbicides except atrazine. Centipedegrass injury was less than 20% at evaluations. However, at 14, 28 and 56 DAT imazapic injured (9 to 19%) centipedegrass than imazethapyr (4 to 11%) at the same rate. Similarly, at the same evaluations metsulfuron injured (8 to 10%) centipedegrass more than sulfometuron (0 to 4%). Atrazine and triclopyr + clopyralid were noninjurious to centipedegrass. With the exception of imazapic at 0.032 and 0.063 lbs. ai/acre, imazethapyr at all rates and atrazine at 1.0 lbs. ai/acre, all herbicides provided $\geq$83% control of Florida pusley and $\geq$75% control of sicklepod. All herbicides provided $\geq$77% control of Palmer amaranth.

IMPACT OF QUINCLORAC ON NEWLY SPRIGGED WARM-SEASON TURFGRASSES. J.B. Unruh and B.J. Brecke. University of Florida, Institute of Food and Agricultural Sciences, West Florida Research and Education Center, Jay, FL.

ABSTRACT

Weed control on newly sprigged warm-season turfgrass is paramount to having a successful, rapid established turf. Conventional herbicide programs using dinitroanilines herbicides typically cause aberrant rooting thus retarding the grow-in. Oxidiazon is the industry standard and sole option for preemergence weed control in newly sprigged warm-season turf. A possible new alternative is quinclorac, an herbicide belonging to a new class of highly selective auxin-type herbicides. In sensitive broadleaf weeds, typical auxin-type herbicide symptoms (cupping and twisting) are expressed. In sensitive grass species, however, quinclorac causes inhibition of shoot and root growth with subsequent tissue chlorosis and necrosis, not typical of other auxin-type products. In the southern United States, quinclorac has been successfully used to control torpedograss (*Panicum repens* L.) in established bermudagrass (*Cynodon* spp.) with no adverse effects. Consequently, the safety of using quinclorac on newly sprigged turf comes into question. Therefore, our objective was to document the effect of quinclorac applications on sprigged warm-season turf species when applied: seven days before to sprigging (7 DBS), at sprigging (@ Sprig), fourteen days after sprig emergence (DAE), and 28 DAE.

A study was conducted at the West Florida Research and Education Center - Jay using a split-plot experimental design with four replications. Main plots measuring 3.1 m X 10.67 m were turfgrass species that included ‘Salam’ Seashore Paspalum (*Paspalum vaginatum* Swartz.), ‘Tifdwarf’ and ‘TifSport’ bermudagrass, and ‘Meyer’ zoysiagrass (*Zoysia japonica* Steud.). Split plots measuring 1.5 m X 3.0 m were herbicide treatments including quinclorac 75DF at 0.84 Kg ha^{-1} (0.75 lb A/A) at the aforementioned timings, oxidiazon 2G at 2.24 kg ha^{-1} (2 lbs A/A) applied at 7 DBS and @ Sprig, and an untreated control (UTC). Plots were sprayed on 04 Aug. 2000 (7 DBS), 11 Aug. 2000 (@ Sprig), 19 Aug. 2000 (14 DAE), and 11 Sep. 2000 (28 DAE) using a CO_2 backpack sprayer calibrated to deliver 190 L/ha at 140 kPa using 11002 nozzles. The plot area was an Orangeburg fine sandy loam with 2.2% O.M., 77% sand, 14% silt, and 9% clay. Plots were sprigged with turf species on 11 Aug. 2000 and irrigation and nutrient applications were adequate to support maximum sprig establishment. Data collected included rate of turf coverage (% Cover) and turf visual quality (1-9 scale; 1=dead turf; 9=best; 6.5 min. acceptable quality), and visual weed control (%).

At one month after sprigging, there were no differences on % cover for ‘Tifdwarf’ bermudagrass and ‘Meyer’ zoysiagrass. For ‘TifSport’ bermudagrass, no differences between quinclorac applications were noted, however, cover was reduced by 50% when oxidiazon was applied 7 DBS. For ‘Salam’ Seashore Paspalum, oxidiazon applications at 7 DBS and @ Sprig, reduced cover by 32 and 41% respectively. By seven weeks after sprigging, differences in plot coverage were noted only for ‘Salam’ Seashore Paspalum. Both oxidiazon timings reduced turf grow-in by 27% when compared with the UTC. No differences were seen with quinclorac applications. A reduction in turf quality was noted with both oxidiazon timings, however, these treatments were still above the minimum acceptable quality. At twelve weeks after sprigging, ‘Tifdwarf’ bermudagrass exhibited a 24% reduction in coverage when oxidiazon was applied 7 DBS and a 19% reduction when applied @ Sprig. Quinclorac applications made @ Sprig and 14 DAE reduced the grow-in of ‘Tifdwarf’ by an average of 19%. As also noted at the 4 and 7 Week after Sprigging ratings, ‘Salam’

Seashore Paspalum coverage was reduced an average of 26% with oxidiazon applications. Although oxidiazon applications retarded the grow-in rate of ‘Salam’ Seashore Paspalum and ‘Tifdwarf’ bermudagrass, these treatments exhibited the greatest level of weed control (98-100%). Quinclorac applications, regardless of timing, only resulted in 76-88% control of crabgrass species (*Digitaria sps.* (DIGSP)), 76-90% control of goosegrass (*Eleusine indica* (L.) Gaertn. (ELEIN)), and 58-70% control of Old World Diamond-flower (*Hedyotis corymbosa* L (OLDCO)). In conclusion, despite application timing, quinclorac did not affect the grow-in of ‘Meyer’ zoysiagrass, ‘TifSport’ bermudagrass, and ‘Salam’ Seashore Paspalum. Although oxidiazon is the industry standard for preemergence weed control on newly sprigged areas, it did impede grow-in of ‘TifSport’ bermudagrass (1 of 3 ratings), ‘Tifdwarf’ bermudagrass (2 of 3 ratings), and ‘Salam’ Seashore Paspalum (3 of 3 ratings).

MSMA ANTAGONISM BY IRON. G.E. Coats, J.M. Taylor, and J.C. Arnold, Mississippi State University, Mississippi State, MS.

ABSTRACT

Turfgrass managers frequently use Fe_2SO_4 (chelated or non-chelated) as an additive with MSMA or other organic arsenical herbicides to minimize discoloration of bermudagrass or zoysiagrass. In a 1996 study evaluating at the possibility of reducing St. Augustinegrass injury to MSMA, data suggested control of Southern crabgrass was reduced. The objective of the studies reported here was to determine if antagonism occurred when iron was added to MSMA.

In a number of experiments MSMA was applied at 2 lb ai/A in combination with an iron additive in 25 gpa. In duplicate experiments in which 4, 6, or 8 fl oz/A Ferromec® was added, crabgrass control was less than 20% while plots treated without Ferromec® was 60% 1 month after treatment. In a separate experiment, 13 additional products containing iron reduced crabgrass control with a single 2 lb/A MSMA application to varying degrees when used at the labeled rate for the iron additive. Preliminary evaluation of these products suggests that the degree of antagonism was likely a reflection of the iron concentration in these products. Antagonism was observed with Ferromec® used with MSMA for dallisgrass control.

TROPICAL SIGNALGRASS (*Urochloa subquadripara*) MORPHOLOGICAL GROWTH RESPONSES FOLLOWING MULTIPLE POSTEMERGENCE HERBICIDE APPLICATIONS. J.S. Weinbrecht*, G.L. Miller, and L.B. McCarty. University of Florida, Gainesville and Clemson University, S.C.

ABSTRACT

Tropical signalgrass is a perennial grassy weed by means of a rapidly sprawling stoloniferous growth habit. Abundant seedhead during the fall further ensures its survival by contributing significantly to its seed bank. Even if on a limited basis, the lignified senescent leaf tissue of tropical signalgrass may also serve as a survival mechanism in the form of a barrier, not only to environmental stresses, but to the uptake and translocation of postemergence herbicide applications. These features, and their relative responses to a variety of conventional postemergence herbicide applications, and various tank-mix combinations, were the focus of greenhouse pot screening trials conducted in 1999 and 2000. The objective was to identify effective treatments that merit further evaluations in subsequent field trials.

A four replicate set of twelve treatments in a RCB included: MSMA (1.2 qt/A); Asulox® (5.0 pt/A); MSMA + Image® (1.2 + 1.3 qt/A); Princep® (2.0 qt/A); Princep® + Prograss® (2.0 + 4.0 qt/A); Drive® (1.0 lb/A); MSMA + Drive® (1.2 qt/A + 1.0 lb/A); Sencor® (0.3 lb/A); MSMA + Sencor® (1.2 qt/A + 0.16 lb/A); Illoxan® + Sencor® (1.4 qt/A + 0.16 lb/A); Illoxan® + Drive® (1.4 + 1.0 lb/A), as well as an untreated control (UTC). All treatments were applied three times at two-week intervals, with the exception of Asulox®, which was applied only twice. Surfactant requirements were addressed per label recommendations. All treatments were applied using a Devries CO_2 track sprayer calibrated to deliver 20 GPA at 3 MPH and 32 PSI. Parameters reported at twelve weeks after initial treatment (WAIT) included area of stoloniferous spread (in^2), above-ground (stoloniferous, senescent leaf, and green leaf) and below-ground (root) oven-dried tissue, as well as seedhead numbers per pot. Efficacy, based on reductions in parameters observed relative to the UTC, were considered fair (70 - 79%), good (80 - 89%), or excellent (90 - 100%).

Over both years, Illoxan® + Sencor® as well as Illoxan® + Drive® were consistently similar to the UTC in terms of stoloniferous, senescent leaf, green leaf, and root tissue dry weights. Likewise, Princep® and Sencor® were similar to the UTC in terms of stoloniferous spread and senescent leaf dry weights, while Princep® and Drive® were similar to the UTC in terms of senescent leaf dry weights and seedhead numbers. As a result, these treatments were considered ineffective in consistently controlling one or more of the significant features associated with tropical signalgrass survival, and as evaluated here, did not merit further evaluation in field trials. Consistent responses over both years at 12 WAIT demonstrated that fair to good green leaf tissue reductions followed any treatment containing MSMA (. 73%) or Asulox® (. 80%). Furthermore, any treatment containing MSMA or Asulox® provided $98% seedhead reduction. Only MSMA applied alone and Asulox provided fair or better (. 72% and . 83%, respectively) stoloniferous spread reductions. However, no treatment provided better than a 57% or 36% reduction in stoloniferous or root dry weights, respectively.

Compared to MSMA and Asulox®, no other treatment or tank-mix combination effective in controlling other difficult perennial weeds, provided evidence of enhanced tropical signalgrass control. Yet despite reductions in green leaf dry weights, seedhead number, and stoloniferous spread, stoloniferous and root dry weights (critical features in perennial survival) were not effectively controlled. As a result, further field evaluations may incorporate MSMA or Asulox®, realizing it to be only a component to an overall control strategy. Along those same lines, although Princep® + Prograss® did not consistently provide reductions in stoloniferous, senescent leaf, green leaf, or root tissue dry weights, it did provide reductions in stoloniferous spread (. 67%) and seedhead numbers ($97%). And based on its existing tolerance in St. Augustinegrass sod production, while effectively controlling common bermudagrass (*Cynodon dactylon*), it may also serve as a component to an overall control strategy. Further screening research will evaluate experimental compounds for their effectiveness in tropical signalgrass control, as well as warm-season turf tolerance.

HERBICIDE TOLERANCE OF WILDFLOWERS USED IN ROADSIDE PLANTINGS. L.S. Warren, Jr. and F.H. Yelverton, Crop Science Department, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

Methyl bromide has been commonly and effectively used by the North Carolina Department of Transportation Roadside Environmental Unit to establish wildflowers in roadside plantings, because most of the selected wildflower species are non-native and struggle early to compete with established, predominant native plants. However, methyl bromide manufacture and use will be reduced 50% in 2001 and 100% by 2005, because it is a Class 1 ozone depleter. Herbicides will play a more important role in the very near future in wildflower establishment and management. The Food Quality Protection Act (FQPA) of 1996 may limit the availability of some of these replacement herbicides. Wildflower tolerance to various preplant incorporated (PPI), preemergence (PRE), and postemergence (POST) herbicides is not clearly known. New and existing PPI, PRE, and POST herbicides were evaluated on 28 wildflower species to obtain this information. A tolerance rating scale of 1 to 9 was used; with 1 representing complete kill and 9 representing no visible herbicide symptoms. A tolerance rating of 6 was considered minimally acceptable (injury was observed but could be tolerated).

Sulphur cosmos (*Cosmos sulphureus*) is a summer-seeded annual that flowers by late summer to early fall. Imazapic (Plateau) applied PRE at 0.0625 lb ai/acre in the greenhouse unacceptably injured (stunted) sulphur cosmos by 28 days after treatment (DAT). However, in a field trial, tolerance ratings of 8.2 and 8.3 were documented at 42 and 57 DAT, respectively, when the sulphur cosmos was in full bloom; indicating that the plants almost completely recovered from early stunting with no effects on flowering. Inadequate rainfall in February – March, 2000 affected herbicide performance in a bur-marigold (*bidens*) sp. trial. PRE applications of isoxaben (Gallery), oryzalin (Surflan), and napropamide (Devrinol) at 0.5, 2, and 2 lb ai/acre in a greenhouse trial produced tolerance ratings of 1, 1, and 2, respectively at 28 DAT. A bur-marigold field trial was sprayed on February 24, 2000 with 0.11 inches of rainfall occurring over the next 14 days. Bur-marigold began germinating on March 3, 2000 during these dry conditions. By 95 DAT, tolerance ratings of 8.2, 8.2, and 7.5 were recorded for Gallery, Surflan, and Devrinol, respectively. The most common wildflower mixture seeded along North Carolina roadsides includes ox-eyed daisy (*chrysanthemum leucanthemum*) and lance-leaved coreopsis (*coreopsis lanceolata*). PPI and PRE herbicides that exhibited acceptable tolerance to both species in a greenhouse trial were EPTC (Eptam), bensulide (Prefar), trifluralin (Treflan), pronamide (Kerb), pyrithiobac (Staple), and ethalfluralin (Curbit) applied at 3.06, 5.0, 0.5, 1.0, 0.032, and 1.125 lb ai/acre, respectively. All PPI and PRE treatments need to be repeated in the field with hope of adequate rainfall for herbicide activation before wildflower germination.

Tolerance of cosmos (*cosmos bipinnatus*) and bur-marigold to a POST MSMA (Bueno 6) application was greatly influenced by plant growth stage. In all greenhouse trials, cosmos and bur-marigold were 1 to 2 inches tall with 2 true leaves when treated with Bueno 6 at 2.04 lb ai/acre. An 8.7 tolerance rating was reported 21 DAT for each species. Cosmos was 13 inches tall when treated with Bueno 6 in a field trial. Tolerance ratings were 2.5 and 3.5 at 17 and 45 DAT, respectively. Bur-marigold was 1 to 5 inches tall when treated in a field. At 42 DAT, a tolerance rating of 3 was reported. With more leaf area at taller plant heights for herbicide contact, cosmos and bur-marigold displayed more visible injury symptoms from a Bueno 6 application. More research is needed to determine the safety of POST herbicide applications to various growth stages of wildflower species.

EVALUATION OF IMAZAPIC FOR WEED CONTROL AND FORAGE TOLERANCE IN TEXAS PASTURELANDS. L.M. Etheredge, P.A. Baumann and F.T. Moore, Texas Agricultural Extension Service, College Station, TX 77843

ABSTRACT

There are many effective herbicides labeled for broadleaf weed control in Texas pasturelands that provide for improved forage quality. However, some annual and perennial grass weeds continue to cause production and quality problems un-abated due to inadequate treatment options. A relatively new herbicide, imazapic, was examined in field studies during 2000 to assess its effectiveness on several pernicious weed species and its effects on forage tolerance.

Two separate weed control experiments tested imazapic rates of 0.0625, 0.125, and 0.187 lb ai/A, using the product Plateau. In one experiment, dallisgrass (Paspalum dilitatum) control was assessed from early applications made when perennial dallisgrass was at 25% green-up and later applications were made when perennial plants were at 100% green-up. Only the 0.187 lb ai/A rate provided in excess of 80% control from the early applications. However, 78, 83 and 95% control was provided by the three rates, respectively, from the late applications when evaluated 60 DAT. Imazapic was also applied in the product Oasis (2 lb ai of imazapic + 4 lb ai of 2,4-D/gallon) in another study in amounts equal to the imazapic rates employed in the dallisgrass studies. Oasis was shown to be effective for controlling field sandbur (Cenchrus incertus), purple nutsedge (Cyperus rotundus) and woolly croton (Croton capitatus). All rates of Oasis (4,8 and 12 oz/A.) provided greater than 87% field sandbur control, 78% purple nutsedge control and 93% woolly croton control. The woolly croton control was likely enhanced by the 2,4-D in the product formulation.

Forage tolerance to imazapic + 2,4-D (Oasis) was studied in three different and essentially pure stands of common, Coastal and Tifton 85 bermudagrass (Cynodon dactylon) pastures. Moderate growth reduction was caused in the Coastal and common bermudagrass plots at the three rates of Oasis examined (4, 8, and 12 oz./A). Growth reduction ranged from 35-46% in the common bermudagrass study and 50-64% in the Coastal bermudagrass study. Crop yields were reflective of this substantial injury. However, injury (growth reduction) dissipated rapidly and was essentially non-existent in the sequential crop (second cutting). When evaluated and harvested 50 and 62 DAT in the common and Coastal bermudagrass studies, respectively, 9% or less injury was observed from any treatment and only the highest rate of Oasis examined in the Coastal bermudagrass experiment caused significant yield reduction. The Tifton 85 bermudagrass study was initiated later in the season (August 4) after an extended dry period during the summer. Crop injury was not as severe in this study as with the other two bermudagrass varieties, ranging from 15-26%, 47 DAT. Significant yield reduction was only recorded from the 12 oz./A rate. Similar to the other crop tolerance studies, injury and yield reductions were non-existent by the second, sequential harvest date.

Imazapic formulations show promise for control of several troublesome Texas pastureland weeds. However, crop injury remains a potential problem that will need to be remediated through rate adjustment, application timing or other factors that are yet to be determined.

WEED CONTROL WITH PLATEAU (IMAZAPIC) AND OASIS (IMAZAPIC + 2,4-D) IN HYBRID BERMUDAGRASS HAY PRODUCTION. D.E. Sanders, R.E. Strahan and G.T. Gentry, Idlewild Research Station, LSU AgCenter, Clinton, LA 70722.

ABSTRACT

Studies were begun in 1996 to investigate the potential use of imazapic for the control of vasey grass (*Paspalum urvillei* Steud.) and smutgrass (*Sporobolus poiretii* Hitche.) in both hybrid and common bermudagrass hay meadows. Two trials were conducted on infestations of vasey grass and two were conducted on smutgrass. Rates of imazapic ranging from .03 to .15 lb ai/A plus .25% V/V nonionic surfactant were applied in May of 1996. Control of vasey grass was greater than 90% at rates .06 lb ai/A or higher in both studies. Control of smutgrass was erratic with excellent control (greater that 90%) at the .10 lb ai/A rate in one study and unacceptable (less than 50%) at the .15 lb ai/A rate in the second study. A hybrid bermudagrass tolerance trial was also conducted in 1996 in a weed free situation. Hybrid bermudagrass varieties Coastal, Alicia, Grazer Brazos, Tifton 44, Russel and a locally improved line of common bermudagrass were treated with imazapic plus .25% V/V NIS at both .10 and .15 lb ai/A in May. Visual injury was recorded at 2 and 7 weeks after treatment. Plots were harvested and both green and dry weights were recorded after the 7 week observation. The hybrids Coastal, Alicia, Russel, Tifton 44 and the common bermudagrass exhibited only minor injury at 2 weeks after application and no significant injury at 7 weeks after treatment. The hybrids Brazos and Grazer exhibited significant injury at 2 and 7 weeks after treatment. Only the hybrids Brazos and Grazer yielded significantly less than the untreated check.

Additional trials using imazapic for the control of vasey grass and smutgrass were conducted in 1997, 1998 and 1999 with results similar to those obtained in 1996. Two additional trials were conducted in 1998 to determine the effect of imazapic on winter annual weeds in hybrid bermudagrass hay meadows. Rates of .05 to .15 lb ai/A plus .25% V/V NIS were applied to dormant bermudagrass (var. Alicia) in February. Plots were infested with volunteer ryegrass (*Lolium multiflorum* Vis.), little barley (*Hordeum pusillum* Nutt.) and buttercup (*Ranunculus sp.)*. Control in both studies was greater than 90% on all three weeds at the .10 lb ai/A rate and higher.

In 2000 four additional studies were conducted at the Idlewild Research Station using imazapic on bermudagrass hay meadows. A timing study was conducted to determine if date of application affected yield. Rates of imazpic (formulated as Oasis) ranging from .06 to .187 lb ai/A imazapic plus .25% V/V NIS were applied on April 27 and again on June 15 to hybrid Alicia bermudagrass in a near weed free situation. Visual injury was recorded and plots were harvested August 5. Both green and dry weights were recorded. There were no significant injury or yield differences noted between any application rates and the untreated check from the April 27 application. There was significant injury and yield loss recorded from the June 14 application. Application rates of .125 lb ai/A or higher resulted in significant injury (stunting) and yield loss. At the highest application rate (.187 lb ai/A) yield was reduced by 62% compared to the untreated check. One trial was conducted comparing imzapic with paraquat, sulfosulfuron, gluphosinate and glyphosate for the control of winter annual weeds. Imazapic provided better than 90% control of little barley and annual ryegrass with 5% injury

compared to sulfosulfuron at 80% control and 3% injury, paraquat at 50% control and 3% injury, gluphosinate at 53% control and 10% injury and glyphosate at 97% control and 40% injury. Two trials were conducted comparing imazpic (Plateau) with imazpic + 2,4-D (Oasis). There were no significant differences in perennial or annual grass weed control or bermudagrass injury between the two formulations.

Imazapic formulated as both Plateau and Oasis provided excellent control of certain perennial and annual grasses. Certain bermudagrass hybrids are more tolerant to imazapic than others. Early applications of imazapic (prior to June) provide equal or better control of certain weeds with less injury to the bermudagrass than do later applications.

SECTION III: WEED MANAGEMENT IN HORTICULTURAL CROPS

CHEMICAL WEED CONTROL AND RESPONSE TO COMPETITION IN MARJORAM (*ORIGANUM SYRIACUM*). J.R. Qasem and C.L. Foy, Faculty of Agriculture, University of Jordan, Amman, Jordan and Department of Plant Pathology, Physiology and Weed Science, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061.

ABSTRACT

Oxyfluorfen and oxadiazon were evaluated in the field for weed control and crop tolerance, and the effects of weed interference in transplanted marjoram (*Origanum syriacum* L.), a desert spice and medicinal plant. Oxyfluorfen was applied immediately prior to transplanting at 0.62 kg ai/ha or postemergence at 0.48 kg/ha when weeds had an average of two to three leaves and were no taller than 10 cm. Oxadiazon was evaluated in similar manner as both pre-transplant (0.96 kg ai/ha) and postemergence (0.62 kg/ha) applications. Untreated controls and hand-weeded (weed-free) plots were also included for comparison. Four replications of all treatments were arranged in a randomized complete block design, and all data recorded were analyzed statistically. Marjoram seedlings were grown in greenhouse flats, then transplanted into the field on June 1, 2000. The plots were sprinkler irrigated once on the following day to activate the herbicides and to promote weed seed germination. Rainfall thereafter was frequent and adequate to support germination and rank growth of the following weed species: common lambsquarters (*Chenopodium album* L.), fall panicum (*Panicum dichotomiflorum* Michx.), Eastern black nightshade (*Solanum ptycanthum* Dun.), stinkgrass (*Eragrostis cilianensis* (All.) E. Mosher), common ragweed (*Ambrosia artemisiifolia* L.), giant foxtail (*Setaria faberi* Herrm.), hairy galinsoga (*Galinsoga ciliata* (Raf.) Blake), quackgrass (*Elytrigia repens* (L.) Nevski), common pokeweed (*Phytolacca americana* L.), Pennsylvania smartweed (*Polygonum pensylvanicum* L.), barnyardgrass (*Echinochloa crus-galli* (L.) Beauv.), and dandelion (*Taraxacum officinale* Weber in Wiggers).

Data recorded during July and August included weed control ratings, percent weed ground cover, marjoram plant height and number of individual shoots. Total shoot growth of marjoram and all weeds were harvested on August 21, 2000 and the data analyzed separately by species. Weed growth was very rank, with some species exceeding 2 m in height and representing 100% ground cover in the nonweeded plots and 88 to 100% in plots treated postemergence. Whereas the postemergence treatments were ineffective, both oxyfluorfen and oxadiazon applied pre-transplanting and activated immediately, along with triggering the maximum flush of weed seed germination, provided satisfactory control during nearly 3 mo, with weed ground cover of 2.5 and 23.8%, respectively. Although the highest shoot production of marjoram occurred in the hand weeded controls, followed by all herbicide-treated plots, then by the nonweeded controls, the only statistically significant differences were between the hand weeded and nonweeded controls. Possibly, some of the gains achieved by chemically reducing weed interference was offset by a low level of growth inhibition of marjoram by the herbicides.

HALOSULFURON RATE AND TIMING APPLICATION AFFECTS ON SUMMER SQUASH AND MUSKMELON. R.S. Buker III and W.M. Stall, University of Florida, Gainesville, Fl.

ABSTRACT

There are currently no available options for chemical control of nutsedge in squash or muskmelon. Halosulfuron provides excellent control of nutsedges and was evaluated for use in summer squash and muskmelon. Tolerance of watermelon and cucumber to halosulfuron has been shown to be dependent on rate and timing of applications. Therefore this research was focused on the affect of rate and timing of applications on yield.

Trials were conducted at the University of Florida Horticultural Unit in Gainesville, Fl , from the spring of 1999 through the spring of 2000. Trails of the summer squash were repeated three times using the variety 'Gentry', while the muskmelon trials were repeated twice using the variety 'Athena'. All trials were designed as a factorial experiment with plots arranged in a randomized complete block. Summer squash was treated with halosulfuron at 0, 1, 2, 3, 4, and 5 weeks after emergence (WAE). Muskmelon was treated with halosulfuron at 3, 4, 5, and7 WAE. In all trials, halosulfuron was applied at each application timing with the rate of 0, 0.024, 0.032, 0.040, and 0.048 kg ai/ha. ANOVA was used to detect significant interactions from treatments and treatment means.

Yield of summer squash was negatively affected by halosulfuron at all application timings before 5 WAE. At each application timing there were negatively linear relationships between yield and rate. The greatest yield loss occurred from applications at 1WAE, ranging from 50 - 60% compared to the control. At 5 WAE squash was being harvested, so applications of halosulfuron at this time are questionable. Applications at 3 WAE had the least impact on yield. Halosulfuron applied at this time may provide an economically viable weed control option. Yield of muskmelon was affected by the timing of halosulfuron, but not the rate. Application timing had a negatively linear affect on yield in the spring of 2000. Maximum yield loss was 12% at 7 weeks after emergence. Yield loss from 2 to 5 WAE was minimal (<10%), except the 3 WAE applications in 1999. The data indicates muskmelon have excellent tolerance to halosulfuron, with minimal impact on yield.

EVALUATION OF HALOSULFURON IN BAREGROUND WATERMELON CULTURE. R.B. Batts, A.S. Culpepper, and K.L. Lewis. North Carolina State University, Raleigh; University of Georgia, Tifton and Cordele.

ABSTRACT

Halosulfuron is the active ingredient in the registered herbicides Permit, Sempra, and Manage. In previous research, halosulfuron preemergence (PRE) and early postemergence (POST) controlled nutsedge (*Cyperus* spp.) and pigweed (*Amaranthus* spp.) well. Pigweed and nutsedge species are two of the most common and troublesome weeds in southeastern vegetable production. Indications are that a halosulfuron-containing herbicide will be available soon for use in vegetables.

An experiment was conducted at two locations in Georgia and one in North Carolina to evaluate weed control and watermelon response to halosulfuron. The experiment included 18 herbicide systems and two non-treated checks. The first nine treatments were halosulfuron at 0.024, 0.036, and 0.048 lb ai/A applied PRE, POST to 1-leaf watermelon, or POST to12- to 15-inch watermelon. The other nine treatments included the following: halosulfuron 0.024 lb/A PRE followed by (fb) halosulfuron 0.024 lb/A POST to 1-leaf watermelon, POST to 12- to 15-inch watermelon, or POST to 1-leaf and 12- to 15-inch watermelon; ethalfluralin at 1.5 lb ai/A PRE with no POST herbicide or with halosulfuron 0.024 lb/A POST at either 1-leaf or 12- to 15-inch watermelon; and bensulide at 0.83 lb ai/A plus naptalam at 3 lb ai/A PRE with no POST herbicide or with halosulfuron 0.024 lb/A POST at either 1-leaf or 12- to 15-inch watermelon.

Averaged over rates, halosulfuron was most effective on yellow nutsedge (*Cyperus esculentus*) in late season when applied POST to 12- to 15-inch watermelon and least effective applied PRE. However, control by halosulfuron at higher rates applied to 1-leaf watermelon was similar to control by all rates applied POST to 12- to 15-inch watermelon. Poor late-season control of yellow nutsedge, coffee senna (*Cassia occidentalis*), and a mixture of ivyleaf morningglory (*Ipomoea hederacea*) and entireleaf morningglory (*I. hederacea* var. *integriuscula*) was noted with all PRE herbicides. Halosulfuron PRE plus POST was more effective than PRE on morningglory, coffee senna, and yellow nutsedge. Halosulfuron PRE plus POST was more effective than POST on coffee senna and morningglory but not yellow nutsedge. At the lower two application rates, halosulfuron was more effective on coffee senna when applied POST. Control of coffee senna was similar from the high rate regardless of application timing. Late-season morningglory control was less than 60% with all single applications of halosulfuron regardless of rate or application timing and with ethalfluralin or bensulide plus naptalam PRE fb halosulfuron POST. Halosulfuron PRE plus POST twice controlled morningglory 90%. Halosulfuron PRE at 0.024 lb/A controlled Palmer amaranth (*Amaranthus palmeri*) 95% late in the season. Halosulfuron applied to 1-leaf and 12- to 15-inch watermelon controlled Palmer amaranth 72 to 85 and 66 to 78%, respectively. Palmer amaranth was controlled at least 85% in all systems with a PRE herbicide followed by halosulfuron POST. Goosegrass (*Eleusine indica*) control was acceptable only in systems with ethalfluralin or bensulide plus naptalam PRE.

Crop injury was evaluated 14 days after PRE applications, 6 and 16 days after 1-leaf applications, and 6 days after 12- to 15-inch applications. Injury from PRE herbicides was less than 10%. Watermelon was injured 38 to 58% 6 days after halosulfuron application at the 1-leaf stage. Injury declined to 25 to 38% at 16 days. Larger watermelon was more tolerant of halosulfuron POST and recovered from injury more quickly. Halosulfuron applied to 12- to 15-inch watermelon injured the crop about 30% regardless of application rate. Watermelon was injured 55% following halosulfuron applied at both the 1-leaf and 12- to 15-inch stages.

Yields in Georgia were closely associated crop injury as well as Palmer amaranth and morningglory control. Although not significantly different, yields with single applications of halosulfuron were numerically greatest with halosulfuron PRE. Yields declined as application date was delayed. Yields were greatest with halosulfuron PRE plus POST at 12- to 15-inch watermelon. Due to injury, yields with halosulfuron PRE fb two POST applications were similar to that with halosulfuron PRE alone. Halosulfuron POST significantly increased yields in systems with ethalfluralin PRE but not with bensulide plus naptalam or halosulfuron PRE. Yields in North Carolina were related primarily to goosegrass control. Poor yields were obtained in all systems that did not include ethalfluralin or bensulide plus naptalam.

MILESTONE - A WEED MANAGEMENT TOOL FOR FLORIDA CITRUS. S.H. Futch and S.D. Delaney; University of Florida, Lake Alfred, FL 33850 and DuPont Agricultural Products, Clermont, FL 34711.

ABSTRACT

Milestone (azafenidin) is an experimental herbicide for use in Florida citrus, sugarcane, and other crops in the United States and the world. Milestone is formulated as an 80DF water-dispersible granule. The herbicide is very safe for use on any age citrus tree. Low use rates, compared to many other products, and the fact that it strongly binds to soil particles resulting in low soil mobility provides favorable environmental properties. Milestone provides effective preemergence weed control for many key broadleaf and grass weeds which are commonly found in Florida citrus groves. Broadleaf weeds controlled by Milestone include: balsam apple vine (*Momordica charantia*), pusley (*Richardia brasiliensis, R. scabra),* hairy beggartick (*Bidens pilosa*), and pigweed (*Amaranthus* spp.). Grasses controlled by Milestone include: alexandergrass (*Brachiaria plantaginea*), crabgrass (*Digitaria* spp.), crowfootgrass (*Dactyloctenium aegyptium*), goosegrass (*Eleusine indica*), guineagrass (*Panicum maximum*), and signalgrass (*Brachiaria platyphylla*). Milestone applied at 20 oz per treated acre provided weed control of 84 to 95 percent at 120 days after treatment. Weed control up to 180 days has been provided in some locations, depending on application rate and season. Milestone has proven safe for use in Florida citrus providing effective weed control of many of the common key weeds found in all citrus production regions.

WEED CONTROL OPTIONS FOR SELECTED CONTAINERIZED ANNUALS AND PERENNIALS. P.R. Knight *, S.L. File, J.M. Anderson, P. Sciarabba, and K. Martin. Mississippi State University, Coastal Research and Extension Center, P.O. Box 193, Poplarville, MS 39470.

ABSTRACT

Although ornamentals comprise a $10 billion a year industry, plant material diversity dictates that they are minor-use crops for most chemical companies. The IR-4 program aids in labeling new or experimental pesticides for minor use crops. The objective of this experiment was to determine the ornamental phytotoxicity and herbicide efficacy for several herbicides and ornamental crops. Fluazipop-B-butyl, Metalochlor, Napromide, Oryzalin, Oxyfluorfen+Oryzalin, and Oxyfluorfen+Pendimethalin were evaluated for weed control on *Gaillardia x grandiflora*. Clethodim, Dithiopyr, and Oxadiazon+Pendimethalin were evaluated on *Echinacea purpurea, Hemerocallis spp., Impatiens walleriana,* and *Begonia semperflorens.* Herbicides were applied at 1, 2, and 4x label rates. Additionally, a control treatment was evaluated. *Gaillardia* treated with Napromide at 1x had acceptable plant quality with reduced weed numbers and percent weed coverage compared to the control. Oxadiazon+Pendamethalin, regardless of rate, provided excellent weed control while maintaining plant quality of *Impatiens.* Oxadiazon+Pendamethalin at 2 or 4x provided excellent weed control and did not reduce plant quality for *Hemerocallis or Echinacea.* Finally, Clethodim, Dithiopyr, and Oxadiazon+Pendimethalin all provided excellent weed control without reduced plant quality for *Begonia*, regardless of rate.

NEW HERBICIDES FOR SNAPBEAN AND SOUTHERNPEA. R.E. Talbert, M.L. Lovelace, E.F. Scherder, N.W. Buehring, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72704 and W.R. Russell, Allen Canning Company, Siloam Springs, AR 72761.

ABSTRACT

Snapbean and southernpea are important vegetable legume food crops grown for human consumption throughout the Southern U.S. region. The land area devoted to these crops is quite minor compared to the major legume crop of the region, soybean, and there is less economic incentive to register new herbicide technologies for these crops. Field trials were conducted each year to evaluate new herbicides for potential use in these crops through new limited support for herbicide efficacy evaluation in minor crops from the IR-4 program and commodity support. This summarizes our results for the 1999 and 2000 growing seasons.

The snapbean field trails were conducted on a producer's field on a silt loam soil each year in cooperation with the Allen Canning Company Pest Management Specialist. Immediately after planting snapbean (cv. Roma II), preemergence (PRE) treatments were applied on May 3, then early postemergence (POST) treatments applied when snapbeans were at the first trifoliate stage on May 27, 1999. In 2000, planting and PRE treatments were applied May 15. The POST treatments were applied in a separate experimental area to weeds 1 to 3 in tall on May 31, 2000. Weeds present included common lambsquarters and goosegrass in 1999 and Palmer amaranth, common ragweed, common lambsquarters, and giant foxtail in 2000. Promising newer treatments for snapbean controlling one or more weed species were dimethenamid PRE at 1 lb/A, flufenacet PRE at 0.3 to 0.6 lb/A, lactofen PRE at 0.2 lb/A, clomazone PRE at 0.5 lb/A fomesafen PRE at 0.2 lb/A, clomazone PRE at 0.5 lb/A, imazamox POST at 0.024 to 0.032 lb/A, imazethapyr POST at 0.032 lb/A, halosulfuron POST at 0.047 to 0.064 lb/A, and imazethapyr + bentazon POST at 0.032 +0.75 lb/A. Treatments not tolerated by snapbean were flumetsulam PRE at 0.063 lb/A, diclosulam PRE at 0.032 lb/A, and cloransulam POST at 0.016 lb/A.

The southernpea field trials were conducted at the Main Experiment Station, Fayetteville, on Captina silt loam soil using cv. Encore planted in July each year. PRE treatments were applied immediately and POST treatments applied 2 to 3 wk after planting. Weed control ratings from these trials included goosegrass, Palmer amaranth, yellow nutsedge, cutleaf groundcherry, and clammy groundcherry. Promising newer treatments for southernpea controlling one or more weed species were dimethenamid PRE at 1 lb/A, flufenacet PRE at 0.25 lb/A, and halosulfuron PRE at 0.026 lb/A. Treatments not tolerated by southernpea were fomesafen PRE at 0.25 lb/A, diclosulam PRE at 0.032 lb/A, imazapic POST at 0.063 lb/A, cloransulam POST at 0.018 lb/A, imazamox POST at 0.036 lb/A, and halosulfuron POST at 0.026 lb/A.

COMPARISON OF WEED CONTROL SYSTEMS FOR YOUNG PECANS. W.H. Faircloth, M.G. Patterson, W.G. Foshee, W.D. Goff, and M.L. Nesbitt. Auburn University, Auburn, AL.

ABSTRACT

Six weed control systems in combination with two irrigation programs were compared in pecan [*Carya illinoensis* Koch. var. 'Desirable'] near Tallassee, AL, in an eight-year study. Newly established pecan trees (planted Oct. 1991) were subjected to one of six weed control systems: 1) preemergence (PRE) herbicides only; 2) PRE herbicides plus mowing; 3) postemergence (POST) herbicides only; 4) POST herbicides plus mowing; 5) PRE plus POST herbicides; and 6) mowing only. Each of the above systems was also tested with and without irrigation, giving a total of 12 treatments. The study had a randomized complete block design with 8 replications. Trees were planted 30ft. apart in rows 40ft. apart. A 10ft. by 10ft. square centered on each tree was the treatment area. PRE herbicides included combinations of diuron, norflurazon, oryzalin, or simazine. POST herbicides were glyphosate or paraquat. Mowings were scheduled on three week intervals throughout the growing season. Weeds of interest to researchers included the perennials bermudagrass [*Cynodon dactylon* (L.) Pers.] and bahiagrass [*Paspalum notatum* Fluegge], and an assortment of broadleaved annuals. Tree growth (diameter or circumference) and nut yield were measured and analyzed for significant differences (P=0.05).

Pecan growth, measured by increase in diameter, showed that irrigation consistently resulted in larger trees at the end of eight seasons. One exception being the PRE+POST system which showed no difference due to irrigation. Trees that received mowing only ranked last in growth each year, and in overall growth at the end of the eighth season. Weed control systems that included POST herbicides (POST only, PRE+POST, or POST+mowing) resulted in the most growth regardless of irrigation regime. Yields for 1998 showed that a PRE+POST weed control system gave highest yields in both the irrigated and non-irrigated trees, with irrigated trees numerically yielding higher than non-irrigated. The POST+mowing, PRE+POST, and PRE only systems (irrigated) gave equivalent yields in 1999 (434 lb/A, 393 lb/A, and 343 lb/A, respectively). Non-irrigated trees that had POST herbicides produced statistically equivalent yields to those mentioned above (308-330 lb/A). Mowing only trees produced fewer nuts than other trees in 1998 and 1999, both irrigated and non-irrigated. Both tree growth and nut yields suggested that using POST herbicides and irrigation gave best results. However, should irrigation not be available or economically feasible, a PRE+POST weed control system gives best results. These data show choice of weed control system is as important as choosing whether or not to irrigate pecan trees.

INFLUENCE OF RIMSULFURON RATES ON THE INTERFERENCE OF PURPLE AND YELLOW NUTSEDGE (*CYPERUS ROTUNDUS* L. AND *C. ESCULENTUS* L.) WITH TOMATO (*LYCOPERSICON ESCULENTUM* MILL). J.P. Morales-Payan, W.M. Stall, R. Charudattan, J.A. Dusky, D.G. Shilling, and T.A. Bewick, University of Florida, Gainesville, FL, Apopka, FL and CSREES, Washington, D.C.

ABSTRACT

Nutsedges (*Cyperus rotundus* L. and *Cyperus esculentus* L) are the most common weeds found in tomato fields in Florida. Even though tomato is a stronger competitor than nutsedges, the interference of nutsedges can significantly decrease tomato growth and fruit yield. Cultural and chemical treatments have been proposed and tested as alternatives to methyl bromide to suppress weeds in vegetable crops. Satisfactory and consistent nutsedge control has not been achieved with most of the preemergence herbicides tested. Sulfonylurea herbicides such as rimsulfuron, halosulfuron and nicosulfuron have been reported to strongly suppress the growth of nutsedges in several crops. They have been reported to be more effective against nutsedges when applied postemergence. Rimsulfuron has been shown to be efficacious in selectively controlling broadleaf weeds, some grasses, and nutsedges in potato. When tested in tomato, the extent of rimsulfuron selectively is cultivar-dependent. Complete eradication of nutsedges might not be economically or biologically justified in order to obtain adequate tomato fruit yield. The objective of this study was to determine the effect of post-emergence applications of selected rimsulfuron rates on purple and yellow nutsedge control and their influence on tomato yield and grade. Field trials were carried out at Matanzas, Dominican Republic in 1996 and Gainesville, FL with purple nutsedge, and at Gainesville, FL and Live Oak, FL with yellow nutsedge in 1997. Sprouted nutsedge tubers were planted just prior to tomato transplanting. Purple nutsedge were planted at 100 plants/m^2 and yellow nutsedge at 50 plants /m^2. These were at the biological threshold populations established for tomato. Rimsulfuron was applied to tomato and nutsedge 15 days after transplanting when the nutsedge were in the 3-5 leaf stage. A non-ionic surfactant was added in all applications at 0.25% v/v. The rimsulfuron rates used were 0, 3.76, 9.37, 23.36, 58.22, 145.09, 361.58, 901.09 and 2245 g/ha. The effect of rimsulfuron rates on both nutsedge species showed that as rate increased, growth decreased. For purple nutsedge, the shoot dry weight of the treated plants were reduced 90% at the 58.22 g/ha rate. Tuber production was inhibited when purple nutsedge plants were treated with 145.09 g/ha and plants were killed at the 361.58 g/ha rate. Tuber production of yellow nutsedge plants was inhibited at the 145.09 g/ha rate, and shoot dry weight was reduced 95% at the 361.58 g/ha rate. Yellow nutsedge plant were not killed with rimsulfuron until they were treated at the 901.09 g/ha rate. Total yield of weed-free tomato was not impacted by rimsulfuron rate until the rate exceeded 145.09 h/ha. Rimsulfuron rate did, however, affect tomato fruit size. Extra-large sized tomato fruit were reduced at rimsulfuron rates exceeding 58.22 g/ha. Purple nutsedge competition reduced tomato total yield at rimsulfuron rates lower than 23.36 g/ha. Tomato total yield was the same as the check from rates of 23.36 g/ha through 145.09 g/ha. Above that rate, total yield was reduced by rimsulfuron toxicity. Highest yields of extra-large fruit were obtained in

purple nutsedge infested plots when rimsulfuron was applied at 23.36 g/ha through the 361.58 g/ha treated plots. Highest yields of extra-large fruit were obtained in the plots treated with 23.36 - 145.09 g/ha rimsulfuron. Purple and yellow nutsedge competition can be minimized to allow maximum total and extra-large fruit production when rimsulfuron is applied post-emergence at 23.36 g/ha to 58.22 g/ha.

SECTION IV: FOREST VEGETATION MANAGEMENT

INCLUSION OF OUST OR OUSTAR IN FALL SITE PREPARATION TANK MIXTURES PROVIDES LONG TERM WEED CONTROL. A.W. Ezell, Department of Forestry, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

A total of 12 herbicide treatments were applied to a recently harvested forest site in Winston County, MS. All treatments were representative of forest site preparation tank mixtures and were applied early September, 1999. Three ounces of Oust® were included in two of the tank mixes, and 19 ounces of Oustar® were included in two of the mixes. All treatments were applied with a CO_2-powered backpack sprayer to simulate aerial application at 10 gpa. In May, June, July, and August of 2000, treatment plots were evaluated for herbaceous competition control. During October, 2000, plots were evaluated for woody stem control based on a comparison with pre-treatment measurements. In May 2000, herbaceous species had reduced the average percent clear ground to 42-62% in plots without Oust or Oustar while those plots with the products added had 94-97% clear ground. Untreated areas had only one percent clear ground by this rating time. Percent clear ground continued to decrease to 10-15% in July for plots without Oust or Oustar while plots were 83-94% clear in treatments with the product. By August, plots with the Oust were 65%-80% clear and those with Oustar were 57-92% clear whereas plots without the products were 5-13% clear. Both Oust and Oustar provided excellent herbaceous weed control for 12 months following application in this study. Oustar provided slightly better control than the Oust.

INTRODUCTION

In establishing a new stand of trees, the competition from herbaceous weeds is a significant factor in the initial survival and growth of planted seedlings. The current conventional approach to this problem is to apply a release treatment over the top of the planted seedlings in either a broadcast or banded pattern. While this competition problem is most often addressed in pine management, it is a noteworthy in hardwood plantation establishment, also. Interest has been expressed in the potential for a site preparation treatment which would also provide first year herbaceous competition control for pine seedlings.

OBJECTIVES

The objectives for this study were as follows:

1) To evaluate the efficacy of Oust and Oustar for herbaceous weed control the year following site prep application.
2) To evaluate various tank mixtures for control of competing woody vegetation during site preparation.

METHODS

The study was installed in Winston County, MS on land owned by The Timber Company. The previous stand had been mixed pine-hardwood and had been harvested in October, 1998. The soil was a clay loam with a pH=5.6. A total of 12 herbicide treatments were applied on September 8, 1999. A complete list of the treatments is found in Table 1. Herbicide treatments were applied to with a CO_2-powered backpack sprayer with a total spray volume of 10 gpa. Each treatment and an untreated check were replicated three times in a completely randomized design.

Prior to treatment, a woody stem count was completed on each plot, and stems were recorded by species and height class. An ocular estimate of brownout was completed at 6WAT, and plots were assessed in October 2000 for any living woody stems. During May, June, July, and August, herbaceous cover was estimated ocularly in the plots. All data were subjected to ANOVA and specific tests to separate means.

RESULTS

The results of herbaceous competition control evaluations can be found in Tables 2, 3, and 4. When compared to untreated areas, the herbicide treatments all exhibited control on herbaceous weeds. However, by July, those treatments without Oust or Oustar generally had 15% or less clear ground while those with Oust or Oustar generally had more than 80% clear ground (Table 2). The addition of either Oust or Oustar provided excellent herbaceous weed control throughout the growing season.

Percent grass cover was relatively low on the area with scattered Panicum spp., Carex spp., and Andropogon accounting for the vast majority of this type vegetation. Only the Andropogon invaded the plots with Oust or Oustar (Table 3). Overall, grass/sedge was not a major competitor on this site.

Broadleaf weeds were a major source of competition on this site. The site preparation mixes without Oust/Oustar did not differ from the untreated check in percent broadleaf coverage (Table 4). The treatments with Oust or Oustar did an excellent job of controlling the broadleaves on this site until August which was 11 months after application. Even then, control was still good with generally less than 33% of the plot covered by broadleaves, although one replication in

Treatment 11 did have higher infestation. The principal species on the site were fireweed (Erechtites hieracifolia), woolly croton (Croton capitatus var. capitatus), common ragweed (Ambrosia artemisifolia), and common pokeweed (Phytolacca americana). The woolly croton was not a problem until late in the growing season and accounts for much of the increased coverage in Oust/Oustar plots in August (Table 4).

A wide variety of woody species occurred on this site, but the majority of stems were either sweetgum (Liquidambar styraciflua), red maple (Acer rubrum), or persimmon (Diospyros virginiana). There was no significant difference among any of the treatments in the control of sweetgum or persimmon, and only one treatment varied significantly in the control of red maple (Table 5). Overall control of woody species was excellent as noted by the "Total" column in Table 5. This percent is for all stems of all species. The more common of the "less frequent" species included loblolly pine (Pinus taeda), winged elm (Ulmus alata), water oak (Quercus nigra), cherrybark oak (Q. pagoda), willow oak (Q. phellos), post oak (Q. stellata) and southern red oak (Q. falcata). Control for these species can be found in Table 6. As might be expected, these species all generally increased their number of stems per acre in the untreated plots (Table 5 and 6).

SUMMARY

Overall, the site preparation treatments in this study did an excellent job. The treatment areas were generally free of woody competition can could be planted easily.

The addition of Oust or Oustar to the treatments provided excellent herbaceous weed control for the entire growing season following application. Oustar did provide slightly better control than Oust, but this could be due to the species involved. Land managers now have an option for first year herbaceous competition control which could avoid release operations.

Table 1. List of treatments in 1999 Fall Oust/Oustar site preparation field trials -MS.

Treatment No.	Herbicides Rates/A.[1]
1	6 QTS KRENITE + 20 OZ CHOPPER + 1 QT TL90
2	4 QTS KRENITE + 20 OZ CHOPPER + 1 QT TL90
3	4 QTS KRENITE + 24 OZ CHOPPER + 1 QT TL90
4	4 QTS KRENITE + 16 OZ CHOPPER + 1 OZ ESCORT + 1 QT TL90
5	4 QTS KRENITE + 20 OZ CHOPPER + 1 QT ACCORD SP + 1 QT TL90
6	5 QTS ACCORD SP + 16 OZ CHOPPER
7	1 QT ACCORD SP + 48 0Z CHOPPER + 1 QT TL90
8	1 QT ACCORD SP + 1 0Z ESCORT + 24 OZ CHOPPER + 1 QT TL90
9	TMT #6 WITH 3 OZ OUST
10	TMT #7 WITH 3 OZ OUST
11	TMT #6 WITH 19 0Z OUSTAR
12	TMT # 7 WITH 19 0Z OUSTAR
13	UNTREATED

[1] all rates are expressed as actual product.

Table 2. Average percent clear ground in 1999 Fall Oust/Oustar site prep field trials-MS

Treatment No.	Time of Evaluation			
	May	June	July	August
	-------------------percent---------------			
1	53b[1]	37b	10b	7c
2	42b	32b	13b	10c
3	62b	37b	18b	13c
4	42b	30b	13b	7c
5	53b	40b	15b	8c
6	47b	30b	10b	5c
7	43b	28b	10b	7c
8	58b	40b	13b	7c
9*	95a	91a	87a	80a
10*	97a	95a	93a	65b
11**	94a	90a	83a	57b
12**	96a	94a	94a	92a
13	2c	1c	0c	0c

[1] values in a column followed by the same letter do not differ at P=0.05.
* Treatments with 3 ounces Oust/A.
**Treatments with 19 ounces Oustar/A.

Table 3. Average percent grass cover in 1999 Fall Oust/Oustar field trials-MS

Treatment No.	Time of Evaluation			
	May	June	July	August
	-------------------percent---------------			
1	2	2	5	7
2	2	2	3	5
3	2	2	4	5
4	2	2	3	5
5	2	2	4	7
6	2	2	4	7
7	2	4	6	7
8	2	3	5	7
9*	0	0	0	1
10*	0	0	0	1
11**	0	0	0	1
12**	0	1	1	2
13	6	7	12	18

* Treatments with 3 ounces Oust/A.
**Treatments with 19 ounces Oustar/A.

Table 4. Average percent broadleaf cover in 1999 Fall Oust/Oustar field trials-MS.

Treatment No.	Time of Evaluation			
	May	June	July	August
	-------------------percent---------------			
1	37b[1]	53b	67b	85b
2	50b	62b	68b	83b
3	43b	58b	67b	80b
4	53b	67b	70b	87b
5	43b	58b	67b	83b
6	53b	67b	75b	87b
7	57b	68b	78b	90b
8	40b	57b	67b	80b
9*	1a	2a	5a	20a
10*	1a	2a	2a	33ab
11**	2a	3a	6a	40ab
12**	1a	1a	2a	7a
13	50b	53b	53b	67b

[1] values in a column followed by the same letter do not differ at P=0.05.
* Treatments with 3 ounces Oust/A.
**Treatments with 19 ounces Oustar/A.

Table 5. Average percent stem reduction of principal species in 1999 Fall Oust field trials - MS.

Treatment No.	Herbicides[1]	Species[2]			
		SWG	REM	PER	Total
		------------percent-------------			
1	Krenite + Chopper (6+20)	-100a[3]	-100a	-100a	-85ab
2	Krenite + Chopper (4+20)	-100a	-100a	-85ab	-90a
3	Krenite + Chopper (4+24)	-100a	-100a	-100a	-98a
4	Krenite + Chopper + Escort (4+16+1)	-100a	-100a	-100a	-94a
5	Krenite + Chopper + Accord SP (4+20+1)	-100a	-100a	-100a	-95a
6	Accord SP + Chopper (5+16)	-100a	-100a	-100a	-96a
7	Accord SP + Escort + Chopper (1+48)	-100a	-100a	-100a	-88a
8	Accord SP + Escort + Chopper (1+1+24)	-100a	-100a	-100a	-93a
9	Trt. #6 + 3 oz Oust/A	-89a	-100a	-100a	-93a
10	Trt. #7 + 3 oz Oust/A	-100a	-100a	-100a	-90a
11	Trt. #6 + 19 oz Oustar/A	-100a	-80b	-100a	-68b
12	Trt. #7 + 19 oz Oustar/A	-100a	-100a	-100a	-94a
13	Untreated	+23b	+260c	+67c	+51c

[1] Krenite and Accord SP = quarts/A., Chopper and Escort = oucnes/A.
[2] SWG = sweetgum, REM = red maple, PER = persimmon
[3] values followed by the same letter in a column do no differ at p=0.05.

Table 6. Average percent stem reduction in "other" species found in 1999 Fall Oust field trials - MS.

Trt No.	Species[1]						
	LLP	WAD	WIE	CBO	WIO	POO	SRO
	percent						
1	-100[2]	-100	+30	*	*	*	*
2	-100	-100	+85	-100	-100	-100	*
3	-100	-100	-46	-100	-100	-100	-100
4	*[3]	-100	-100	*	*	*	*
5	*	*	nc[4]	-85	*	-100	*
6	-100	*	-30	-100	-100	-100	-100
7	-23	*	-77	-100	*	*	-100
8	-58	-100	-100	-100	-100	-100	-100
9	-88	+100	-100	-100	-100	-100	-100
10	-10	-100	*	-100	-100	-100	-100
11	+33	+30	-89	-70	*	-57	*
12	-57	nc	-37	-100	-100	-100	-100
13	*	+700	+143	+30	nc	+31	+233

[1] LLP = loblolly pine, WAO = water oak, WIE = winged elm, CBO = cherrybark oak,
WIO = willow oak, POO = post oak, SRO = southern red oak.
[2] negative values indicate reduction in number of stems.
[3] insufficient stems for evaluation
[4] nc = no change

HERBICIDE AND GIRDLING TREATMENTS FOR CREATING WILDLIFE SNAG TREES FROM MATURE LOBLOLLY PINE. T.B. Harrington, School of Forest Resources, University of Georgia, Athens, GA 30602-2152 and J.W. Taylor, Forest Health Protection, State and Private Forestry, USDA Forest Service, Atlanta, GA 30367.[1]

ABSTRACT

Snags (standing dead trees) are important habitat for a variety of bird and mammal species. In this operational trial, several herbicide and girdling treatments were applied to mature loblolly pine (*Pinus taeda*) at different timings in 1998 and 1999 to identify those with rapid rates of crown injury to accelerate snag formation and to restrict pine seedfall into a clearcut area. The trial was conducted on eight sites at the Savannah River Site. Treatments included double girdling, hack 'n' squirt with Tordon®101-M, a soil drench with Tordon®K, and a ground application of granules of Spike®. Crown injury was 93-99% following the hack 'n' squirt and soil drench treatments, while it was 26-27% following the girdling and Spike® treatments. Crown injury following June and September treatment timings (29-31%) was less than that of the other timings (49-64%), suggesting that these timings may not adequately prevent pine seedfall into a clearcut area. Loss of trees from breakage and uprooting was greater following the November treatment timing, but the reason for this response was not identified. Results indicate that the hack 'n' squirt and soil drench treatments with Tordon® provided rapid rates of crown injury for a variety of timings. Treatment application prior to June is most likely to prevent pine seedfall.

INTRODUCTION

To provide nesting, roosting, and other forms of habitat for birds and mammal species, forest managers need effective methods to create snags in managed stands of southern pine. In particular, they need treatments that cause rapid rates of crown injury to prevent natural seedfall from occurring into a clearcut area. This prevents excess densities of volunteer pines from developing within the newly established pine plantation. Herbicide and girdling treatments are logical choices for creating snags because they are relatively inexpensive and can be applied selectively to individual trees without injuring other vegetation.

[1]Financial and in-kind support was provided by the Savannah River Forest Station, USDA Forest Service, New Ellenton, SC. The authors thank Mr. Jamie Scott and his staff for assistance with site selection, treatment application, and photography.

MATERIALS AND METHODS

This operational trial was conducted at the Savannah River Site, a National Environmental Research Park near Aiken, SC. At least 50 mature loblolly pines were preserved at each of 8 sites that were scheduled for clearcut harvesting. After clearcutting, one of the following treatments was randomly assigned to each of 10 trees per site:

1. Untreated check.
2. Double girdling with a chainsaw at 4.5 ft. aboveground (6 in. between girdled bands).
3. Hack 'n' squirt with a 50% solution of 101-M in water (edge-to-edge cuts were made with an axe; about 2 ml of solution was applied to each cut).
4. Soil drench with Tordon®K within the tree's crown perimeter (3 qts./acre).
5. Application of Spike®20P granules within the tree's crown perimeter (5 lbs. a.i./acre).

Treatments were applied at the following 8 timings (1 timing per site): 98-07-01 (year-month-day), 98-09-10, 98-11-12, 99-01-28, 99-03-22, 99-05-17, 99-06-21, and 99-09-22. On October 5, 1999, 3 to 15 months after treatment, a visual assessment of crown injury (%) was recorded for each tree. This time was selected for treatment assessment because it provided an indication of whether crown injury was sufficient to prevent pine seedfall, which occurs in autumn. There was one exception to this evaluation date: crown injury data for the last timing (99-09-22) was collected on April 17, 2000. Number of trees lost to breakage or uprooting also was recorded.

An arc-sine, square-root transformation was applied to the individual-tree measurements of crown injury and loss to breakage or uprooting to homogenize the residual variances. Each variable was subjected to analysis of variance with the sources of variation, treatment and treatment timing. Confounding of site and treatment timing prevented testing of the treatment-by-timing interaction. Multiple comparisons of least squares means (a=0.05) were conducted with Bonferroni adjusted probabilities.

RESULTS AND DISCUSSION

Crown injury was 93-99% following the hack 'n' squirt and soil drench treatments, while it was 26-27% following the double girdling and Spike® treatments ($P \leq 0.001$) (Figure 1). Loss of trees from breakage and uprooting (<1%) did not vary significantly (P=0.441) among treatments.

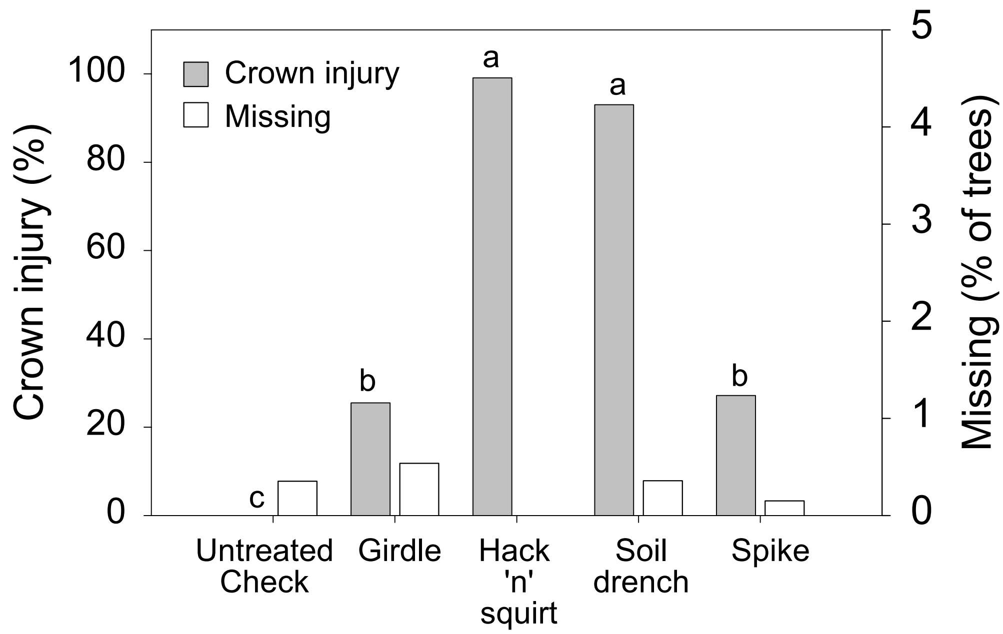

Figure 1 Figure 1. Crown injury and loss of trees from breakage and uprooting 3 to 15 months following several treatments for creating wildlife snags from mature loblolly pine.

Crown injury following June and September 1999 treatment timings (29-31%) was less than that of the other timings (49-64%) (P=0.006) (Figure 2). This may indicate that summer treatment timings may not adequately prevent pine seedfall into a clearcut area. Loss of trees from breakage and uprooting was greater following the November timing (>2%) versus the other timings (<1%), but the reason for this response was not apparent.

Results of this operational trial indicate that the hack 'n' squirt and soil drench treatments provided the most rapid rates of crown injury. Treatment application prior to June is most likely to prevent pine seedfall into a clearcut area. Loss of snags from breakage and uprooting is not likely to exceed 2% per year.

The following are other things to consider when using Tordon® for hack 'n' squirt treatments on mature pines.[2] The cut into the stem should be slanted to prevent the herbicide solution from dripping out, and it need not be any deeper than 0.5 in. into the xylem. A small chainsaw is ideal for making the cut, and the herbicide should be applied immediately after cutting to ensure uptake into the tree's vascular system. The individual cuts need not be edge to edge. Two in. of stem circumference can be left from the end of one cut to the beginning of the next cut. Avoid spilling the herbicide on the soil surface, since it can injure other plant species if it comes into contact with their foliage or roots. Finally, consider using the formulation, Tordon®101-R, which is a ready-to-use 50% solution of Tordon®101-M in water.

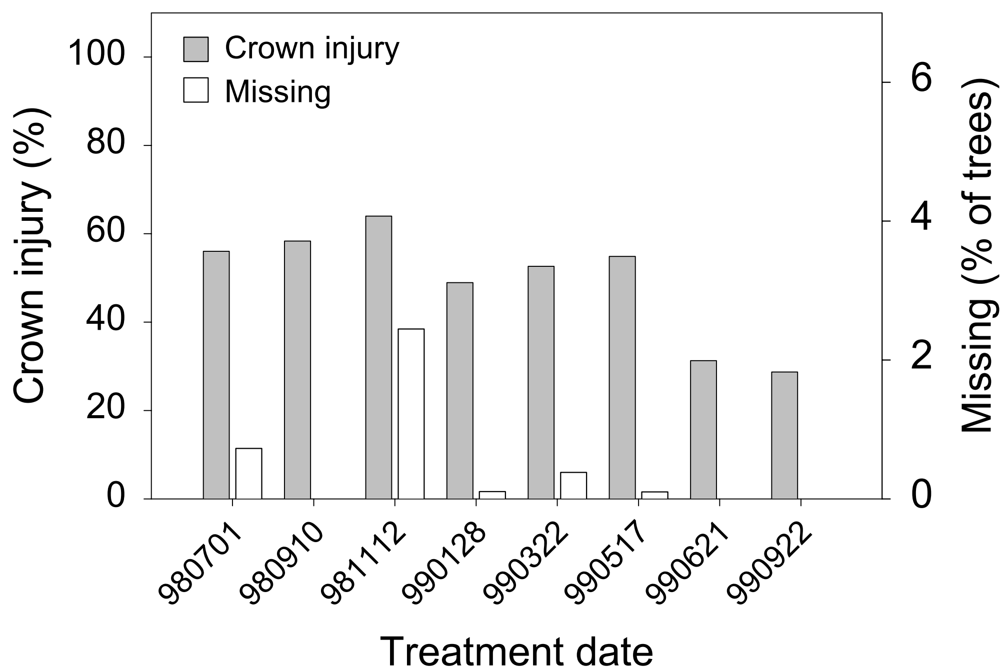

Figure 2 Figure 2. Crown injury and loss of trees from breakage and uprooting following eight timings of five treatments for creating wildlife snags from mature loblolly pine. Response variables were evaluated on October 5, 1999 except for the last timing, which was evaluated on April 17, 2000.

[2] W. Kline, Dow Agrosciences, Duluth, GA. Personal communication.

WEED CONTROL AND SEEDLING GROWTH USING PRE-EMERGENCE OUST, VELPAR OR VELPAR+OUST IMPREGNATED DAP. D.A. Knox and J. L. Yeiser. Arthur Temple College of Forestry, Stephen F. Austin State University, Nacogdoches, TX 75962.

ABSTRACT

Currently managers apply herbicide and fertilizer over the top of newly planted loblolly pine seedlings in two separate passes and incurring two application costs. A technology that accomplishes both weeding and feeding in one pass will reduce cost and save time. The objective of this study is to compare the efficacy and subsequent seedling growth of pre-emergence applications of (1) conventional liquid herbicide treatments, (2) fertilizer and herbicide treatments applied in two separate passes (current technology) and (3) DAP impregnated with herbicide and applied with one pass (weed and feed technology).

Three sites were tested. The Diboll, TX site was clearcut in September 1998, chemically prepared in September 1999 with Arsenal+Garlon 4 (16oz+2qt), mechanically mulched and subsoiled in October, and planted in February 2000. In Picayune, MS, the site was clearcut in December 1998, shear and raked in October, double bedded in November of 1999, and planted in January 2000. The Whitfield, AL site was clearcut in August and burned in December, both in 1998. In 1999, the site was prepared in July with a Chopper+Escort+Accord (40oz+1oz+1qt) herbicide treatment, subsoiled in December, and planted in January 2000. Ten treatments were tested in TX and twelve treatments in MS and AL. Treatments were: (1) Velpar+Oust (1qt+2oz) applied as a liquid spray, (2) V+O impregnated on DAP (1qt+2oz+125 lb) applied as a granule, (3) Velpar impregnated on DAP (1qt+125 lb) applied as a granule, (4) Velpar impregnated on DAP (1qt+250 lb) applied as a granule (not TX), (5) Oust (2oz) applied as a liquid spray, (6) Oust as a liquid spray followed by DAP applied as a granule (2oz & 125 lb), (7) Oust as a liquid spray followed by DAP applied as a granule (2oz & 250 lb) (not TX), (8) Oust impregnated on DAP (2oz+125 lb) applied as a granule, (9) Oust impregnated on DAP (2oz+250 lb) applied as a granule, (10) Oust impregnated on DAP (4 oz+125 lb) applied as a granule, (11) DAP (125 lb) applied as a granule (no herbicide) and (12) Untreated Check. All sites were subject to a July through October 2000 drought.

At all three sites, significantly more weed control was observed on herbicide treated plots than untreated check and DAP only plots. In TX and MS, overall weed control for evaluations 60 days after treatment (DAT) exceeded 90%; control 120 DAT exceeded 80%. In AL, overall weed control 60 DAT exceeded 80% and declined to 70% 120 DAT. At all three sites, all two-pass treatments (Oust (2 oz) followed by 125 or 250 lb DAP), conventional sprays of Velpar+Oust, and treatments of DAP impregnated with Oust (4 oz) or Velpar+Oust provided similar and best weed control. In TX and MS, Oust (2oz) was among treatments providing best weed control. In MS, Velpar impregnated on 250 lb of DAP was among treatments providing best weed control. Velpar impregnated on 125 lb of DAP provided least consistent weed control. Seedlings at the MS site were not measured at the time this report was prepared. In TX, all treatments containing a herbicide exhibited significantly greater seedling survival (88%) than check (73%) or DAP only (46%) treatments. No differences in survival were recorded in AL (65%). In TX and AL, seedlings growing in herbicide treated plots were taller and had more volume than seedlings in check and DAP only plots. Growth differences among fertilized and unfertilized plots were not detected. Drought negatively impacted survival and growth at all three sites.

EARLY SEASON APPLICATIONS OF OUSTAR FOR HERBACEOUS WEED CONTROL IN LOBLOLLY PINE PLANTATIONS. A.W. Ezell, Department of Forestry, Mississippi State University, Mississippi State, MS 39762 and J.L. Yeiser, Stephen F. Austin State University, Nacogdoches, TX 75962.

ABSTRACT

Herbaceous weed control is extremely important in the establishment of loblolly pine plantations and is widely practiced across the South. Oustar® is a product which has potential for use in such applications. During April, 2000, four rates of Oustar were applied in first year loblolly pine plantations in Mississippi and Texas. In addition, two tank mixtures which are considered industry standards were applied in the same locations for comparison. All six treatments were replicated three times in Mississippi and four times in Texas. Plots were evaluated at 30, 60, 90, and 120 DAT for control of herbaceous species and for any symptoms of crop damage. Fifteen sample trees were measured in each treatment plot prior to application and at the end of the first growing season. Total seedling height and groundline diameter (GLD) were the measurement parameters.

Survival did not vary significantly among the herbicide treatments or the untreated areas. This is believed to be attributed to adequate early growing season rainfall. In Texas, all treatments maintained more than 90% control of competition for 90 DAT and only one treatment had less than 90% clear ground at 120 DAT. In Mississippi, treatment plots remained more than 90% clear for 60 DAT, but percent clear ground had reduced to 78-90% at 90 DAT and 75-83% at 120 DAT. No significant differences existed among any treatments at either location at 120 DAT. Overall, the industry standards performed as well or slightly better than the Oustar treatments, but any difference were minor, and control by all treatments was considered to be excellent. In Texas, only the highest rate of Oustar had tree height which was significantly different, and while more differences in Mississippi existed, no

rate response was evident. No significant differences existed for groundline diameter (GLD) measurements in Texas, but all treatments resulted in significantly greater GLD than the untreated plots in Mississippi.

INTRODUCTION

Establishing pine plantations continues to be a major focus of forest management in the South. For years, forest land owners have recognized the importance of herbaceous weed control and such applications are part of most forest industry management plans. This control typically includes an application during the first growing season either as a banded or broadcast treatment. Control is hoped to last for 120 days after treatment (DAT) or longer. In an effort to examine new approaches to this management scenario, this study was installed at locations across the South.

Objectives

The objectives of the study were as follows:

1) To compare various rates of Oustar® to accepted industry standards for herbaceous weed control.
2) To evaluate the efficacy of all treatments on various weed complexes and further evaluate crop tolerance of Oustar applied over loblolly pine seedlings.

METHODS AND MATERIALS

A total of six herbicide treatments were applied in this study (Table 1). These included four rates of Oustar and two tank mixes which are considered to be industry standards. In addition, an untreated check was considered as a treatment in all plot installations. All treatments were installed with a randomized complete block design with a minimum of three replications per treatment.

Study sites were selected in both Mississippi and Texas. In Mississippi, the study was installed on land owned by The Timber Company which had been harvested in May 1999, chemically site prepared in August 1999, burned and planted with 1-0 bareroot loblolly pine seedlings in January 2000. The soil was a Ruston sandy clay loam with a pH=5.2. The study site in Texas was on land owned by Temple-Inland Corporation which was harvested in September 1998, site prepared in 1999 and planted with containerized loblolly pine seedlings in January 2000. The soil was a sandy clay loam with a pH=5.5

All treatments were applied on either April 10, 2000 (MS) or April 11, 2000 (TX). Each treatment plot was a five-foot spray swath (width) with each plot of a variable length required to ensure the presence of 15 measurement trees per plot. All treatments were applied with a $C0_2$-powered backpack sprayer with a total spray volume of 10 gpa.

Prior to application, the total height and groundline diameter of each measurement tree was recorded to facilitate growth comparisons. At 30, 60, 90, and 120 DAT, an ocular evaluation was completed on each plot to assess competition control and any symptoms of damage on the pine seedlings which could have occurred as a result of the herbicide treatments. At the end of the growing season, the trees were again measured for total height, groundline diameter, and survival. Data were subjected to ANOVA and specific tests for separation of means.

RESULTS

Survival in all treatment plots at both study locations was considered to be excellent (Table 2). None of the differences were statistically significant, and any differences (however minor) are believed to be attributable to individual seedling tolerance and/or microsite variation.

In competition control, all herbicide treatments remained more than 90% clear of herbaceous competition for 60 DAT in Mississippi (Table 3). The chemical site preparation exhibited some residual effect in that untreated plots remained more than 25% clear throughout the study in Mississippi and that is thought to have contributed to the excellent survival in untreated plots. By 120 DAT in Mississippi plots, clear ground had decreased to 75-83% in treatment plots with no statistical differences among the herbicide treatments. At the Texas site, all treatments remained more than 90% clear for 90 DAT, and only one (16 oz. Oustar) was less than 90% at 120 DAT. No statistical differences existed among treatments, with the exception of untreated plots which averaged only 17% clear ground by 120 DAT (Table 4).

Table 5 has the average total heights for seedlings after one growing season, and the tallest trees were in the Oust/Velpar tank mix at both locations. The average height in the Oust/Arsenal mix was equal to the other industry standard in Mississippi, but was appreciably less (though not significant) in Texas. In both locations, the highest rate of Oustar (19 oz./A) had some of the lower heights while the 16 oz. rate was statistically similar to the tank mix averages at both sites. Of note is the discrepancy between height growth in untreated plots between locations. Height growth was the lowest average overall in Mississippi, but ranked second in Texas. This is possibly an effect of having containerized seedlings in Texas.

The effect of containerized seedlings was quite possibly also evident in groundline diameter measurements (Table 6). All averages in Texas were very similar while the seedlings in untreated areas in Mississippi were only approximately half the size of seedlings in all treatment plots except the 13 oz./A Oustar treatment. As there is no apparent rate response or other treatment effect in the data, this lower overall diameter in 13 oz. Oustar plots can only be attributable to seedling variation in the bareroot stock.

In summary, survival was exceptional in all plots in consideration of the extreme drought of 2000. All herbicide treatments provided excellent control for the entire study period, and the Oustar treatments provided comparable results to the "industry standard" tank mixes. A rate response was not evident in the Oustar applications although growth parameters were less in some of the Oustar - 19 oz./A plots. Average height varied by site and treatment, and average groundline diameter varied more in Mississippi than in Texas. However, seedlings in Mississippi had significantly greater groundline diameter in the treated plots which should be of note to managers planning to use 1-0, bareroot seedlings. Finally, none of the treatments caused any damage to any of the seedlings in this study.

Table 1. List of treatments utilized in 2000 Oustarfield trials.

Treatment No.	Herbicide and Rate[1]/Acre
1	10 oz. Oustar
2	13 Oz. Oustar
3	16 oz. Oustar
4	19 oz. Oustar
5	2 oz. Oust + 32 oz. Velpar L
6	2 oz. Oust + 4 oz. Arsenal AC
7	Untreated

[1] actual product

Table 2. Average survival in 2000 Oustar field trials (average all reps per site).

Treatment	Location	
	TX	MS
	----------percent--------	
10 oz. Oustar	100.0a	97.4a
13 oz. Oustar	97.9a	93.9a
16 oz. Oustar	97.9a	97.5a
19 oz. Oustar	93.7a	90.2a
Oust + Velpar (2 + 32)	93.7a	97.6a
Oust + Arsenal (2 + 4)	100.0a	100.0a
Untreated	93.7a	94.4a

Table 3. Average percent clear ground in 2000 Oustar field trials (no wood stem coverage included)- MS.

Treatment	Time of Observation			
	30DAT	60DAT	90DAT	120DAT
		-------------------percent---------------		
10 oz. Oustar	96a[1]	93a	83ab	78a
13 oz. Oustar	98a	95a	78b	75ab
16 oz. Oustar	97a	96a	85a	81a
19 oz. Oustar	97a	96a	87a	78a
Oust + Velpar (2+32)	97a	96a	88a	81a
Oust + Arsenal (2+4)	97a	91a	90a	83a
Untreated	45b	32b	25c	28c

[1] means followed by the same letter in a column do not differ at P=0.05.

Table 4. Average percent clear ground in 2000 Oustar field trials (avg. all reps) - TX.

Treatment	Time of Observation (DAT)			
	30	60	90	120
	-------------------percent---------------			
10 oz. Oustar	93a[1]	94a	90a	92a
13 oz. Oustar	98a	97a	96a	92a
16 oz. Oustar	98a	98a	96a	71a
19 oz. Oustar	99a	99a	99a	99a
Oust + Velpar (2+32)	98a	97a	97a	97a
Oust + Arsenal (2+4)	99a	99a	99a	96a
Untreated	27b	27b	27c	18b

[1] means followed by the same letter in a column do not differ at P=0.05.

Table 5. Average seedling height for pine seedlings in 2000 Oustar field trials.

Treatment	Study Site	
	TX	MS
	----------inches--------	
10 oz. Oustar	22.6bc	28.7ab
13 oz. Oustar	23.9abc	24.2bc
16 oz. Oustar	24.8ab	27.2abc
19 oz. Oustar	21.1c	26.8bc
Oust + Velpar (2+32)	26.0a	30.5a
Oust + Arsenal (2+4)	22.9abc	30.5a
Untreated	25.3ab	20.6c

Table 6. Average seedling groundline diameter of pine seedlings in 2000 Oustar field trials.

Treatment	Study Site	
	TX	MS
	----------inches--------	
10 oz. Oustar	0.60a	0.63a
13 oz. Oustar	0.64a	0.49b
16 oz. Oustar	0.66a	0.63a
19 oz. Oustar	0.60a	0.59ab
Oust + Velpar (2+32)	0.68a	0.56ab
Oust + Arsenal (2+4)	0.65a	0.69a
Untreated	0.64a	0.32c

WILDLING PINE CONTROL WITH R6447, OUST, AND KRENITE S COMBINATIONS. J.L. Yeiser, Stephen F. Austin State University, Nacogdoches, TX 75962.

ABSTRACT

With small harvesting areas and SMZs becoming increasingly common, over seeding from neighboring pine stands and over stocking of young plantations may become more prevalent. Managers need a treatment that controls unwanted wildling pine germinants while releasing without injury, planted pine seedlings. The objective of this study was to compare R6447, Oust, and Krenite pre- and post-emergence combinations for reduction of herbaceous weeds, wilding control, and resultant growth of planted loblolly pine (Pinus taeda L.) seedlings. In Texas and Mississippi, herbaceous weed control was similar and best 60 and 120 days after pre-emergence treatments of Oust (3oz) and Milestone+Oust mixtures. In Mississippi, similar and best weed control was also achieved with Milestone (10oz) alone. In Alabama, best and similar control 60 days after treatment (DAT) was achieved with all test treatments. Control deteriorated, and 150 DAT, only Milestone+Oust mixtures were best. Germinant control at all three sites was considered inadequate, although statistical differences were detected. In spite of the drought year, seedling growth was greater for several Oust and Milestone+Oust mixtures than checks.

INTRODUCTION

Mchanical and chemical treatments combined with prescribed fire are commonly used to create growing conditions enhancing survival and growth of newly planted pine seedlings. These same growing conditions also promote pine germinant establishment. With small harvesting areas and SMZs becoming increasingly common, over seeding from neighboring pine stands and over stocking of young plantations may become more prevalent. Forest managers need a treatment that controls unwanted wildling pine seed, germinants and seedlings and releases genetically improved, newly planted pine seedlings without injury.

In 1999, directed and over-the-top treatments of Krovar IDF (20 oz and 40 oz) were compared to a conventional weed control treatment of Oust (3 oz). Krovar IDF (1) provided little additional weed control, (2) damaged planted pine seedlings, and (3) gave similar control of pine germinants as Oust. In the same study, R6447 (azafenidin 10 oz) provided similar weed control, seedling performance and germinant control as Oust (3 oz). With major risk of damage to planted pine seedlings by directed and over-the-top treatments of Krovar IDF (20 oz and 40 oz) and the lack of enhanced pine seed control by R6447, the use of directed and over-the-top treatments of these products for pine seed and wildling control was not recommended. Mixtures were not tested in 1999. In 2000, over-the-top mixtures of R6447 and Oust followed by directed applications of Krenite S were evaluated for wilding control, reduction of herbaceous weeds and resultant growth of loblolly pine (Pinus taeda L.) seedlings.

METHODS

The 2000 study plan was established on three sites, one in each of Texas, Mississippi and Alabama. Site descriptions, application dates and equipment, plus major and minor competitors are presented for comparison in Table 1. Table 2 contains a list of test treatments and rates.

Test treatments were applied to single-row, plots consisting of 16-planted seedlings. The internal 12 seedlings comprised the measurement plot, leaving two seedlings on each end as buffers. Also, each measurement plot contained 4, 3, and 3 subplots, in Texas, Mississippi, and Alabama, respectively. Subplots were approximately 1-ft X 1-ft centered on bed crowns and sown with 50 orchard-grown seeds of loblolly pine on March 2 in Texas, March 13 in Mississippi, and March 28, 2000 in Alabama. Seeds were not stratified, but were water soaked over night. Seeds were raked lightly to a dept of ¼" or less into the soil. All three sites received small showers of rainfall within three days of sowing.

In Texas, measurement seedlings were tallied for survival, total height, and ground line diameter (GLD) on March 3, 2000 and again in October 2000, after one growing season. Volume index was computed as height X ground line diameter^2. Final measurements for seedlings at the Mississippi and Alabama sites were not available at the time this report was prepared. Only results of seedling survival and growth in Texas will be presented.

The study protocol was installed as a randomized complete block design with four blocks in Texas and three blocks in each of Mississippi and Alabama. Each block contained 13 single-row treatment plots. Treatment effects for germinant survival and planted seedling height, GLD, and volume index were partitioned using the GLM procedure of SAS and means separated using Duncan's New Multiple Range test. All tests were conducted at the p=0.05 level.

RESULTS AND DISCUSSION

Seedling survival and growth data are available for Texas only (Table 2). Seedling survival exceeded 90% for all treatments and was not significantly different. Differences in total height, ground line diameter and volume index were present but small, perhaps due to the extreme summer and fall drought (Table 4). Greatest values were observed for height, ground line diameter and volume index for treatments of Oust (3oz) alone and Milestone+Oust (10oz+30z, 5oz+3oz) mixtures.

Similar and best herbaceous weed control was achieved with pre-emergence Milestone+Oust mixtures or Oust in Texas and Mississippi (Table 3). Also similar and best in Mississippi were treatments of Milestone (10oz) alone. In Alabama, best and similar control 60 DAT was achieved with all test treatments. Control deteriorated, and 150 DAT only Milestone+Oust mixtures were best.

Overall mortality of germinating pine seeds was 94%, 84%, and 96% in Texas, Mississippi, and Alabama, respectively (Table 4). In Texas, Mississippi, and Alabama, 84%, 73%, and 92% mortality occurred in checks and pre-emergence herbicide treatments induced 95%, 85%, and 96% mortality, respectively. Statistical differences are presented in Table 3. In Texas, control was similar and best for 11 of 12 herbicide treatments that ranged in control from 98% to 92% with an average of 95%. Least and similar control resulted on check (83%) and Oust (3oz) (88%) plots that averaged 86%. The difference among best and worst treatments is 9%. These results are considered of statistical but not biological significance. In Mississippi, treatments of Oust (3oz), Milestone (5oz, 10oz), and Milestone+Oust (10oz+3oz) provided similar germinant control as the check. In Alabama, the check was among those treatments with greatest germinate mortality. Clearly, control of germinating pine seedlings by pre-emergence Oust, Milestone, and Milestone+Oust mixtures at all three test sites is inadequate. A paired comparison of post-emergence treatments with and without Krenite S failed to show consistently significant reduction of germinates. For example, Krenite S in a post-emergence application significantly reduced germinants in only two treatment pairs in Texas (Milestone (5oz), Oust (3oz)) and four treatment pairs in Mississippi (Milestone+Oust (10oz+3oz), Milestone+Oust (5oz+3oz), Milestone (10oz), Milestone (5oz)). In Alabama, best Krenite S treatments only equaled the mortality on checks.

In conclusion, Oust and Milestone+Oust mixtures provided significant and practical levels of herbaceous weed control and resultant seedling growth. Control of pine germinates by all Oust, Milestone, and Milestone+Oust treatments tested was inadequate.

Table 1. Description of the three study sites including application and evaluation dates, equipment, and competitors

	Texas	Mississippi	Alabama
Location	Diboll (Angelina)	Picayune (Hancock)	Whitfield (Sumter County)
Physiography	Upper Coastal Plain	Flatwoods Coastal Plain	Interior flatwoods Coastal Plain
Soils	sandy loam	silt loam	clay loam
Stand	mixed pine-hardwood	mixed pine-hardwood	mixed pine-hardwood
Clearcut	Sep-98	Dec-98	Aug-98
Site Preparation	9/99 Arsenal+Garlon 4 (16oz+2qt)	10/00 shear & pile 12/99 burned windrows	12/98 burn 7/99 aerial spray 10 gpa Chopper+Escort+Accord 40oz+1oz+1qt
	subsoiled 10/99	11/99 subsoiled double bed	subsoiled 12/99
Planted	Containerized Dec 99	Bare root Jan 00	Bare root Jan 00
Application	Pre-emergence over the top 3-Mar-00	Pre-emergence over the top 14-Mar-00	Pre-emergence over the top 29-Mar-00
Equipment	"T" boom with 4, 8002 nozzles	"T" boom with 4, 8002 nozzles	"T" boom with 4, 8002 nozzles
	6-ft band, 10gpa	6-ft band, 10gpa	6-ft band, 10gpa
Application	Post-emergence over the top 18-Jul-00	Post-emergence over the top 14-Jun-00	Post-emergence over the top 1-Jun-00
Equipment	"T" boom with 2, K1.5 nozzles	"T" boom with 2, K1.5 nozzles	"T" boom with 2, K1.5 nozzles
	6-ft band, 10gpa	6-ft band, 10gpa	6-ft band, 10gpa
Minor Competitors	panicgrass, Andropogon	bermudagrass, sedge, common ragweed, crabgrass, lambs quarter, fall panicum, red root	bermudagrass, sedge, crabgrass, Andropogon, panicgrass, wooly croton, Solanum, polk, goldenrod, tropic croton
Major Competitors	late boneset, dogfennel, American burnweed	none	none
	no woody arborescents	no woody arborescents	no woody arborescents

Table 2. Height (HT), ground line diameter (GLD), and volume index of container grown loblolly pine seedlings after one growing season in Diboll, TX as a result of combinations of pre-emergence (applied March 6, 2000) and post emergence (applied July 18, 2000) herbicide treatments.[1]

PRE-EMERGENCE HERBICIDE	RATE	POST-EMERGENCE HERBICIDE	RATE	HT	GLD	VOLUME INDEX
				(in)	(in)	(in^3)
Milestone+Oust	10oz+3oz	none	none	27.7 a	0.82 ab	22.1 a
Milestone+Oust	10oz+3oz	Krenite	5%	26.6 ab	0.75 bc	18.9 abc
Milestone+Oust	10oz+3oz	Krenite+Oust	5%+3oz	26.7 ab	0.86 a	21.8 a
Milestone+Oust	5oz+3oz	none	none	27.7 a	0.81 ab	20.8 abcd
Milestone+Oust	5oz+3oz	Milestone+Oust+Krenite	5oz+3oz+5%	25.6 abc	0.86 a	17.6 abcd
Milestone+Oust	5oz+3oz	Krenite+Milestone	5%+5oz	25.3 abc	0.71 c	14.8 bcde
Milestone	10oz	none	none	25.1 abc	0.70 c	13.7 cdef
Milestone	10oz	Krenite	5%	22.5 bc	0.68 cd	12.0 def
Milestone	5oz	none	none	23.2 bc	0.60 de	10.0 ef
Milestone	5oz	Krenite	5%	24.0 abc	0.68 cd	13.0 cdef
Oust	3oz	none	none	28.3 a	0.84 ab	23.7 a
Oust	3oz	Krenite	5%	25.6 abc	0.88 a	21.8 a
Check	none	none	none	21.8 c	0.54 e	7.8 f

[1]Means within a column sharing the same letter are not significantly different (Duncan's New Multiple Range test (p=0.05 level).

Table 3. Overall herbaceous weed control 60 and 150 days after pre-emergence treatment (DAT) of herbicides targeting unwanted herbaceous and wildling pine competitors of planted loblolly pine seedlings.

PRE-EMERGENCE HERBICIDE	RATE	POST-EMERGENCE HERBICIDE	RATE	OVERALL	CONTROL
				(%)	(%)
TEXAS	applied 3-Mar-00		applied 18-Jul-00	evaluated May-00	evaluated Aug-00
Milestone+Oust	10oz+3oz	none	none	99.0a	97.0a
Milestone+Oust	10oz+3oz	Krenite	5%	98.5a	97.0a
Milestone+Oust	10oz+3oz	Krenite+Oust	5%+3oz	99.0a	95.3a
Milestone+Oust	5oz+3oz	none	none	98.0a	83.5a
Milestone+Oust	5oz+3oz	Milestone+Oust+Krenite	5oz+3oz+5%	98.0a	93.5a
Milestone+Oust	5oz+3oz	Krenite+Milestone	5%+5oz	98.5a	91.0a
Milestone	10oz	none	none	89.3b	55.0b
Milestone	10oz	Krenite	5%	90.0b	52.5b
Milestone	5oz	none	none	82.5c	52.5b
Milestone	5oz	Krenite	5%	87.5bc	60.0b
Oust	3oz	none	none	97.5a	87.8a
Oust	3oz	Krenite	5%	97.8a	86.8a
Check	none	none	none	37.5d	22.5c
MISSISSIPPI	applied 14-Mar-00		applied 14-Jun-00	evaluated May-00	evaluated Aug-00
Milestone+Oust	10oz+3oz	none	none	99.0a	97.7ab
Milestone+Oust	10oz+3oz	Krenite	5%	99.0a	98.7ab
Milestone+Oust	10oz+3oz	Krenite+Oust	5%+3oz	99.0a	99.3a
Milestone+Oust	5oz+3oz	none	none	98.3a	96.7ab
Milestone+Oust	5oz+3oz	Milestone+Oust+Krenite	5oz+3oz+5%	99.0a	99.0ab
Milestone+Oust	5oz+3oz	Krenite+Milestone	5%+5oz	99.0a	99.0ab
Milestone	10oz	none	none	98.0a	97.7ab
Milestone	10oz	Krenite	5%	95.0bc	96.0ab
Milestone	5oz	none	none	94.7c	80.0d
Milestone	5oz	Krenite	5%	92.0d	87.3c
Oust	3oz	none	none	97.7a	91.7abc
Oust	3oz	Krenite	5%	97.0ab	96.3ab
Check	none	none	none	48.7e	21.7e
ALABAMA	applied 29-Mar-00		applied 1-Jun-00	evaluated May-00	evaluated Aug-00
Milestone+Oust	10oz+3oz	none	none	87.7a	85.0ab
Milestone+Oust	10oz+3oz	Krenite	5%	94.7a	78.3abc
Milestone+Oust	10oz+3oz	Krenite+Oust	5%+3oz	85.3a	76.7bcd
Milestone+Oust	5oz+3oz	none	none	86.3a	65.0def
Milestone+Oust	5oz+3oz	Milestone+Oust+Krenite	5oz+3oz+5%	76.7ab	88.3a
Milestone+Oust	5oz+3oz	Krenite+Milestone	5%+5oz	76.7a	88.3a
Milestone	10oz	none	none	78.7ab	66.7def
Milestone	10oz	Krenite	5%	80.7ab	60.0f
Milestone	5oz	none	none	79.3ab	65.0def
Milestone	5oz	Krenite	5%	85.7a	63.3ef
Oust	3oz	none	none	84.0a	73.3cde
Oust	3oz	Krenite	5%	84.3a	66.7def
Check	none	none	none	61.7b	21.7g

[1] Treatment means within a column sharing the same letter are not significantly different (Duncan's New Multiple Range Test, P=0.05).

Table 4. An assessment 60 days after treatment of the number of pine germinants surviving pre- and post-emergence treatment in Texas, Mississippi, and Alabama.

PRE-EMERGENCE HERBICIDE[1]	RATE	POST-EMERGENCE HERBICIDE	RATE	PRE-EMERGENCE	POST-EMERGENCE
DIBOLL, TX	applied 3-Mar-00		applied 18-Jul-00	evaluated May-00	evaluated Sep-00
Milestone+Oust	10oz+3oz	none	none	1.3c	1.1bc
Milestone+Oust	10oz+3oz	Krenite	5%	1.1c	0.6bc
Milestone+Oust	10oz+3oz	Krenite+Oust	5%+3oz	1.3c	0.1c
Milestone+Oust	5oz+3oz	none	none	2.1c	1.5bc
Milestone+Oust	5oz+3oz	Milestone+Oust+Krenite	5oz+3oz+5%	3.0bc	1.9bc
Milestone+Oust	5oz+3oz	Krenite+Milestone	5%+5oz	3.3bc	1.1bc
Milestone	10oz	none	none	2.3c	1.9bc
Milestone	10oz	Krenite	5%	2.6c	0.1c
Milestone	5oz	none	none	3.9bc	3.4ab
Milestone	5oz	Krenite	5%	2.4c	0.6c
Oust	3oz	none	none	6.0ab	5.0a
Oust	3oz	Krenite	5%	3.6bc	1.8bc
Check	none	none	none	8.3a	5.4a
PICAYUNE, MS	applied 14-Mar-00		applied 14-Jun-00	evaluated May-00	evaluated Sep-00
Milestone+Oust	10oz+3oz	none	none	1.6f	0.6c
Milestone+Oust	10oz+3oz	Krenite	5%	13.4a	6.2a
Milestone+Oust	10oz+3oz	Krenite+Oust	5%+3oz	9.7abc	3.0bc
Milestone+Oust	5oz+3oz	none	none	3.3ef	3.0bc
Milestone+Oust	5oz+3oz	Milestone+Oust+Krenite	5oz+3oz+5%	6.9cde	5.0ab
Milestone+Oust	5oz+3oz	Krenite+Milestone	5%+5oz	6.4cde	0.0c
Milestone	10oz	none	none	10.2abc	7.7a
Milestone	10oz	Krenite	5%	5.3def	1.4c
Milestone	5oz	none	none	9.0bcd	7.1a
Milestone	5oz	Krenite	5%	9.8abc	0.6c
Oust	3oz	none	none	4.6ef	2.4bc
Oust	3oz	Krenite	5%	11.6ab	2.4bc
Check	none	none	none	11.3a	8.0a
WHITFIELD, AL	applied 29-Mar-00		applied 1-Jun-00	evaluated May-00	evaluated Sep-00
Milestone+Oust	10oz+3oz	none	none	0.9c	0.1d
Milestone+Oust	10oz+3oz	Krenite	5%	0.9c	0.7bcd
Milestone+Oust	10oz+3oz	Krenite+Oust	5%+3oz	0.9c	1.0bcd
Milestone+Oust	5oz+3oz	none	none	1.2c	0.3cd
Milestone+Oust	5oz+3oz	Milestone+Oust+Krenite	5oz+3oz+5%	2.3bc	2.3a
Milestone+Oust	5oz+3oz	Krenite+Milestone	5%+5oz	1.3c	0.8bcd
Milestone	10oz	none	none	4.1a	1.4abc
Milestone	10oz	Krenite	5%	2.4abc	1.3abc
Milestone	5oz	none	none	3.3ab	1.3abc
Milestone	5oz	Krenite	5%	1.4c	0.6cd
Oust	3oz	none	none	3.8ab	1.3abc
Oust	3oz	Krenite	5%	3.1ab	1.8ab
Check	none	none	none	1.3c	0.4cd

[1] Treatment means within a column sharing the same letter are not significantly different (Duncan's New Multiple Range Test, P=0.05).

SITE PREPARATION BROWNOUT TRIALS USING AC1014109. L.R. Nelson, A.W. Ezell and J.L. Yieser. Clemson University, Clemson, SC; Mississippi State University, Mississippi State; and Stephen F. Austin State University, Nacogdoches, TX.

ABSTRACT

Herbicide treatments were installed in September, 2000 at two locations to evaluate the performance of AC 1014109 for forest site preparation. Study sites included an upper coastal plain site near Louisville, MS and a coastal plain site 35 miles SE of Nacogdoches, TX. Dominant hardwood species were sweetgum, red maple, water oak, post oak and black cherry in MS. Lesser species included American beautyberry, privet and smilax. Major species on the TX site included sweetgum and southern red oak with an understory of yaupon, baccharis, American holly, sumac and American beautyberry. Herbicide treatments included imazapyr (Chopper®) @ 12 oz ai/ac + 12.5 % V/V vegetable oil (Sun-It II®) and AC1014109 @ 48, 51.1, 102.2, 153.3, and 204.4 fl oz product/ac. Treatments were applied with a CO_2 backpack-pole sprayer. A randomized complete block experimental design was used at both locations. Plots were 100 ft x 25 ft with 3 replicates. Evaluations were conducted 8 WAT. Measurements consisted of ocular estimates of percent foliar brownout of hardwoods and understory grasses, forbs and shrubs.

Herbicide treatments did not provide high levels of brownout on the various vegetation types. In MS, AC 1014109 @ 153.3 oz/ac resulted in 73 and 87 % brownout of grasses and broadleaf forbs, respectively. Most of the other treatments provided 50 % or less brownout. None of the treatments resulted in greater than 60 % brownout on woody brush. Similar results on woody species occurred on the TX site. The highest rate of 1014109 provided 70 % while the remaining treatments resulted in 63 % or less. The three highest rates of AC 1014109 provided greater than 90 % brownout of grasses and broadleaf forbs.

HERBACEOUS WEED CONTROL OF PASTURE VEGETATION WITH COMBINATIONS OF IMAZAPYR, SULFOMETURON, AND METSULFURON. T.B. Harrington, School of Forest Resources, University of Georgia, Athens, GA 30602-2152 and M. Link, DuPont Agricultural Products, Byron, GA 31008.[3]

ABSTRACT

Herbaceous weed control treatments typically are applied over young pine seedlings during the first year after planting to promote their survival and to accelerate their early growth. Two common pasture species, bermuda grass (*Cynodon dactylon*) and bahia grass (*Paspalum notatum*), can be particularly competitive with newly planted seedlings of loblolly pine (*Pinus taeda*). In addition, bermuda grass is tolerant of the sulfonylurea herbicides. In this study, combinations of Arsenal®, Oust®, and Escort® herbicides were compared with or without surfactant for their ability to control these two grass species in a plantation of loblolly pine near Collins GA. In the first 2 months after treatment (May 1 to June 27, 2000), bermuda grass cover decreased by 11% (absolute cover units) in treatments that included Arsenal®, while it increased by 28% in treatments that did not include it. Likewise, bermuda grass cover decreased by 11% in treatments with Oust® at 0.75 oz/acre, while it increased by 9% in treatments with Oust® at 1.5 oz/acre. Bahia grass cover decreased by 7% in treatments that included Escort®, while it decreased by 1% in treatments that did not include it. By August 28, bermuda grass cover had increased by an average 41% in the herbicide treatments, while bahia grass cover had decreased by 11%. Despite these changes in vegetation abundance, the treatments did not stimulate a significant increase in survival of pine seedlings (10% in the untreated check versus 22% in the treated plots) probably because of the severe summer drought of 2000. Relationships of August untreated cover of bahia grass to that of bermuda grass had slopes approximately equal to one, suggesting that the two species have similar competitive abilities that allow them to co-exist.

INTRODUCTION

Conversion of a pasture to a pine plantation can be challenging if competing species are tolerant of herbicides labeled for forestry use. For example, bermuda grass is tolerant of Oust® and Escort®, and it will become more vigorous when these herbicides are applied because of the competition release that they provide. However, Oust® can be an important component of herbaceous weed control treatments because of the residual control of broadleaf weeds that it provides. Thus, in order to effectively control the complex of grass and broadleaf weeds that are present on pasture sites, tank mixtures of two or more herbicides are needed. The objective of this study was to compare various combinations of Arsenal®, Oust®, and Escort® herbicides with or without surfactant for their ability to control bermuda and bahia grasses and promote survival and growth of newly planted seedlings of loblolly pine.

MATERIALS AND METHODS

The study was conducted on a degraded bermuda and bahia grass pasture near Collins GA (Tattnall County). Soils are loamy sands of the Tifton series (Plinthic Paleudults). In winter 1999-2000, loblolly pine seedlings had been planted at an approximate spacing of 6 ft x 10 ft. Twenty-seven plots, each 30 ft x 150 ft in dimension, were installed in spring 2000. Eight herbicide treatments and an untreated check were assigned to the plots with 3 replications of each treatment arranged in a completely randomized design (Table 1). Treatments were applied on May 1, 2000 with a CO_2 sprayer (30 p.s.i. pressure, 20 gal./acre spray volume, and a 6-ft. spray swath via four 8002VS nozzles). Immediately prior to treatment and at 2 months (June 27) and 4 months (August 28) after treatment (MAT), cover (%) of each herbaceous species was assessed visually within each of five 1-m^2 quadrats per plot. At the pre-treatment measurement, 20 herbaceous species were present; however, by the end of June and

[3] Financial and in-kind support for this research was provided by DuPont Agricultural Products. The authors thank Mr. Mike Dollar and Mr. Bill Dean for their assistance with site selection.

August the community was composed almost entirely of bermuda and bahia grasses. Therefore, only the treatment responses of these two herbaceous species could be quantified. Injury (%), groundline diameter (mm), and height (cm) of all pines were measured in each plot (*n*=16-21 seedlings).

Table 1. Combinations of Arsenal®, Oust®, and Escort® herbicides with or without Entry II® surfactant, that were compared for their ability to control bermuda and bahia grasses and promote survival and growth of loblolly pine seedlings.

Treatment	Entry II®	Oust®	Escort®	Arsenal®
	% by volume	------------- oz. a.i./acre	-------------	oz. a.e./acre
1	0.0	0.75	0.6	2
2	0.5	0.75	0.6	2
3	0.0	0.75	0.6	3
4	0.5	0.75	0.6	3
5	0.0	0.75	0.0	3
6	0.0	1.50	0.0	2
7	0.5	0.00	0.6	2
8	0.5	1.50	0.6	0
9	0.0	0.00	0.0	0

A variety of indices were tested for quantifying changes in grass abundance following treatment. Of these, change in cover (absolute units, %) from pre-treatment to post-treatment provided the most sensitive measure of treatment response. Values of change in cover of grasses and survival, injury, groundline diameter, and height of pine seedlings were averaged by plot and subjected to analysis of variance (ANOVA). To homogenize the residual variances in the ANOVA, an angular transformation (arc-sine, square-root of a proportion) was applied to pine survival and injury, while a logarithmic transformation was applied to pine groundline diameter and height. Pre-treatment abundance of each species and pre-treatment size of pine were included as covariates in the respective ANOVA's. Non-orthogonal contrasts were used to test for differences between: 1) untreated versus treated plots, 2) presence versus absence of Entry II® surfactant, 3) presence versus absence of Oust®, 4) low versus high rates of Oust®, 5) presence versus absence of Escort®, 6) presence versus absence of Arsenal®, and 7) low versus high rates of Arsenal®. Significance levels for each contrast were calculated as Bonferroni-adjusted probabilities.

To provide a measure of species' competitiveness, regression analysis was used to quantify the relationship between August untreated cover of bahia grass versus that of bermuda grass, and *vice versa*. These relationships were linearized with an angular transformation.

RESULTS AND DISCUSSION

Absolute cover values of bermuda and bahia grasses following the various treatments indicate that, on all of the herbicide-treated plots, cover of bermuda grass cover increased between the second and fourth months after treatment, while cover of bahia grass decreased (Table 2).

Table 2. Cover of bermuda and bahia grasses 2 and 4 months after treatment (MAT) with various combinations of Arsenal®, Oust®, and Escort® herbicides.

	Bermuda grass		Bahia grass	
Treatment	Cover (%) 2 MAT	Cover (%) 4 MAT	Cover (%) 2 MAT	Cover (%) 4 MAT
1	18	71	4	1
2	8	62	4	0
3	12	66	6	0
4	11	42	7	1
5	11	58	11	2
6	14	78	10	3
7	11	48	3	0
8	52	84	4	0
9	40	39	12	27

During the first two months after treatment, bermuda grass cover decreased by 11% (absolute cover units) and increased by 28% in the presence versus absence of Arsenal®, respectively (Table 3). Likewise, bermuda grass cover decreased by 11% and increased by 9% in treatments that contained Oust® at 0.75 versus 1.5 oz/acre, respectively. Bahia grass cover decreased by 7% and 1% in the presence versus absence of Escort®, respectively (Table 4). From May to August, bermuda grass cover increased by an average 41% in the herbicide treatments, while bahia grass cover decreased by 11%. Change in cover of either species did not differ in the presence versus absence of surfactant.

Table 3. Change in cover of bermuda grass 2 and 4 months after treatment (MAT) as affected by specifications of the various herbaceous weed control treatments. Significance levels are shown only for contrasts that had P<0.1.

	D Cover (%) 2 MAT			D Cover (%) 4 MAT		
Contrast	Mean1	Mean2	*P*	Mean1	Mean2	*P*
Check vs. trmt	+17	-6	0.01	+5	+41	<0.01
+/- Entry II®	-2	-10		+41	+41	
+/- Oust®	-5	-11		+41	+37	
Lo/hi Oust®	-11	+9	<0.01	+37	+51	
+/- Escort®	-4	-12		+43	+34	
+/- Arsenal®	-11	+28	<0.01	+38	+63	0.07
Lo/hi Arsenal®	-10	-12		+42	+32	

Table 4. Change in cover of bahia grass 2 and 4 months after treatment (MAT) as affected by specifications of the various herbaceous weed control treatments. Significance levels are shown only for contrasts that had P<0.1.

	D Cover (%) 2 MAT			D Cover (%) 4 MAT		
Contrast	Mean1	Mean2	P	Mean1	Mean2	P
Check vs. trmt	*+6*	-6	0.04	+17	-11	<0.01
+/- Entry II®	*-7*	-4		-15	-8	
+/- Oust®	*-5*	-11		-10	-23	
Lo/hi Oust®	*-5*	-4		-10	-8	
+/- Escort®	*-7*	-1	0.04	-13	-6	
+/- Arsenal®	*-5*	-7		-11	-11	
Lo/hi Arsenal®	*-7*	-4		-12	-11	

Despite these changes in vegetation abundance, the treatments did not stimulate a significant increase in survival of pine seedlings (10% in the untreated check versus 22% in the treated plots) probably because of the summer drought of 2000. Loblolly pine size was slightly larger in the presence versus absence of Arsenal® (data not shown). Levels of pine injury were not influenced by any of the treatment specifications.

Relationships of August untreated cover of bahia grass to that of bermuda grass had slopes approximately equal to 1 (Figure 1), suggesting that the two species have similar competitive abilities. The somewhat smaller slope for the relationship of bahia grass cover to bermuda grass cover (0.8), compared to that of the opposite relationship (1.0), indicates that increases in bermuda grass cover result in smaller decreases in bahia grass cover than vice versa. Although bermuda grass was highly competitive and able to increase its cover throughout the growing season by excluding bahia grass and other species, this abundance relationship suggests that bahia grass is able to survive and maintain itself as an important component of the vegetative community.

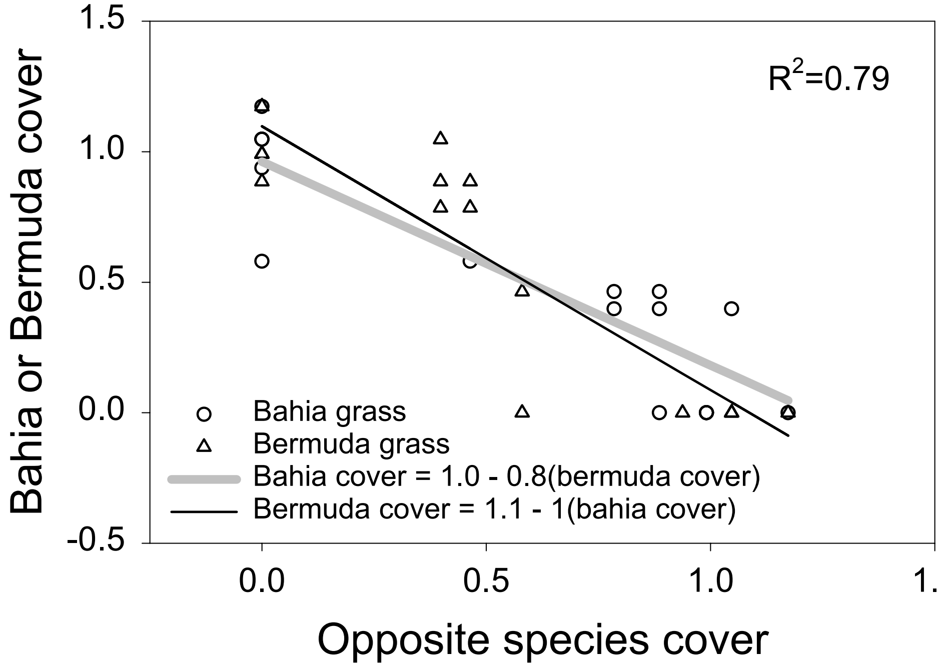

Figure 1. Regression relationships of August untreated cover between bahia grass and bermuda grass and *vice versa.* The data in these relationships has been linearized with an angular transformation (arc-sine, square-root of cover expressed as a proportion).

WOODY STEM CONTROL USING TANK MIXTURES OF FOSAMINE, IMAZAPYR, GLYPHOSATE AND METSULFURON. L.R. Nelson and A.W. Ezell. Clemson University, Clemson, SC and Mississippi State University, Starkville.

ABSTRACT

Herbicide treatments were installed during the 1999 growing season at two locations to evaluate the performance of fosamine tank mixtures for forest site preparation. Study sites included a piedmont site near Abbeville, SC and an upper coastal plain site near Louisville, MS. Dominant hardwood species were sweetgum, water oak and winged elm in SC and sweetgum, red maple, red oak spp. and winged elm in MS. Herbicide treatments included fosamine @ 4 lb ai/ac + imazapyr (Chopper®) @ 6 oz ai/ac + surfactant (Dynamic®) @ .25 % v/v, fosimine @ 4 lb ai/ac + imazapyr (Chopper) @ 6 oz ai/ac + metsulfuron @ .9 oz ai/ac + surfactant (Dynamic) @ .25 % v/v, fosamine @ 4 lb ai/ac + imazapyr (Chopper) @ 6 oz ai/ac + glyphosate (Accord®) @ 1.5 lb ai/ac + MON 59120 @ .25 % v/v and fosamine @ 4 lb ai/ac + imazapyr (Arsenal Applicators Concentrate®) @ 6 oz ai/ac + surfactant (dynamic) @ .25 % v/v. Treatments were applied with a CO_2 backpack-pole sprayer in mid-August. A randomized complete block experimental design was used at both locations. Plots were 100 ft x 25 ft with 3 replicates. Evaluations were conducted 8 WAT and again at 12 MAT. The 8 WAT measurements included ocular estimates of percent foliar brownout of hardwoods and understory grasses and forbs. The 12 MAT measurements included stem counts of live woody stems by species. These values were compared to initial stem counts to determine percent control.

All treatments provided effective brownout of grasses. Fosimine + imazaypr (Chopper) + Glyphosate + surfactant resulted in 95 % brownout at both locations. Brownout with the other treatments ranged from 63 to 88 %. All treatments were significantly different than the check plots which were rated at 5 and 0 % in MS and SC, respectively.

Herbicide treatments did not differ statistically with respect to percent brownout of broadleaf forbs. Percent brownout ranged from 83 to 100 %. All treatments differed from check plots which were rated at 7 and 0 % in MS and SC, respectively.

Herbicide treatments did not differ statistically with respect to overall percent brownout of hardwood species. Foliar brownout ranged from 70 to 95 %. All treatments differed from the check plots which were rated at 0 % at both locations. Herbicide treatments were particularly effective on sweetgum in SC. Brownout ranged from 95 to 100 %. Low levels of brownout occurred on water oak with a range of 23 to 42 %. Two treatments were effective on winged elm. Applications of Fosamine + imazapyr (Chopper) + metsulfuron and Fosamine + imazapyr (Chopper) + glyphosate resulted in 100 and 95 % brownout, respectively. Remaining treatments provided less than 50 % brownout.

The above three-way mixtures provided effective (90 % or more) control of all species on both sites. Low level control of water oak and winged elm in SC resulted from the Krenite plus Chopper treatment. Krenite mixed with either Chopper or Arsenal provided poor control of red maple and winged elm in MS.

INITIAL BROWNOUT RESPONSE TO MON78015, MON78229, MON 78128, AND OTHER GLYPHOSATE PRODUCTS AND TANK MIXTURES. A.W. Ezell, Department of Forestry, Mississippi State University, Mississippi State, MS 39762, L.R. Nelson, Clemson University, Clemson, SC 29634, and J.L. Yeiser, Stephen F. Austin State University, Nacogdoches, TX 75962.

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 was replicated three times at all locations. A pretreatment inventory of woody stems in plots was completed by species and height class, and an ocular estimate of brownout was completed at 8 WAT.

Overall, all treatments did an excellent job of brownout on grass and broadleaf species. The Texas site had little or no broadleaf coverage in the plots, but Mississippi and South Carolina exhibited greater than 90% brownout on herbaceous competition. Overall brownout of woody species in Mississippi ranged from 83 - 95% with no significant difference between any of the herbicide treatments. In Texas, brownout of woody species ranged from an average of 49% to 89% but the treatments did not vary significantly (statistically) in their performance. In South Carolina, two of the herbicide treatments were statistically significant in their brownout difference from the other 8 treatments on woody species. Average brownout ranged from 64-87% at this site. Considering all species at all study sites, the brownout response to these treatments is considered to be excellent.

HARDWOOD STEM REDUCTION WHEN PREPARING PINE SITES WITH A NEW FORMULATION OF HEXAZINONE. J.L. Yeiser, Stephen F. Austin State University, Nacogdoches, TX 75962 and A.W. Ezell, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Site preparation rates of Velpar L and a new Velpar DF formulation were tested alone and in combination with Garlon 4 for unwanted woody stem reduction on pine sites in Texas and Mississippi. In Texas only, Velpar L+Accord and Krenite S+Arsenal AC were also tested. Herbicide treatments were applied in Texas on June 1, 1999 and in Mississippi on June 5, 1999. Both sites were evaluated 16 months following treatment. When the new Velpar DF formulation was compared with Velpar L, percent stem reduction of American beautyberry, sweetgum, yaupon, post oak, water oak, and overall species was similar. In Mississippi, the new Velpar DF alone and in mixture with Garlon 4 reduced red maple and post oak more than Velpar L. In contrast, Texas sweetgum was controlled more with new Velpar DF and Velpar L than with Velpar DF+Garlon, Velpar L+Garlon 4 or Velpar L+Accord mixtures suggesting antagonism. Although differences were detected for specific species, overall stem reduction was similar for the new and current formulations of Velpar both alone and mixed with Garlon 4, illustrating the trade-off in species control that can occur. Rootstocks were effectively controlled by herbicides. Ingrowth was similar for herbicide and check plots. Sixteen months after treatment, competitor levels on herbicide plots were significantly less than on check plots, but perhaps still too high for intensive pine culture. The new hexazinone formulation shows promise as part of an integrated pest management approach to preparing sites for planting.

INTRODUCTION

Herbicides used during the chemical preparationof pine sites include, but are not limited to, Arsenal AC, Accord, Garlon 4, Velpar L and Krenite S. DuPont has developed a new formulation of hexazinone, called Velpar DF, and its potential for woody plant control during the preparation of pine sites is unknown. The objective of this study was to compare woody stem reduction resulting from site preparation applications of Velpar L and Velpar DF, alone and in combination with Garlon 4 for the control of unwanted woody species occupying pine sites.

METHODS

A site in Texas and Mississippi were selected for testing. The Texas test site was in the Upper Coastal Plain near Diboll (Angelina County). The soil was a moderately well drained sandy loam with a top 6-in. pH of 4.5. This site supported a mixed pine hardwood stand prior to clearcutting in the fall of 1998. Yaupon (Ilex vomitoria Ait.), and sweetgum (Liquidambar styraciflua L.) were the dominant woody species occupying the site. Sweetgum and oak were very uniform in height and commonly 3-ft. tall. Yaupon was somewhat less uniform in height and varied from 1.5- to 4-ft. in height. Minor components of green ash (Fraxinus pennsylvanica Marsh.), post oak (Q. stellata Wangenh.), mockernut hickory (Carya tomentosa (Poir.) Nutt), honeylocust (Gleditsia triacanthos L.), mixed red oak (Quercus falcata Michx. and Q. nigra L.) and fringetree (Chionanthus virginicus L.) were present in too few plots or occurred too infrequently to justify an individual species assessment. These species were also commonly 3-ft. tall when herbicides were applied. At treatment time, light grass (Dichanthelium spp) and light broadleaf communities were present, perhaps due to the heavy litter layer. American beautyberry (Callicarpa americana L.) did occur in major proportions throughout test plots. Soil moisture was good on application day. Plots were geo-referenced to facilitate plot assessment over time. Loblolly pine (Pinus taeda L.) seedlings were planted in January 2000.

The Mississippi site was in the Upper Coastal Plain approximately 5 miles west of Ackerman, MS. The soil was a clay loam with a pH of 5.6. The site supported a mixed pine-hardwood stand prior to clearcutting in October 1998. The major undesired woody species occupying the site were sweetgum, mixed red oaks (Quercus phellos L., Q. nigra L., Q. falcata Michx. and Q. pagoda Raf.), and red maple (Acer rubrum L.). Lesser amounts of post oak (Q. stellata Wangenh.) and black cherry Prunus serotina Ehrh.) were scattered across plots. At the time of treatment, moderate grass (panicgrasses Dichanthelium spp, and sedges Carex spp) and broadleaf communities (ragweed (Ambrosia artemisiifolia L.), goldenrod (Solidago odora Ait.), dock (Rumex spp), dogfennel (Eupatorium capillifolium (Lam.) Small) and mares-tail (Conyza canadensis (L)) existed. Soil moisture on application day was moderate.

Test treatments were:

1. 6 qt of Velpar L (3 lb a.i.) + 2 qt of Garlon 4,
2. 4 lb of new Velpar DF (3 lb a.i.) + 2 qt of Garlon 4,
3. 6 qt of Velpar L,
4. 4 lb of new Velpar DF,
5. 6qt of Velpar L + 2 qt of Accord (in Texas only),
6. 4 qt of Krenite S + 16 oz of Arsenal AC in Texas only, and
7. Untreated Check

A backpack aerial simulator supporting a single, KLC9 flood nozzle approximately 12 ft above the ground was used to broadcast herbicides in a total carrier volume of 10 GPA in Texas on June 1, 1999 and in Mississippi on June 5, 1999. A single pass was used to spray treatment plots. The dimensions of treatment plots were 100 ft X 30 ft. Rootstocks within an internal measurement plot 80 ft X 10 ft were followed for treatment efficacy. All test treatments at both sties contained 2.5% Timberland 90 surfactant.

Prior to treatment, measurement plots received a 100% inventory of woody species. On October 2, 2000 in Mississippi (16 months after treatment), stems surviving treatment were tallied by species. In Texas, pretreatment rootstocks > 1-ft in height were flagged. In October 9, 2000, unflagged stems > 1-ft in height were tallied as ingrowth. Competitor stems 16 months after treatment was computed as the sum of treated but surviving stems plus ingrowth. Percent stem reduction was computed as the number of competitor stems divided by the initial stem count on each plot.

Seven treatments in Texas and five treatments in Mississippi were established in each of three blocks according to a randomized complete block design. In Texas, statistical parameters were percent control of treated hardwoods, ingrowth of hardwoods, and the total number of competing hardwood stems 16 months after treatment. In both Texas and Mississippi percent stem reduction was also a statistical parameter. Data were analyzed according to an analysis of variance using the GLM procedure of SAS (6). Means were separated using Duncan's New Multiple Range test. All tests were conducted at the P=0.05 level.

Drought was severe in Texas during both years of this study. Below average rainfall occurred from mid-June 1999 through late February 2000. Drought commenced again in July of 2000 and continued through data collection in October. A major drought occurred in Mississippi during 2000 as well.

RESULTS

Mississippi,
All herbicide treatments reduced rootstocks on sprayed plots while rootstock numbers commonly increased on check plots (Table 1). When stand-alone treatments of the new formulation of Velpar DF and Velpar L were compared, percent stem reduction of sweetgum, water oak, and overall species was similar. The new Velpar DF reduced red maple and post oak better than Velpar L. When the new DF and current liquid formulations of Velpar were mixed with Garlon 4 and compared, the new Velpar DF+Garlon 4 reduced more rootstocks of red maple and water oak. In contrast, Velpar L+Garlon 4 reduced more rootstocks of sweetgum and post oak. Both mixtures reduced all species similarly. In general, Velpar L+Garlon 4, new Velpar DF+Garlon 4, Velpar L, and Velpar DF were in the group of treatments best reducing competitors in 4, 3, 3, or 5, respectively, of the 5 species groups of competitors tested.

Texas

American beautyberry was controlled best by hexazinone mixtures and Krenite S+Arsenal AC (Table 2). Hexazinone alone did not control American beautyberry. Because ingrowth was similar across all plots, soil active herbicides did not impede plot reinvasion of American beautyberry. The number of competitors 16 months after treatment in plots treated with hexazinone alone or Velpar L+Garlon 4 was similar to the check and greater than for other herbicides. Conceptually, best treatments reduce existing and ingrowth of new rootstocks leaving few unwanted rootstocks to compete with newly planted pine seedlings. Treatments varied in the number of competitors present in test plots 16 months after treatment. For example, untreated check plots initially supported 13 rootstocks of American beautyberry. Plots receiving best treatments for American beautyberry reduction (new Velpar DF+Garlon 4, Velpar L+Accord) initially supported 13 rootstocks. On assessment day, best herbicide treatments and untreated plots had 6 and 19 rootstocks of American beautyberry, respectively. Therefore, best herbicide treatments reduced American beautyberry rootstocks 54% while it increased 46% in checks. This difference is significant.

Sweetgum control was best with Krenite S+Arsenal AC and differed among treatments of hexazinone alone and hexazinone mixed with Accord or Garlon (Table 2). Generally, hexazinone mixtures provided less control than hexazinone alone, suggesting antagonism. The number of ingrowth rootstocks of sweetgum was consistent across treatments and lower than observed for other species. When the number of rootstocks surviving treatment was summed with ingrowth, fewer competitor rootstocks resulted from treatments of hexazinone alone, Velpar DF+Garlon or Krenite S+Arsenal AC. If best treatments leave the fewest pine seedling competitors, then treatments exhibiting greatest sweetgum reduction are hexazinone alone, new Velpar DF+Garlon 4, Krenite S+Arsenal AC. These herbicide treatments and checks started with 12 and 13 rootstocks, respectively. Sixteen months following treatment, 3 and 11 sweetgum rootstocks occurred in plots of best treatments and checks, respectively. Rootstocks were reduced by 75% on treated and 15% on untreated plots and this difference is significant. The reduced rootstock number on check plots probably resulted from two consecutive years of major drought.

Rootstocks of yaupon were similarly controlled by all herbicide treatments (Table 2). Yaupon was probably the test species most difficult to control. Ingrowth was similar for all treated and untreated plots. Because control was generally low for yaupon, the number of ingrowth rootstocks equaled and commonly exceeded the number of rootstocks controlled. Consequently, competitor levels 16 months after treatment were commonly greater than when the study began. In fact, herbicide (excluding Velpar DF) and check plots started with 10 and 17 rootstocks, respectively. When assessed 16 months after treatment, herbicide and check plots supported 12 and 23 rootstocks, respectively. This represents a 20% and 65% increase on herbicide and untreated plots, respectively. This difference was significantly different. Velpar DF may have performed poorly on yaupon because, as a stand alone, it lacked the leaf conditioners present in Velpar L and Garlon 4 needed for enhanced waxy-leaf penetration.

When all species on the test site were considered, control of unwanted woody stems was greater for herbicide than check treatments (Table 2). Control was similar for all herbicide treatments and ingrowth was similar for all treatments. Numerically, herbicide plots started with an average of 184 and check plots 216, rootstocks. Sixteen months after treatment, 65 and 211 competitor rootstocks were growing on treated and untreated plots, respectively. This represented a significant reduction with 65% and 2% fewer rootstocks on treated than untreated plots, respectively.

When stand-alone treatments of the new formulation of Velpar DF and the current formulation of Velpar L were compared, percent stem reduction of American beautyberry, sweetgum, and overall species was similar (Table 2). Yaupon was the only species for which the new Velpar DF formulation did not reduce comparable rootstock numbers as did Velpar L. In mixtures with Garlon, both formulations similarly reduced stems of sweetgum, yaupon and overall species (Table 2). New Velpar DF+Garlon 4 reduced more rootstocks of American beautyberry than Velpar DF+Garlon 4. In general, Velpar L+Garlon 4, new Velpar DF+Garlon 4, Velpar L, Velpar DF, Velpar L+Accord, and Krenite S+Arsenal AC were in the group of treatments best reducing competitors in 2, 4, 3, 2, 3, or 3, respectively, of the 4 competitor groups tested. This indicates the new Velpar DF+Garlon was among those treatments providing best control in 4 of 4 competitor groups and shows promise as an herbicide mixture for site preparation.

In Texas, control varied by species and herbicide treatment (Table 2). Ingrowth was consistent within and across species. For American beautyberry and yaupon, the initial number of competitor rootstocks was similar to smaller than numbers 16 months after treatment. Only sweetgum experienced a consistent reduction in rootstock number. The number of rootstocks for all species 16 months after treatment indicated herbicides significantly reduced rootstocks. But the number of rootstocks at the end of the study, and therefore present during the first growing season, may still be too high for intensive pine culture. Managers committed to intensive pine culture on similar sites should consider integrated pest management with hexazinone or hexazinone mixtures providing a component of the needed weed control.

In conclusion, current and new formulations of hexazinone alone and in Garlon mixtures generally provided similar percent stem reduction of unwanted hardwoods occupying the two pine test sites. Use of the new formulation resulted in similar water oak and overall species reduction and more red maple reduction in Mississippi than currently achieved with Velpar L. Also, sweetgum reduction was less in Texas from hexazinone mixtures with Garlon and Accord than hexazinone alone. Results illustrate the benefits in control from some species and the loss of control for other species from tank mixtures. Antagonism for some species may exist for tank mixtures suggesting further refinement of the blends is needed. None of the test treatments reduced ingrowth below that of checks. Sixteen months after treatment, competitor levels on herbicide plots were significantly less than on check plots, but perhaps still too high for intensive pine culture. The new hexazinone formulation and its tank mixtures show promise as part of an integrated pest management approach to unwanted woody plant control during the preparation of pine sites for planting.

Table 1. Test plots near Ackerman, MS were treated on June 5, 1999 and plots evaluated on October 2, 2000 for stem reduction (%).

HERBICIDES[1]	RATE (Prod/ac)	SWEETGUM	RED MAPLE	POST OAK	WATER OAK	ALL SPECIES
		(%)	(%)	(%)	(%)	(%)
Velpar L+Garlon 4	6 qt.+2 qt.	-91a	-75c	-100a	-98a	-81a
New Velpar DF+Garlon 4	4 lb.+2 qt.	-75b	-100a	-73b	-98a	-76a
Velpar L	6 qt.	-100a	-83b	-61b	-98a	-63a
New Velpar DF	4 lb.	-100a	-100a	-91a	-100a	-72a
Check	None	-16c	+31d	+157c	+24b	+26b

[1] Treatment means within a column sharing the same letter are not significantly different (Duncan's New Multiple Range Test, P=0.05).

Table 2. Site preparation plots near Diboll, TX were inventoried in May 1999 for initial rootstocks, herbicides were applied on June 1, 1999 and plots evaluated on October 9, 2000 for control (%), ingrowth (number of rootstocks), total competitors (number of rootstocks) and percent stem reduction.

HERBICIDES[1]	RATE (Prod/ac)	AMERICAN BEAUTYBERRY				
		Initial	Control	Ingrowth	Competitors	Reduction
Velpar L+Garlon 4	6 qt.+2 qt.	12	81a	10a	13ab	+8b
New Velpar DF+Garlon 4	4 lb.+2 qt.	12	90a	8a	6b	-50a
Velpar L	6 qt.	12	20b	8a	17a	+42c
New Velpar DF	4 lb.	11	30b	7a	14a	+27c
Velpar L+Accord	6 qt.+2 qt.	14	94a	7a	6b	-57a
Krenite S+Arsenal AC	4 qt.+16 oz.	11	83a	5a	8b	-27b
Check	None	13	15b	5a	19a	+46c
				SWEETGUM		
Velpar L+Garlon 4	6 qt.+2 qt.	14	68cd	2a	8ab	-43b
New Velpar DF+Garlon 4	4 lb.+2 qt.	12	63d	2a	5bc	-58ab
Velpar L	6 qt.	9	78bc	1a	4bc	-56ab
New Velpar DF	4 lb.	10	81b	1a	3c	-70ab
Velpar L+Accord	6 qt.+2 qt.	14	64d	3a	8ab	-43b
Krenite S+Arsenal AC	4 qt.+16 oz.	16	97a	1a	1c	-94a
Check	None	13	3e	2a	11a	-15c
				YAUPON		
Velpar L+Garlon 4	6 qt.+2 qt.	11	51a	9a	13b	+18a
New Velpar DF+Garlon 4	4 lb.+2 qt.	9	51a	6a	11b	+22a
Velpar L	6 qt.	13	45a	7a	17ab	+31a
New Velpar DF	4 lb.	6	35a	5a	10b	+67b
Velpar L+Accord	6 qt.+2 qt.	9	46a	3a	9b	0a
Krenite S+Arsenal AC	4 qt.+16 oz.	9	32a	3a	10b	+11a
Check	None	17	3b	6a	23a	+65b
				ALL SPECIES		
Velpar L+Garlon 4	6 qt.+2 qt.	183	80a	21a	58b	-68a
New Velpar DF+Garlon 4	4 lb.+2 qt.	160	81a	22a	52b	-67a
Velpar L	6 qt.	311	67a	23a	126b	-59a
New Velpar DF	4 lb.	165	75a	20a	61b	-63a
Velpar L+Accord	6 qt.+2 qt.	149	80a	19a	49b	-67a
Krenite S+Arsenal AC	4 qt.+16 oz.	138	80a	16a	44b	-68a
Check	None	216	11b	19a	211a	-2b

[1] Treatment means within a column sharing the same letter are not significantly different (Duncan's New Multiple Range Test, P=0.05).

COMPETITION CONTROL AND CROP TOLERANCE IN PLANTED HARDWOOD SEEDLINGS FOLLOWING APPLICATIONS OF VARIOUS MIXTURES OF OXYFLUORFEN AND SULFOMETURON METHYL. L. Walton, Rohm and Haas Co., Tupelo, MS 38801 and A.W. Ezell, Department of Forestry, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

A total of nine herbicide treatments were applied over-the-top of recently planted hardwood seedlings. Hardwood species utilized in the study included cherrybark oak (Quercus pagoda), Nuttall oak (Q. nuttallii), sycamore (Platanus occidentalis), sweetgum (Liquidambar styraciflua) and yellow poplar (Liridendron tulipfera). All seedlings were 1-0, bareroot nursery stock and were planted in February 2000. Preemergent treatments were applied March 1, 2000 and postemergent treatments were applied June 23, 2000. All treatments had three replications in a completely randomized design. All applications utilized a total spray volume of 20 gpa. Evaluations were conducted at 30, 60, 90, and 120 DAT and consisted of ocular evaluations of percent cover by different vegetative types and any symptoms of damage to crop species from the herbicide application. In November 2000, survival measurements were recorded by species and treatment. Generally, the treatments which included Oust maintained a higher percentage of clear ground for the first 90DAT. This was primarily due to the presence of grass species which Goal 2XL does not control. Control of broadleaf species was comparable in all treatments. By 120DAT, vines and grass cover had eliminated most clear ground in all treatment plots. Crop tolerance - None of the treatments resulted in any damage to any of the seedlings. Survival - The growing season of 2000 experienced an extreme drought with little or no rainfall between late June and November. However, most trees had adequate resources to establish themselves prior to the onset of the drought and only yellow poplar exhibited any notable mortality prior to the end of the growing season. The yellow poplar mortality was attributed to an early onset of physiological activity by these seedlings in combination with a late freeze, and the mortality was uniform irrespective of herbicide treatment. Thus, the results for yellow poplar in this study are considered inconclusive due to freeze damage. Other species all had 70-88% survival at the end of the year. Summary - Both herbicides can be used safely on the species in this study. Goal 2XL can be applied either pre- or postemergent with no damage. Competition control will vary by the weed species complex on the site.

BROWNOUT OF VELPAR L+GLYPHOSATE MIXTURES FOR THE PREPARATION OF PINE SITES. J.L. Yeiser and A.W. Ezell, Stephen F. Austin State University, Nacogdoches, TX 75962; and Mississippi State University, Mississippi State 39762.

ABSTRACT

The objective of this study was to assess the potential of Velpar L+ DuPont glyphosate pre-mix for the brownout and control of post-harvest, unwanted herbaceous and woody vegetation occupying pine sites.

One site in Mississippi (Oktibbeha County) and one in Texas (Angelina County) were tested. The Mississippi site was harvested in November 1999. Treatments were applied at two timings. Early treatments were applied on May 12 and late treatments on June 26, 2000. Soil was a clay loam and moist on application day. Panicgrasses, broomsedge, and sedges were dominant grass species. Dominant broadleaf weeds were goldenrod, dogfennel, and small flower morning. Unwanted woody species include mockernut and shagbark hickory, red maple, and post oak. In Texas, the site was harvested in December 1999. An industry check treatment (Velpar L (6qt)) was applied on May 22 with all other treatments applied on July 12, 2000. The soil was a sandy loam and moist on application day. Moderate levels of grasses, (panic grasses, broomsedge, and sedges) broadleaf weeds (goldenrod, dogfennel, and late boneset), and woody species (winged elm, mixed oak and yaupon) were common to all test plots.

In Mississippi, early treatments were: (1) Velpar L+DuPont glyphosate (6qt+2qt), (2) Velpar L+DuPont glyphosate (4qt+4qt), (3) Velpar L (8qt). Late treatments were: (4) Velpar L (8qt), (5) Velpar L+DuPont glyphosate (6qt+2qt), (6) Velpar L+DuPont glyphosate (4qt+4qt), (7) Chopper+Accord+Timberland 90 (48oz+1qt+1pt), and (8) Accord SP+Chopper (5qt+16oz). In Texas, test treatments were: (1) Velpar L (6qt), (2) Velpar L (8qt), (3) Velpar L+DuPont glyphosate (6qt+2qt), (4) Velpar L+DuPont glyphosate (4qt+4qt), (5) Chopper+Accord SP+Timberland 90 (48oz+1qt+1pt), (6) Accord SP+Chopper (5qt+16oz), and (6) untreated check. Mississippi and Texas plots were evaluated eight weeks after application for brownout (%).

In Mississippi, late (82%) treatments provided more brownout of grass than early (67%) treatments. Best brownout of grasses (84%) was achieved with a late application of Velpar+DuPont glyphosate (4qt+4qt), Chopper+Accord SP+Timberland 90 (48oz+1qt+1pt) or Accord SP+Chopper (5qt+16oz). Broadleaf weeds were browned best (94%) by a late application of Velpar+DuPont glyphosate (4qt+4qt), Chopper+Accord SP+Timberland 90 (48oz+1qt+1pt) or Accord SP+Chopper (5qt+16oz). Least brownout (75%) of broadleaf weeds was accomplished with an early application of Velpar L+DuPont glyphosate (4+4) or Velpar L (8) and a late application of Velpar L+DuPont glyphosate (6qt+2qt). Woody species were browned best (78%) with a late application of Chopper+Accord SP+Timberland 90 (5qt+16oz+1pt). Intermediate brownout resulted from an early application (64%) of Velpar L+DuPont glyphosate (6qt+2qt, 4qt+4qt) and a late application of Velpar L+DuPont glyphosate (6qt+2qt) or Accord SP+Chopper (5qt+16oz). Least brownout (55%) resulted from Velpar (8qt both early and late) and a late application of Velpar L+DuPont glyphosate (4+4). All treatments sufficiently browned grasses, broadleaf weeds and woody species to carry a fire.

In Texas, no differences were detected among treatments for brownout of grasses eight weeks after treatment. Values ranged from 100% for the high to 57% for the low. Furthermore, all hexazinone and Accord SP+Chopper (5qt+16oz) treatments achieved 100% brownout. Chopper+Accord+Timberland 90 (48oz+1qt+1pt) provided 70%

brownout and the untreated check had 57% brownout, reflecting the drought and high temperatures. Brownout of broadleaf weeds was similar for all herbicide treatments. All treatments of hexazinone and Accord SP+Chopper (5qt+16oz) achieved 100% brownout. Chopper+Accord SP+Timberland 90 (48oz+1qt+1pt) provided 83% brownout while the untreated check displayed 37% brownout. Brownout of woody species was similar for all treatments of hexazinone and Accord SP+Chopper (5qt+16oz) and greater than for Chopper+Accord+Timberland 90 (48oz+1qt+1pt). Values for brownout ranged from 80% for the high (Velpar L in May) to 10% for the check. In conclusion, although statistical differences were detected among treatments, all herbicide treatments conditioned foliage of grasses, broadleaf weeds, and woody species sufficiently to carry a fire.

A METHOD OF ASSESSING ECONOMIC THRESHOLDS OF HARDWOOD COMPETITION. S.A. Knowe, Department of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, TN 37901-1071.

ABSTRACT

A procedure was developed for computing economic thresholds of hardwood competition in loblolly pine plantations. The economic threshold represents the break-even level of competition above which hardwood control is a financially attractive treatment. Sensitivity analyses were conducted to examine the relative importance of biological facors (site index and planting density) and economic factors (cost of a hardwood control treatment, pine stumpage value, and interest rate) in determining economic thresholds.

Growth models were used to determine the level of hardwood basal area (HBA) at which the discounted cost of a hardwood control treatment equals the reduction in present value of merchantable timber due to competition.
A basal area prediction model was fit with absolute HBA, rather than percent HBA, and then used to simulate the effects of hardwood competition in loblolly pine plantations. Loblolly pine yield response models at age 25 were developed for each level of site index. The intercept (α) and slope (β) of the yield response models were highly correlated with site index (SI). Therefore, the yield response models were generalized by expressing the intercepts and slopes as linear functions of SI:

$$Y = \alpha + \beta \times HBA = [\alpha_0 + \alpha_1 SI] + [\beta_0 + \beta_1 SI] \times HBA$$

where Y=loblolly pine yield (tons/acre), SI=loblolly pine site index (base age 25), and other terms as previously defined. The generalized yield models were used to compute HBA when the net present value of the pine response was zero. The economic threshold concept was expressed by setting the present value of merchantable volume lost to competition (VL) equal to the present value of the cost of a hardwood control treatment (TC), and then rearranging as follows:

$$\mathrm{HBA}_{\mathrm{ET}} = \frac{\mathrm{TC} \times (1 + \mathrm{i})^{\mathrm{r-t}}}{\mathrm{VL} \times \mathrm{SV}}$$

where HBA_{ET}=hardwood basal area (ft^2/acre) at the economic threshold, TC=cost of hardwood control treatment ($/acre), VL=volume lost to hardwood competition (tons/acre), SV=pine stumpage value ($/ton), i=interest rate, r=rotation age, and t=age of hardwood control treatment. Volume lost to hardwood competition is the product of slope of the generalized loblolly pine yield response model, which is a function of site index, and hardwood basal area. A hardwood basal area growth model was developed for projecting hardwood basal area to age 3, which is when release treatments would be applied. In this example, r (rotation age) was set at 25 years and t (age of hardwood control treatment) was set at 3 years.

Sensitivity analyses examined the relative importance of site index, interest rate, pine stumpage value, and treatment cost in determining economic thresholds for loblolly pine. The most important biological factor was site index, and interest rate was the most important economic factor, especially on poor sites. A 1% increase in interest increased the economic threshold level of hardwood basal area by 1-2 ft^2/acre on good sites and by 5 ft^2/acre on poor sites. Pine stumpage value and cost of hardwood control treatment cost were relatively unimportant in determining economic thresholds. Increasing loblolly pine stumpage value decreased the economic threshold by 0.5 ft^2/acre on good sites and by 1.0 ft^2/acre on poor sites. A $5/acre increase in treatment cost increased the economic threshold level of hardwood basal area by 0.50 ft^2/acre on good sites and by 0.75 ft^2/acre on poor sites.

This procedure can be used to determine whether hardwood competition control treatments are economically justified for particular plantations. The ability to prescribe site-specific competition control treatments is important in ensuring the public that herbicides and other treatments are used judiciously.

FIELD PERFORMANCE EVALUATIONS OF DOW AGROSCIENCES GLYPHOSATE FORMULATIONS ON HERBACEOUS WEEDS AND BRUSH. W.N. Kline and P.L. Burch; Dow AgroSciences, LLC, Indianapolis, Indiana 46268.

ABSTRACT

Glyphosate is one of the most widely used and researched herbicides in the world. DAS has formulated 2 glyphosate products which are being marketed in the Vegetation & Crops/Industrial Vegetation Management Businesses. Field trials were established in Georgia and Virginia during 1999 and 2000 to confirm comparative efficacy between DAS glyphosate products and industry standards.

The following questions were addressed in the trials. 1) Does Dow AgroScience formulation of glyphosate, Glypro Plus**** (formulated with surfactant), provide equivalent efficacy to industry standards on weeds and grasses? 2) Does Glypro* (Dow AgroScience glyphosate formulation without surfactant) alone or combined with Arsenal Herbicide, perform equivalent to the industry standard, Accord or Accord + Arsenal on brush species?

Broadleaf weed and grass field trial comparisons between Monsanto glyphosate formulations Roundup Pro & Roundup vs DAS Glypro Plus formulations did not show any significant differences at any of the rates evaluated. Consistent and similar results were demonstrated between DAS and Monsanto formulations when comparisons were made between equivalent rates - 0.25 lbs, 1.0 lb, 3.0 lbs per acre in trials established in 1999 and again in 2000. Based upon extensive DAS internal and contract field research trials, DAS glyphosate formulations can be considered equivalent to Monsanto formulations when used on herbaceous weeds and grasses.

Brush control comparisons between DAS glyphosate formulations vs industry standard formulations were summarized at 1 YAT from brush trials established in 1999 in Georgia and Virginia. Rates of 2 lbs/acre and 4 lbs/acre of DAS glyphosate (Glypro Plus & Glypro) vs equivalent rates of Accord and Roundup Pro were compared; combination treatments of Glypro + Arsenal vs Accord + Arsenal were also evaluated in these trials.

Overall, when all species were combined over both locations (GA & VA), similar rates of all formulations provided comparable results; and the two combinations with Arsenal provided comparable results. Results from these trials did not demonstrate any statistically significant differences between formulations at equivalent rates.

Based upon field trials and commercial use to-date DAS formulations, Glypro Plus and Glypro can be considered equivalent to Monsanto formulations when used for brush control.

HERBACEOUS WEED CONTROL IMPROVES SURVIVAL OF PLANTED SHUMARD OAK SEEDLINGS ON MISSISSIPPI RIVER FLOODPLAIN SITES. J.D. Hodges and A.W. Ezell, Department of Forestry, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Shumard oak seedlings were planted on a cutover site in the Mississippi River floodplain which had received both chemical and mechanical site preparation treatments. Soil at the site was a Commerce silt loam and the elevation was such that the area does not flood. Planting stock was 1-0, bareroot seedlings. A total of seven active herbicide treatments were applied at a preemergent timing over the top of the planted seedlings prior to the onset of the 1998 growing season. In addition, an untreated check was established and all treatments were replicated three times. Each plot consisted of 200 linear feet of planted row with 20 seedlings. Seedlings were tagged and flagged for measurement purposes. Competition control was evaluated at 30,60,90, and 120 days after treatment. At each evaluation timing, the seedlings were evaluated for any symptoms of herbicide damage. In November of 1998 and 1999, seedling survival was recorded. Overall, herbaceous competition control significantly increased seedling survival. Differences exist among treatments and between year of observation. Without herbaceous competition control, seedling survival and plantation establishment may be questionable in areas of severe weed pressure.

HERBACEOUS WEED CONTROL AND RESULTANT PINE SEEDLING GROWTH WITH NEW OUST, VELPAR, AND ESCORT FORMULATIONS: YEAR TWO RESULTS. R. Wood and J.L. Yeiser. Stephen F. Austin State University, Nacogdoches, TX 75962.

ABSTRACT

New extruded formulations of Oust, Velpar, and Escort in selected combinations and with Arsenal were tested in three studies in East Texas for loblolly pine seedling performance. Herbaceous weed control and year-one seedling survival and growth were presented previously. Droughts during 1999 and again in 2000 significantly influenced both seedling survival and growth. Seedling performance was similar for new and current formulations and conventional mixtures at comparable rates. Seedling survival and growth from treatments of Oustar, a new premix containing new Velpar DF and Oust XP, was similar to conventional formulations of Velpar L+Oust at comparable rates.

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INTRODUCTION

Herbaceous weed control about newly planted pine seedlings has been widely tested and its benefits well documented (1,2,3). In studies where the effects of various components of competition (woody and herbaceous) have been examined, competition from herbaceous species has contributed more to lost pine growth through age three than woody species (1,2). Consequently, herbaceous vegetation control after planting has gained rapid acceptance as a means of increasing pine survival and growth and justifies continued efforts to refine formulations and rates for efficacious weed control.

Oust, Velpar, Escort and Arsenal are among the herbicides commonly used for control of early herbaceous competitors in pine plantations (4,5,6,7). Therefore, the objective of this report is to compare pine performance for (1) current and new extruded formulations of Oust, Velpar and Escort in selected combinations and with Arsenal AC and (2) Oustar, a premix formulation of the new Velpar DF+Oust XP, with the conventional Velpar L+Oust mixture.

METHODS

The study site was in East Texas near Woden (Nacogdoches County) and had a moderately well to well-drained sandy loam soil (8). Previously, the site had supported a mixed pine-hardwood stand. This stand was clearcut in June 1997 and treated chemically on July 1, 1998 with 16 oz of Arsenal, 0.75 oz of Escort, and two qt of Accord. In late October, a fixed Piedmont plow was used to subsoil and bed the site. Genetically improved loblolly pine seedlings were hand planted on January 5, 1999 on an 8-ft by 10-ft spacing.

For all three studies, treatment plots consisting of 16-planted seedlings were staked with a plot marker. Each seedling in a plot was marked with a stake flag. Internal to each treatment plot was a measurement plot containing 12 seedlings, leaving two seedlings on each end as buffers. Total height and ground line diameter was recorded for measurement seedlings prior to the application of herbicides.

A CO_2 backpack sprayer connected to a "T" boom supporting four, 8002 nozzles was used to apply herbicides in a 6-ft. band centered over-the-top of seedlings. All treatments were early post-emergence when dominant species were less than 2-in. tall. The Oust treatments were applied on March 25 to 80% bare ground, the Velpar treatments on March 31 to 70% bare ground and the Escort treatments on April 6 to 60% bare ground. Primary competitors for all three studies were Rubus spp, ragweed (Ambrosia artemisiifolia L.), wooly croton (Croton capititus Michx.) and poorjoe (Diodia teres Walt.). On application day, buds on planted pine seedlings in the Oust study were 12/16 unchanged and 4/16 elongated, in the Velpar study 3/16 unchanged, 6/16 elongated, and 7/16 flushed, and in the Escort study 1/16 unchanged, 10/16 elongated and 5/16 flushed.

Competitor control in 10% intervals was visually made 30, 60, 90 and 120 days after treatment (DAT). In mid-October 1999 and 2000, after one and two growing seasons, seedlings were assessed for survival (%), total height (cm) and ground line diameter (GLD, mm). Seedling measurements were converted to inches for analysis. Volume index for surviving seedlings was computed as height X ground line diameter^2.

Treatments in each of the three studies were installed in a randomized complete block design with four blocks. The Oust, Velpar and Escort studies had 12,12 and 14 treatments, respectively, in each block. Treatment effects were partitioned using the ANOVA procedure of SAS with means separated according to Duncan's New Multiple Range test. All tests were conducted at the P=0.05 level.

Drought and temperature were major factors influencing seedling performance. During March 1999 through February 2000, monthly rainfall totals were 1.84 in., 2.44 in., 4.4 in., 4.0 in., 0.5 in., 0.2 in., 3.37 in., 2.66 in., 0.57 in., 2.83 in., 0.1 in., and 1.6 in., respectively. Rain was average (3.5 in) or above until July 2000. Temperatures during July through September 1999 were commonly 97°-103° F. During 2000, July through September was uncommonly dry with a 61-day, no rain period concurrently with 23 consecutive days above 100° F. The drought and high temperatures probably explains the overall poor survival and limited seedling growth.

RESULTS AND DISSCUSSION

When screening Oust formulations for seedling survival, treatment differences were detected (Table 1). After two growing seasons, six (Oust XP (2oz), Oust (2oz), Oust XP+Arsenal (2oz+4oz, 2oz+6oz), Oust+Arsenal (2oz+4oz), Oust XP+Velpar (2oz+1qt) of 12 treatments had survival averaging 58%. Survival was computed as 59%, 48%, and 48% for new Oust, current Oust, and all herbicide treatments, respectively. In contrast, the check had 25% survival. Low survival occurred on plots treated with Velpar L (1qt), Arsenal (4 oz, 6oz) Oust+Arsenal (2+6oz), Oust+Velpar L (2oz+1qt), and nothing (check). Survival ranged from a high of 66% (Oust XP (2oz)) to a low of 25% (check). Minor differences were detected for total height, with 10 of 12 test treatments producing tall seedlings averaging 45 in. (Table 1). Total heights were 44, 47, and 44 in. for new Oust XP, current Oust, and all herbicide treatments, respectively. In comparison, the check seedlings were 35 in. tall. Short seedlings were found on plots treated with a low rate of a single herbicide (Oust XP (2oz), Arsenal (4oz), and Check (none)). Heights ranged from a high of 47 in. (Oust+Arsenal (2oz+4oz, 2oz+6oz), Oust+Velpar (2oz+1qt)) to a low of 35 in. (check). Differences in GLD were minor with 9 (Oust (2oz), Oust XP+Arsenal (2oz+4oz, 2oz+6oz) Oust+Arsenal (2oz+4oz, 2oz+6oz), Oust+Velpar (2oz+1qt) Oust XP+Velpar (2oz+1qt), Arsenal (6oz), Velpar (1qt)) of 12 treatments with large GLDs that averaged .78 in. (Table 1). The GLDs for new Oust, current Oust, and all herbicide treatments had means of .75, .82, .77 in., respectively. Check seedlings on the other hand, had ground line diameters of .57 in. Small GLDs occurred on check plots or plots treated with low rates and single applications of Arsenal (4oz) and Oust XP (2oz). GLDs ranged from a high of 0.87 (Arsenal+Oust (2oz+4oz)) to a low of 0.57 in. (check). Volume index differed among treatments (Table 1). Eight of 12 treatments had high index values. These eight treatments were Oust (2oz), Oust XP+Arsenal (2oz+4oz, 2oz+6oz) Oust+Arsenal (2oz+4oz, 2oz+6oz), Oust+Velpar (2oz+1qt) Oust XP+Velpar (2oz+1qt), and Arsenal (6oz). Their average volume index was 35 in^3. Values of 29, 39, and 32 $in.^3$ were computed for new Oust, current Oust, and all herbicide treatments, respectively. The mean volume index for check seedlings was 13 in^3. In general, seedling plots treated with the current and new Oust formulations had similar survival and growth. Seedling performance was significantly enhanced with herbaceous weed control.

Differences in seedling performance were detected among hexazinone formulations (Table 1). Eleven of 12-herbicide test treatments had high survival that averaged 63%. In contrast, low survival occurred on check plots averaging 50%. The three formulations of Velpar containing 8 oz a.i. of hexazinone each (Velpar DF (10.7oz), new Velpar DF (10.7oz), Velpar L (1qt)), averaged 62% survival. When the rate of hexazinone was increased from 8 oz a.i. to 12 oz a.i., survival increased to 64%. The amount of hexazinone and sulfometuron in 1qt+2oz of Velpar L+Oust and 12.7 oz. of Oustar is the same and survival for these two treatments was 60% and 52%, respectively. Survival for Oustar, a pre-mix of Velpar DF and Oust XP, Arsenal+Oust combinations and Velpar+Oust was statistically similar. Height and GLD were large on the same nine treatments (Oust+Arsenal (2oz+6oz) Oustar (9.5oz, 12.7oz, 25.4oz), Velpar DF (16oz), new Velpar DF (16oz), new Velpar DF (10.7oz), Velpar L (1qt), Velpar+Oust (1qt+2oz)) (Table 1). Total height and GLDs for these nine treatments averaged 53 in. and 0.98 in., respectively. All herbicide treatments produced mean seedling total height of 52 in. and GLD of 0.96. Checks were significantly smaller being 43 in. in total height and 0.73 in. at GLD. Least seedling total height and ground line diameter occurred on plots receiving the same three treatments (check, current Velpar DF, Arsenal+Oust (4oz+2oz)). Height ranged from a high of 56 in. (Oustar (25.4oz)) to a low of 43 in. (check). GLD ranged from 1.06 in. (Oustar (25.4oz)) to 0.73 in. (check). Mean volume index differed among treatments (Table 1). Eight (Oustar (9.5oz, 12.7oz, 25.4oz), Velpar DF (16oz), new Velpar DF (16oz), new Velpar DF (10.7oz), Velpar L (1qt), Velpar+Oust (1qt+2oz)) of 12 treatments had high index values averaging 60.9 $in.^3$. The mean volume index for all herbicide treatments was 56.0 $in.^3$. Low index values were computed for six treatments - untreated check, Arsenal+Oust (4oz+2oz, 6oz+2oz), new Velpar DF (16oz), Velpar DF (10.7oz), and Velpar L (1qt). Perhaps the poor seedling performance by Arsenal+Oust treatments was due to treatment timing. Imazapyr relies heavily on leaf uptake, but 70% bare ground existed on application day. Perhaps the poor seedling growth on Velpar treated plots resulted from a less than optimal timing on moderately tolerant competitors. Overall, seedlings treated with comparable rates of the current and new Velpar formulations as well as Oustar, the pre-mix formulation of Velpar+Oust, had similar survival and growth. Control of herbaceous competitors significantly increased seedling survival and growth.

Response to Escort formulations differed for seedling parameters survival, total height, ground line diameter, and volume index (Table 1). High seedling survival was recorded for nine (current and new Escort+Oust (1oz+2oz), Escort (1oz), Velpar+new Escort (1qt+1oz), Arsenal+current and new Escort (6oz+1oz), Arsenal (6oz), Arsenal+Oust (4oz+2oz), Velpar L+Oust (1qt+2oz)) of 14 treatments. These nine treatments averaged 74% survival. In comparison, treatments of all herbicide, new Escort formulation and current Escort formulation had 74%, 66%, and 72% survival, respectively. Lowest survival, often half that of herbicide plots, occurred on checks that averaged 31%. Tall seedlings occurred in nine (current and new Escort+Oust (1oz+2oz), Velpar+new Escort (1qt+1oz), Arsenal+current and new Escort (6oz+1oz), Arsenal (6oz), Velpar L+Oust (1qt+2oz), Arsenal+Oust (4oz+2oz), Velpar L (1qt)) of 14 test treatments. Mean height of seedlings on these nine treatments was 56 in. Mean height for treatments of all herbicide, the new Escort formulation, and the current Escort formulation was 54, 56 and 53 in., respectively. Short seedlings grew on check plots and averaged 38 in. Large GLDs were recorded for five (current and new Escort+Oust (1oz+2oz), Velpar+new Escort (1qt+1oz), Arsenal+current and new Escort (6oz+1oz)) of 14 test treatments. These five treatments averaged 1.1 in. for GLD. In comparison, treatments of all herbicides, the new Escort formulation and the current Escort formulation had mean GLDs of 1.0, 1.0 and 1.0 in, respectively. GLD ranged from a high of 1.1 in. (current and new Escort+Oust (1oz+2oz), current and new Escort+Arsenal (1oz+6oz)) to low of 0.6 (check). Volume index was large and averaged 5.6 $in.^3$ for four (new Escort+Oust (1oz+2oz), Escort+Oust (1oz+2oz), Arsenal+New Escort (6oz+1oz) and Arsenal+Escort (6oz+1oz)) of 14 treatments (Table 1). Mean volume index was computed as 4.1, 4.2 and 4.7 $in.^3$ for treatments of all herbicides, new Escort formulation, and current Escort formulation, respectively. Values for volume index ranged from a high of 6.4 $in.^3$ (new Escort+Oust (1oz+2oz)) to a low of 1.8 (check) $in.^3$. Seedling survival and growth was enhanced by herbaceous weed control.

In conclusion, after two growing seasons, differences in seedling performance were detected among treatments in the studies of new Oust, Velpar and Escort formulations. In general, the magnitude of seedling survival and growth was less than previously experienced, presumably due to two years of major drought. Seedling performances were similar for industry checks such as Arsenal+Oust (6+2oz, 4+2oz) and Velpar+Oust (1qt+2oz) and new and current formulations of Oust, Velpar, and Escort. Oustar, the premix formulation of the new Velpar DF and Oust XP, performed similarly as conventional Velpar L+Oust treatments at comparable rates.

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Table 1. Seedling survival (%), height (in.), ground line diameter (in.) and volume index (in.^{3}) after two growing seasons on a moderately-well to well-drained, sandy soil in East Texas near Woden (Nacogdoches County).

Treatment[1]	Rate[2]	Survival	Height	Ground Line Diameter	Volume Index
Oust formulations					
Oust XP	2 oz	66a	41abc	0.70bc	25.5cd
Oust	2 oz	52abcd	44ab	0.75ab	29.5abcd
Oust XP+Arsenal	2 oz + 4 oz	62ab	45ab	0.74ab	28.2abcd
Oust+Arsenal	2 oz + 4 oz	58abc	47a	0.87a	42.7ab
Oust XP+Arsenal	2 oz + 6 oz	54abcd	44ab	0.75ab	27.9abcd
Oust+Arsenal	2 oz + 6 oz	35de	47a	0.84ab	44.7a
Oust XP+Velpar L	2 oz + 1 qt	54abcd	46a	0.82ab	35.3abc
Oust+Velpar L	2 oz + 1 qt	45bcde	47a	0.80ab	36.8abc
Arsenal	4 oz	35de	39bc	0.70bc	22.8cd
Arsenal	6 oz	35de	43ab	0.77ab	33.8abc
Velpar L	1 qt	29e	43ab	0.76ab	25.0bcd
Check		25e	35c	0.57c	12.9d
Velpar formulations					
Arsenal+Oust	4 oz + 2 oz	60ab	46cd	0.83cd	39.7cd
Arsenal+Oust	6 oz + 2 oz	71ab	50abc	0.92abc	48.8bcd
Oustar[3]	25.4 oz	69ab	56a	1.06a	74.0a
Oustar	12.7 oz	60ab	55ab	1.04a	67.6ab
Oustar	9.5 oz	65ab	54ab	0.96abc	61.6abc
Velpar DF	16 oz	65ab	54ab	0.97abc	56.1abc
New Velpar DF	16 oz	63ab	54ab	0.96abc	55.1abcd
Velpar DF	10.7 oz	75a	49bcd	0.84bcd	40.9cd
New Velpar DF	10.7 oz	52ab	54ab	0.99ab	59.0abc
Velpar L	1 qt	58ab	52abc	0.92abc	51.8abcd
Velpar L+Oust	1 qt+2 oz	52ab	51abc	1.03a	61.8abc
Check		50b	43d	0.73d	32.2d
Escort formulations					
New Escort+Oust	1 oz + 2 oz	85a	59a	1.1ab	5.0abc
Escort+Oust	1 oz + 2 oz	77abc	58a	1.1ab	6.4a
New Escort	1 oz	44d	51bcd	0.9ef	3.4cd
Escort	1 oz	69abc	48d	0.9ef	3.3cd
Velpar L+ New Escort	1 qt + 1 oz	71abc	57ab	1.0ab	3.4cd
Velpar L+Escort	1 qt + 1 oz	62bcd	48cd	0.9cdef	3.2cd
Arsenal+New Escort	6 oz + 1 oz	65abc	56ab	1.1ab	4.9abc
Arsenal+Escort	6 oz + 1 oz	81ab	57a	1.1a	5.9ab
Arsenal	6 oz	69abc	54abc	1.0bcde	3.6cd
Velpar+Oust	1 qt + 2 oz	75abc	57ab	1.0bcd	4.0bc
Arsenal+Oust	4 oz + 2 oz	71abc	53abcd	1.0bc	4.2bc
Velpar L	1 qt	60bcd	53abcd	0.9def	3.2cd
Oust	2 oz	58cd	49cd	0.9f	3.3cd
Check		31e	38e	0.6g	1.8d

[1] Treatment means within a column sharing the same letter are not significantly different (Duncan's New Multiple Range test, P=0.05 level).
[2] Product per treated acre.
[3] Oustar is a premix formulation by DuPont consisting of the new Velpar DF and Oust XP (63%:12%).

EFFECTS OF HERBACEOUS COMPETITION CONTROL ON HABITAT QUALITY IN PIEDMONT PINE PLANTATIONS. V.L. Ford and P.D. Keyser, Westvaco Corporation, Rupert, WV 25984.

ABSTRACT

In a study designed to assess herbaceous weed control effectiveness with different site preparation methods, three rates of Oust (0, 2, and 4 ounces per acre) were applied during the first year to planted loblolly pine seedlings at seven locations throughout the Appomattox Area. Site preparation methods used were pile only, burn only, chop and burn, rake and disk, and Velpar ULW (7 pounds per acre) and burn. All of the herbicide treatments and a control were applied randomly in three replications on each site (a total of 21 location/block combinations). Vegetation responses were measured the application year and for two years thereafter in July by a line-intercept method. In September of 1991 (year two) all sites were operationally sprayed for hardwood brush control (imazapyr). Although herbaceous communities and wildlife food declined in the first year after application, vegetation rebounded in the second year. There were no significant differences in food for quail or deer after the first year of application for any treatment. Results indicated that all classes of herbaceous vegetation were dramatically reduced the first year. During the second and third growing seasons, most species/groups showed substantial improvement, in many cases matching the control. This was particularly true for those plant genera important as deer and quail foods: *Rubus, Smilax, Phytolacca, Lonicera*, and *Ambrosia* all matched the control by year two and thereafter. Legumes, notably *lespedezas*, faired more poorly never recovering to the level of the control.

INTEGRATING CHEMICAL PRUNING WITH WOODY BRUSH SUPPRESSION. F.A. Roth, R.J. Colvin, Arkansas Agricultural Experiment Station, Southwest Research and Extension Center, Hope AR 71801, C.E. Walls, Timberland Enterprises, Inc., Little Rock, AR 72227, T.R. Clason, Louisiana State University Agricultural Center, Hill Farm Research Station, Homer, LA 71040.

ABSTRACT

Herbicide based vegetation management practices enhance seedling growth and development during the reforestation of commercial pine plantations. In many cases, the resulting free to grow conditions provide fertile ground for the establishment of unwanted volunteer pine seedlings. If untreated, these encroaching pine can have a negative impact on crop pine growth. Volunteer seedlings can be suppressed with an array of non selective contact herbicides applied as a directional spray, but successful treatment requires accessibility for ground based application methods. Plantations planted at wider than traditional row spacings would afford application access but could create large limbed sapling size trees. Thus, a study was established to determine the feasibility of integrating chemical pruning with woody brush suppression.

The study was established in a 4-year-old loblolly pine (*Pinus taeda* L.) plantation located on International Paper Company land near Patmos AR. The area was chemically site prepared with imazapyr and glyphosate at 8 oz and 2 lbs ai/acre in 1995; planted at 450 trees/acre (8 ft x 12 ft) in 1996; received two consecutive years of herbaceous weed control beginning in 1996; and fertilized with DAP at 250 lbs/acre in 1998. Chemical pruning treatments, which were applied in September 1999, included a 1 % paraquat solution, a 2 % glufosinate solution, a 2 % fosamine solution, and an untreated control. Each herbicide solution contained Timberland 90 at a 0.5 % solution. Spray volume for each herbicide solution was 90 gallons/acre with an effective spray width and height of 12 and 9 feet, respectively. Treatment plots were 0.11 acres in size and contained a 0.08 acre measurement plot. Experimental design was a randomized complete block design having four treatment plots replicated three times. Measurement parameters included pine mortality, pine growth, and changes in height to live crown. Tree data were collected in September 1999 and September 2000.

Although fosamine treatment mortality averaged 9 trees per acre, there was no detectable mortality rate difference among treatments. Tree basal area growth varied among treatments averaging 0.032, 0.031, 0.037, and 0.038 ft^2 for paraquat, glufosinate, fosamine, and control. Paraquat and glufosinate mean tree basal area growth was 0.05 ft^2 less that the mean fosamine and control growth. Changes in height to the live crown varied among treatment with all herbicide treatment height changes being significantly greater than the control treatment. Mean treatment increase in height to live crown was 5.6, 5.0, 3.6, and 1.5 ft for paraquat, glufosinate, fosamine, and control. All herbicides tested were effective for chemical of lower limbs in young loblolly pine plantations.

EFFICACY OF TANK MIXES OF OUST, ESCORT, AND ARSENAL APPLIED TO ABANDONED FIELDS BEING PLANTED IN LOBLOLLY PINE. R.A. Williams* and J.A. Earl, Arkansas Agricultural Experiment Station and School of Forest Resources, University of Arkansas at Monticello, 71656.

ABSTRACT

First-year loblolly pine seedlings planted in an old field were treated post-emergent to herbaceous competition in May with various tank mixes of Escort, Oust, and Arsenal. Survival, height, and groundline diameter were measured both before treatment and at the end of the first growing season. Every 30 days (until 150 days after treatment), random locations were evaluated for percent bare ground and brownout. Around July 1, herbaceous vegetation was clipped to identify major competitors and to give some idea of the amount of biomass produced. Overall survival at the end of year one was 80 percent, and there were no statistical differences among treatments. Heights and diameters showed significant differences, and the best overall growth performance for both was found

in the industry standard of two ounces Oust plus four ounces Arsenal AC. All herbicide treatments did reasonably well in controlling herbaceous competition, with some differences found but no common factor to identify the ones which did the best.

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 (cm) and groundline diameters (mm) were measured before treatment and after the first growing season. Initial measurements were evaluated using the Shapiro-Wilkes test to make sure the data were normal before analysis. 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 survival, both before treatments were applied and at the end of the 1st growing season. 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 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, 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

Herbaceous competition

Major herbaceous competitors include blackeyed susan (*Rudbeckia hirta* L.), horseweed (*Conyza canadensis* L. Cronq.), broomsedge (*Andropogon virginicus* L.), panic grass (*Panicum* sp.), bermuda (*Cynodon dactylon* L. Pers.), flatsedge (*Cyperus odoratus* L.), and common ragweed (*Ambrosia artemisiifolia* L.). The oven dry weights of the herbaceous sampled yielded an estimate of 1.41 tons/ac (3179.5 kg/ha).

Herbicide efficacy

Efficacy was measured in terms of bare ground percentage because all plots started with between 0 and 5 percent at treatment date. After 30 DAT, significant differences were already beginning to show (Table 2). All herbicides did better than the control, but the rates containing Oust+Arsenal alone and the Escort+Oust,+Arsenal with surfactant treatment did significantly worse than the others. At 60 DAT, the Escort+Arsenal with surfactant was the least effective along with the untreated check. Ninety and 120 DAT, the differences among herbicides showed slight differences. By day 150, the drought had taken it's toll apparently and caused differences among treatments, but there were none by the end of the growing season. Bermuda was particularly resistant to all attempts to control with herbicide. It browned out slightly for the first two months following treatment, but never died back until winter.

Survival
Overall survival was excellent in mid-May at ninety-nine percent and still very good by the season's end at eighty percent. Table 1 shows that there were no significant differences in either initial or ending survival. The higher rates of Arsenal, plus the industry standard of Oust+Arsenal survived slightly better than the other treatments. Many trees survived and were growing through early summer, only to be later victims of the drought.

Height and diameter growth
The best performer overall for the first growing season was the industry standard mix of two ounces Oust plus four ounces Arsenal AC (Table 1). It was significantly better in both height and groundline diameter growth. For herbicides only, the rate consisting of one ounce Escort plus four ounces of Arsenal AC with surfactant did the worst in both height and diameter growth. While the untreated control did reasonably well in height, it was clearly the worst in diameter growth at nearly one-third the average diameter of the top performer. Most of the treatments performed similarly for height growth, with the range from 26 to 33 cm (10 to 13 in). The range for diameter growth (not including the control) was from 2.7 to 4.9 mm (0.11 to 0.19 in). The herbicide treatments did seem to cause stunted growth for the first 2 months after planting. While the untreated check was showing growth flushes, some of the treated seedlings appeared to be dormant.

CONCLUSIONS

Even with the severe drought conditions in the summer of 2000, seedling survival was more than acceptable at eighty percent. Even the untreated plots survived at nearly seventy percent, which should be good enough for pine establishment. The concern about pine injury due to herbicide was observed, but the herbaceous weed control proved beneficial enough to allow height growth equal to the control by season's end. However, all herbicide treatments far surpassed the control plots on groundline diameter growth. When comparing herbicide efficacy, all tank mixtures did reasonably well with no clear pattern of superiority throughout the whole growing season. For seedling growth performance, it's hard to beat the industry standard of two ounces Oust plus four ounces Arsenal AC. It will be interesting for the comparisons made after year two, to see if the drought conditions of 2000 caused any aberrations or if these patterns will hold.

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Table 1. Comparison of height growth (cm), groundline diameter growth (mm), and survival (%) after one growing season

	1st Seasons Growth[1]		Survival[1]	
Treatment[2]	Ht	GLD	Init	Year 1
1. 1oz Escort+1oz Oust+4oz Arsenal	27.1 cd	3.8 b	100.0 a	78.0 a
2. 1oz Escort+1oz Oust+4oz Arsenal+3.2oz Entry II	27.7 cd	3.3 c	99.0 a	76.0 a
3. 1oz Escort+1oz Oust+6oz Arsenal	25.9 d	3.1 c	99.0 a	87.0 a
4. 1oz Escort+1oz Oust+6oz Arsenal+3.2oz Entry II	27.5 cd	4.2 b	99.0 a	86.0 a
5. 1oz Escort+6oz Arsenal	29.3 bc	4.3 b	98.0 a	87.0 a
6. 2oz Oust+4oz Arsenal	33.0 a	4.9 a	97.0 a	88.0 a
7. 1oz Escort+4oz Arsenal+3.2oz Entry II	26.0 d	2.7 d	100.0 a	71.0 a
8. 1oz Escort+2oz Oust +3.2oz Entry II	30.6 ab	3.9 b	99.0 a	76.0 a
9. Untreated control	26.6 bcd	1.6 e	100.0 a	68.0 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

Table 2. Bare ground (%) comparison throughout the first growing season

	Days After Treatment[1]					
Treatment[2]	30	60	90	120	150	270
1. 1oz Escort+1oz Oust+4oz Arsenal	48 abc	77 a	82 a	73 a	67 abc	64 a
2. 1oz Escort+1oz Oust+4oz Arsenal+3.2oz Entry II	36 bcd	67 ab	69 ab	66 a	53 bcd	93 a
3. 1oz Escort+1oz Oust+6oz Arsenal	48 abc	93 a	57 ab	34 ab	19 e	63 a
4. 1oz Escort+1oz Oust+6oz Arsenal+3.2oz Entry II	33 bcd	68 ab	63 ab	39 ab	35 de	44 a
5. 1oz Escort+6oz Arsenal	48 abc	93 a	66 ab	75 a	81 ab	95 a
6. 2oz Oust+4oz Arsenal	31 cd	68 ab	34 ab	70 a	49 cde	51 a
7. 1oz Escort+4oz Arsenal+3.2oz Entry II	76 a	29 bc	43 ab	35 ab	51 bcd	95 a
8. 1oz Escort+2oz Oust +3.2oz Entry II	63 ab	61 ab	47 ab	74 a	85 a	86 a
9. Untreated control	8 d	18 c	29 b	0 b	31 de	49 a

[1]Survival means within a column sharing the same letter are not significantly different (Tukey's Studentized Range Test, p=0.05)

[2]Product per acre

CONTROL OF FIVE-LEAF AKEBIA (*AKEBIA QUINATA*) IN AN OLD-GROWTH FOREST UNDERSTORY S.M. Zedaker and P.L. Burch. Department of Forestry, Virginia Tech, Blacksburg, VA, 24061, Dow AgroSciences LLC, Christiansburg, VA, 24073.

ABSTRACT

More than 5,000 non-native plant species have escaped their intended purpose as ornamentals and cultivars and have established free-living populations in and around native North American forests. Non-indigenous plant populations are spreading at the rate of over 1.5 million acres per year. *Akebia quintata,* called chocolate vine or five-leaf akebia, is a woody climbing vine in the *Lardizabalaceae* family. Akebia was brought to the U.S. in 1845 as an ornamental from northern Asia. The vine is very shade and drought tolerant, which has contributed to its establishment and persistence in 16 eastern states from Michigan and Connecticut to Georgia. Akebia spreads rapidly by vegetative means, with individual vines reported to grow 20 to 40 feet per year. Akebia can retain its leaves year-round in warmer climates and its purple-violet seed pods, with a whitish pulpy core and many tiny black seeds, are attractive to birds. Chocolate vine grows so rapidly that it can kill off existing ground-level vegetation and understory trees and shrubs by overtopping them. Canopy trees are not immune because of akebia's persistence and once established, germination and growth of native plants is excluded.

In this case, akebia has invaded an old-growth stand of mostly yellow poplar (*Liriodendron tulipifera*) in a culturally significant amenity forest (James Madison Landmark Forest at Montpelier). Where established, it has eliminated most plant species except other problematic exotic vines like Japanese honeysuckle (*Lonicera japonica*) and periwinkle (*Vinca minor* & *V. major*). Due to its expanse of cover and rapid reinvasion, individual plants cannot be pulled or cut. The objective of this study was to devise a control method that would eliminate akebia while minimizing negative impacts on native plants and mature trees. Triclopyr (as Garlon 4, 4lb/gal EC)) and glyphosate (as Glypro, 4lb/gal SL) were applied at four different times at 1 and 2 lbs ae/ac. Each herbicide treatment was mixed

in water with 0.25% v/v of non-ionic surfactant. Treatments were applied using a CO_2 powered backpack sprayer and an 8010E flat fan nozzle. Each plot was 6 by 70 feet in size with a 3-foot untreated buffer between each plot. Each treatment was applied at a total volume of 40 gallons per acre. The experiment was conducted in a completely randomized design with for replications for each spray date. Control was measured using the line-intercept method. The number of akebia intercepts was determined along a 25 foot line in the center of each spray plot. Native plant numbers and cover were also assessed.

Triclopyr was more effective than glyphosate for the control of akebia for January, February and May spray dates. October applications were not assessed to date. Two lbs ae/ac of triclopyr resulted in over 90% control when applied in January. Efficacy was higher for both herbicides when they were applied in January; May applications received rain only one hour after application and February applications were adversely affected by hard frosts that killed akebia leaves prior to applications. Native plants were not harmed by the dormant season applications and a diversity of native understory herbs was established where akebia was controlled.

REDUCING HARDWOOD STEMS ON PINE SITES WITH ACCORD SP, CHOPPER, AND KRENITE S COMBINATIONS. J.L. Yeiser, L.R. Nelson, and A.W. Ezell, Stephen F. Austin State University, Nacogdoches, TX 75962; Clemson University, Clemson, SC 29634-1003; and Mississippi State University, Mississippi State 39762.

ABSTRACT

Site preparation rates of Accord SP, Chopper, Krenite and selected Accord SP mixtures were contrasted for control of unwanted woody species occupying pine sites following harvest. One site in each of Texas, Mississippi, and South Carolina were tested. Herbicides were applied in August 1999 and plots evaluated for percent stem reduction in late summer of 2000. In South Carolina, treatments of Accord SP, Accord SP+Chopper and Accord SP+Garlon in addition to Krenite S+Chopper and Chopper significantly and similarly reduced unwanted stems of sweetgum, red maple, water oak and overall species. In Mississippi, Accord SP, and Accord SP+Chopper treatments provided woody stem reduction comparable to other test treatments. Only Krenite+Chopper provided significant reduction of more species than Accord SP. In Texas, Accord SP, Accord SP+Chopper and Accord SP+Garlon in addition to Krenite+Chopper and Chopper all provided excellent and comparable control of the unwanted woody species tested. Ingrowth occurred on all Texas treatment plots and was the primary origin of woody competitors during the first growing season. The number of hardwood rootstocks present at planting time may be too high for systems of intensive pine culture. Herbicide treatments did not influence the level of herbaceous competition the spring following application. The resultant herbaceous competitor community was dominated by broadleaf species. Accord SP, Krenite S, Chopper and selected mixtures have promise as part of an integrated approach to woody plant control when preparing pine sites for planting.

INTRODUCTION

Accord SP has replaced Accord for use as the major glyphosate formulation for site preparation. Accord SP controls unwanted pine and a wide range of hardwoods occupying pine sites. Krenite, manufactured by DuPont, also controls pine and numerous hardwood species. The objective of this screening study was to compare hardwood stem reduction resulting from treatments of Accord SP, Krenite S, Chopper and selected mixtures during the preparation of sites for planting with loblolly pine.

METHODS

One site in each of Texas, Mississippi, and South Carolina were selected for testing (Table 1). The post-harvest Texas site was dominated by oak (Quercus. stellata Wangenh., Q. marilandica Muenchh., Q. incana Bartr.), hickory (Carya tomentosa (Poir.) Nutt, C. cordiformis (Wangenh.) K. Koch), sassafras (Sassafras albidum (Nutt.) Nees, summer grape (Vitis aestivalis Michs.) and sumac (Rhus copallina L., R. glabra L., R. aromatica L.). Minor components of ash (Fraxinus spp, gum bumelia (Bumelia lanuginosa (Michx.)Pers., and farkleberry (Vaccinium arboreum Marsh.) occurred infrequently throughout plots. Prior to treatment, slash and harvesting debris were mechanically thrashed leaving a heavy mulch layer across the site, perhaps explaining the presence of light grass (Andropogon virginicus L., Dichanthelium spp) and broadleaf communities on application day. Soil moisture was good on application day. Loblolly pine (Pinus taeda L.) seedlings were planted in January 2000.

In Mississippi, the hardwood community following harvest was dominated by sweetgum, mixed red oaks (Quercus phellos L., Q. nigra L., Q. falcata Michx. and Q. pagoda Raf.), and red maple (Acer rubrum L.). Lesser amounts of post oak and black cherry Prunus serotina Ehrh.) were scattered across plots. At the time of treatment, moderate grass (panicgrasses Dichanthelium spp, and sedges Carex spp) and broadleaf communities (ragweed (Ambrosia artemisiifolia L.), goldenrod (Solidago odora Ait.), dock (Rumex spp), dogfennel (Eupatorium capillifolium (Lam.) Small) and mares-tail (Conyza canadensis (L)) existed. Soil moisture on application day was moderate.

The harvest in South Carolina left sweetgum, water oak, and red maple dominant on the site (Table 1). Minor unwanted woody species included black cherry, winged elm winged sumac, black oak, southern red oak, white oak and blackgum. Soil was dry on application day.

A backpack aerial simulator supporting a single, KLC9 flood nozzle approximately 12 ft above the ground was used to broadcast herbicides in a total carrier volume of 10 GPA. A single pass was used to spray treatment plots. The dimensions of treatment plots were 100 ft X 30 ft. Rootstocks within an internal, 80 ft X 10 ft measurement plot were followed for treatment efficacy. The surfactant used was Timberland 90 (2.5%). Treatments are presented in Table 2.

Prior to treatment in summer 1999, measurement plots received a 100% inventory of woody species > 1-ft in height. Plots were again inventoried in the summer of 2000 for stems/rootstocks surviving treatment. Stems > 1-ft in height and absent at the initial inventory but present for the final inventory were tallied as ingrowth. Percent control=number of treated rootstocks dead/total number of rootstocks. An index of post-treatment woody competition is computed by summing the number of rootstocks surviving treatment and the new emerging rootstocks. Percent stem reduction=((the number of dead stems X (-1))+ingrowth)/total. Negative values indicate a decrease in competitors and a positive value denotes an increase in competitors. In Texas, percent herbaceous ground cover was visually assessed in May 25, 2000, approximately 10 months after treatment. Seedling survival was evaluated on October 9, 2000.

Ten treatments were tested. Treatments were assigned to plots in a randomized complete block design with three blocks. In Mississippi and South Carolina data were analyzed for percent stem reduction. In Texas, statistical parameters included percent control of treated hardwoods, ingrowth of hardwoods, the total number of competing hardwood stems 10 months after treatment, and percent stem reduction. Data were analyzed using the GLM procedure of SAS (6). Means were separated using Duncan's New Multiple Range test. All tests were conducted at the P=0.05 level.

Soil moisture in Texas, Mississippi, and South Carolina was moderate at study onset. In Texas, severe drought occurred during fall and winter of 1999. All three sites experience extreme drought during the summer and fall of 2000.

RESULTS

South Carolina

Many treatments significantly and similarly reduced unwanted stems of sweetgum, red maple, water oak and overall species (Table 2). For example, 8 (94%), 7 (82%), 9 (86%), and 8 (86%) out of 9 possible herbicide treatments similarly reduced sweetgum, red maple, water oak, and all species, respectively. Accord SP (8qt) was among the treatments providing best reduction of each test species. Glyphosate plus proprietary surfactants (Accord SP (8qt)), and glyphosate with a proprietary penetrant as well as different tank partners and rates commonly resulted in similar reduction. Accord SP (8qt) alone, Accord+MON59120 (8qt+2.5%), Accord SP+Chopper (7qt+10oz, 5qt+24oz), and Krenite+Chopper (6qt+10oz, 4qt+24oz) reduced more red maple stems than Accord SP+Garlon 4 (6qt+48oz) and more sweetgum, red maple, and all species stems than Krenite S (6qt).

Mississippi,

Accord SP (8qt) and eight additional treatments (Accord+MON59120 (8qt+2.5%), Accord SP+Chopper (7qt+10oz, 5qt+24 oz), Accord SP+Garlon 4 (6qt+48oz), Krenite S+Chopper (6qt+10oz, 4qt+24oz) Chopper (64oz), Krenite S (6qt)) provided best stem reduction of sweetgum, water oak, winged elm and all species (Table 2). Accord SP (8qt) provided intermediate reduction of red maple stems. Changing surfactants (Accord+MON59120) failed to reduce more red maple stems and forfeited water oak and overall control. A mixture of Accord SP+Chopper (5qt+24oz) did reduce more red maple stems than Accord SP (8qt), but surrendered wing elm reduction. A mixture of Accord SP+Garlon 4 (6qt+48oz) failed to provide best reduction of red maple, water oak and winged elm, leaving more holes in the spectrum of control than Accord SP alone (8qt). Only Krenite S+Chopper (4qt+24oz) provided a broader spectrum of reduction than Accord SP (8qt). Chopper (64oz) and Krenite S+Chopper (6qt+10oz) reduced the red maple that Accord SP (8qt) did not, but both failed to reduce the winged elm that Accord (8qt) did reduce. Accord SP (8qt), Accord+MON59120 (8qt+2.5%), Accord SP+Chopper (7qt+10oz), Accord SP+Chopper (5qt+24oz), Accord SP+Garlon 4 (6qt+48oz), Krenite S+Chopper (6qt+10oz), Krenite S+Chopper (4qt+24oz), Chopper (64oz), and Krenite S (6qt) provided best reduction of 4, 2, 4, 4, 2, 4, 5, 4, and 1, respectively, of the five species groups tested. These data suggest Accord SP (8qt) alone and Accord SP+Chopper (7qt+10oz, 5qt+24oz) treatments provide woody stem reduction comparable to rival test treatments.

Texas

Plot assessments for individual species revealed similar control of rootstocks of hickory, oak, sassafras and summer grape (Table 3). Mortality on checks was probably due to drought and significantly less than for herbicide treatments. For all individual species, ingrowth was statistically similar across all treatments, including the check, although zero ingrowth was recorded for some species and treatment combinations. With excellent control and limited ingrowth, the number of established competitors 12 months after treatment to compete with planted pine seedlings was small and similar for all herbicide treatments and species. Percent stem reduction by species was similar for all herbicide treatments and significantly better than for untreated check plots.

When all species were considered as a group, control was excellent (Table 3). Ingrowth on plots treated with Accord SP+Chopper (7qt+10oz) and Accord SP+Garlon 4 (6qt+48oz) was similar to the untreated check. Otherwise, ingrowth was similar. For all treatments, ingrowth contributed significantly to the number of established competitors 12 months after treatment. Competitors on check plots were significantly greater than other treatments. Competitors present on herbicide treatments differed only for extreme values. For example, Krenite S+Chopper (6qt+10oz) and Chopper (64oz) had an average of 5.3 competitor rootstocks. This was significantly fewer than Accord SP+Garlon (6qt+48oz) with an average of 26.3 rootstocks. Competitor levels for all herbicide treatments may be too high for intensive pine management. Percent stem reduction was lowest for check plots. Percent stem reduction for Accord SP (8qt), Accord SP+Chopper tank mixes, Krenite S+Chopper tank mixes, Chopper and Krenite S was best and similar. Data suggest Accord SP (8qt) and Accord SP+Chopper tank mixes, Krenite S+Chopper tank mixes, Chopper, and Krenite S provided similar woody stem control.

In spite of the high rates tested, herbaceous ground cover in May was similar for all treatments. Mean ground cover for herbicide treatments was 64% and the untreated check 60%. Herbaceous competition was largely from a tall broadleaf, cucumber-leaf sunflower, Helianthus debilis, with approximately one percent cover from grass, largely Andropogon spp.

Seedling survival after one growing season ranged from a high of 88% (Krenite S+Chopper (6qt+10oz) to a low of 63% (Accord SP+Chopper (7qt+10oz)) with the check in the middle with 71% survival. Survival on all treatment plots met the manager's projected goal of 400 seedlings per acre.

In conclusion, Accord SP, Chopper, Krenite S and selected mixtures provided comparable control of the unwanted woody species tested. Stem reduction was excellent for all three sites. Ingrowth occurred on all Texas treatment plots and was the primary origin of the woody pine-seedling competitors during the first growing season. The number of competing rootstocks at the Texas site suggests competition levels may still be too high for sites planned for intensive pine culture. Herbicide treatments did not influence the level of herbaceous competition the spring following application. The resultant herbaceous competitor community was dominated by broadleaf species, with the obvious absence of grasses. Accord SP, Krenite S, Chopper and selected mixtures have promise as part of an integrated approach to woody plant control when preparing pine sites for planting.

Table 1. Description of the three study sites including application and evaluation dates.

	Texas	Mississippi	South Carolina
Location	Mount Enterprise (Rusk)	Ackerman (Choctaw)	Antreville (Abbeville)
Physiography	Upper Coastal Plain	Upper Coastal Plain	Upper Coastal Plain
Soils	carizzo deep sand	sandy clay loam	sandy clay loam
Stand	mixed pine hardwood	mixed pine hardwood	mixed pine hardwood
Clearcut	Oct 1997	Nov 1998	Jan 1998
Site Preparation	mulched June 99	None	shear & pile 1998
Application Date	Aug 7, 1999	Aug 13, 1999	Aug 16, 1999
Stems Counted	Initial July 1999	Initial Aug 1999	Initial Aug 1999
	Final Aug 2000	Final Oct 2000	Final Aug 2000

Table 2. Test plots near Ackerman, MS were treated on August 13, 1999 and evaluated on October 4, 2000 and test plots near Antreville, SC were treated on August 15, 1999 and evaluated August 11, 2000 for percent stem reduction of unwanted hardwoods on pine sites.

HERBICIDES[1]	RATE (Prod/ac)	SWEETGUM	RED MAPLE	WATER OAK	WINGED ELM	ALL SPECIES
		(%)	(%)	(%)	(%)	(%)
SOUTH CARLINA		(%)	(%)	(%)		(%)
Accord SP	8 qt	-93a	-83a	-77a		-89a
Accord+MON59120	8 qt+2.5 %	-92a	-55ab	-83a		-88a
Accord SP+Chopper	7 qt+10 oz	-93a	-100a	-100a		-94a
Accord SP+Chopper	5 qt+24 oz	-100a	-100a	-93a		-98a
Accord SP+Garlon 4	6 qt+48 oz	-92a	-17b	-62a		-82a
Krenite S+Chopper	6 qt+10 oz	-82a	-33ab	-98a		-72a
Krenite S+Chopper	4 qt+24 oz	-98a	-100a	-100a		-92a
Chopper	64 oz	-100a	-100a	-100a		-71a
Krenite S	6 qt	+10b	-17b	-60a		-27b
Check	None	+17b	-15b	+217b		+28c
MISSISSIPPI						
Accord SP	8 qt	-93a	-58b	-100a	-100a	-84ab
Accord+MON59120	8 qt+2.5 %	-97a	-54b	-83b	-100a	-73b
Accord SP+Chopper	7 qt+10 oz	-100a	-67b	-100a	-91a	-96a
Accord SP+Chopper	5 qt+24 oz	-93a	-100a	-100a	-60c	-95a
Accord SP+Garlon 4	6 qt+48 oz	-96a	-69b	-67c	-60c	-85ab
Krenite S+Chopper	6 qt+10 oz	-98a	-100a	-97a	-20d	-87a
Krenite S+Chopper	4 qt+24 oz	-100a	-100a	-100a	-100a	-98a
Chopper	64 oz	-100a	-100a	-100a	-75bc	-97a
Krenite S	6 qt	-90a	+33c	-69c	-33d	-59c
Check	None	-5b	+39c	-55c	+56e	+10d

[1] Treatment means within a column sharing the same letter are not significantly different (Duncan's New Multiple Range Test, P=0.05).

Table 3. Site preparation plots near Mt. Enterprise, TX were inventoried in August 1999 for initial number of rootstocks, herbicides were applied on August 7, 1999 and plots evaluated on August 1, 2000 for control of treated rootstocks, ingrowth of new rootstocks, total competitors 12 months after treatment, and percent stem reduction.

Herbicides[1]	Rate (Prod/ac)	Initial	Control	Ingrowth	Competitors	Reduction
		Rootstocks per plot	(%)	Rootstocks per plot	Rootstocks per plot	(%)
				HICKORY		
Accord SP	8 qt	9	-100a	1.3a	1.3b	-86a
Accord+MON59120	8 qt+2.5 %	9	-100a	1.5a	1.5b	-90a
Accord SP+Chopper	7 qt+10 oz	6	-100a	0.8a	0.8b	-78a
Accord SP+Chopper	5 qt+24 oz	10	-100a	2.3a	2.3b	-51a
Accord SP+Garlon 4	6 qt+48 oz	5	-100a	1.5a	1.5b	-69a
Krenite S+Chopper	6 qt+10 oz	13	-100a	0.5a	0.5b	-93a
Krenite S+Chopper	4 qt+24 oz	10	-100a	0.8a	0.8b	-87a
Chopper	64 oz	8	-100a	0.7a	0.7b	-92a
Krenite S	6 qt	10	-100a	2.0a	2.0b	-79a
Check	None	8	-23b	1.7a	6.7a	-8b
				OAK		
Accord SP	8 qt	24	-100a	1.5a	1.5b	-88bc
Accord+MON59120	8 qt+2.5 %	11	-100a	0.5a	0.5b	-96c
Accord SP+Chopper	7 qt+10 oz	5	-97a	0.4a	0.5b	-89bc
Accord SP+Chopper	5 qt+24 oz	10	-100a	0.6a	0.6b	-86bc
Accord SP+Garlon 4	6 qt+48 oz	16	-97a	1.5a	1.8b	-91bc
Krenite S+Chopper	6 qt+10 oz	11	-100a	1.3a	1.3b	-56b
Krenite S+Chopper	4 qt+24 oz	9	-100a	0.6a	0.6b	-93bc
Chopper	64 oz	13	-100a	0.3a	0.3b	-89bc
Krenite S	6 qt	14	-89a	1.3a	1.5b	-81bc
Check	None	10	+8b	0.6a	10.7a	+16a
				SASSAFRAS		
Accord SP	8 qt	40	-97a	4.0a	4.7b	-81b
Accord+MON59120	8 qt+2.5 %	33	-100a	2.0a	2.0b	-92b
Accord SP+Chopper	7 qt+10 oz	32	-100a	11.7a	11.7b	-69ab
Accord SP+Chopper	5 qt+24 oz	46	-100a	3.0a	3.0b	-94b
Accord SP+Garlon 4	6 qt+48 oz	65	-100a	7.3a	7.3b	-86b
Krenite S+Chopper	6 qt+10 oz	32	-100a	0.7a	0.7b	-99b
Krenite S+Chopper	4 qt+24 oz	52	-100a	1.7a	2.0b	-96b
Chopper	64 oz	42	-100a	4.7a	4.7b	-80b
Krenite S	6 qt	25	-100a	4.0a	4.0b	-83b
Check	None	44	-58b	12.0a	32.3a	-40a
				SUMMER GRAPE		
Accord SP	8 qt	8	-100a	0.3a	0.3b	-97bc
Accord+MON59120	8 qt+2.5 %	5	-100a	3.0a	3.0b	-6ab
Accord SP+Chopper	5 qt+24 oz	9	-100a	2.3a	2.3b	-68abc
Krenite S+Chopper	4 qt+24 oz	6	-100a	2.3a	2.3b	-57abd
Accord SP+Chopper	7 qt+10 oz	5	-100a	2.0a	2.0b	-63abc
Krenite S+Chopper	6 qt+10 oz	10	-100a	0.7a	0.7b	-89bc
Accord SP+Garlon 4	6 qt+48 oz	4	-100a	2.7a	2.7b	-40abc
Chopper	64 oz	9	-100a	0.0a	0.0b	-100c
Krenite S	6 qt	9	-100a	0.7a	0.7b	-93bc
Check	None	6	-34b	2.7a	7.3a	+8a
				ALL SPECIES		
Accord SP	8 qt	119	-100a	9.3b	9.3bc	-86c
Accord+MON59120	8 qt+2.5 %	99	-100a	8.7b	8.7bc	-91c
Accord SP+Chopper	5 qt+24 oz	108	-100a	10.3b	10.3bc	-90c
Krenite S+Chopper	4 qt+24 oz	106	-100a	7.7b	7.7bc	-93c
Accord SP+Chopper	7 qt+10 oz	70	-99a	16.0ab	16.3bc	-76bc
Krenite S+Chopper	6 qt+10 oz	95	-100a	4.7b	4.7c	-94c
Accord SP+Garlon 4	6 qt+48 oz	81	-100a	26.3a	26.3b	-46b
Chopper	64 oz	86	-100a	6.0b	6.0c	-94c
Krenite S	6 qt	94	-100a	8.8b	8.8bc	-91c
Check	None	105	-26b	18.3ab	96.0a	-9a

[1] Treatment means within a column sharing the same letter are not significantly different (Duncan's New Multiple Range Test, P=0.05).

PERSISTENCE IN SOIL LEACHATE AND EFFICACY OF FIVE HERBICIDES USED TO CONTROL KUDZU (*PUERARIA LOBATA*) ON PINE FOREST REGENERATION SITES IN THE COASTAL PLAIN OF SC. P.B. Bush and Y.C. Berisford, Agricultural and Environmental Services Laboratories, T.B. Harrington, Warnell School of Forest Resources and J.F. Dowd, Department of Geology, The University of Georgia, Athens, GA 30602 and J.W. Taylor USDA Forest Service, Region 4, Forest Health, Atlanta, GA 30367**

ABSTRACT

Five site-preparation herbicides were monitored for their potential to move to shallow groundwater and to control kudzu on four different soil types at the Savannah River Site near Aiken, SC. The herbicides were used alone or in combination with dense plantings of fast-growing loblolly pine seedlings (*Pinus taeda* L). Clopyralid (Transline®), metsulfuron methyl (Escort®), picloram (Tordon 101M®), tebuthiuron (Spike 20P®), and triclopyr (Garlon 4®) were applied to entire plots during July, 1997, and then spot applications were made to emerging kudzu in June, 1998 and 1999. Pine seedlings were planted in Jan., 1998 to induce competition and provide shade to the emerging kudzu. Herbicide residues were monitored in leachate that was collected from paired lysimeters (one shallow at 51-58 cm deep and one deep at 84-109 cm deep) in each treatment and control plot from July, 1997 through Dec., 2000. Efficacy of the treatments was determined by percent cover, biomass, and leaf area index.

The herbicides controlled, but did not eradicate kudzu and caused the development of three distinct plant communities. The metsulfuron methyl, picloram, and triclopyr plots were dominated by a mixture of herbaceous cover, and the clopyralid plots were overrun with blackberry. Tebuthiuron quickly eliminated most plant cover, except kudzu which required a longer time to subdue than did the other herbicides. In general, residue levels peaked near application times, after precipitation events, or after herbaceous cover had been significantly reduced by the herbicides. All herbicides leached to 51-58 cm and all, except triclopyr, leached to 84-109 cm after the initial whole-plot application. Leaching after the spot applications was highly variable within each herbicide treatment and across all soil types. The residue levels that were detected in the deep lysimeters represent potential movement into shallow groundwater; however, the levels were several orders of magnitude below the LC50s of *Daphnia*, bluegill sunfish or rainbow trout and did not approach the human RfD. Metsulfuron methyl persisted at 0.025-0.1 ppb for 182-353 days in shallow lysimeters and at 0.025-0.07 ppb for 182-300 days in the deep lysimeters. Triclopyr residues were not persistent and remained below 6 ppb during the study. The only occurrence of triclopyr in the deep lysimeters was at 0.3 ppb 79 days following the first spot application. In deep lysimeters, clopyralid was not persistent and limited leaching occurred, with residue levels of 0.42-2.84 ppb in 12 of 102 deep lysimeter samples.

Tebuthiuron and picloram were the only herbicides that were transported laterally. Tebuthiuron was the most mobile and persistent of the herbicides. Residues were detected in 104 of 107 shallow leachate samples and in 100 of 108 deep leachate samples at levels up to 1664 ppb. Peak residue levels in the shallow lysimeters ranged from 94 ppb (105 days after the initial application) to 1664 ppb (58 days after the first spot treatment). Peaks in the deep lysimeters ranged from 69-734 ppb 34-77 days after the first spot treatment. In the block that was essentially a fill area, tebuthiuron residues remained above 400 ppb (402-1664 ppb) in the shallow lysimeter samples and above 180 ppb (181-734 ppb) in the deep lysimeters throughout a 354-day period that followed the first spot application. The high residue levels and persistence of tebuthiuron were probably a result of tebuthiuron's effectiveness in creating a nearly bare plot; hence it induced a condition of reduced evapotranspiration that increased the volume of water available for leaching. Picloram was mobile and persisted at 0.6-2.5 ppb in shallow and deep lysimeters for at least 10 months after the initial application. Residues were detected at 0.6-68.5 ppb in 63 of 98 shallow leachate samples and at 0.6-15 ppb in 65 of 103 deep lysimeter samples; however, most (85%) of the samples contained residue levels # 2.5 ppb.

When used as part of a managed forest regeneration program, the relative potentials of the herbicides to move into shallow groundwater in our study were: tebuthiuron > picloram > metsulfuron methyl > clopyralid > triclopyr.

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A COMPARISON OF TIMING, RATE, AND FORMULATION OF GLYPHOSATE AND TRICLOPYR FOR CONTROL OF CHINESE PRIVET (*LIGUSTRUM SINENSE*). T.B. Harrington and G. Ahuja, School of Forest Resources, University of Georgia, Athens, GA 30602-2152.***

ABSTRACT

Chinese privet (*Ligustrum sinense* Lour.) is a semi-evergreen shrub that grows to a height of 16+ ft, has multiple stems, and reproduces from root sprouts and abundant seed production. Introduced from China in 1852, it has escaped and now dominates understories of mesic forests throughout the southeastern U.S. Because of its shade tolerance and abundant regeneration, privet is able to thrive under dense hardwood canopies and may be an important factor limiting regeneration of bottomland hardwoods. In this research, two non-soil-active herbicides (glyphosate and triclopyr) were tested at various timings (April, June, August, October, and December 2000), rates (0, 1.5, 3.0, 4.5, and 6.0 lbs. a.e./acre), and formulations (Accord®SP vs. Roundup®Pro and Garlon®3A in water vs. Garlon®4 in JLB®improved plus oil) to identify cost-effective and safe methods for controlling privet under bottomland hardwoods. In addition, a root trenching study was initiated to determine whether below-ground linkages among privet plants limit herbicide efficacy.

The research site is located at the junction of McNutts and Barber Creeks near Athens, GA. Soils are Madison-Louisa sandy clay loams (Typic Hapludults). During spring 1999, all privet stems were cut by the Georgia Department of Transportation. In April 2000, 208 plots, each 10 ft x 30 ft in dimension, were established to provide 4 replications of each treatment in a randomized complete block design. For the trenching study, 18 additional plots were established, 9 of which had their circumference trenched to a 20 in. depth with a Ditch Witch® to sever below-ground linkages with surrounding privet. Three sub-lethal rates of Accord®SP (0, 0.375, and 0.75 lbs. a.e./acre), replicated 3 times in a completely randomized design, were applied to the trenched and non-trenched plots in August 2000. Immediately prior to each treatment and in October 2000, 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 from each study 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. The discussion will be limited to results from the April, June, and August treatments.

In the herbicide rate and timing study, the timing-by-herbicide and rate-by-herbicide interactions were significant. Multiple comparisons of means revealed that privet cover following each of the herbicide treatments (0% to 9%) was significantly less than that of the untreated check (21% to 36%). Privet cover following Accord®SP was less than that following Garlon®3A for the April and June, but not August, timings. For the Accord®SP treatments, privet cover was less following the April timing versus the June and August timings. Privet cover following Accord®SP was less than that following Garlon®3A for rates of 1.5 and 4.5 lbs. a.e./acre. In the herbicide rate and formulation study, privet cover did not differ significantly between Accord®SP and Roundup® Pro or between Garlon®3A in water and Garlon®4 in oil. In the trenching study, privet cover following 0.375 and 0.75 lbs. a.e./acre of Accord®SP was less than that of the untreated check, but it did not differ significantly in the presence versus absence of trenching, although cover development in non-herbicide-treated plots appeared to be limited somewhat by trenching.

These preliminary results indicate that low rates of Accord®SP can provide a high level of control of privet cover, especially when applied in April. Reductions in privet cover following Accord®SP were greater than those following Garlon®3A. Privet control did not differ significantly between formulations of each herbicide. Monitoring of treatment efficacy will continue in 2001 and 2002 in order to identify those treatments capable of providing long-term control of privet free of root or stem resprouting.

KUDZU DEMONSTRATION UPDATE 2001. J.D. Byrd, Jr., J.W. Barnett, Jr., and D.B. Mask. Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

Abstract

Kudzu infested sites near Oxford and Holly Springs, MS were selected for control demonstration sites to evaluate the effectiveness of five, yearly sequential herbicide applications. Sites were selected that had a kudzu population large enough for each treatment to be applied to approximately one acre. Since the initiation of this demonstration in 1998, the site near Oxford has been developed for commercial building and a second site was treated in 1999. In Oxford, treatments were applied by air in 80 gallons spray volume in early September, 1999 and late August, 2000. At Holly Springs, treatments were applied late August, 1998, late September, 1999, and early October, 2000. In 1998, aerial applications of 20 gallons spray volume were used for treatment delivery. However, in 1999 and 2000 ground applications using 80 gallons per acre have been used to deliver treatments. At all application timings, except Holly Springs in 2000 kudzu has been in bloom. Timberland 90 nonionic surfactant has been used with all

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treatments at 0.5% by volume, except those treatments that include Roundup. At 2 years after the initial treatment in Holly Springs, three treatments provided at least 90% control: Transline at 16 oz/A plus Escort at 3 oz/A, Escort at 4 oz/A, and Tordon 101M at 256 oz/A. Three treatments provided control in the 60 to 80% range: Transline at 22 oz/A plus Garlon 3 at 32 oz/A, Tordon K at 64 oz/A, and Vanquish at 64 oz/A plus Escort at 3 oz/A. The other treatments, Transline at 22 oz/A and Vanquish at 64 oz/A plus Transline at 11 oz/A provided 40% control or less. In Oxford, after one application, three treatments, Escort at 4 oz/A, Roundup at 128 oz/A plus Escort at 2 oz/A, and Tordon K at 64 oz/A provided at least 85% control. Roundup at 128 oz/A, Garlon 3 at 128 oz/A, Transline at 22 oz/A Tordon 101M at 256 oz/A, Vanquish at 64 oz/A plus Escort at 3 oz/A, and Vanquish at 64 oz/A plus Transline at 11 oz/A provided between 60 and 85% control. Vanquish at 128 oz/A and Garlon 3 at 43 oz/A plus Transline at 22 oz/A failed to provide at least 60% control.

THE INFLUENCE OF HERBACEOUS COMPETITONS CONTROL ON FIRST- YEAR SURVIVAL OF PLANTED CHERRYBARK AND SHUMARD OAKS. J.R. Cameron, A.W. Ezell, S.H. Schoenholtz, and M.E. Kubiske, Mississippi State University, Starkville, MS 39759

ABSTRACT

For many years, pine trees have been grown using plantation management. Recently, many forest landowners have expressed interest in the possibility of growing hardwoods in the same manner. This study is being conducted to address many existing questions regarding seedling size, competition control, and first-year survival.

A randomized complete block design with split-split plots was established in 1999 on a recently harvested area on an island in the Mississippi River five miles west of Greenville, MS. Two different species of oaks were planted (Cherrybark and Shumard). Three different size classes (small, medium, and large) of each species were planted. One half of the seedlings received pre-emergent herbicide application for competition control in March 2000. In June 2000, half of the seedlings in the pre-emergent treatment plots received a post-emergent application. Results from first year evaluations are presented.

INVESTIGATION OF DWARF PALMETTO [*Sabal minor (Jacq.) Pers.*] CONTROL IN LOUISIANA LOW WOODLANDS. R.J. Lencse, R.M. Louque, E.K. Twidwell and R.E. Strahan, Louisiana State University AgCenter, Louisiana Cooperative Extension Service, Baton Rouge, LA 70894-5100.

ABSTRACT

Two field studies were established in a low woodland site to evaluate efficacy of eleven herbicides for dwarf palmetto control. This site was selected to prevent cattle in a pasture from over-running the experiments. All herbicides investigated are registered for pasture use. Dwarf palmetto can cause direct, physical injury to livestock due to the pointed, sharp ends of the leaves and cause unthrifty animals by competing for pasture grass growth requirements and reduce livestock grazing. The plant causes physical injury to humans and is famous for serving as a refuge for wasps and rattlesnakes.

A search of herbicide labels registered for pasture use found dwarf palmetto was not specifically listed on any pasture herbicide label. Although FIFRA allows use of a herbicide on a labeled site for a pest not on the label, it would be used at the growers' risk. The objective of these two studies was to determine foliar-applied herbicide(s) that could be used by pasture owners to provide excellent control of dwarf palmetto.

In the first study, designated the cut-stem study, the number of green palmetto leaves/plant and the length of the longest stem/plant (petiole length) were recorded. The dwarf palmetto stems were then cut near the soil line and formulated herbicide was immediately applied to cover the end of each cut stem. Two untreated check treatments were included: one in which the stems were cut and the green weight of the stems and leaves obtained for each plant (cut treatment, cut-stem study) and another in which petiole length was determined and the stems not cut (no cut treatment, cut stem study). Total visual plant necrosis of stems plus leaves was observed 100, 149 and 344 DAT (days after treatment) with green weight/plant and petiole length/plant recorded for the untreated plants at 344 DAT. Formulated herbicides examined were: Plateau AS, Remedy, Crossbow, Grazon P+D, Roundup Ultra, Weedmaster, Stinger, Gordon Amine 300, Tordon 22K, Hi-Dep and Velpar.

The second study, designated the foliar study, five formulated herbicides which provided excellent dwarf palmetto necrosis in the cut-stem study at 100 DAT were selected. Herbicides selected and rates applied in the foliar study were: Plateau 0.17% v/v (volume/volume), Roundup Ultra 2% v/v, Weedmaster 0.83% v/v, Crossbow 1.5% v/v and Remedy 1.25% v/v. All treatments, except Roundup Ultra, contained 1.0% v/v Destiny crop oil concentrate. Treatments were applied with a CO2 backpack connected to a hand-held spray boom with single 8006 even fan nozzle to thoroughly wet the upper and lower surfaces of the leaves and stems, the plant around the crown and the plant near the soil line. The number of green leaves/plant at application was recorded as was visual necrosis and the

number of green leaves/plant at 76 and 165 DAT. Both studies were arranged in a completely random design with ten replications, one plant equal to one replication. LSD values were calculated at the 0.05 level.

Results of the cut-stem study 100 DAT indicated that formulated Plateau AS provided 100% necrosis while formulated Remedy (97%), Crossbow (96%), Grazon P+D (91%) and Roundup Ultra (91%) provided 91 to 97% necrosis. All other formulated herbicides showed a range of 40 to 80% necrosis. At 344 DAT, all treatments, except Gordon Amine 300 and Hi-Dep showed a range of 92 to 100% necrosis. Results of the foliar study at 65 DAT indicated there was no significant difference in the number of green leaves between the Weedmaster, Crossbow and Remedy treatments. At 165 DAT, there was no significant difference between the number of green leaves between Crossbow and Remedy. However, Remedy provided significantly greater necrosis (92%) than Crossbow with 64% necrosis. In conclusion, these studies indicate growers should use a foliar application of Remedy at 2.0% v/v + 1.0% crop oil concentrate and drench the plant for excellent herbicidal control of dwarf palmetto.

Although not discussed, data is presented for growth observations of the cut-stem study from the two untreated checks: cut-stem treatment; number of stems 6.9[*] and 1.7[**], length 22.6 inches[#], weight 2.75 and 0.43 pounds: no-cut stems; number of stems 5.5 and 4.8, length 36 inches and 43 inches, weight 2.23 pounds[#].

[*],[**] at day 0 and 344, respectively. [#] at day 344 only.

EVALUATION OF PLATEAU®, OASIS®, AND OUTRIDER® FOR CONTROL OF JOHNSONGRASS (*SORGHUM HALEPENSE*) ON HIGHWAY RIGHTS-OF-WAY. J.C. Arnold, G.E. Coats, J.M. Taylor, and K.C. Hutto. Mississippi State University, Mississippi State.

ABSTRACT

Two experiments were established to evaluate johnsongrass control on highway rights-of-way. Applications were made with a CO_2 backpack sprayer to 4-8 leaf johnsongrass. Visual ratings were made through 3 months after treatment (MAT) at monthly intervals. Herbicides evaluated included imazapic, imazapic + 2,4-D, MSMA, sulfosulfuron, sulfometuron, and glyphosate.

The first experiment was conducted in 1999 and repeated in 2000 to evaluate imazapic and MSMA combinations. The purpose of this experiment was to determine if the addition of MSMA to imazapic increased johnsongrass control as well increasing the spectrum of weeds controlled. The imazapic rates were 0.0625, 0.094, and 0.125 lb ai/A. The MSMA rates were 0, 1, and 2 lb ai/A. When averaged over 2 years, johnsongrass control at 2 MAT was at least 83% with 0.125 lb/A imazapic alone or tank-mixed with MSMA and 0.094 lb/A imazapic tank-mixed with 2 lb/A MSMA. These treatments were significantly better than all other treatments. At 3 MAT, results were similar to the 2 MAT ratings, johnsongrass control was at least 79%. The addition of 2 lb/A MSMA to 0.094 lb/A imazapic increased johnsongrass control to 81% compared to 66% with imazapic alone. Johnsongrass control with all other treatments was 66% or less. These data indicate that 0.125 lb/A imazapic could be used alone for adequate johnsongrass control, however, using 0.094 lb/A imazapic would require the addition of 2 lb/A MSMA to achieve equivalent johnsongrass control. Imazapic rates lower than 0.094 did not provide acceptable johnsongrass control with the addition of MSMA and therefore would not be recommended.

The second experiment compared 0.156 lb/A imazapic, Oasis® (0.188 lb/A imazapic + 0.375 lb ae/A 2,4-D acid), and 0.062 lb ai/A Outrider® (sulfosulfuron) and an industry standard of 0.05 lb ai/A Oust® (sulfometuron) tank-mixed with 0.5 lb ai/A Roundup Pro® (glyphosate).

Johnsongrass control was 90% with imazapic or imazapic + 2,4-D, which was better than sulfosulfuron (80%) or sulfometuron + glyphosate (85%) at 2 MAT. Imazapic or imazapic + 2,4-D controlled johnsongrass at least 89% at 3 MAT compared to 80% or less with other treatments.

Bermudagrass injury was within an acceptable level (<30%); however, bermudagrass density was 50% with sulfosulfuron compared to 23% or less with all other treatments at 3 MAT.

SECTION VII: ECOLOGICAL AND PHYSIOLOGICAL ASPECTS OF WEED SCIENCE

SEASON-LONG INTERFERENCE BETWEEN YELLOW NUTSEDGE (CYPERUS ESCULENTUS) AND BELL PEPPER. T.N. Motis [1], S.J. Locascio [1], and J.P. Gilreath [2], University of Florida, [1]Horticultural Sciences Dept., Gainesville, FL, [2]Gulf Coast Research and Education Center, Bradenton, FL.

ABSTRACT

Due to the scheduled phase-out of methyl bromide and the lack of herbicides with acceptable nutsedge activity, detailed knowledge of nutsedge/crop competition is important for developing alternative nutsedge management strategies for bell pepper production. An additive study was conducted at Gainesville during spring- 1999 and 2000 to determine the effect of two in-row pepper spacings (22.9 and 30.5 cm) and initial yellow nutsedge tuber densities of 0, 30, 60, 90, and 120 tubers/m^2 in spring 1999 and 0, 15, 30, 45, 60, and 90 tubers/m^2 in spring 2000 on pepper fruit production. Bell pepper transplants and nutsedge tubers were planted at the same time on drip-irrigated, polyethylene-mulched beds. Pepper plants were sampled at 6 weeks after planting (WAP) for leaf area and total N concentration. During spring 2000, light (photosynthetic active radiation) readings were recorded at 6 WAP to quantify shading of pepper by nutsedge. Treatments were arranged in a randomized complete block design and replicated five times. Pepper fruits were harvested twice with nine and twelve days between harvests in spring 1999 and spring 2000, respectively. Fruit yields declined rapidly as nutsedge density increased from 0 to 30 tubers/m^2. Yields were reduced 40 % at the lowest nutsedge density of 15 tubers/m^2 during spring 2000. Nutsedge densities of 30, 45, 60, and 90 tubers/m^2 reduced marketable fruit yields by 55, 65, 69, and 74 %, respectively. Thus, the biological threshold at which further yield loss is minimal was 45 tubers/m^2. The marketable yield loss due to nutsedge competition was 6 % greater with pepper plants spaced 30.5 than 22.9 cm apart. Total N concentration of pepper plants (leaf and stem tissue combined) sampled 6 WAP decreased linearly from 3.99 to 3.01 % with an increase in nutsedge density. In spring 2000, shading of pepper plants by nutsedge 6 WAP increased from 10 to 45 % with an increase in nutsedge density. Pepper leaf area declined from 1096 to 615 cm^2/plant as nutsedge density increased from 0 to 90 tubers/m^2. These results indicate that pepper yield reduction was due to competition between pepper and nutsedge for nutrients and light.

OCCURRENCE AND MANAGEMENT OF ALS INHIBITOR RESISTANT RYEGRASS (*Lolium multiflorum* Lam.) IN TEXAS. 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

ABSTRACT

Italian ryegrass is one of the top ten most troublesome weeds for the southern United States wheat growing region and one of the most damaging and difficult to control weeds in the eastern wheat (*Triticum aestivum)* producing regions of Texas. Ryegrass is becoming an increasingly difficult weed to manage in the Central Texas Blacklands wheat-growing region. Physical characteristics such as a dense root system, ability to withstand mild drought, high tiller number, and upright growth habit make it an effective competitor for moisture, mineral nutrients, light and space. Due to their high efficacy, low use rates, and low mammalian toxicity, the ALS (acetolactate synthase) inhibiting sulfonylurea (SU) herbicides have been widely used as effective tools in combating ryegrass infestations. Until recently, good control could be obtained with full rate applications of SU herbicides such as chlorsulfuron, triasulfuron, and chlorsulfuron plus metsulfuron methyl. However, reports from growers, agrochemical representatives, and extension personnel indicate widespread presence of ryegrass populations resistant to these herbicides in this region. The ability of ryegrass to evolve resistance to herbicides is well documented. Due to recent advances in plant breeding, imidazolinone tolerant wheats have been introduced to possibly aid in ALS resistant ryegrass management. The objectives of future research in this area are: to identify the presence of resistant ryegrass populations in the Blacklands region, identify cross resistance to sulfonylurea and imidazolinone herbicides as well as other classes of herbicides, explore alternative chemistries and control strategies to reduce herbicide resistance, and examine specific soil parameters influencing resistance buildup.

A study was conducted during the 1999-2000 growing season in McLennan County, Texas on a field where sulfonylurea resistant ryegrass infestations were suspected. The objective of this trial was to evaluate several rates of selected herbicides for Italian ryegrass control in imidazolinone tolerant wheat. Clearfield variety Fidel soft white winter wheat was planted with a no-till grain drill. Visual ratings (0-100%) were taken to quantify level of control. After heading, ryegrass and wheat biomass was collected per 400 in^{-2} from each treatment and dry weights were taken for each species. PRE herbicide treatments included triasulfuron at 0.21, 0.42, and .84 oz ai/a, pendimethalin at 1.5 #ai/a, and pendimethalin followed by a POST application of tralkoxydim at 2.88 oz ai/a. POST treatments included imazamox at 0.63 and 0.94 oz ai/a, and clodinafop at 0.8 oz/a. applied to 2 to 3 leaf ryegrass. Clodinafop provided the highest levels of control of any POST treatments with 88% and 83% control at 4 and 6 WAT, respectively. Triasulfuron at 0.42 oz ai/a gave 89%, 78%, and 70% control and the 0.84 oz ai/a rate gave 90%, 88%, and 87% control respectively at 6, 9, and 11 WAT. These levels of control indicate that the ryegrass population was not resistant to triasulfuron. Triasulfuron at 0.21 oz ai/a provided significantly lower control than the two highest rates with 73%, 40%, and 41% control at each rating. There were no significant differences between triasulfuron at

0.42 oz ai/a, pendimethalin alone and pendimethalin followed by tralkoxydim. Ryegrass dry matter weights were lowest for the 0.42 oz ai/a rate of triasulfuron followed by 0.8 oz ai/a clodinafop. The results of this study indicate that there are alternatives to control ryegrass infestations in wheat, however there is a need for additional research to determine where SU or imidazolinone resistant populations exist and evaluate SU resistant populations for cross resistance to imidazolinone herbicides.

COMPETITION OF SMOOTH AMARANTH (*AMARANTHUS HYBRIDUS*) AND LIVID AMARANTH (*A. LIVIDUS*) WITH CUCUMBER. A.D. Berry and W.M. Stall, G.E. Macdonald, B. Rathinasabapathi, and R. Charudattan. University of Florida, Gainesville, Fl.

ABSTRACT

In 1998, approximately 10,000 acres of cucumber (*Cucumis sativus*) were planted in Florida, with a total value of more than $53 million. The crop loss in cucumbers due to weeds in Florida in 1992 was 11% (Bridges 1992).

Amaranthaceae is a family that includes some of the most troublesome weeds, such as khakiweed and pigweed. There are several species of pigweed that are commonly found in Florida such as, spiny (*Amaranthus spinosa* L.), smooth (*Amaranthus hybridus* L.), and livid (*Amaranthus lividus* L.). Smooth and livid amaranth are annual weeds that grow throughout the southeast portion of the U.S. Smooth pigweed is an erect herbaceous summer annual, which can grow to 2.5m tall. Livid amaranth is a herbaceous summer annual with prostrate growth.

Objectives of this experiment were to determine the intra- and interspecific interference of smooth and livid amaranth with cucumber. As well as, determine the critical density and biological threshold. Trials were established in the spring of 2000 at the University of Florida Horticultural Unit in Gainesville, Fl. and the fall of 2000 at the University of Florida Horticultural Unit in Gainesville, Fl. and at the Suwannee Valley Research and Education Center at Live Oak, Fl. An additive design was implemented as a randomized complete block and four replications for each season. The crop density was constant at four plants per meter. In the spring of 2000, amaranth densities were 0, 2, 4, 6, 8 and 10 per meter. In the fall of 2000, amaranth densities were 0, 4, 6, 8, 10 and 12 per meter. Amaranth populations were established at crop emergence and allowed to compete for the entire growing season. Analysis of Variance (ANOVA) was performed to determine the significance of the treatment effect, varying amaranth densities on cucumber fruit yield, and regression analysis was performed on the variable density.

Density was a significant factor for total yield. Cucumber yield decreased as weed density increased. There was no interaction between weed species for total yield. The critical density (10% total yield reduction) occurred at 1-2 weeds per meter, depending on season and location. The biological threshold appears to be 6-8 weeds per meter. The dry weights, for both smooth and livid amaranth, were lower in the mixed population (interspecific) than in the pure stands (intraspecific). More interspecific competition occurred, which demonstrates the competitive nature of cucumber.

INTERFERENCE OF PALMER AMARANTH WITH GRAIN SORGHUM. J.W. Moore,* D.S. Murray, R.B. Westerman, and S.W. Murdock. Oklahoma State University, Stillwater, OK 74078.

ABSTRACT

Field experiments were conducted near Perkins in 2000 and near Chickasha in 1999 and 2000 to evaluate the competitive effects of Palmer amaranth on grain sorghum. The eight weed densities used were 0 (the weed-free check), 1, 2, 4, 6, 9, 12, and 18 plants/15 m of row. The grain sorghum in these experiments experienced full-season interference from Palmer amaranth. Grain sorghum yield and Palmer amaranth biomass were measured in 1999 and 2000. Additional data collected in 2000 included: peduncle lengths, sorghum head lengths, Palmer amaranth heights, the mean number of seed per panicle, grain sorghum test weights, and grain sorghum grades. Grain sorghum yield decreased 97 kg/ha (1.8%), 190 kg/ha (3.5%), and 92 kg/ha (2.7%) for each increase by one Palmer amaranth plant/15 m of row at Chickasha in 1999, Chickasha in 2000, and Perkins in 2000, respectively. Although full-season competition from Palmer amaranth had a negative affect on grain sorghum yields, no differences were detected for grain sorghum peduncle lengths or grain sorghum head lengths at either location in 2000. Palmer amaranth weights showed a positive linear response to an increase in Palmer amaranth density; however, no differences in Palmer amaranth heights were detected. For each increase by 1 kg of Palmer amaranth/plot, the percentage of grain yield reduced was estimated at 5.3, 5.9, and 9.1% at Chickasha in 1999, Chickasha in 2000, and Perkins in 2000, respectively. In 2000, the mean number of seed per panicle were reduced by 27 seed at Perkins and by 50 seed at Chickasha for each increase in one Palmer amaranth/15 m of row. Grain sorghum test weights decreased as the number of Palmer amaranth increased at Chickasha in 2000; however, there were no differences detected at Perkins in 2000. At Chickasha in 2000, grain sorghum grades decreased as the number of Palmer amaranth increased, but at Perkins in 2000, the grain sorghum grades were not affected.

SMELLMELON (*Cucumis melo L.* Var *dudaim* Naud.) CONTROL AND COMPETITIVE INTERACTIONS IN COTTON (*Gossypium hirsutum*). C.H. Tingle, G.L. Steele, B.V. Ottis, and J.M. Chandler, Texas Agricultural Experiment Station, Texas A&M University, College Station, TX 77843

ABSTRACT

Field studies were conducted in 1999 and 2000 at the Texas Agricultural Experiment Station, near College Station, TX to determine the critical smellmelon density that causes a loss in cotton yield. Additional studies were conducted to determine the critical period of competition between smellmelon and cotton along with early and mid season control strategies.

Competition Study. The competition between cotton and smellmelon was determined by transplanting smellmelon at densities of 2, 3, 5, and 10 plants per 10 m of cotton row. Plots were hand hoed to remove any additional weed species allowing smellmelon to compete full season. Yield was determined by harvesting the center row of each plot. In 1999, yield from the weed-free plot was 2679 kg/ha. With the addition of 2 or 3 smellmelon per 10 m, yield was significantly reduced to 2218 and 2223 kg/ha, respectively. Yield was further reduced with densities of 5 or 10 smellmelon plants per 10 m and was 1757 and 1709 kg/ha, respectively. In 2000, the weed-free seed cotton yield was 3108 kg/ha. Smellmelon competition was more severe in 2000 and 2 or 3 smellmelon plants per 10 m reduced seed cotton yield to 2280 and 2160 kg/ha, respectively. With the addition of 5 or 10 smellmelon plants per 10 m, yield was further reduced to 1924 and 1539 kg/ha, respectively.

Critical Period. To determine the critical period for smellmelon and cotton competition, studies were conducted evaluating the time of smellmelon introduction and removal. The purpose of the introduction study was to simulate smellmelon germination at different periods throughout the growing season, while the removal study simulated smellmelon control throughout the season. Times consisted of 0, 2, 4, 6, 8, 10, 12, and 14 weeks after planting (WAP) of cotton. Smellmelon densities of 10 plants per 10 m of row were transplanted or removed at these periods. As before, any additional weeds were removed by hand hoeing and yields were determined by harvesting the center row. In 1999, results from full-season smellmelon competition was 1772 kg/ha. By delaying the introduction period to 2 WAP, yield increased to 2429 kg/ha. Similar yields were observed for the remaining introduction periods and ranged from 2478 to 2610 kg/ha. No yield differences were observed between weed-free and removal periods of 2 and 4 WAP which ranged from 2505 to 2610 kg/ha. However, when smellmelon was allowed to compete with cotton for at least 6 weeks, yield was reduced to 2427 kg/ha. Cotton yield decreased for competition periods of 8, 10, and 12 WAP and was 2146, 2022, and 1903 kg/ha, respectively. In 2000, full-season smellmelon competition resulted in 1539 kg/ha. When smellmelon introduction periods were delayed 2 or 4 WAP, yield increased to 2104 and 2197 kg/ha, respectively. Yield reductions were less than 8% for the remaining introduction periods. When smellmelon were allowed to compete until 2 WAP, yield was reduced to 2362 kg/ha. Yield continued to decrease with the remaining removal periods.

Control Strategies. Smellmelon control was evaluated with various postemergence (POST) cotton herbicides. The herbicide treatments included glyphosate (1.1 kg a.i./ha), pyrithiobac (0.07 kg/ha), fluometuron (1.1 kg/ha) + MSMA (2.2 kg/ha), and bromoxynil (0.56 kg/ha). Application timings consisted of POST-1 (5-15 cm smellmelon) or POST-2 (45-60 cm smellmelon). Smellmelon control was at least 97% with POST-1 applications of glyphosate, pyrithiobac, or fluometuron + MSMA. Control decreased to 65% with POST-1 applications of bromoxynil. When applications were delayed until POST-2, smellmelon control was 72 or 68% for either bromoxynil or fluometuron + MSMA, respectively. Smellmelon control was 83% with POST-2 applications of pyrithiobac, but only 38% for glyphosate.

WEED CONTROL EVALUATIONS FOR FLORIDA SILAGE CORN (ZEA MAIZE). E.R.R.L. Johnson, G.E. MacDonald, D.A. Drew, C.L. Main and J.A. Tredaway. University of Florida, Gainesville.

ABSTRACT

Weed control is essential for economical silage corn production. Due to governmental, environmental, and economical concerns alternative weed control methods are needed for silage corn production. Field experiments were conducted at three sites in Levy Co. and one site in Alachua Co., FL in 2000 to evaluate the efficacy of several compounds for weed control under normal silage production conditions in Florida. Treatments were arranged in a randomized complete block design with four replicates. Treatments (lbs.-ai/A) at the three Levy Co. sites were an untreated control, atrazine + pendimethalin (1.5 + 0.75) spike, atrazine + isoxaflutole (1.5 + 0.094) PRE, atrazine + metribuzin + metolachlor (0.75 + 0.25 + 0.95) PRE, with metribuzin dropped at 2 sites in Levy Co. and the atrazine rate increased to (1.5), isoxaflutole + mesotrione (ZA-1296) (0.094 + 0.094) PRE, isoxaflutole + mesotrione (0.094 + 0.125) PRE, flumetsulam + metolachlor (0.04 + 0.95) PRE, mesotrione + nicosulfuron (0.094 + 0.031) POST, with the mesotrione rate changed to (0.125) for 2 Levy Co. sites, isoxaflutole followed by dicamba (0.094 fb 0.25) PRE fb EP, atrazine fb paraquat (1.5 fb 0.25) EP fb PD, isoxaflutole + carfentrazone (0.094 + 0.094) PRE, and atrazine + mesotrione + crop oil (1.5 + 0.094 + 1.0) POST. Additional treatments in Alachua, Co. included, atrazine + mesotrione + crop oil (1.5 + 0.125 + 1.0) EP, carfentrazone (0.008) EP, atrazine + carfentrazone (1.5 + 0.008) EP, dicamba + carfentrazone (0.25 + 0.008) EP, atrazine + nicosulfuron + crop oil (1.5 + 0.031 + 1.0) EP, atrazine +

metolachlor + crop oil (1.5 + 0.95 + 1.0) EP, metolachlor fb dicamba (0.95 fb 0.25) PRE fb EP, flumetsulam fb nicosulfuron (0.4 fb 0.031) PRE fb EP, atrazine fb isoxaflutole (1.5 + 0.063) PRE, atrazine fb isoxaflutole (1.5 + 0.078) PRE. Treatments were applied using a CO_2 backpack sprayer calibrated to deliver 20 gpa at 34 psi. Data collected included Florida pusley (*Richardia scabra*), goosegrass (*Eluesine indica*), Palmer amaranth (*Amaranthus palmerii*), and purple nutsedge (*Cyperus rotundus*) control, early season corn injury, and corn fresh weight - above ground biomass.

Excellent control of target weeds was observed in most treatments. The atrazine, pendimethalin, and/or metolachlor treatments at all sites provided maximum weed control (92-100%) and no injury or reduction in yield. Isoxaflutole in combination with other compounds provided 23-88% goosegrass control and 20-97% Palmer amaranth control. Isoxaflutole was weaker on grasses than expected in a few treatments, but efficacy was increased with the addition of other compounds. Further studies need to be run under Florida conditions to fully evaluate the efficacy of isoxaflutole alone. Mesotrione in combination with other compounds provided from 23-100% Palmer amaranth control and 20-90% goosegrass control. Florida pusley was controlled by a variety of broadleaf compounds, including metolachlor, dicamba, atrazine, and mesotrione. Some disparity of weed control was noted at a Levy Co. site that was planted early season. Also, early season corn injury was observed at this site in Levy Co. associated with isoxaflutole possibly due to cool temperature. There was no yield loss at any of the sites due to either weed pressure or herbicide damage. Corn yields at the Levy Co. sites were similar to the national average at approximately 15 tons/A. However, yields were significantly lower (9.0 tons/A) at the Alachua Co. site across all treatments due to water stress.

INTERFERENCE OF CROWNBEARD (*Verbesina encelioides*) WITH PEANUT (*Arachis hypogaea*). C.J. Gray *, D.S. Murray, E.W. Palmer, and T.B. Scroggins. Department of Plant and Soil Sciences. Oklahoma State University, Stillwater, OK 74078.

ABSTRACT

Crownbeard (*Verbesina encelioides*) is an annual weed that is the fourth most common and the third most troublesome weed in Oklahoma peanuts. Crownbeard, a member of the sunflower family (Asteracaea/Compositae), is native to the southwestern United States and the Mexican Plateau; however, it is also found in South America, Australia, and the Middle East. Crownbeard prefers deep sandy soils of disturbed sites and is extremely drought tolerant. The leaves have a grayish-green appearance due to a heavy covering of white hairs on the leaf surface and it can reach a height of 1.5 to 5 ft. The inflorescence is approximately 1 to 1.5" wide and contains yellow ray and disk florets. Crownbeard may also contain allelopathic capabilities. Due to a toxin called galegine, which is found in the foliage, crownbeard is extremely toxic to livestock including sheep, cattle, and swine.

A field experiment was conducted near Colony, OK to determine if the presence of crownbeard reduced peanut yield and also to determine what weed measurement variables would predict the yield reduction. The experimental design was a randomized complete block with four replications. Plot size was 12 ft by 40 ft. The soil type was loamy sand with a pH of 6.9 and 0.7% organic matter. A natural population of crownbeard was removed 0 (weed-free check), 4, 6, 8, 10, 12, 14, and 16 weeks after emergence. Crownbeard were removed from all four rows; however, within rows 2 and 3 the crownbeard were cut at soil level with hand clippers, counted, dried, and weighed. After weed removal, the plots were kept weed free for the remainder of the growing season.

Results concluded the presence of crownbeard did reduce peanut yield linearly. For each week of crownbeard interference, peanut yield was reduced by 2.6%, while full-season interference reduced peanut yield 52% when compared to the weed-free check. For each week the crownbeard was allowed to grow, dry weed weights increased 1 lb/120 ft^2. In this experiment, dry weed weights and weed densities were not good predictors for estimating peanut yield. The control of crownbeard is necessary for potentially maximizing peanut yield in Oklahoma.

INTERFERENCE AND CONTROL OF TRUMPETCREEPER (*CAMPSIS RADICANS*) IN SOYBEAN J.T. Edwards and L.R. Oliver. Department of Crop, Soil, and Environmental Sciences. University of Arkansas, Fayetteville, AR 72704.

ABSTRACT

Trumpetcreeper (*Campsis radicans*) is a woody, perennial vine common in no-till Arkansas soybean fields. In the spring of 1999 a study was initiated at the Pine Tree Branch Research Station, near Colt, AR, to determine the level of interference of trumpetcreeper in soybean. Interference plots were 3 by 9 m and arranged in a completely randomized design. A second study was initiated to determine the herbicide and herbicide timing for trumpetcreeper control in Roundup Ready soybean. The experimental design was a randomized complete block with a split block arrangement, with the main-plot factors being till or no-till and the sub-plot factors being herbicide treatment. Soybean was no-till planted in 19-cm rows at 484,000 seed/ha. Interference potential was best expressed by the rectangular hyperbolic equation y=a*x/(1+b*x), where y = percentage yield loss and x = trumpetcreeper shoot

density per 0.5 m^2. The estimates for a and b were 22.38 and 0.24, respectively, with a standard error of 10.83. For example, the predicted yield loss for an area with one trumpetcreeper plant per 0.5m^2 would be 18%.

The main effect of tillage provided superior control to that of no-tillage at every rating. 1.12 kg ai/ha glyphosate applied at the V4 soybean growth stage provided 95% weed control at two weeks following treatment and 82% control at one year following treatment. No advantage was found to increasing the glyphosate rate above 1.12 kg/ha in the spring, but 2.24 kg/ha glyphosate in the fall was required to provide adequate control the following year. A fall application of 3.36 kg ai/ha dicamba was required to obtain the same control as 1.12 kg/ha glyphosate in the fall, and 2,4-D did not provide adequate control at any rate. This study indicates that low densities of trumpetcreeper can produce significant interference with soybean, and can be best controlled by 1.12 kg/ha glyphosate.

FLURIDONE TOLERANT HYDRILLA (*HYDRILLA VERTICILLATA*) IN FLORIDA. G.E. MacDonald * and W.T. Haller, Agronomy Dept., University of Florida, Gainesville; and M.D. Netherland, Sepro Co., Carmel, IN.

ABSTRACT

The control of the invasive submersed aquatic plant hydrilla in Florida's large public water resources has come to rely upon use of the photosynthetic/carotenoid inhibiting herbicide fluridone. Hydrilla is usually controlled (since 1980) for a year or longer by single applications of fluridone at 6-12 ppb at a cost of usually less than $100/acre. Native emergent plants and many native submersed species are not affected by these low application rates. Hydrilla in Florida reproduces only via asexual means (turions, stem fragments, root crowns), so the development of fluridone tolerance was far from anticipated. Recently, however, it has become evident that hydrilla in several Florida lakes has developed tolerance to fluridone, now requiring applications of >25 ppb for effective control. Susceptible populations treated with fluridone show a dramatic decrease (as expected) in the levels of the plant pigments carotenoid, phytofluene and chlorophyll. However, levels of these pigments from tolerant plants are decreased to a much lesser extent in response to fluridone treatment. Studies are currently underway to investigate the possible mechanism(s) of fluridone tolerance in hydrilla.

DEVELOPMENT AND PRODUCTIVITY OF ROUNDUP READY COTTON UNDER CONVENTIONAL AND NARROW-ROW SYSTEMS. M.L. Mobley, N.R. Burgos, and M.R. McClelland, Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, 72701

ABSTRACT

The yield of cotton could potentially be improved by using herbicide-resistant cotton and ultra narrow-row spacing. Also by monitoring the growth and development of cotton, better management decisions can be made. This study was done to compare the development and yield of Roundup Ready cotton under conventional and ultra-narrow row spacing and to determine if preemergence herbicides are necessary. It was conducted in 1999 at Little Rock and Fayetteville, AR, then repeated in 2000 at Marianna and Fayetteville, AR. Fayetteville was irrigated whereas Little Rock and Marianna were dryland.

Narrow rows were spaced 7.5 or 10 inches apart and conventional rows were 30 or 40 inches apart. Herbicide treatments consisted of a total postemergence (POST) program of Roundup Ultra (1 to 3 and 6 to 8 leaves) or a herbicide program with Cotoran + Dual Magnum preemergence (PRE) followed by Roundup Ultra at 1 to 3 leaves, followed by Staple and Select, as needed. Cultivars used were PM1220 in 1999 then PM1218 in 2000. In 2000, a nontransgenic cultivar, ST474, was added. The treatment for ST474 in narrow rows was a PRE application of Cotoran + Dual Magnum followed by Staple and Select as needed. For conventional row spacings Cotoran + Dual Magnum was applied PRE followed by Cotoran + Karmex early directed, Direx + MSMA late directed, and Direx layby.

In this study, the computer program COTMAN was used for in-season monitoring of cotton growth and development. When weed pressure was heavy, omitting PRE herbicides delayed cotton development. Under ultra-narrow rows, the development of cotton was limited and cutout was earlier than cotton grown in conventional rows. However, it is apparent that the target development curve from the COTMAN program, which was established from conventional cotton spacings, may not provide an optimum curve for ultra-narrow row cotton. In 2000 at Marianna under both row spacings and herbicide programs, development was below that of the target development curve. The herbicide program did not affect the square shed rate regardless of row spacing.

Treatments affected yield differently at the three locations. At Little Rock and Marianna, yield was increased when a PRE herbicide was applied. At Fayetteville, however, yield was not increased with PRE application. In 2000 at Fayetteville and Marianna, PM1218 with a PRE produced higher yields than the standard cultivar, ST474, in both row spacings. In Little Rock, yield did not differ between row spacings. In Fayetteville both years, cotton in conventional row spacing had higher yields than ultra-narrow rows. However, at Marianna ultra-narrow row cotton produced higher yields than conventional-row cotton.

It was concluded that cotton development was limited under narrow rows but under dryland conditions, higher plant population could produce yields equal to or greater than conventional-row cotton. Omission of PRE herbicides for Roundup Ready cotton could reduce yields when initial weed population is high.

THE EFFECT OF MALATHION ON STAPLE METABOLISM. S.L. File, R.H. Blackley, and D.B. Reynolds. Mississippi State University, Mississippi State, MS.

ABSTRACT

Previous research has indicated that malathion inhibits the metabolism of sulfonylurea herbicides in several crops. Pyrithiobac, which has the same mode of action as the sulfonylurea herbicides, has been shown to interact with malathion in cotton. Significant visual injury, such as bronzing and chlorosis, has been reported in previous studies. In 1999 field grown plants were utilized at the Plant Science Research Center near Starkville, MS to evaluate the effects of malathion applications on pyrithiobac metabolism in cotton. Malathion applications at 0.85 kg ai/ha were made with a CO_2 backpack sprayer delivering 140 L/ha. These applications were made 6, 3, 1, and 0 hours before application of pyrithiobac. ^{14}C-pyrithiobac was applied at the 0 hour timing interval to the 3rd leaf of each plant.

Total recovery was 92 to 94%, and ^{14}C-pyrithiobac absorption ranged from 16 to 20%. Translocation was minimal, and at least 92% of the ^{14}C remained in the treated leaf. The majority of ^{14}C was recovered in the wash solution which ranged from 73 to 75%. Thin-layer chromatography was used to determine pyrithiobac metabolism. The amount of ^{14}C remaining as parent material, or the herbicidally active form, was minimal (4 to 9%) and did not differ among treatments. These data suggest that close application timing of 0.85 kg/ha malathion in relation to timing of pyrithiobac applications does not increase injury of cotton based on the metabolism of the parent molecule to inactive metabolites.

VEGETATATIVE REPRODUCTION OF TORPEDOGRASS. R.M. Tenpenny, D.L. Sutton, and G.E. MacDonald. University of Florida, Gainesville, FL.

ABSTRACT

Florida agriculture and ecologically important areas are in constant competition with exotic, invasive plants. Introduction of non-native plant species, such as torpedograss, can modify the biological characteristics of established ecosystems causing a disruption in wildlife habitats and recreational lands. Non-native aquatic weeds also play a large role in the economic losses of agriculture and industry by impeding irrigation and drainage canals of crops and other important land areas.

Torpedograss is a perennial grass species that occurs throughout many aquatic and wetland ecosystems in Florida. Torpedograss spreads vegetatively via the production of rhizomes, stolons and bulbils (basal bulbs). Glyphosate (N-[phosphonemethyl] glycine) is the most commonly recommended herbicide for torpedograss control, and the only EPA approved herbicide for torpedograss control in standing water. Control with glyphosate is often short-term with rapid regrowth occurring from nodal regions along rhizomes, stolons and bulbils. Therefore, a better understanding of the vegetative reproduction of torpedograss is highly warranted. The specific objectives of these studies were to 1) determine the influence of apical dominance on the regrowth of torpedograss and 2) determine the reproductive capacity of single node segments.

Experiments were conducted under greenhouse conditions at the University of Florida, Ft. Lauderdale, Research and Education Center during the summer of 2000 and at the University of Florida in Gainesville during the late fall of 2000. Apical and nonapical shoot segments (5 nodes) were planted and allowed to grow for four weeks. Plants were harvested and separated into rhizome, shoot, stolon, and bulbil sections. In addition, single node sections of shoots and rhizomes were planted and regrowth determined after 3 and 4 weeks. Data were subjected to ANOVA and means separated using Fisher least significance procedure. There was a significant experiment by location interaction for each experiment therefore results are presented separately for each location.

No significant difference for regrowth of shoots or rhizomes occurred between apical and nonapical stems at either location. More thorough review of growth mechanisms in Gainesville during the second trial showed no significant difference in shoot formation of bulbils between apical and nonapical shoots. However, apical shoots produced more nodes by the end of the growth period. Rhizomes and shoots fragmented into one-node sections exhibited high percentages of regrowth, with 85% and 90% regrowth respectively, for the Ft. Lauderdale and Gainesville locations. With the high nodal regrowth potential of torpedograss, mechanical techniques of control will only increase its density. These studies also suggest little to no dormancy (lack of apical dominance) of rhizome or stolon nodes

THE EFFECT OF WEED-FREE INTERVALS ON PEACH (*PRUNUS PERSICA* (L.) BATSCH) TREE GROWTH, YIELD, AND FRUIT QUALITY. A.W. MacRae, W.E. Mitchem, D.W. Monks, and R.K. Galloway. Department of Horticultural Science, North Carolina State University. Raleigh, NC 27695-7609.

ABSTRACT

Studies were conducted at Auman's Orchard in Westend, and Burkehead's Orchard in Norman, North Carolina to determine the critical weed-free period for 'Summer Prince' and 'Norman' peach (*Prunus persica* (L.) Batsch). Treatments were weed-free intervals of 0, 3, 6, 9, 12, and 15 weeks of weed control after tree bloom. Paraquat at 1.08 kg ai/ha plus a non-ionic surfactant at 0.25% v/v was applied every ten days to maintain the weed-free treatments. Paraquat applications were made with a tractor mounted sprayer calibrated to deliver 288.4 L/ha at 267 kPa of pressure. Treatments were arranged in a randomized complete block design with six replications. Common bermudagrass (*Cynodon dactylon* (L.) Pers.), smooth pigweed (*Amaranthus hybridus* L.) and common lambsquarters (*Chenopodium album* L.) were the primary weeds at Auman's Orchard with common bermudagrass being the most common weed. Horseweed (*Conyza canadensis* (L.) Cronq.), smooth crabgrass (*Digitaria ischaemum* (Schreb.) Muhl.) and large crabgrass (*Digitaria sanguinalis* (L.) Scop.) were the primary weeds at Burkehead's Orchard with horseweed being the most common weed. Total yield (kg/ha), and total fruit number (#/ha) were determined at fruit maturity. Individual fruit weight (g) and fruit width (cm) were determined by collecting ten fruit from three trees in each plot, measuring fruit weight and width, and then dividing by ten.

Data analysis showed no difference between the weed-free intervals for tree growth (trunk cross-sectional area). For the most part, the highest values for fruit weight, fruit width, and total fruit yield were found to be with the 12 weeks or greater weed-free interval. Maintaining the orchard floor weed-free until at least 12 weeks after bloom resulted in the greatest fruit quality (individual fruit weight and width) and total yield (number and weight).

PHYSIOLOGICAL BEHAVIOR OF POST-DIRECTED FLUMIOXAZIN IN COTTON (*GOSSYPIUM HIRSUTUM*). A.J. Price, W.A. Pline, and J.W. Wilcut. North Carolina State University, Raleigh, NC 27695.

ABSTRACT

Flumioxazin, (Valor) is an experimental herbicide being developed by Valent USA as a postemergence-directed (PDS) treatment in cotton. Localized injury has been observed on green cotton stems less than 30 cm tall when flumioxazin was applied as a postemergence directed spray (PDS). Severe injury may occur when flumioxazin contacts cotton foliage, as when heavy rain splashed treated soil onto plants or during an inaccurate PDS application. Thus, absorption and translocation of ^{14}C-flumioxazin was investigated in cotton at several growth stages over time. Cotton (5415RR) at 4, 8, and 12-leaf growth stages was treated with ^{14}C-flumioxazin on a 5-cm^2 section of lower stem just above the soil surface simulating a PDS application. Stems were treated with 10 mL of solution containing $4.5*10^6$ Bq ^{14}C-flumioxazin plus nonionic surfactant (NIS) at 0.25% (v/v). Plants were harvested at 4, 24, 48, and 72 hours after treatment (HAT) and divided into the treated stem area, untreated stem area, mature leaves, immature leaves and buds, roots, and when applicable: fruiting branches (including the peduncles on the fruiting branch), squares, and bolls. At harvest, the treated stem was washed with a 10 mL solution of 1:1 methanol:water + NIS at 0.25% (v/v) to recover non-absorbed ^{14}C-flumioxazin. Plant parts were dried, weighed and subsequently oxidized to recover absorbed ^{14}C.

Absorption and translocation of ^{14}C-flumioxazin by cotton was influenced by growth stage and harvest time with these main effects being significant at P £ 0.05. There was a growth stage by harvest time interaction. At 4 HAT, total ^{14}C absorption was 38, 40, and 59% at 4, 8, and 12-leaf growth stages, respectively. Total ^{14}C absorbed at 72 HAT was 77, 76, and 95% at 4, 8, and 12-leaf growth stages respectively. More ^{14}C was absorbed by 12-leaf cotton within 48 HAT than 4 or 8-leaf cotton at 72 HAT.

A significant majority (31-57%) of applied ^{14}C remained in the treated stem for all growth stages and harvest times. Translocation of absorbed ^{14}C was limited to 1% in mature leaves, 1% in immature leaves and buds, 2% in the untreated stem, and 2% in the roots at the 4-leaf growth stage 4 HAT. Translocation significantly increased in 4-leaf cotton to 11% in mature leaves, 3% in immature leaves and buds, and 6% in the untreated stem. Translocation of absorbed ^{14}C in 8-leaf cotton 4 HAT was 3% in mature leaves (significantly higher than 4-leaf) and 2% in immature leaves and buds, roots, and untreated stem. Translocation of absorbed ^{14}C in 8-leaf cotton 72 HAT significantly increased to 6% in mature leaves and 6% in the untreated stem. Translocation in 12-leaf cotton 4 HAT was significantly higher in mature leaves (6%) and the untreated stem (6%). Twelve-leaf cotton roots contained at least three times more ^{14}C than 4 and 8-leaf cotton at all harvest times.

Treated cotton stems usually contained higher concentrations (Bq/gram) of ^{14}C than any other tissue. The highest concentrations of ^{14}C found in 4-leaf cotton, excluding the treated stem, was in immature leaves and buds 48 HAT. This concentration was one-ninth the ^{14}C concentration found within the treated stem. Untreated stems and roots contained less than one-twentieth the ^{14}C concentration found within treated stems at the 4-leaf growth stage. The highest concentrations of ^{14}C found in 8-leaf cotton, excluding the treated stem, was in mature leaves. This concentration of ^{14}C was one-fourth the concentration found in treated stems. Stems and roots contained less than

one-eighth the ^{14}C concentration found in treated stems at the 8-leaf growth stage. Treated cotton stems in 12-leaf cotton at 48 and 72 HAT contained a lower ^{14}C concentration than treated stems of 4 and 8-leaf cotton at the same respective harvest time. Cotton at the 12-leaf growth stage contained higher ^{14}C concentrations in stems at 4 HAT and roots 72 HAT than 4 and 8-leaf growth stages at the same respective harvest time. Within 12-leaf cotton, less than 5% absorbed ^{14}C translocated to reproductive structures; however, on a Bq/g dry weight basis, this represents at least one tenth and up to one third the concentration of ^{14}C detected in treated stems. Research is currently ongoing to determine metabolism of ^{14}C-flumioxazin in cotton.

GLYPHOSATE APPLICATIONS AT WEED FLOWERING TO REDUCE SOIL SEED BANK. E.R. Walker and L.R. Oliver, Department of Crop, Soil and Environmental Sciences, University of Arkansas, Fayetteville, AR 72704

ABSTRACT

Two continuous field studies were established at the Pine Tree Experiment Station in 2000 to determine the effects of glyphosate applications at weed flowering on glyphosate-tolerant soybean (*Glycine max*) to reduce the soil seed bank. The experimental design for each study 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. Each site was conventionally tilled and a natural population of barnyardgrass (*Echinochloa crus-galli*), Palmer amaranth (*Amaranthus palmeri*), pitted morningglory (*Ipomoea lacunosa*) and prickly sida (*Sida spinosa*) was present. Glyphosate-tolerant soybean cultivars Asgrow 4602 RR, Deltapine 5644 RR, and Deltapine 6200 RR were planted on a 30-in row spacing. Studies were irrigated according to the Arkansas Irrigation Scheduling Program. Herbicide treatments included glyphosate at 1.0 lb a.i./A applied at soybean growth stage V3, then 0, 0.125, 0.25, 0.5, and 1.0 lb/A applied at either first weed flower or first weed flower, then sequentially every 10 days until the 7-day pre-harvest interval. The standard comparison was 1.0 lb/A glyphosate applied at soybean growth stages V3 and V6, and a weedy check was also included. Visual weed control ratings were taken 2 weeks after the V3 glyphosate application and immediately prior to first weed flower glyphosate applications. Initial weed populations were determined by collecting and analyzing four soil cores per plot and taking weed counts in 1 yd^2 immediately prior to V3 glyphosate applications. Weed identification, biomass, and seed production data were obtained from weeds harvested from 1 yd^2 area in each plot immediately prior to harvest. In addition, germination tests will be conducted on seed collected from these samples. Four 1-ft. samples per plot were used to determine glyphosate effects on soybean flowering and seed production and soybean yields were taken. Neither glyphosate application timing nor rate reduced soybean yield. However, maturity group IV soybean yield was less than maturity group V and VI yields.

IDENTIFICATION OF PITTED MORNINGGLORY (*IPOMOEA LACUNOSA*) ECOTYPES. D.O. Stephenson, IV and L.R. Oliver. Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72701.

ABSTRACT

Morphological experiments were initiated in the summer of 2000 at the Arkansas Agricultural Research and Extension Center in Fayetteville to investigate the possible existence of pitted morningglory (*Ipomoea lacunosa*) ecotypes. The experiment was a randomized complete block experimental design with four replications. Single-plant pitted morningglory seed samples were received from areas in the United States where it grows indigenously. Single plant samples were grown full-season using a trellis system to provide support. The samples were germinated in the greenhouse and planted in the field 2-m apart on a trellis. Leaf size, leaf shape, runner length, and leaf and stem pubescence were recorded 8 weeks after emergence (WAE). Amounts of leaf and stem pubescence were visually estimated using a 0 to 3 scale (0 = no pubescence/glabrous; 3 = total coverage with dense pubescence). Flowering date was also recorded so days after emergence (DAE) until first flower could be computed. On the day of flower initiation, flower color was recorded.

Samples from Delaware (DE), Missouri (MO), North Carolina (NC), northeast Arkansas (AR), Tennessee (TN), Mississippi (MS), and Louisiana (LA) were selected as representative samples. There was no difference in leaf size 8 weeks after emergence (WAE) between samples. The DE, MO, and NC samples had a heart-shaped leaf. An arrow-shaped leaf was observed for the AR sample, and an arrow to heart mixture was seen for TN, MS, and LA samples. There were no differences in runner length 8 WAE among all samples. All samples were rated 0 to 2 on the leaf and stem pubescence scale. White flowers were observed for all samples. Southern U. S. (MS and LA) samples had a longer DAE until first flower compared with northern U. S. (DE, MO) samples. In general, samples from the central U. S. (NC, AR, and TN) were different than northern samples, but not different from southern samples.

Five samples were selected from Arkansas representing the Northeast (NE), West-Central (W-C), East-Central (E-C), Southeast (SE), and Southwest (SW) regions of the state. The SW sample had a larger leaf size compared to all other Arkansas samples 8 WAE. The NE sample had an arrow-shaped leaf and the E-C sample had a heart-shaped

leaf with lobes similar to red morningglory (*Ipomoea coccinea*). All other samples had an arrow to heart mixture. There were no differences in runner length 8 WAE among the Arkansas samples. All samples obtained a 0 or 1 on the leaf and stem pubescence scale. The flower color for the five samples, except SW Arkansas, was white. The SW sample had a purple flower. A difference was observed for the DAE until first flower, with samples from SE and SW Arkansas having longer DAE until first flower than samples from NE Arkansas. Samples from central Arkansas were not different from northern or southern Arkansas samples.

EFFECT OF GROWTH STAGE ON ABSORPTION, TRANSLOCATION, AND ACCUMULATION OF ^{14}C-GLYPHOSATE IN GLYPHOSATE-RESISTANT COTTON. W.A. Pline, A.J. Price, J.W. Wilcut, K. Edmisten, and R. Wells. North Carolina State University, Raleigh, NC.

ABSTRACT

Previous research has indicated that ^{14}C-glyphosate is translocated to reproductive tissue such as squares and bolls within 3 days of application (1). However, the fate of glyphosate throughout the life cycle of a plant is not known. A study was conducted to investigate the fate of foliar-applied ^{14}C-glyphosate on cotton at the 4- or 8-leaf growth stages, when harvested at various growth stages. The newest fully expanded leaf of a 4- or 8-leaf stage cotton plant was treated with 10 mL of a solution containing 0.1 mCi ^{14}C-glyphosate and 0.25% NIS. Plants were then harvested at 8 or 10-leaf, 12-leaf, midbloom (8 to 10 nodes above white bloom), and cutout (5 nodes above white bloom, physiological maturity) stages. Leaves were washed and non-absorbed ^{14}C-glyphosate remaining on the leaf surface was quantified. Thirty to 37 % of ^{14}C-glyphosate applied remained in the plant at cutout from plants treated at the 4- or 8-leaf stages. At cutout, 2.1 and 2.6% of applied ^{14}C-glyphosate remained in reproductive tissue (squares and bolls) from 4- and 8-leaf treated plants, respectively. The concentration of ^{14}C-glyphosate in tissue on a Bq g^{-1} dry weight basis was greatest in mature leaves, immature leaves, and buds in plants treated at the 4-leaf stage. Plants treated at the 8-leaf stage and harvested at all growth stages except 2 WAFB showed a higher concentration of ^{14}C-glyphosate in squares than in other plant tissue. Accumulation of ^{14}C-glyphosate in squares of plants treated at the 8-leaf stage reached a maximum of 153.6 kBq g^{-1} dry weight at the 12-leaf stage harvest. This concentration corresponds to 5.7 times greater accumulation of ^{14}C-glyphosate in squares, than in roots which may also be metabolic sinks. Squares from plants treated at the 8-leaf stage accumulated significantly more glyphosate than those treated at the 4-leaf stage at all harvest timings except cutout. These data suggest that reproductive tissues such as bolls and squares can accumulate ^{14}C-glyphosate at higher concentrations than other tissues, especially when the herbicide treatment is applied either POST or PDS during the reproductive phase.

1. Pline, W.A., K.L. Edmisten, J.W. Wilcut, and R. Wells. 2000. Roundup (Glyphosate) Behavior in Roundup-Ready (Glyphosate-tolerant) Cotton. Proc. Beltwide Cotton Conf. pg. 1479.

EFFECT OF TEMPERATURE AND RELATIVE HUMIDITY ON ^{14}C-DISTRIBUTION AND EFFICACY OF GLYPHOSATE. S.D. Sharma and M. Singh. University of Florida-IFAS, Citrus Research and Education Center, Lake Alfred, Florida.

ABSTRACT

The present study was conducted to examine the effect of temperature or relative humidity on the absorption, translocation, and bio-efficacy of glyphosate applied to Florida beggarweed (*Desmodium tortuosum* L.). There were two studies, one with a range of temperature [16/11, 22/17, and 35/30EC (± 0.5EC)] and the second with a range of relative humidity [45, 70, and 95% (± 5%)]. When air temperature effects were assessed, a constant RH of 70% (± 5%) was used, and while RH effects were being determined, an air temperature regime of 22/17EC (± 0.5EC), was maintained. Average photosynthetic photon flux density (PPFD) of 225 :$Em^{-2}s^{-1}$ at the plant level was measured by LI-700 Quantum Photometer. The plants were acclimatized for 72 h prior to the herbicide application in growth chambers under specific temperature or RH. Seedlings of beggarweed at the 3rd fully expanded leaf of the 4-leaf stage were used for ^{14}C-glyphosate treatments and bioefficacy study.

Uptake and translocation of ^{14}C-glyphosate were significantly higher at 22EC or 95% RH than 16 and 35EC or 45 and 70% RH at all harvest times. These values were also significantly higher when influence of temperature or RH recorded when the effects across harvest times (6, 24, 48, 72 h) were averaged. Further, uptake and translocation were significantly higher at 48 h than the other harvest time when the effects across temperatures (16, 22, 35EC) were averaged. Maximum translocation was obtained at 72 h harvesting time when the effects of RH (45, 70, 95%) were averaged. When glyphosate was sprayed to beggarweed, the maximum foliar damage was observed 19% at 22 or 35EC and 23% at 95% RH. Bioefficacy results were similar to ^{14}C-glyphosate translocation at 22EC and 95% RH. The results indicated that temperature or RH influenced the absorption process of glyphosate and the optimum temperature and relative humidity for Desmodium control were 22EC and 95% RH.

TECHNIQUES FOR QUANTIFYING GLYPHOSATE CONCENTRATIONS IN NON-TRANSGENIC CROPS. J.H. Massey, M. Boyette, K.M. Bloodworth and D.B. Reynolds, Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Research measuring yield reductions in corn (Zea *mays* L) exposed to sub-lethal doses of glyphosate, such as would occur in spray drift events, has found that yield reductions often weakly correlate to plant height and visual injury measurements. Knowledge of glyphosate concentrations present in corn tissue at the onset of visual injury might improve potential yield reduction estimates. Published methodologies for the quantification of glyphosate residues in plant tissue, however, are quite involved and require instrumentation not common to many residue laboratories. The accumulation of shikimate, an intermediate in the shikimate pathway, in plant tissue may serve as an indirect measure of glyphosate exposure in non-Roundup Ready crops. The objectives of our research were (1) to determine if shikimate concentrations in field-grown corn tissue exposed to sub-lethal doses of glyphosate could serve as an analytical surrogate for glyphosate, and (2) to determine if shikimate concentrations present at the onset of visual injury could improve yield reduction estimates in corn injured by spray drift.

Based on preliminary work comparing shikimate recovery using several reported extraction methods, corn leaf tissue was finely chopped and extracted with 1 N HCl for 72 h at a ratio of 1:5 tissue:extractant (w/v). The pH of the extracts was adjusted to pH 3 and filtered prior to HPLC analysis using a Phenomenex Lichrosorb 5 NH_2 column, isocratic mobile phase of 95:4:1 ACN:H_2O:H_3PO_4, and UV detection at 210 nm. Using this method, shikimate recoveries from fortified corn tissue averaged 106.8 ± 11.1%. The limit of detection for shikimate using this method was approximately 5 mg/L.

Field-grown corn at the three growth stages (2-3 leaf, 6-8 leaf, 12-15 leaf) was treated with 0, 0.023, 0.046, 0.093, 0.187 and 0.38 lbs ai/A glyphosate. These application rates were intended to simulate levels of glyphosate occurring during spray drift events. The experimental design for the field treatments was a randomized complete block design using a factorial arrangement of treatments with four replications per treatment. Tissue samples were collected and visual injury and plant height measurements were made at approximately 7 d intervals.

Preliminary results from the extraction and analysis of corn exposed to glyphosate at the 2-3 leaf stage and collected nine days after treatment (DAT) indicate that leaf tissue concentrations of shikimate were not significantly different from background levels of shikimate for all but the highest application rate of 0.38 lb/A; fresh-weight shikimate concentrations for this treatment averaged 411 ± 38 ppmw. In comparison, significant visual injury was detected at 0.38 and 0.187 lb/A but not the lower application rates. Coupled with reports from the literature, these findings suggest that accumulated shikimate concentrations may begin to decline prior to the onset of visual injury in field grown corn. Additional research continues to determine the utility of shikimate accumulation as a correlation factor in the estimation of yield reductions due to sub-lethal glyphosate spray drift onto non-transgenic crops.

USE OF ALLELOPATHIC RICE WITH REDUCED HERBICIDE RATES FOR CONTROL OF BARNYARDGRASS (*ECHINOCHLOA CRUS-GALLI).* M.L. Lovelace, R.E. Talbert, R. Dilday, E.F. Scherder, and N.W. Buehring. University of Arkansas, Fayetteville, Arkansas.

ABSTRACT

Previous research has indicated that some rice varieties may be allelopathic to certain rice weeds. A study was conducted in 2000 at the Rice Research and Extension Center, Stuttgart AR, to evaluate potential allelopathic rice varieties in combination with reduced herbicide rates for control of barnyardgrass (*Echinochloa crus-galli*). The treatments were arranged in a factorial design and each treatment was replicated four times. The main factors of the experiment were rice cultivar and herbicide. The rice cultivars consisted of Drew, Lemont, Rexmont, PI 312777, and Tequing. The herbicides were thiobencarb (Bolero 8EC) at 1 lb ai/A applied delayed preemergence (DPRE), thiobencarb at 2 lb ai/A applied DPRE, propanil (Stam 4E) at 2 lb ai/A applied at the 2 to 3 leaf stage of rice, or no herbicide. Treatments were applied with a CO_2 backpack sprayer at 10 gal/A. Plots were rated for visual control and injury at 4, 8, and 12 weeks after rice emergence (WAE) and yield data was obtained at rice maturity. Data were subjected to analysis of variance, and means were separated with the Least Significant Difference Test (LSD) at the 0.05 confidence level.

PI 312777 and Tequing displayed the greatest allelopahtic potential, controlling barnyardgrass 80 and 95%, respectively at 4 WAE in the absence of herbicides. By 12 WAE, both cultivars controlled barnyardgrass greater than 97% in the absence of herbicides. Application of herbicides did not improve the control of barnyardgrass due to the excellent control achieved from allelopathy and competition.

Drew and Lemont provided 60 and 50% suppression of the barnyardgrass growth in the absence of herbicides at 4 WAE. By 12 WAE, Drew still provided 70% suppression of barnyardgrass, while Lemont had much less suppression of barnyardgrass, 35%. The reduced rate of propanil did not effectively increase control in combination with these rice cultivars because of the natural infestation of propanil-resistant barnyardgrass in the test site.

Thiobencarb at 1 and 2 lb/A applied to Drew provided greater than 90% control at 4 WAE and greater than 97% control by 12 WAE. Thiobencarb at 2 lb/A applied to Lemont was the only herbicide that provided acceptable control of barnyardgrass in Lemont (70 and 90% control at 4 and 12 WAE, respectively).

Rexmont did not effectively suppress barnyardgrass, providing less than 30% control of barnyardgrass in the absence of herbicides. By 12 WAE, thiobencarb applied to Rexmont only provided 50% control of barnyardgrass, while propanil did not improve control compared to Rexmont with no herbicide.

Although PI 312777 and Tequing provided the greatest control of barnyardgrass, Tequing yield was greater than that of PI 312777. This may have been attributed to shattering of rice from the panicles on PI 312777. Tequing rice yield ranged from 155 to 180 bu/A, while PI 312777 only yielded from 125 to 145 bu/A. Drew and Lemont yield reflected barnyardgrass control in that Drew yield was 110 bu/A with no herbicide and or treated propanil, and increased to 150 bu/A when treated with thiobencarb at 2 lb/A. Lemont yield was 75 bu/A without herbicide or when treated with propanil, but increased to 125 bu/A when treated with thiobencarb at 2 lb/A. Regardless of treatment, Rexmont yield was not greater than 80 bu/A due to lack of barnyardgrass control.

Data indicate that there is potential for use of allelopathy in rice for weed control. In order to maximize this potential, there is a need for development of rice cultivars from lines such as PI 312777 and Tequing with acceptable agronomic and grain qualities.

DIFFERENTIAL RESPONSE OF RICE AND RED RICE (*ORYZA SATIVA* L.) TO SHADE AND NITROGEN. E.N. Cable, N.R. Burgos, P.A. Counce, and D.R. Gealy. University of Arkansas, Fayetteville, AR; Rice Research and Extension Center, Stuttgart, AR; Dale Bumpers National Rice Research Center, USDA-ARS, Stuttgart, AR.

ABSTRACT

Red rice (*Oryza sativa* L.) and rice are categorized under the same genus and species. They are similar in their molecular and morphological structures, yet red rice is more competitive than cultivated rice. A field study was conducted at the Rice Research and Extension Center in Stuttgart, AR to compare the response of rice and red rice to different shading and nitrogen levels. The study utilized a split-split plot design with the main plots being variety, the subplots being shading level, and the sub-subplots being nitrogen level. Two rice cultivars ('Bengal' and 'Wells') and two red rice ecotypes (Katy red rice and Stuttgart strawhull) were transplanted into the field June 15, 2000. Nitrogen at three rates (0, 100, 200 kg ha-1) was applied preflood one week later. Each variety was subjected to one week of 50% shade 10 days after anthesis with a photosynthesis reading being taken at two days after shade application. At the end of the season, plants were harvested and the numbers of tillers, number of panicles, and above ground biomass were recorded.

In this study it was found that Stuttgart strawhull adapted better to shade and to nitrogen fertilization than 'Bengal' by producing more tillers, panicles and biomass. While not as competitive as Stuttgart strawhull, Katy red rice showed higher panicle numbers than 'Bengal' under shade and high nitrogen. And regardless of shade or nitrogen levels, Katy red rice had more biomass than 'Bengal.' Regarding photosynthesis, while the rice cultivars and Katy red rice photosynthesized at the same rate under full sunlight, Katy red rice photosynthesized at a higher rate under 50% shade and its rate was cut only by 18% while 'Bengal' and 'Wells' were cut by 33% and 50% respectively.

EFFECT OF TILLAGE AND HERBICIDE TREATMENTS ON REDVINE (*BRUNNICHIA OVATA)* SUBTERRANEAN MORPHOLOGY. E.C. Gordon, T.C. Keisling, L.R. Oliver, and T.A. Castillo. Northeast Research and Extension Center, Keiser, AR, University of Arkansas, Fayetteville, AR, and RiceTec, Jonesboro, AR.

ABSTRACT

Redvine (*Brunnichia ovata (*Walt.) Shinners*)* is a perennial weed that reproduces from seed, rootstock and rhizomes. Redvine infested areas that were exposed to different tillage practices, slicing techniques, and herbicide treatments were selected to excavate and observe the root and rhizome morphology. When comparing tillage systems, deep tillage appeared to delay rhizome development for a period of time following cultivation, but a characteristic branching occurred over time. Shallow cultivation (2.5 to 7.5 cm) concentrated rhizomes immediately below the depth of plowing; whereas, no-till areas had a concentration very near the soil surface. Slicing the underground parts of redvine will not kill rhizomes if they are still attached to a live portion of the taproot. The herbicides dicamba and glyphosate reduced the density of redvine rhizomes, but they did not provide control of the entire underground plant structure.

COMPARISON OF GLYPHOSATE APPLIED WITH STANDARD AND LIGHT-ACTIVATED HOODED SPRAYERS. D.A. Peters, P.A. Dotray, J.W. Keeling, and J.A. Bond. Texas Tech University, Texas Agricultural Experiment Station, and Texas Agricultural Extension Service, Lubbock, TX 79403.

ABSTRACT

A field experiment was conducted in 2000 at the Texas Tech Research Farm near New Deal, TX to compare weed control using mechanical cultivation, a conventional postemergence-directed hooded sprayer, and a light-activated hooded sprayer in a glyphosate-tolerant cotton production system. Treatments included trifluralin at 0.75 lb ai/A applied preplant incorporated (PPI) followed by prometryn at 1.2 lb ai/A applied preemergence followed by mechanical cultivation as needed; trifluralin PPI followed by a postemergence-topical (PT) broadcast application of glyphosate at 0.75 lb ae/A at the four leaf growth stage, and glyphosate applied at 0.75 lb ae/A with a conventional hooded sprayer (HS) as needed; trifluralin PPI followed by glyphosate PT broadcast and glyphosate applied at 0.75 lb ae/A with a light-activated hooded sprayer (LAS) as needed; and trifluralin PPI followed by a PT application of glyphosate at 0.75 lb ae/A on a fourteen inch band over the row at the four leaf stage and glyphosate applied at 0.75 lb ae/A with the LAS as needed. Total as needed applications were as follows: cultivation, 3X; HS, 2X; LAS, 2X; and band + LAS, 2X. 'Paymaster 2326 RR' cotton was planted at a seeding rate of 15 lb/A on 40 inch rows on May 9, 2000 and mechanically harvested on November 20, 2000. Experimental design was a randomized complete block with four replications. Plots were 8 rows by 600 feet. Preplant incorporated treatments were applied on February 29 and incorporated with a springtooth harrow prior to bedding, and preemergence applications were made on May 10. Postemergence treatments were applied on June 9, July 3, and July 18, when weeds were 1 to 6 inches tall. Control of Palmer amaranth (*Amaranthus palmeri* S. Wats), common cocklebur (*Xanthium strumarium* L.), and silverleaf nightshade (*Solanum elaeagnifolium* Cav.) was rated visually on June 23 (early season), July 28 (mid season), and August 14 (late season). The amount of spray solution used by the LAS was determined by subtracting the tank volume remaining after spraying a single plot from the initial tank volume. Percent herbicide savings was calculated based on the amount of solution required to apply a broadcast treatment.

Control of Palmer amaranth was similar for all treatments and ranged from 83-88% at the early rating. At the mid and late season ratings, the LAS treatments provided at least 88% Palmer amaranth control and were similar to HS and greater than cultivation. Common cocklebur control with 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 rating. At the mid and late season rating, LAS provided control similar to HS and greater than cultivation. At the June glyphosate application, a savings of 85% was observed with LAS. Glyphosate savings of 63 and 67% were observed with the July 3 application, and savings of 56 and 71% were observed on July 18. Lint yields ranged from 379-433 lb/A and no differences were observed among treatments.

Additional studies were conducted near Ropesville, TX on a producer's farm. LAS was used to control Palmer amaranth and devil's-claw [*Proboscidea louisianica* (Mill.) Thellung] in glyphosate-tolerant cotton in a minimum tillage field following a PT application of glyphosate. Plot size was 15 acres. Control of Palmer amaranth and devil's-claw was 95 and 80%, respectively, and herbicide savings ranged from 70-78%.

These data indicate that weed control programs utilizing LAS provided weed control similar to that obtained with a conventional sprayer and significant herbicide savings were observed. Because of the high cost of this equipment, the economic feasibility of using LAS will continue to be evaluated in 2001.

SECTION IX: DEVELOPMENTS FROM INDUSTRY

OVERVIEW: SUCCESS OF CLEARFIELD CORN AND LIGHTNING HERBICIDE PRODUCTION SYSTEM IN KENTUCKY. G.S. Stapleton. BASF Corporation, Dyersburg, TN 38024.

ABSTRACT

Two imidazolinone resistant corn cell lines were identified in the mid-1980's. The first was used to develop commercial imidazolinone-resistant (IR) hybrids that have a homozygous recessive gene expression and confer cross-resistance to all AHAS/ALS inhibiting mode of action chemistries. The other cell line is heterzygous and is known as imidazolinone-tolerant (IT). Although IT hybrids do not confer cross-tolerance, they can be developed more rapidly and make up more than 95 percent of the more than 300 available hybrids on the market. All IT and IR hybrids are now recognized under the Clearfield production system. Clearfield corn is developed through natural selection of resistant cells in tissue culture. Conventional backcrossing is then used to incorporate the trait into high yielding hybrids. Clearfield hybrids are therefore, not transgenically modified.

Lightning herbicide was introduced in 1997 for use in Clearfield corn. It offers broad-spectrum weed control with contact and residual activity. Lightning is composed of imazethapyr and imazapyr active ingredients and when coupled with Clearfield corn provides alternative weed control options under all tillage systems and soil types. Lightning can be applied from spike to 20 in tall corn and has excellent tank-mix flexibility.

Unique to the Clearfield corn and Lightning production system is the rapid adoption in the state of Kentucky (KY). In 2000 seven percent of the U.S. corn market was planted to Clearfield corn, whereas in Kentucky almost 20 percent was planted. However, only 47 percent and almost 90 percent of the Clearfield corn in the U.S. and KY, respectively, received an application of Lightning. Since 1998 Lightning use has virtually doubled each year in KY with approximately 200,000 acres treated in the year 2000. Consistency of performance may be a contributing factor to the relative adoption of Lightning use in KY. While 68 (U.S.) to 78 (KY) percent of the total corn acres still receive a soil applied herbicide application, nationwide only 25 percent of the Lightning treated acres got a preemergence or preplant incorporated application and 33 percent had just Lightning postemergence alone. In KY 95 percent of the Lightning acres received some type of soil treatment. A tank-mix partner was also used 95 percent of the time in KY with an oil-based adjuvant and a nitrogen fertilizer source added 90 percent and 95 percent, respectively, to the postemergence treatment. In the U.S. 88 percent of the Lightning had a nonionic surfactant with just 65 percent with a nitrogen source. The primary program in KY has consisted of Atrazine preemergence followed by Lightning plus Atrazine early postemergence. However, mixtures of Lightning plus Distinct have looked promising.

Clearfield hybrid performance and development, and weed spectrum have obviously also contributed to the success of Lightning in KY. Clearfield hybrids are outperforming many standard hybrids and are providing better yields compared to their base genetic parents in many instances. However, understanding a system approach to obtaining consistently excellent weed control along with maximizing hybrid yield potential is ultimately the key to success with any crop production program.

REDEEM R&P HERBICIDE[****]: A NEW PRODUCT FOR PASTURE WEED CONTROL. W.N. Kline, P.L. Burch, V.F. Carrithers, T.C. Geselius, M.B. Halstvedt and J.A. Nelson. Dow AgroSciences LLC, Indianapolis, IN 46268.

ABSTRACT

Redeem R&P is a new non-restricted use broadleaf weed management herbicide introduced by Dow AgroSciences in 2000 for use in range & pasture. Uses include control of annual and perennial broadleaf weeds in rangeland, permanent grass pastures, non-crop areas such as fencerows, around farm buildings, and CRP acres. Some of the benefits of this new product for range & pastures are: There are no grazing restrictions except for lactating dairy animals, it does not contain 2,4-D (important in sensitive crop areas such as cotton), it is a low odor formulation, the formulation is a practically non-volatile amine, and it provides superior and consistent control of many tough broadleaf weeds

Redeem R&P is a 3.0 lb ae/gallon formulation containing 0.75 lb ae of clopyralid amine and 2.25 lb ae of triclopyr amine in each gallon. The general label rate range is from 1.5 to 4 pts/acre. In 2000 broadcast foliar trials were established with Redeem R&P to observe efficacy on key weed species in range & pasture. Target weeds included: Bitter Sneezeweed, Horsenettle, Cocklebur, Camphorweed, Goldenrod, Curly Dock, Wooly Croton, Ironweed, Marshelder, Buttercup, Canada thistle, musk thistle, bull thistle, tropical soda apple, wax myrtle, blackberry and multiflora rose. Field trials initiated during the 2000 growing season are showing good activity on most of these key weeds. Rates for efficacy range from 1.5 to 2 pints for early season treatments and up to 2.5 to 3 pints for later

[*] Trademark of Dow AgroSciences, LLC

season and at flowering stage. Additional trials will be established in 2001 to expand weed control data and to establish long term control of perennial species such as blackberry & multiflora rose.

POST-DIRECTED AND HOODED SPRAYER WEED EFFICACY RESULTS WITH AIM™ AND AIM™ MIXTURES IN COTTON. T.W. Mize, FMC Corporation, Agricultural Products Group, 7502 Dreyfuss, Amarillo, TX, 79121, H.R. Mitchell, FMC Corporation, APG, Lewisville, MS, H.G. Hancock, FMC Corporation, APG, Hamilton, GA, J.J. Knabke, FMC Corporation, APG, Clovis, CA, and L.D. Hatfield, FMC Corporation, APG, Philadelphia, PA.

ABSTRACT

Carfentrazone-ethyl (F8426) is a new chemistry discovered by FMC Corporation that is registered for use in corn (field & sweet), grain sorghum, soybeans, rice, small grains, and burndown as Aim™ 40DF. The product is characterized by rapid weed control activity that offers other advantages such as a novel mode of action, no soil residual or carryover, activity on Roundup Ready® volunteer cotton, and no systemic off-target potential. Aim™ is non-selective on cotton, and research trials have shown significant activity in a post-directed or shielded spray use pattern for the control of key weeds with the product used alone or in an additive combination with other cotton postemergence herbicides. Development will continue to determine the optimum fit of Aim™ in cotton postemergence weed control programs as well as in other cotton use patterns such as preplant burndown and defoliation.

Introduction

Carfentrazone-ethyl has shown excellent potential as a new weed control tool in cotton in initial studies as a directed spray in cotton. Research trials from across the Cotton Belt have indicated control or enhancement of control on many troublesome weed species with carfentrazone-ethyl used alone or in combination with standard cotton postemergence herbicides. Several trials were conducted from 1998 through 2000 and results will be given on the summary data from all trials on selected key weeds in cotton.

Materials and Methods

Several post-directed replicated research trials were initiated in 1998, which focused on the efficacy of Aim™ on key cotton weeds at locations across the U.S. Trials were evaluated at 3, 7, and 15 DAT. Research in 1998 was concentrated on rate range determination and adjuvant selection for optimization of weed control parameters with the product alone. In 1999 and 2000, evaluation timings were expanded to 3, 7, 15, and 30 DAT to determine both the initial burndown and ultimate control capabilities of the individual herbicides and their mixtures. Targeted optimum Aim™ rates were directed at key weeds in cotton in combination with Roundup Ultra®, Buctril®, and Staple® to determine additive versus standalone attributes of Aim™ on each species.

Results and Discussion

Summarized weed control data from 1998 and 1999 demonstrated that Aim™ was highly effective on species that represent major problem pests in cotton production. Aim™ alone gave excellent control of *Ipomea spp*. and Lanceleaf sage (*Salvia reflexa)*.

As an additive to standard rates of Roundup Ultra®, Buctril®, and Staple®, carfentrazone-ethyl was shown to provide excellent augmentative benefits for efficacy on several weeds. In some cases, the standard herbicides only gave partial control or suppression that was greatly improved with the addition of Aim™.

Roundup Ultra® efficacy data showed enhancement of control with Aim™ on Spurred Anoda (*Anoda cristata)*, *Ipomea spp*., Hemp Sesbania (*Sesbania exaltata)*, and Sicklepod (*Cassia obtusifolia)*, when carfentrazone-ethyl was added at Aim™ rates as low as 0.008 lb ai/A. Of particular significance is the speed of control value that Aim™ addition brings to Roundup Ultra®. Carfentrazone-ethyl provided quick burndown efficacy superior to Roundup Ultra® in all cases to more quickly accomplish the removal of weed competition for nutrient and moisture conservation and enhanced yield potential.

The addition of Buctril® to carfentrazone-ethyl in a weed control system was examined on *Ipomea spp*. and on Spurred Anoda (*Anoda cristata)*. Initial burndown activity was somewhat enhanced with Aim™ added, and the overall control by 15 DAT showed a significant efficacy increase over Buctril® alone on these weeds.

Staple® efficacy data demonstrates that Aim™ was capable of enhancing burndown and ultimate overall control with Staple® on *Ipomea spp*., especially when tested under hot and dry conditions not conducive to optimum Staple® activity. Interesting additive activity was also seen on Yellow Nutsedge (*Cyperus esculentus)*.

Overall conditions in the Southeast and Mid South areas of the U.S. were in general hot and dry in 1999 and 2000 throughout the normal period at which postemergence weed control applications are made. Thus, many of the trials were challenged by these conditions and efficacy of both the standards and Aim™ were significantly influenced by the environment.

Summary

Carfentrazone-ethyl is well into development as a new post-directed weed control tool in cotton that offers to provide growers enhanced efficacy on key pests alone or as an additive product to postemergence standards. Aim™ has shown efficacy in cotton and in other crops on a wide spectrum of weeds, especially when mixed with other herbicides for additive activity. Key weeds in other crops that Aim™ will control alone include Velvetleaf (*Abutilon theophrasti* Medik), Annual *Solanum* spp., *Amaranthus spp*. (including Waterhemp), and Lambsquarters (*Chenopodium album*).

In cotton, carfentrazone-ethyl test results indicated clearly that the product would fit as both a standalone and mixture product in post-directed weed control systems, providing quicker burndown and enhanced efficacy for some of the cotton herbicides on the markets.

Carfentrazone-ethyl development in cotton will continue in 2001 to further determine optimum use parameters and advantages in cotton weed control systems, as well as potential for other use patterns such as preplant burndown and cotton harvest aid application. Aim™ registration has been submitted for weed control and harvest aid uses in cotton, with an expected review in 2001.

CGA 362622 USE IN COTTON AND SUGARCANE. J.W. Wells, J.C. Holloway, Jr., E.K. Rawls, P. Forster, C. Dunne, D. Porterfield, and J. Allard, Syngenta Crop Protection, Inc., Greensboro, NC 27419.

ABSTRACT

CGA 362622 is a new postemergence herbicide being developed for use in cotton, sugarcane, citrus, almond and turf by Syngenta Crop Protection, Inc. U.S. registration for use in these crops is expected in 2003. It is in the sulfonylurea chemical family and has been assigned the proposed common name trifloxysulfuron sodium. The commercial formulation is expected to be a 75WG.

CGA 362622 will be used postemergence in cotton. Applications should include 0.25% non-ionic surfactant. It can be applied over the top of and post-directed on larger cotton up to layby. The use rates are extremely low, even for a sulfonylurea herbicide. A rate of 5.3 g ai/ha (0.1 ounce of 75WG formulated product) applied over the top of cotton provides excellent activity on several difficult to control weeds, including sicklepod (*Senna obtusifolia*). Post-directed application rates range from 7.9 to 13.3 g ai/ha. Weeds controlled include sicklepod, coffee senna (*Senna occidentalis*), cocklebur (*Xanthium strumarium*), pitted morningglory (*Ipomoea lacunosa*), ivyleaf morningglory (*Ipomoea hederacea*), redroot pigweed (*Amaranthus retroflexus*), and hemp sesbania (*Sesbania exaltata*). CGA 362622 also shows good activity on purple nutsedge (*Cyperus rotundus*), yellow nutsedge (*Cyperus esculentus*), and johnsongrass (*Sorghum halepense*).

CGA 362622 can be applied at up to 15.9 g ai/ha post over-the-top of sugarcane and can be applied at up to 31.8 g ai/ha post-directed in sugarcane up to layby. Applications should be made with 0.25% non-ionic surfactant. Weeds controlled in field trials include purple nutsedge, yellow nutsedge, flatsedge (*Cyperus odoratus*), redroot pigweed, spiny pigweed (*Amaranthus spinosa*), cocklebur, and sicklepod. CGA 362622 also shows good activity on Broadleaf panicum (*Panicum adspersum*), itchgrass (*Rottboellia cochinchinensis*), johnsongrass, guineagrass (*Panicum maximum*), and horse purselane (*Trianthema portulacastrum*).

EVALUATION OF WEED CONTROL SYSTEMS USING ROUNDUP ULTRA® EXCLUSIVELY AND ROUNDUP ULTRA IN COMBINATION WITH RESIDUAL HERBICIDES IN ROUNDUP READY™ COTTON. R.F. Montgomery and L.R. Hawf. Monsanto Co. Union City, TN and Sasser, GA.

ABSTRACT

A field experiment was conducted at 11 locations in 8 states by academic cooperators, private consultants and Monsanto researchers during the 2000 growing season to assess crop safety, weed control and residual activity of herbicides used in combination with Roundup on Roundup Ready Cotton. Species rated for control at one or more of the locations included sicklepod (*Cassia obtusifolia*), tall morningglory (*Ipomea purpurea*), carpetweed (*Mollugo verticillata*), tropic croton (*Croton glandulosus*), common cocklebur (*Xanthium strumarium*), small flower morningglory (*Jacquemontia tamnifolia*), ivy leaf morningglory (*Ipomoea hederacae*), pitted morningglory (*Ipomoea lacunosa*), palmer amaranth (*Amaranthus palmeri*), barnyardgrass (*Echinochloa crus-galli*), prickly sida (*Sida spinosa*), velvetleaf (*Abutilon threophrasti*), and broadleaf signalgrass (*Bracharia platyphylla*). Some studies were rated for overall grass and/or broadleaf weed control rather than individual species. All control ratings at each location were averaged to create a variable (ALLWEED) representing overall season long weed control. Early weed control ratings were averaged across location to create a variable (EARLY) representing weed control 21 days after

the first post-directed (PD) treatment was applied. Late weed control ratings were averaged across location to create a variable (LATE) representing weed control at harvest. Treatments included Roundup applied postemergence (POST) at the 4 leaf cotton growth stage followed by (fb) Roundup PD at lay-by in combination with one of the following herbicides: Direx, Caparol, Cotoran, Prowl, Dual II Magnum, Lasso, Goal, Aim, or Firstrate. Other treatments included Roundup plus Dual II Magnum overtop fb Roundup plus Caparol, Roundup plus Staple fb Roundup, Roundup plus Staple fb Roundup plus Staple and Roundup fb MON78095 PD at lay-by. These treatments were compared to systems using Roundup POST at the 4 leaf cotton growth stage fb PD at Roundup at layby, Roundup POST at the 2 and 4 leaf cotton growth stage fb Roundup PD at lay-by, and Roundup POST at the 4-leaf cotton growth stage fb Roundup PD early fb Roundup PD at lay-by. Data were pooled across locations. Single degree of freedom contrast were used to determine differences among treatment least square means (LSMEAN).

The best treatments (p>0.05) produced ratings for ALLWEED ranging from 89.5 to 92 % were: Roundup POST at the 2 and 4-leaf cotton growth stage fb Roundup PD at lay-by, Roundup POST fb Roundup plus Firstrate PD at lay-by, Roundup POST fb Roundup early PD fb Roundup PD at lay-by, Roundup plus Dual II Magnum POST fb Roundup plus Caparol PD at lay-by, Roundup POST fb Roundup plus Caparol PD at lay-by, Roundup POST plus Staple fb Roundup PD at lay-by, Roundup plus Lasso POST fb Roundup plus Lasso PD at lay-by, Roundup POST fb Roundup plus Lasso PD at lay-by, Roundup POST plus Staple fb Roundup plus Staple PD at lay-by, Roundup POST fb Roundup plus Aim PD at lay-by, Roundup POST fb Roundup plus Caporal PD at lay-by, Roundup POST fb Roundup plus Cotoran PD at lay-by and Roundup POST fb Roundup plus Prowl PD at lay-by.

EARLY ratings were not different for any of the treatments (p>0.61) in this study. EARLY treatment LSMEAN ranged from 84 - 90% control. Weed control differences among treatments were more apparent (P>0.01) at the final rating. The highest LATE rating was produced by the same group of treatments that produced the highest level of ALLWEED control with exception of Roundup plus Lasso POST fb Roundup plus Lasso PD at lay-by and Roundup POST fb Aim PD at lay-by. These treatments using Roundup in combination with Lasso and Aim also showed the highest level of cotton injury of all the treatments in the study. Crop injury and the lack rapid canopy development may have effected LATE ratings for these treatments. LATE ratings were more consistent with ALLWEED ratings than EARLY ratings.

The most injurious treatment group (p>0.05) were those utilizing Roundup in combination with Lasso, Aim, Staple, Direx, Goal, Prowl and Caporal. The LSMEAN for this treatment group ranged from 1.5 to 3.2%. While overall treatment LSMEAN are relative low across all locations, this group of treatments had location crop injury LSMEAN ratings ranging from 6.75 to 12.50%. The Roundup Ready weed control system offers producers a great deal of flexibility as suggested by high levels of weed control with a number of treatments in this study. These studies from across the cotton belt suggest that systems using Roundup as the primary or the only herbicide for weed control continue to offer producers simple, safe and effective weed control.

FIELD PERFORMANCE EVALUATIONS OF SPIKE DF: A NEW TEBUTHIURON FORMULATION FROM Dow AgroSciences. P.L. Burch, W.N. Kline and V.F. Carrithers; Dow AgroSciences, LLC, Indianapolis, Indiana 46268.

ABSTRACT

Spike* herbicides, containing the active ingredient tebuthiuron, are widely used throughout the world. Spike 80W provides excellent efficacy on key weeds in total vegetation control markets, however the wettable powder formulation (Spike 80W) has poor handling, mixing and settling characteristics. Dow AgroSciences has developed a dry flowable formulation to improve handling, mixing & settling characteristics compared to the wettable powder. Field trials were needed to confirm comparative weed control efficacy between Spike DF formulation and Spike 80W. The following questions were addressed in the trials. (1) Is the efficacy of SPIKE DF equivalent to or better than SPIKE 80W? (2) How do handling, mixing and over-night settling characteristics of SPIKE DF compare to SPIKE 80W?

Trials were established in three locations, Virginia, Georgia and Washington. Treatments were applied using CO_2 powered backpack sprayers. There were four replications per site with heavy weed pressure. Visual assessment of percent control by species was taken at 4 and 8 weeks after treatment. Data were analyzed using ANOVA.

Control of target weeds indicates that Spike 80DF herbicide was equivalent to or slightly better than Spike 80W herbicide when compared on grass weed species. Combinations of 2 lbs Spike 80DF plus 4 oz Oust per acre or 2 lbs Spike 80DF plus 8lbs diuron per acre was slightly better than Spike 80W combinations with Oust or diuron. Based upon these trials, Spike 80DF formulation can be considered to have equal to or greater efficacy when compared to the Spike 80W formulation. Contract researchers and DAS Field Scientists evaluated handling, mixing, and over-night settling characteristics of Spike 80DF and found this formulation far superior to Spike 80W.

* Trademark of Dow AgroSciences, LLC

DCPA FOR RESIDUAL WEED CONTROL IN VEGETABLE CROPS. P.D. Vaculin, D. Wang, C. Duerksen, and S. Parker. AMVAC Chemical Company, Newport Beach, CA. (131).

ABSTRACT

DCPA, trade name DACTHAL®, was discovered by Diamond Alkali company in the mid 1950's and was first patented as an herbicide in 1958. It has been labeled for herbicidal use on turf and on a variety of crops, including many specialty food crops since the early to late 1960's in the United States. DACTHAL is labeled for preemergence control of over 40 grass and broadleaf weeds. Its excellent crop safety and effective weed control have made it a very widely used herbicide in many vegetable crops including onions and cole crops.

Supplies of DACTHAL have become quite low since production was discontinued in 1997 by ISK Biosciences. Amvac Chemical Corporation, a Los Angeles, California based company, whose corporate strategy is to acquire mature product lines from large multinational companies, saw an opportunity to add a valuable herbicide to their growing portfolio of specialty products.

Amvac announced the purchase of the global DACTHAL herbicide business on May 15, 2000. Amvac secured a new source for the active ingredient. The United States EPA requires that the chemical profile of the new source be reviewed and approved. The required data has been provided to EPA and approval is expected by spring, 2001.

The DACTHAL label has been transferred from ISK Biosciences to Amvac. The new Amvac label for DACTHAL is available and there are no changes, with the exception that the Turf and Ornamental section has been incorporated into the main product label. Once the EPA approves the new source of active ingredient, DACTHAL will be available for use as Amvac labeled product. The purchase of DACTHAL by Amvac will keep another valuable product available for growers of many high value specialty crops.

SUPPORRT HERBICIDE: A NEW 2,4-DB FORMULATION FOR SOYBEAN WEED CONTROL. S.N. Bartee and M.S. Bernard, Bartee Agrichemical Consultants, Inc., Olathe, KS 66061; Cedar Chemical Corporation, Memphis, TN 38137.

ABSTRACT

For many years, 2,4-DB, [4-(2,4-dichlorophenoxy)butanoic acid], formulated as the dimethylamine salt (liquid) has been tank mixed with other soybean postemergence (POST) herbicides to aid in control of broadleaf weeds. One major limitation of applying liquid 2,4-DB to soybean varieties has been possible plant injury and subsequent yield reductions. Generally topical applications of liquid 2,4-DB rates have been limited to < 0.5 oz ai./A (2 oz/A of liquid formulated product) to minimize potential soybean injury in Midwest indeterminate cultivators; and < 7.0 oz ai/A (14 oz/A of liquid formulated product) in determinate soybean varieties in the South .

Field trials were conducted during a two-year period (1998-99) comparing two 2,4-DB formulations to determine different responses of indeterminate and determinate soybeans, visual broadleaf weed control, and impact on soybean yield. The dimethylamine salt (Butoxone 200) was compared to the 2,4-DB acid formulation (SuppoRRt). Several studies included 2,4-DB formulations tank mixed with Roundup Ultra.

During all field trials, SuppoRRt applied at 0.5 oz ai./A did not produce any visible soybean injury in indeterminate varieties. In addition, SuppoRRt applied up to 1.0 oz ai/A did not reduce any yields in determinate varieties. Butoxone 200 at >4.0 oz ai./A did produce some minor soybean stem epinasty, occasional shortening of main stem internodes or slight reduction in blooms in determinate soybeans. At equivalent rates, SuppoRRt provided improved broadleaf weed control compared to Butoxone 200.

The addition of dry 2,4-DB at 0.5 oz ai./A to Roundup Ultra at 1 lb ai./A improved control of common ragweed, velvetleaf, tall waterhemp, spotted spurge, sicklepod, and morningglory species compared to Roundup Ultra applied alone.

In southern determinate soybeans, yields were not reduced in any field trial where SuppoRRt was applied at < 1.0 oz ai./A. Where broadleaf weed pressure was moderate, the addition of 2,4-DB to the tank mixture with Roundup Ultra improved weed control and subsequently increased soybean yield.

TOUCHDOWN WITH IQ TECHNOLOGY: POSTEMERGENCE WEED CONTROL AND TOLERANCE IN GLYPHOSATE TOLERANT CORN, COTTON, AND SOYBEAN. C.F. Grymes, S.M. Schraer, J.D. Smith, D.B. Black, S.H. Martin, and D.C. Pullins, Syngenta, Leland MS 38756.

ABSTRACT

Touchdown® with IQ™ technology is a new non-selective herbicide recently registered by Syngenta. Touchdown is a new formulation of glyphosate utilizing the diammonium salt and is safe on glyphosate tolerant corn (*Zea mays*), cotton (*Gossypium hirsutum*), and soybean (*Glycine max*). This novel formulation has been researched to determine the attributes of the compound. Benefits include enhanced cuticle penetration, translocation throughout the plants vascular system, and glyphosate penetration into the target plant. Over 170 field trials have shown consistent, effective weed control and excellent tolerance on glyphosate tolerant crops.

Response of glyphosate tolerant corn and soybean was evaluated in 13 and 18 trials, respectively, in 2000. Touchdown with IQ technology and Roundup Ultra® were applied at rates of 0.75, 1.5, and 3.0 lb ae/A in a sequential two application program. Corn trials exhibited very little phytotoxicity with a minimal response occurring in only two of the trials at any application rate. In soybean trials, no yellowing of the foliage was observed at the 0.75 lb/A rate. Corn and soybean yields were not affected by rates at or below 1.5 lb/A, regardless of application timing. Response was similar for both Touchdown and Roundup Ultra.

Response of glyphosate tolerant cotton was evaluated in 16 trials. Touchdown with IQ technology and Roundup Ultra were applied at a rate of 0.75 lb/A to two and four leaf cotton, or sequentially to two and four leaf cotton. Another sequential treatment included 0.75 lb/A followed by 0.56 lb/A. Some slight chlorosis and stunting were observed in some trials from both Touchdown and Roundup Ultra. Yields were also similar between Touchdown and Roundup Ultra.

Weed efficacy trials were conducted in all three glyphosate tolerant crops. Touchdown with IQ technology at 0.56 lb/A provided >90% control of common cocklebur (*Xanthium strumarium*), common lambsquarters (*Chenopodium album*), giant ragweed (*Ambrosia trifida*), seedling johnsongrass (*Sorghum halepense*), redroot pigweed (*Amaranthus retroflexus*), velvetleaf (*Abutilon theophrasti*), and tall waterhemp (*Amaranthus tuberculatus*). The 0.75 lb/A rate resulted in >90% control of prickly sida (*Sida spinosa*). Two of the cotton efficacy trials demonstrated greater pitted morningglory (*Ipomoea lacunosa*) control with Touchdown applied at the two-leaf cotton stage than that observed with Roundup Ultra.

PERFORMANCE OF MESOTRIONE IN CORN WEED CONTROL SYSTEMS. S.M. Schraer, J.D. Smith, C.F. Grymes, B.D. Black, S.H. Martin, D.H. Long, and J.C. Boykin. Syngenta Crop Protection, Leland, MS.

ABSTRACT

Mesotrione (2-[4-methylsulfonyl-2-nitrobenzoyl]-1,3-cyclohexanedione), code numbered ZA1296, is a new active ingredient for broadleaf weed control in corn. Mesotrione 4SC (4 lb ai/gal) can be applied both preemergence and postemergence. Postemergence applications of mesotrione will control velvetleaf (*Abutilon theophrasti* Medicus), common cocklebur (*Xanthium strumarium* L.), pigweeds and waterhemps (*Amaranthus* sp.), common lambsquarters (*Chenopodium album* L.), common ragweed (*Ambrosia artemisiifolia* L.), jimsonweed (*Datura stramonium* L.), nightshade (*Solanum* sp.), common sunflower (*Helianthus annuus* L.), smartweed (*Polygonum* sp.), and several other common broadleaf weeds. The typical use rate postemergence is 0.094 lb ai/A of mesotrione with crop oil concentrate and with or without UAN fertilizer. For larger or more difficult-to-control broadleaf weeds such as morningglories (*Ipomoea* sp.), the addition of 0.25 lb atrazine is recommended.

Broad spectrum grass and broadleaf weed control systems include mesotrione applied postemergence following preemergence applications of an acetanilide herbicide or atrazine premix, or a postemergence tankmix of mesotrione with a postemergence grass herbicide. Applied preemergence with an acetanilide, mesotrione provides control of all of the important weeds, including velvetleaf, pigweeds, waterhemps, common lambsquarters, common ragweed, common sunflower, jimsonweed, nightshade, smartweed, plus other grasses and broadleaves. Mesotrione performs well in conventional, minimum and no-tillage programs.

Corn has excellent tolerance to both preemergence and postemergence applications of mesotrione. Mesotrione should not be applied postemergence to corn treated with terbufos, and should not be tank-mixed with foliar organophosphate insecticides. There are no interactions with other soil insecticides or foliar applied-pyrethroid insecticides.

SECTION XI: SOIL AND ENVIRONMENTAL ASPECTS OF WEED SCIENCE

EMPLOYING REMOTE SENSING TO EVALUATE CHANGES IN LAND USE AND ESTIMATE PROBABLE PESTICIDE RUNOFF TO SURFACE WATERS. M.L. Mortimer, J.H. Massey, D.R. Shaw, J.R. Steil, J.A. Ballweber, and M.C. Smith, Department of Plant and Soil Sciences, Remote Sensing Technologies Center, and Mississippi Water Resources Research Institute, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

In an effort to control and eventually reduce nonpoint-source pollution, the Environmental Protection Agency (EPA) recently decided to implement the Total Maximum Daily Load (TMDL) requirement of the 1972 Clean Water Act, beginning in 2001. As a result of the EPA's actions, there has been an effort to determine alternative methods of evaluating bodies of surface water on the 303(d) list of impaired waterbodies other than traditional manual water sampling. Laboratory analysis for traditional water samples is time consuming and expensive, and manual sampling is difficult to do over an entire watershed. There are various other issues that are associated with the TMDL implementation procedure, such as how the EPA might standardize the method of listing bodies of surface waters as impaired, as well as how TMDLs will be established and enforced.

Remotely-sensed images in combination with pre-existing databases may form an effective decision support system, which can be used to prioritize waterbodies on Mississippi's 303(d) list that can potentially be de-listed. The previously existing data and the imagery can also provide inputs to water quality predictive models. For example, databases containing information on pesticide usage, land cover classification, precipitation, soils, and possibly other types of environmentally relevant data, such as digital elevation models (DEMs), can be arranged in thematic layers over remotely-sensed images in a GIS database. In an experimental pilot project at Mississippi State University, this procedure will be performed for both 1987 imagery and 2001 imagery for the upper portions of the Pearl River watershed. The remotely-sensed images, along with the corresponding environmental data for each set of images, will show the changes in land use over time. Land cover often determines pesticide use, and pesticide use usually changes as land use or land cover changes. Ground-truthed data will be correlated to parameters in the multispectral imagery. Once this correlation is established, selected features from remotely sensed images can provide inputs to water quality models. Using remote sensing with pre-existing databases from a diversity of sources can determine inputs for water quality models and show the effect of land use changes on surface water quality. Remote sensing, with the aid of previously existing data, can potentially save time, money, and resources in the effort to evaluate impaired bodies of water and eventually establish TMDLs for these waterbodies.

THE EFFECT OF MULCHING SYSTEMS ON HERBICIDE MOBILITY. S.L. File, P.R. Knight, and D.B. Reynolds. Mississippi State University, Mississippi MS 39762.

ABSTRACT

Increased pesticide use in ornamental horticultural crop applications has heightened concern over the fate of herbicides and their potential accumulation in surface and groundwater supplies. Production of horticultural crops in sandy soils under heavy irrigation regimes has resulted in a high potential for some herbicides to leach into groundwater. Mulches are commonly utilized in landscape practices but little is known about their effect on herbicide efficacy and mobility. Therefore the objective of this research was to evaluate the mobility of three commonly used herbicides when applied over various mulching systems.

Treatments were arranged in a three (pendimethalin, isoxaben, and metolachlor) x four (bare soil, newspaper pellets, pine bark, and pine straw) factorial in a randomized complete block design with four replications. The experiment was repeated and all data were subjected to analysis of variance to test for significance. Acetate tubing (5cm x 30cm) was filled with a sandy loam soil in 100g increments before being covered with two inches of mulch. Columns were irrigated with 250 ml of deionized water under saturated-flow conditions and then allowed to drain for 24h before treatments were applied. All ^{14}C- labeled herbicides were applied in 1000µl of deionized water to each column in a cross-hatch pattern. Following herbicide application, columns drained for 24 h before leachate volume was recorded and sampled. Two 1 µl aliquots from each leachate sample were combined with scintillation cocktail and analyzed by liquid scintillation spectrometry. Columns were then frozen and sectioned with a 2 inch PVC cutter into the following segments: mulch if applicable, 0-5, 5-10, 10-15, 15-20, and 20-25 cm soil sections. Soil segments were air dried and mixed throughly before three 2-g samples were taken from each and combusted with a biological oxidizer at 900^0 C for 4 min. Mobility was determined by calculating percent of herbicide collected at different soil depths and in the leachate, relative to amount applied.

All three herbicides had over 85% recovery and showed no differences among herbicide treatments when averaged over mulching system. When averaged over herbicides, newspaper pellets adsorbed more ^{14}C-herbicide compared to any other mulch. Recovery of ^{14}C-herbicide was lower with pine bark when compared to any other mulch. Compared with pendimethalin and isoxaben, metolachlor leached more from the mulch layer into the soil profile, indicating a higher leaching potential. These data indicate that these mulches decrease leaching regardless of herbicide used. These results also demonstrate that newspaper pellets reduced herbicide movement compared to other mulching system examined. These data indicate that mulches may aid in decreasing herbicide movement into surface and groundwater from landscape beds.

USING A DISC-FLOW METHOD TO BETTER UNDERSTAND HERBICIDE-SOIL INTERACTIONS.
M.C. Smith, D.R. Shaw, M. Boyette, W.L. Kingery, J.H. Massey, and M.L. Mortimer, Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Thin-disk flow experiments may provide both kinetic and equilibrium data on solute-soil interactions in a more natural environment than batch experiments. The objective of this research was to determine the feasibility of using thin-disc flow to explore imazaquin-soil interactions. Soil used throughout these experiments was a Brooksville silty clay, pH 6.8. Batch equilibrium studies used "cold" and ^{14}C-labeled imazaquin at initial solution concentrations from 0.075 to 150 μM imazaquin in 5 mM $CaCl_2$. The solution to soil ratio was 2:1. Samples reached equilibrium by 24 hr on a horizontal shaker and were centrifuged at 4500 rpm for 30 min. With equilibrium solution concentrations less than 2.0 μM, the resulting linear adsorption isotherm K_d averaged 0.34. However, if equilibrium concentration was above 2.0 μM, the resulting isotherm fit a Freundlich isotherm with $K_f = 0.35$ and n = 0.86.

In the saturated breakthrough concentration (BTC) thin-disc studies, 3.0 g air-dry soil was place on a 0.20 μm filter and sealed in a 47 mm Nalgene® In-Line Filter Holder. Soil was conditioned with 200 ml deionized water followed by 200 ml 0.5-M $CaCl_2$ followed by 1000 ml 5-mM $CaCl_2$. Imazaquin at 3.0 and 29.3 μM in 5-mM $CaCl_2$ plus KBr was then pumped at 3 ml min^{-1} through the soil-disc. Effluent was collected in 5 or 10 ml fractions. After collecting 500 ml effluent, flow was stopped and remained static for 24 hr. When flow resumed, fractions were collected for an additional 500 ml. Imazaquin concentration was determined by HPLC analysis. Dilution within the system was negated by using Br^- as a conservative tracer. The BTC curves were equivalent for the 3.0 and 29.3 :M imazaquin solutions. Imazaquin was present in the initial samples at approximately 38% of the influent concentration (C_o). At a cumulative volume of 50 ml, the effluent concentration was 99% of C_o for the imazaquin solutions. When herbicide solution flow was resumed after the 24 hr stoppage, imazaquin concentration in the effluent decreased by approximately 15%. The decrease demonstrated equilibrium was not achieved prior to the stoppage. The adsorption and desorption of imazaquin in saturated soil followed first-order kinetics. Collectively, these data suggest sorption kinetics are driving the imazaquin-soil interaction.

In separate studies, moist soil (7.5% water wt wt^{-1}) was treated with 133 g ae ha^{-1} ^{14}C-imazaquin (0.015 μCi g^{-1} soil) and incubated for 24, 72, and 168 hr. After incubation, 3.25 g moist soil was placed in the thin-disc filter apparatus and desorbed with 5.0-mM $CaCl_2$. All three incubation times were desorbed with a flow rate of 1.0 ml min^{-1}. The 72 hr-incubation time was also desorbed with additional flow rates of 0.33 and 0.67 ml min^{-1}. A total of 50 ml effluent was collected in 1.0 ml fractions. Flow was stopped for 24 hr, then resumed using the identical flow rate. Imazaquin solution concentration was determined by liquid scintillation counting and purity was confirmed with HPLC analysis. The herbicide concentration in soil was inferred by subtracting herbicide detected in the effluent from the initial soil concentration. Desorption kinetics were calculated by graphing imazaquin soil concentration on the y-axis versus the pore volume of effluent passing through the soil-disc on the x-axis. With all incubation times and flow rates, soil concentration decreased curvilinearly as pore volumes increased. Thus, the natural logarithm of soil concentration was plotted to test for first-order kinetics fit. The graph of the natural logarithm plot was also curvilinear. However, within the desorption curve, three distinct linear phases were present for each incubation time and flow rate. The R^2 of linear regression of these data averaged 0.98. This strongly suggests that each desorption curve was multiphasic, with each phase having first-order rate kinetics. When averaged over the 3 phases of desorption, incubation time greatly influenced desorption kinetics. Desorption rate (k) for the 24 hr incubation time was 0.088 ln(μmol kg^{-1}) / pore volume [ln(μmol kg^{-1}) pv^{-1}], compared to k = 0.069 ln(μmol kg^{-1}) pv^{-1} for the 72 and 168 hr incubation times. Thus, the kinetics of the shortest incubation time was 1.28 times faster than the longer incubation times. However, flow rate did not affect kinetics, with all three flow rates of the 72 hr incubation time averaging k = 0.070 ln(μmol kg^{-1}) pv^{-1}. When averaged over the 3 incubation times, the first desorption phase averaged k = 0.144 ln(μmol kg^{-1}) pv^{-1}. However, k decreased to 0.053 and 0.030 ln(μmol kg^{-1}) pv^{-1} for the intermediate and late desorption phases, respectively. Thus, initial desorption rate was approximately 5 times higher than the late phase. An imazaquin partitioning coefficient (K_d) was calculated by comparing the soil and solution concentration of imazaquin after the 24 hr stop-flow period. This K_d was 0.47, compared to 0.34 with the batch equilibrium experiments. These data indicate that desorption of field application rates of imazaquin are multiphasic. It is probable that initial desorption is from the most weakly adsorptive sites, and later herbicide loss if from the most tightly bound sites.

PREDICTION OF PERENNIAL WEED OCCURRENCE USING TERRAIN MODELING AND SOIL ATTRIBUTES IN Kentucky NO-TILL FIELDS. C.L. Brommer and W.W. Witt. Department of Agronomy, University of Kentucky, Lexington, KY 40546.

ABSTRACT

Conservation tillage practices have increased in row crops across the United States and no-till agriculture makes up 50% of the total row crop acreage in Kentucky. These tillage practices have many benefits to producers over the use of traditional tillage practices. There are problems associated with no-till fields in Kentucky and one of these is higher relative population of perennial weeds. The perennial weed population establishes primarily because of the lack of preplant tillage to disrupt the taproots of many broadleaf perennial weeds. Extension personnel and producers alike have noticed that perennial weed communities establish in similar areas in many different fields. These areas may include low or bottom portions of fields and in places where water would be more available. Producers also face the problem of having more acreage to manage to stay solvent. The added land area decreases the amount of time a producer can scout fields and make herbicide applications. With these observations in mind, a study was established to try and correlate the terrain attributes of no-till fields with occurrence of perennial weed populations.

One of the University of Kentucky's agricultural research farms, located in Woodford Co., was used as the initial site for these studies. A field was selected which had been in no-till production for several years and was currently planted in soybean. Populations of hemp dogbane, trumpetcreeper, and hedge bindweed were located and their position documented with a Starlink® GPS backpack unit. Digital elevation maps (DEM) were created from landform surveys. From the DEM a series of hydrological and terrain maps were creates using ARCINFO. Data from these maps were used in conjunction with regression modeling to monitor the correlation between hydrology, terrain factors and perennial weed population. Terrain factors included slope gradient, profile curvature, plan curvature, tangential curvature, specific catchment area, upslope length, distance to local depression, elevation above local depression, and secondary terrain attributes of compound topographic index, stream power index, sediment transport capacity, and depression proximity index.

A correlation was drawn between the location of trumpet creeper (*Campsis radicans*) and with the catchment area (0.31) and the slope index (0.41) as well as, Hedge bindweed (*Calystegia sepium* (L.) R. Br.) with the catchment area (0.38) and the slope index (0.40). All correlation values were at the 0.01 level. Both of these values are indicators of run off and topography in a field. Soil factors did not have close correlations to weed presence. Data collected for soil-perennial weed correlation were not above (0.03). No correlations were found between Hemp dogbane and any of the terrain characteristics or with the soil attributes. Future research will also include top soil and subsoil characteristics and the relation to perennial weed occurrence. Research at different sites throughout the state of Kentucky will be conducted in the coming months to validate the models created at the Woodford Co. site.

NURSERY IRRIGATION PRACTICES IMPACT PESTICIDE LEVELS IN RUNOFF WATER. J.A. Briggs, T. Whitwell, and M.B. Riley. Clemson University, Clemson, SC.

ABSTRACT

Field research was conducted at a wholesale container plant nursery near Chesnee, SC, in the summer of 2000, to determine the effects of reduced irrigation amounts following fungicide and herbicide applications on pesticide levels in runoff water. In the Southeast US, irrigation is applied to container plants on a daily basis during the growing season. Irrigation follows fungicide and insecticide applications within 24 hours and immediately follows herbicide applications. Treatments were spray applications of a fungicide and herbicide followed by reduced (0.3 cm) or pulsed (1.8 cm) irrigation volumes. Pulsed treatment consisted of three 30 minute irrigation cycles with 90 minute rest periods between cycles. The fungicide, thiophanate-methyl was applied to production beds at the rate of 0.4 kg ha^{-1} using an air blast sprayer 20 hours before irrigation treatments. The preemergence herbicide oryzalin was spray applied to beds at a rate of 2.9 kg ha^{-1} on the day of irrigation treatment. Following the day of application, pulsed irrigation was applied to both treatments. Runoff samples were collected at 15 minute intervals from both treatments through three days of pulse irrigation. Samples were analyzed by HPLC after pesticide extraction onto solid phase extraction columns.

Oryzalin was detected in all runoff samples from both treatments. Highest concentrations noted were from the first samples on the day of treatment and were 3.5 and 3.9 mg ml^{-1} for the reduced and pulsed irrigation treatments, respectively. Concentrations decreased throughout subsequent sampling periods and sampling days. On one day after treatment, concentrations were higher from the reduced treatment for the majority of runoff samples. At two days after treatment, concentrations were similar among treatments for all but one sample. Total amounts of oryzalin detected in runoff water were greater from the reduced treatment on one day after application, but similar among treatments as a total for the study. As a percent of applied amount, 7% of oryzalin was detected as leaving application site in runoff water. Thiophanate-methyl was detected on only the day of treatment for the pulsed irrigation treatment and through one day after treatment in the reduced irrigation treatment. Greatest concentrations noted were 1.4 and 2mg ml^{-1} in the reduced and pulsed treatments, respectively. Total amounts of thiophanate-

methyl in runoff water were lower from the reduced irrigation treatment, 0.2 g as compared to 0.6 g from the pulsed irrigation treatment. As a percent of amount applied, 0.2 and 0.9% of thiophanate-methyl was detected as leaving application site in runoff water from the reduced and pulsed irrigation treatments, respectively.

A reduction in post pesticide application irrigation volumes lowered amounts of thiophanate-methyl in runoff water but did not affect amounts of oryzalin. Thiophanate-methyl has a water solubility ten times greater than oryzalin, and quickly degrades to carbendazim. Oryzalin is a stable herbicide with a very low vapor pressure. Reductions in irrigation volume following pesticide application may reduce quantities of soluble, readily degradable pesticides that leave application site in runoff water.

RELATIONSHIPS OF SOIL/SOLUTION DISTRIBUTION COEFFICIENTS (K VALUES) AND SELECTED SOIL PROPERTIES FOR WEAKLY BASIC HERBICIDES. J.B. Weber, G.G. Wilkerson, and R.B. Leidy, North Carolina State University, Raleigh, NC 27695

ABSTRACT

Statistical evaluation of pesticide soil/solution distribution coefficients (K_d or K_f values) with selected soil parameters [% organic matter (OM), % clay mineral (CM), and 1:1 soil:water pH] revealed that the K values were only weakly correlated with the soil parameters when all pesticides were selected, but were highly correlated when only weakly basic chemicals were selected. Equations were developed for calculating K values for nine weakly basic herbicides, including atrazine, cyanazine, fluridone, metribuzin, prometon, prometryn, propazine, simazine, and terbutryn when the three soil parameters are known for a given soil.

TILLAGE SYSTEMS AND FILTER STRIPS AFFECT HERBICIDE LOSSES IN SURFACE RUNOFF. S.B. Blanche, D.R. Shaw, J.H. Massey, M. Boyette, and T.H. Koger, Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Field studies were conducted in 1999 and 2000 to evaluate the effectiveness of vegetative filter strips in conjunction with three different tillage systems: a conventionally tilled system (CT), a no-till system (NT), and a no-till with wheat (*Triticum aestivum* L.) residue system (NTR) for reducing runoff volume, sediment, fluometuron and norflurazon in surface runoff. Trials were conducted on runoff plots 4 m x 22 m in Brooksville, MS, on a Brooksville silty clay (fine montmorillinitic, thermic Aquic Chromudert, 3% slope, 3.2% organic matter content, pH 6.3 in Ap horizon). Cotton (*Gossypium hirsutum* L.) was planted in 76-cm rows and all plots received 1.7 kg ai/ha fluometuron and norflurazon PRE. Treatments consisted of a 1 m filter strip of switchgrass (*Panicum virgatum* L.), a perennial grass with a stiff, erect growth habit. The filter strips were installed at the base of each tillage system and an adjacent, unfiltered plot was paired with it for comparison. The samples were analyzed using liquid-liquid extraction and HPLC methodology to determine fluometuron and norflurazon concentrations in runoff. Average extraction efficiency for fluometuron and norflurazon was 87 and 93%, respectively.

In the initial runoff event 0 days after treatment (DAT) in 1999, sediment losses were reduced 86, 79, and 93% by adding a filter strip to CT, NT and NTR systems, respectively, when compared to a NT system without a filter strip. Across tillage systems in 1999, cumulative fluometuron loss was reduced 44% when a filter strip was present. In 1999, cumulative norflurazon loss was reduced 47% by adding a filter strip, regardless of tillage system. In the first runoff event of 2000, there were no differences between any treatment with respect to fluometuron, norflurazon and sediment losses in surface runoff. Across all treatments, fluometuron loss in the initial runoff event was between 80 and 89% of the cumulative loss over the 1999 growing season. Flometuron losses were between 3.6 and 15.6% of the amount applied in 1999 and between 3.1 and 6.0% of the amount applied in 2000. Total norflurazon loss in the initial runoff event, regardless of treatment, was between 88 and 98% of the cumulative loss over the 1999 growing season. Norflurazon losses were 1.0 to 9.9% of the amount applied in 1999 and 1.9 to 5.2% of the amount applied in 2000. In the first runoff event, more herbicide was available to enter solution than in subsequent runoff events due to insufficient time for adsorption to soil colloids, and for degradation. At 0 DAT in 2000, fluometuron loss was between 60 an 86%, and norflurazon loss was between 61 and 81% of the total loss over the entire growing season. In NT systems in 1999, sediment losses were reduced 80% when a filter strip was present.

ASSESSING SOYBEAN RESPONSE TO HERBICIDE APPLICATION USING MULTISPECTRAL IMAGERY. C.S. Bray, D.R. Shaw, J.A. Mills, and S.B. Blanche, Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762; and Monsanto Agricultural Products Co., Collierville, TN 38017.

ABSTRACT

Even though many herbicides are labeled for application over-the-top of soybean, at times there are adverse reactions to these applications. Multispectral remote sensing images may be useful in determining levels of crop stress induced by herbicides. Vegetation Indices (VI) may be used to create ratios between the specified wavelength bands collected by remote sensing to evaluate plant canopy reflectance response to the herbicide applications.

An experiment was conducted using multispectral imagery to observe soybean response to various postemergence herbicides. Images were collected throughout the growing season using an aerial multispectral camera with 1-m resolution, and ground-reference data were collected using a hand-held hyperspectral sensor. Multispectral imagery was collected six weeks after single herbicide applications and four weeks after sequential applications. Hand-held data were collected 2 weeks after treatment for single applications and 2 days after treatment for sequential applications. Exact locations for sample collection were pinpointed with GPS. Plots were 7.7 m wide and 365 m long, making each plot 0.28 ha. There were fourteen treatments in the trial including single and sequential applications, a weedy check, and a weed-free check. Single applications consisted of 840 g ae/ha glyphosate (Roundup Ultra), 840g/ha glyphosate (Roundup Ultra Max), 840 g/ha glyphosate (Roundup Ultra Dry), 840 g/ha sulfosate, 630 g/ha glyphosate plus 4 g ai/ha Chlorimuron, 630 g/ha glyphosate plus 10 g ai/ha cloransulam, and 630 g/ha glyphosate plus 140 g ai/ha acifluorfen. Sequential application consisted of 840 g/ha glyphosate (Roundup Ultra) followed by (fb) 630 g/ha glyphosate (Roundup Ultra), 840 g/ha glyphosate (Roundup Ultra Max) fb 630 g/ha glyphosate (Roundup Ultra Max), 840 g/ha glyphosate (Roundup Ultra Dry) fb 630 g/ha glyphosate (Roundup Ultra Dry), 840 g/ha sulfosate fb 630 g/ha sulfosate, 630 g/ha glyphosate plus 4 g/ha chlorimuron fb 630 g/ha glyphosate plus 4 g/ha chlorimuron, 630 g/ha glyphosate plus 10 g/ha cloransulam fb 630 g/ha glyphosate plus 10 g/ha cloransulam, and 630 g/ha glyphosate plus 140 g/ha acifluorfen fb 630 g/ha glyphosate plus 140 g/ha acifluorfen.

Vegetation indices were calculated using band values from data sets in the multispectral image and hand-held data. Vegetation indices include Red Vegetation Index (RVI), Normalized Difference Vegetation Index (NDVI), Difference Vegetation Index (DVI), Normalized Difference Vegetation Index green (NDVIg), Soil Adjusted Vegetation Index (SAVI), and Global Environmental Monitoring Index (GEMI). Although data were collected using hyperspectral sensor, the data were converted to multispectral bands. Using vegetation indices, patterns were classified for comparisons of treatments. Treatment comparisons include glyphosate and herbicide-free checks, single and sequential applications of glyphosate, single and sequential applications of glyphosate formulations, single applications and sequential applications of tank mixtures, glyphosate to single and sequential tank mixtures, and comparisons of weed-free and weedy check to herbicide treatments. Treatments were classified by numerical values assigned to the pixels at the sampling locations in the multispectral aerial and hand-held data. Resubstitution Summary using a Linear Discriminant Function was used to classify the reflectance response from the multispectral imagery and hand-held data.

Hand-held data and aerial data were classified correctly 100% for comparisons between glyphosate applications and herbicide-free areas, as well as the comparison of single and sequential applications of glyphosate. Hand-held data for sequential applications of glyphosate formulations were correctly classified 100% of the time, whereas the aerial data were only classified correctly 75% of the time. For single applications of glyphosate formulations, hand-held data were classified correctly only 59%, and aerial 66%, of instances tested. Thus, glyphosate formulations can be differentiated with sequential treatments, but single applications were difficult to delineate. This may be partially attributed to the reduction in response with the longer period of time after treatment. Hand-held data for the tank-mix treatments were classified 100%, whereas the data from aerial data were classified correctly 89%. Single tank mixtures were classified correctly 88% of the time with hand-held data and 89% of the time with aerial images. When glyphosate was compared to tank mixtures, hand-held and aerial imagery were only classified correctly 55% of the time. Therefore, multispectral remote sensing imagery has the potential to identify fields or portions of fields stressed by herbicides, at times even when visible injury was not present.

VALIDATION OF MSU-HADSS COTTON WEED CONTROLS IN MISSISSIPPI. W.F. Bloodworth, A. Rankins, Jr., and D.B. Reynolds. Mississippi State University, Mississippi State, MS.

ABSTRACT

Weed control continues to be an integral part of cotton production. The introduction of computerized decision aides may allow growers, consultants, and pesticide applicators to make more accurate weed control recommendations. These applications are designed to help the user select the most efficacious and most economical product available. Herbicide Application Decision Support System (HADSS), developed by North Carolina State University, is one such product. HADSS selects the best treatments on a cost to benefit basis, which can be very economical and environmentally beneficial to the producer.

Successful validation has been completed in Mississippi for use in soybean. The purpose of this study was to modify and validate the accuracy of postemergent recommendations by HADSS in cotton production. Herbicide ratings and crop competitiveness have been taken from data collected from university trials. These data were manipulated by WeedEd, a database editor, to enable HADSS to predict the most beneficial treatment.

Studies were conducted in 1999 and 2000 at four locations across Mississippi. Treatments were arranged as a split-split-plot in a randomized complete block design with four replications. Main plots were comprised of Roundup Ready, BXN and a conventional cotton variety, sub-plots were no-preemergence or Cotoran 1.25 lbs ai/A PRE and sub-sub-plots consisted of an early postemergence (early-POST) HADSS recommendation, a mid-postemergence (mid-post) HADSS recommendation, a weedy check, and a weed free check. These treatments were evaluated for efficacy, crop safety, and yield. Treatments included: 1) prowl at 1 lb ai/A plus cotoran at 1.25 lb ai/A followed by (fb) an early season postemergence HADSS recommendation (PRE fb early POST (HADSS)); 2) prowl at 1 lb ai/A plus cotoran at 1.25 lb ai/A followed by (fb) a mid-season postemergence HADSS recommendation (PRE fb mid-POST (HADSS)); 3) early postemergence HADSS recommendation (early- POST) only; 4) mid- postemergence HADSS recommendation (mid- POST) only; weed free and untreated check for both PRE and POST only treatments. Weed populations were quantified, recommendations were generated by HADSS and treatments were applied at the 2-4 and 6-8 leaf stages.

HADSS recommendations containing preemergence treatments provided better than 90% control. Treatments void of a preemergence application gave at least 80% control except for a single recommendation in the BXN system. The yield from the weed free plots did not yield significantly more than the two herbicide recommendations. Thus these data indicate that yields were optimized when utilizing the HADSS recommendations. The use of this decision-aid should facilitate the use of the most efficacious and economical treatment in Roundup Ready, BXN, and conventional cotton varieties.

THE EFFECT OF CGA-362622 ON GRAMINICIDE EFFICACY. D.G. Wilson, Jr., D.B. Reynolds, J.C. Sanders, and E.L. Sanders. Mississippi State University, Mississippi State, MS

ABSTRACT

Experiments were conducted at the Plant Science Research Center, Starkville, MS, to evaluate johnsongrass control with tank mixtures and sequential applications of 2.15 g ai/A CGA-362622 with 0.069 lbs ai/A Assure (quizalofop-P), 0.188 lbs ai/A Fusilade (fluazifop-P), and 0.125 lbs ai/A Select (clethodim). Treatments were arranged as a two factor factorial in a randomized complete block design. Factor A consisted of application timings of CGA-362622 7, 3, and 1 day before and after application of each graminicide. At day 0 (when the graminicide was applied) CGA-362622 was also tankmixed with each graminicide. Additionally, each graminicide was applied alone for comparison with the sequential and tankmixture applications. Factor B consisted of graminicides, all of which were applied at day 0 to minimize differences in control due to johnsongrass size.

Johnsongrass control 28 days after treatment (DAT), with all graminicides, was reduced (14 - 54%) when tankmixed with CGA 362622. Tank mixtures with Select resulted in 54% antagonism 28 DAT, which was greater than with any other graminicide. Johnsongrass control was reduced more when CGA-362622 was applied 1 or 3 days prior to Assure or Fusilade than when applied 1 or 3 days after. Johnsongrass control was generally affected the same by CGA-362622 applied before or after applications of Select. Based upon these preliminary data it would appear that CGA-362622 should not be tankmixed with a graminicide. It also appears that less antagonism occurs when the graminicide is applied first than when applied sequentially with CGA-362622. Overall it would appear that at least a 3 day interval should be allowed following graminicide application before application of CGA-362622. If CGA-362622 is applied first then at least a 7 day interval before application of graminicides is needed to reduce chances of antagonism.

EFFECT OF CARRIER VOLUME ON CROP RESPONSE TO SIMULATED DRIFT OF GLYPHOSATE AND GLUFOSINATE. J.M. Ellis, J.L. Griffin, C.A. Jones, and E.P. Webster, Louisiana State University Ag Center, Baton Rouge, LA 70803, and J.L. Godley, R & D Research, Inc., Washington, LA 70589.

ABSTRACT

Field experiments were conducted at the Ben Hur Research Farm near Baton Rouge, LA, and the R & D Research Farm near Washington, LA, to evaluate corn and soybean response to simulated drift of glyphosate (Roundup Ultra) and glufosinate (Liberty). Past research investigating simulated drift has evaluated a series of herbicide rates using a constant carrier volume. However, this is not what occurs in a field situation. Consequently, crop response to simulated drift rates was compared using both constant carrier volume and carrier volumes varied proportionally to the herbicide rates. The experimental design was a randomized complete block with a three-factor factorial treatment arrangement with four replications. The first and second factors were herbicide and herbicide drift rate. Drift rates represented 1/8 and 1/16 of the use rates of 1.0 lb ai/A glyphosate and 0.38 lb ai/A glufosinate. The third factor was carrier volume. Simulated drift rates for each herbicide were applied in constant carrier volume of 25

gallons/A and in variable carrier volumes of 3.1 gallons/A for the 1/8 rate and 1.6 gallons/A for the 1/16. Herbicide treatments were applied using a tractor mounted compressed air sprayer with a spray pressure of 27 psi. A TurboTeejet® 110005 nozzle was used for all treatments and tractor speed was adjusted to obtain the desired carrier volumes. Tractor speed was 0.6 mph for the constant carrier volume and 5 and 10 mph for the 3.1 and 1.6 gallons/A proportional carrier volumes, respectively. Treatments were applied to 6 lf 'Dekalb 687' corn and 2 to 3 trifoliate 'DPL 3588' soybeans. Data collected included crop injury and height 7, 14, and 28 days after treatment (DAT) and crop yield. Data were subjected to analysis of variance to test for significance of main effects for each factor and interactions and means separated using Fisher's protected Least Significant Difference (LSD) at the 5% level of probability.

Differences in corn injury and height, and yield reductions were not herbicide dependent, therefore data were averaged across herbicides. At 7 DAT, corn height was reduced more when the 1/8 rate was applied in proportional carrier volume (29%) compared to constant carrier volume (23%). The 1/16 rate did not reduce corn height when applied in either constant or proportional carrier volume. Corn injury 7 DAT increased from 32 to 45% for the 1/8 rate and 18 to 36% for the 1/16 rate when the carrier volume was adjusted proportionally with the herbicide drift rate. Corn height 28 DAT was reduced 18% when the 1/8 rate was applied in constant carrier volume and 42% when applied in proportional carrier volume. Corn height was reduced only 10% when the 1/16 rate was applied in constant carrier volume, but reduced 38% when applied in proportional carrier volume. Corn injury was 33% when 1/8 of the use rate was applied in constant carrier volume and increased to 46% when applied in proportional carrier volume. Corn injury for the 1/16 rate doubled (18 to 37%) when the carrier volume was adjusted proportionally to the herbicide drift rate. For the 1/8 and 1/16 rates, corn yield reduction was 1.6 and 1.8 times greater for the proportional spray volume compared to the constant spray volume.

Unlike corn, differences in soybean response were not affected by carrier volume, but could be attributed to the herbicides. Soybean height averaged across carrier volumes was reduced by the 0.125 rate of glyphosate 23, 20, and 16% at 7, 14, and 28 DAT, respectively. Neither of the simulated drift rates of glufosinate and the 0.063 rate of glyphosate reduced soybean height at the three evaluation dates. The 1/8 and 1/16 rates of glyphosate injured soybeans 31 and 19%, 7 DAT. Glufosinate applied at the 1/8 and 1/16 rates injured soybeans 26 and 16%, respectively. By 28 DAT, the 1/8 and 1/16 rates of glyphosate injured soybeans 13 and 7%. Only the 1/8 rate of glufosinate resulted in soybean injury (3%). Soybean recovery from herbicide injury was rapid and yield was not affected.

In conclusion, corn was much more sensitive than soybeans to carrier volume for the simulated drift rates of glyphosate and glufosinate. Results indicate that simulated drift research where carrier volume is maintained constant over a rate range may underestimate the negative effect on sensitive crops.

DETECTION, CLASSIFICATION, AND QUANTIFICATION OF HERBICIDE DRIFT UTILIZING SPECTRAL SIGNATURES. K.M. Bloodworth, L.M. Bruce, C.D. Rowland, and D.B. Reynolds. Mississippi State University, Mississippi State, MS.

ABSTRACT

The increased use of non-selective herbicides in transgenic cotton has led to increased herbicide drift onto non-transgenic cotton. Increased interest in the use of remote sensing in agriculture as heightened interest in the potential for the detection and quantification of herbicide drift using hyperspectral imagery. These images have the potential to provide not only evidence of drift events but may also quantify degree of injury and potential yield reductions. In previous research, plant height was found to be a leading indicator of herbicide injury and yield reduction where no visual injury was observed. The use of hyperspectral imagery for assessing large areas for herbicide drift may be useful in discerning small differences that are not discernable by visual inspection.

Research was conducted in 2000 to evaluate the potential use of data obtained from hand held spectroradiometers in detection of drift as compared to visual injury ratings and reduced cotton yields. The experimental design was a randomized complete block with a two factor factorial arrangement of treatments. Factor A was Roundup Ultra (glyphosate) applied at rates of 0.375, 0.187, 0.093, 0.046, and 0.023 lbs ai/A. Factor B consisted of application timings at cotyledon, pinhead square, and first bloom. Visual injury ratings were taken on seven day intervals after treatments were applied. Spectroradiometer data were taken on fourteen day intervals using a FieldSpec Pro. Data were analyzed using the Proc Discrim feature in SAS with cross validation (leave one out testing) and resubstitution options. This procedure was used to classify each treatment by spray and no-spray, application timing, and high and low rates based on spectral data.

The cotton displayed no visual injury at any rating interval. When spectroradiometer data were analyzed, treatments were classified by injury correctly 65-66% of the time even when no visual injury was observed. When classified according to timing, the untreated could be distinguished from the cotyledon and square treatments 81% of the time. These preliminary data indicate that hyperspectral data may be useful in detection and quantification of drift injury in nontransgenic cotton.

PLANTING METHODS TO AVOID HERBICIDE CARRYOVER INJURY ON GRAIN SORGHUM. K.A. Hollon and T.F. Peeper. Oklahoma State University, Stillwater, Oklahoma.

ABSTRACT

The objective of this study was to determine whether planting methods affect Maverick herbicide carryover injury to grain sorghum. Experimental design was a 2x2x3 factorial arrangement of treatments with the following factors: A = planting method, B = treatment, C = depth. The planting methods were rotary trash whips or conservation furrowers in front of the double disk openers on a John Deere Max Emerge no-till planter with 30-inch row spacing. The treatments were Maverick or no treatment. Depth was three separate settings for both the rotary trash whips (0, 0.25, and 0.5 inches) and the conservation furrowers (0, 1.5, and 3.0 inches). Maverick was applied to treated plots the second week of January 2000 at three locations (Perry, Lahoma, and Chickasha, Oklahoma). Maverick rate was 0.031 lbs ai/acre. Wheat growth stage at application was 1 to 6 tiller. During February 2000 all plots were fertilized for a yield goal of 40 bushels/acre. In April 2000 all plots were sprayed with 1.5 lbs ai/acre Roundup Ultra to simulate crop failure, reduce residue at planting, and conserve moisture. Between April 25 and May 15, 2000 all plots (2 rows x 25 feet) were seeded with 54000 seeds/acre of DK-36 grain sorghum. After seeding all plots were sprayed with 1.5 lbs ai/acre Roundup Ultra and 0.71 lbs ai/acre Dual II Magnum. All plots received 200 lbs/acre 46-0-0 at planting. Sorghum plant density/acre and plant height was measured in June 2000 approximately 2 weeks after emergence. Sorghum plant height and head density/acre was measured in July 2000. The Perry and Lahoma locations were harvested August 22 and 23, 2000 with a small plot combine. All samples were cleaned with a small industrial seed cleaner using a 12/64-inch top screen and a 1/20-inch bottom screen then weighed. Test weight and moisture percentage was determined for each sample. All yields were adjusted to 13.5% moisture content. All plots at Chickasha were hand harvested by clipping all sorghum heads from each plot and weighing. This was done due to extreme bird feeding damage at this site. Results showed the rotary trash whips at all depths to be an ineffective means of eliminating Maverick herbicide carryover injury to grain sorghum. Grain sorghum plant density was significantly lower in Maverick-treated plots than in untreated plots. Yield increased in Maverick-treated plots as conservation furrower depth increased.

INTERACTION OF ALS INHIBITING HERBICIDES WITH ULV APPLICATIONS OF MALATHION. W.F. Bloodworth, K.M. Bloodworth, and D.B. Reynolds. Mississippi State University, Mississippi State, MS.

ABSTRACT

As a selective postemergence over the top (POST) herbicide labeled in cotton, pyrithiobac {2-chloro-6-[4,6-dimethoxy-2-pyrimidinyl)thio]benzoic acid} controls several problematic weeds including pitted morningglory (*Ipomoea lacunosa* L.), entireleaf morningglory (*Ipomoea hederacea* var. *integriuscula* Gray), common cocklebur (*Xanthium strumarium* L.), velvetleaf (*Abutilon theophrasti* Medik.), and hemp sesbania (*Sesbania exaltata* (Raf.) Rydb. Ex A.W. Hill). Pyrithiobac is applied as an early POST treatment which coincides with the application of many insecticides. One of these insecticides is malathion {O,O-dimethyl s-(1,2-dicarbethoxyethyl) phosphorodithioate}, which is the current insecticide of choice for the boll weevil (*Anthonomus grandis* Boheman) eradication program. These classes of pesticides can induce beneficial or detrimental interactions when used in combination with herbicides. CGA-362622 is a broad spectrum ALS inhibiting herbicide with the proposed common name of trifloxysulfuron sodium. Previous research with CGA-362622 has shown similar effects as pyrithiobac in postemergence applications. It is suspected that the presence of malathion in cotton plants affects the ability of the plant to metabolize the active parent herbicide molecule into inactive metabolites.

There has been concern over these interactions in certain areas of Mississippi and other states currently involved in boll weevil eradication programs because of the uncertainty of when malathion applications will be made relative to pyrithiobac and potential CGA-362622 applications on various production areas. Producers using pyrithiobac and CGA-362622 based weed control programs in boll weevil eradication areas have no way of knowing when malathion applications will be made or whether an interaction may occur. Producers need to know the essential time interval between insecticide and herbicide applications to ensure crop safety. Research has shown there to be a detrimental interaction between applications of malathion and these herbicides when applied to cotton. Previous research has shown significant visual injury, but this injury has had little effect on fruiting or yield. In these studies, malathion was applied in high volume applications and also as a tank mix with pyrithiobac. Further laboratory research has shown increased injury when pyrithiobac and malathion are applied in cool conditions. Therefore, the objectives of this research were to determine the interaction of applications of pyrithiobac and CGA-362622 made at various time intervals before and after ultra low volume (ULV) malathion applications under field conditions. Research was conducted in 1999 and 2000 at the Plant Science Research Center near Starkville, MS, and the Black Belt Branch Experiment Station near Brooksville, MS, to evaluate ULV applications of malathion with pyrithiobac and CGA-362622. Aerial malathion applications were made by the Southeastern Boll Weevil Eradication Foundation at 0.76 lbs ai/A. Applications of 1.0 oz ai/A pyrithiobac and 0.076 oz ai/A CGA-362622 were made with a CO_2 backpack sprayer delivering 15 gallons per acre. Treatments consisted of topical applications of pyrithiobac and CGA-362622 at 24, 8, 4, 2, 1, 0.5 h before or 0.5, 1, 2, 4, 8, and 24 h after the malathion application. The pyrithiobac and CGA-362622 treatment was applied within 5 minutes of the malathion treatment at the 0-h time interval.

Data included visual injury (0-100 scale), nodes above white flower (NAWF), nodes above cracked boll (NACB), and yield in the pyrithiobac experiment. In the CGA-362622 experiment, data included visual injury (0-100 scale) and yield. No visual injury was observed at 7, 14, or 28 DAT rating intervals. NAWF, NACB, and yield exhibited no significant difference between treatments. The results of these preliminary studies indicate that there is no detrimental effect of ULV malathion applications made to cotton when pyrithiobac and CGA-362622 have been applied. The reason these results differ from previous research may be due to using an ultra low application volume rather than standard (e.g. 15 GPA) application volumes of malathion, and no tank true tank-mixture. Also, lower injury may be the result of applications being made under warmer field conditions. These data indicate that ULV malathion applications applied at the rates used by the BWEP in Mississippi do not adversely interact with pyrithiobac or CGA-362622 applications.

SECTION XII: RESEARCH POSTERS

PHYSIOLOGICAL AND ANATOMICAL RESPONSES OF GLYPHOSATE-RESISTANT AND CONVENTIONAL COTTON TO GLYPHOSATE. W.A. Pline*, K. Edmisten, J.W. Wilcut, R. Wells. North Carolina State University, Raleigh, NC.

ABSTRACT

Decreased retention of bolls in glyphosate-resistant cotton treated with glyphosate has been reported in both field and greenhouse environments (1). The level of resistance to glyphosate may be less in reproductive tissues than in other portions of the plant, causing premature fruit abscission and drop. Shikimic acid accumulation in response to EPSPS inhibition in glyphosate-sensitive plants is a reliable assay for assessing glyphosate toxicity (2, 3). The level of shikimic acid accumulation in square (floral bud) tissue, fruiting branches, and the square's subtending leaf of glyphosate-resistant (GR) and conventional DP 5415 cotton treated with three rates of glyphosate was measured. Glyphosate was applied to the subtending leaf of a square and allowed to translocate to the fruiting branch and square tissue for 48 hours. Shikimic acid accumulation in samples was then measured via HPLC analysis. Accumulation of shikimic acid increased with increasing rate of glyphosate in conventional cotton in leaf, fruiting branch, and square tissue. Shikimic acid accumulation in GR cotton was evident in fruit tissue. Accumulation in conventional cotton was greatest in leaf tissue with 60,000 μg shikimic acid/g fresh weight at 1.12 kg/ha, followed by fruit tissue with 32,000 μg shikimic acid/g fresh weight, and fruiting branches with 28,000 μg shikimic acid/g fresh weight. At the 1.12 kg/ha glyphosate rate, conventional cotton accumulated 13-fold more shikimic acid than GR cotton in leaves, yet only 2.5-fold more in square tissue, suggesting a reduction of glyphosate tolerance in square tissue versus leaf tissue in GR cotton. Many bolls which are not retained in some glyphosate treated GR cotton varieties dry down, yet remain attached to the plant, with a distinct v-shaped scar at the point of boll attachment to the fruiting branch (termed "cavitation"). Cross sections of the fruiting branch at the dried bolls' point of attachment were stained with phloroglucinol to visualize xylem and lignified tissue. At the tip of the v-shaped scar, furthest from the point of attachment, the necrotic tissue extends only partially through the bark layer. Closer towards the point of attachment, the necrotic tissue extends deeper through the secondary xylem. At the point of attachment, a band through the abscission zone indicates that lignin may be present in cell walls of cells in the abscission zone. If lignin were present in these cells, it may prevent the abscission of a dead boll by keeping cells in the abscission zone bound together. Lignin precursors are synthesized via the phenolpropanoid pathway from aromatic amino acids. The shikimic acid pathway in GR crops is modified by the addition of a glyphosate-resistant CP4-EPSPS enzyme. It is possible that the addition of another EPSPS enzyme in the shikimic acid pathway may influence the flow of metabolites to down-stream products such as lignin. Glyphosate-resistant soybeans have been reported to have a greater lignin content than conventional soybeans (4). Acid soluble and insoluble lignin was quantified in conventional and glyphosate-resistant cotton grown under phytotron conditions at 1 week after first bloom (1 WAFB) and cutout stages. There were no significant differences between conventional, GR, and glyphosate treated GR cotton indicating that the addition of the glyphosate-resistant EPSPS gene does not greatly influence the flow of precursors to form lignin in GR cotton.

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SURVEY OF WEEDS INFESTING MISSISSIPPI SOYBEANS. A. Rankins, Jr., J.D. Byrd, Jr., D.B. Mask, and J.W. Barnett, Jr., Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

During the 2000 soybean (*Glycine max* (L.) Merr.) growing season, a weed survey was conducted throughout the major soybean production areas in Mississippi. This research was initiated to quantify the changes in weed spectrums throughout the state since the last soybean weed surveys in Mississippi were conducted in the 1980's.

One hundred and ninety-two soybean fields across 38 counties in Mississippi were randomly selected throughout the state for this survey. Within each county surveyed, one field was sampled per 10,000 planted acres of soybean in that county. Soybean acreage in each county was based on Mississippi Agricultural Statistics Service estimates. Counties with fewer than 5,000 acres of soybean were not sampled. At each soybean field sampled, a 100-ft^2-sample area was randomly selected and marked with flagging. Trimble® GPS (Global Positioning System) units were used to record the coordinates of each corner of the sample area. This was done to insure that in the future

these exact locations could be sampled again. Within each sample area, weed species present and densities were quantified and recorded. Other data recorded at each sample site were soybean growth stage and row spacing. Each weed species identified in the survey was ranked based on the number of occurrences.

Narrow row and wide row soybean fields comprised 63 and 23% of the total fields sampled, respectively. Fourteen percent of the fields sampled were drilled and broadcast soybean. Sixty-five weed species were identified in the survey and 7 of the 192 points sampled were void of weeds. Statewide the most common weed was prickly sida (*Sida spinosa* L.), which was present in 40% of the fields sampled, followed by pitted morningglory (*Ipomoea lacunosa* L.) (34%), entireleaf morningglory (*Ipomoea hederacea* v. *integriuscula* Gray) (29%), broadleaf signalgrass (*Brachiaria platyphylla* (Griseb.) Nash) (27%), nodding spurge (*Euphorbia nutans* Lag.) and hyssop spurge (*Euphorbia hyssopifolia* L.) (22%), barnyardgrass (*Echinochloa crus-galli* (L.) Beauv.) (18%), yellow nutsedge (*Cyperus esculentus* L.) (17%), hemp sesbania (*Sesbania exaltata* (Raf.) Rydb. ex A. W. Hill) (16%), johnsongrass (*Sorghum halepense* (L.) Pers.) (15%), prostrate spurge (*Euphorbia humistrata* Engelm. ex. Gray) (14%), sicklepod (*Senna obtusifolia* (L.) Irwin and Barnaby) (10%), common cocklebur (*Xanthium strumarium* L.) (9%), trumpetcreeper (*Campsis radicans* (L.) Seem. ex. Bureau) (8%), redvine (*Brunnichia ovata* (Walt.) Shinners) (7%), ivyleaf morningglory (*Ipomoea hederacea* (L.) Jacq.) (7%), carpetweed (*Mollugo verticillata* L.) (7%), large crabgrass (*Digitaria sanguinalis* (L.) Scop.) (7%), purple nutsedge (*Cyperus rotundus* L.) (6%), palmleaf morningglory (*Ipomoea wrightii* Gray) (5%), curly dock (*Rumex crispus* L.) (5%), and cutleaf eveningprimrose (*Oenothera laciniata* Hill) (5%).

In eastern Mississippi, broadleaf signalgrass was the most common species, followed by prickly sida, sicklepod, pitted morningglory, entireleaf morningglory, common cocklebur, and balloonvine (*Cardiospermum halicacabum* L.). However, in the Mississippi Delta prickly sida was the most common, followed by pitted morningglory, nodding and hyssop spurge, entireleaf morningglory, barnyardgrass, broadleaf signalgrass, and hemp sesbania.

Results from these data and previous soybean weed surveys in Mississippi indicate a slight shift in the spectrum composition of the most common weeds infesting soybeans since the early 1980's. Particularly, the occurrence of common cocklebur and johnsongrass has significantly decreased. Statewide common cocklebur and johnsongrass were present in 66 and 65% of fields sampled in 1982, respectively. However, common cocklebur and johnsongrass were present 9 and 15% of fields sampled in 2000, respectively. Also, these data suggests that sicklepod, common cocklebur and balloonvine are more prevalent in eastern Mississippi than in the Delta.

WEED MANAGEMENT WITH DICLOSULAM IN STRIP-TILLAGE PEANUT (*ARACHIS HYPOGAEA*).
A.J. Price, S.C. Troxler, and J.W. Wilcut. North Carolina State University, Raleigh, NC 27695.

ASTRACT

Experiments were conducted at three locations in North Carolina in 1999 and 2000 to evaluate weed management systems in strip-tillage peanut. The peanut cultivars were 'NC 10C' in 1999 and 'NC 12C' in 2000. Peanuts were planted in 91 cm rows into corn (*Zea mays*) stubble in 1999 and into cotton (*Gossypium hirsutum*) and soybean (*Glycine max*) stubble in 2000. Diclosulam was evaluated with standard preemergence (PRE) and postemergence (POST) herbicide systems in a factorial treatment arrangement. The PRE herbicide options were: 1) paraquat at 0.70 kg ai/ha plus dimethenamid at 1.40 kg ai/ha, 2) paraquat at 0.70 kg/ha plus dimethenamid at 1.40 kg/ha plus diclosulam at 0.027 kg ai/ha, or 3) paraquat at 0.70 kg/ha plus diclosulam at 0.027 kg/ha. Postemergence herbicide options were: 1) nothing, 2) acifluorfen at 0.28 kg ai/ha plus bentazon at 0.56 kg/ha, or 3) imazapic at 0.07 kg ai/ha. Nonionic surfactant at 0.25% (v/v) was included in all treatments. The experimental design was a randomized complete block with three replications. All herbicide treatments improved control of the annual grass complex which included broadleaf signalgrass (*Bracharia platyphylla*), goosegrass (*Eleusine indica*), large crabgrass (*Digitaria sanguinalis*), and Texas panicum (*Panicum texanum*). Dimethenamid systems controlled these species better than systems that did not contain dimethenamid. Imazapic POST improved control of the annual grass complex while acifluorfen plus bentazon did not. Clethodim late POST at 0.14 kg ai/ha plus crop oil concentrate at 1% (v/v) was needed for all systems to supplement control of annual grasses. Preemergence treatments that contained diclosulam controlled eclipta (*Eclipta prostrata*), common lambsquarters (*Chenopodium album*), common ragweed (*Ambrosia artemisiifolia*), and velvetleaf (*Abutilon theophrasti*) at least 98% full season. Similar levels of control for *Ipomoea* species and prickly sida (*Sida spinosa*) required EPOST and POST herbicides. Yellow nutsedge (*Cyperus esculentus*) control with diclosulam ranged from 65 to 100%, depending on location, while POST imazapic containing systems controlled yellow nutsedge at least 98%, regardless of PRE herbicide system. Peanut treated with dimethenamid PRE yielded 1,390 to 2,450 kg/ha and these yields were always increased by additional inputs of diclosulam PRE or EPOST plus POST herbicides. Yields from imazapic-treated peanut were higher than acifluorfen plus bentazon treated peanut in two comparisons and equivalent in the other seven comparisons. Dimethenamid PRE treated peanut returned \$-308 to \$329 ha and net returns were increased by additional inputs of diclosulam PRE or EPOST plus POST herbicides. Diclosulam PRE treated peanut returned \$705 to \$1657 ha and was increased by additional inputs of EPOST plus POST herbicides. The highest and most consistent net returns each year were peanut treated with diclosulam followed by EPOST plus POST herbicides.

USE OF REMOTE SENSING TECHNOLOGY FOR ANALYZING COMPETING VEGETATION ON CUTOVER FOREST SITES. B.F. Montgomery, A.W. Ezell, D.R. Shaw, J.D. Byrd, Jr., D.L. Evans, L.M. Bruce, J.R. Cameron, J.W. Barnett, Jr., and F.E. LaMastus, Mississippi State University, Mississippi State, MS.

ABSTRACT

This study includes seven regeneration areas in east central Mississippi. Each area was harvested within a year of its enrollment into the project. The study has been underway for one year and the proceeding year will be used to analyze data collected. Handheld spectrometer (ASD) data was collected and will be analyzed to classify principle species. Multi-spectral and hyper-spectral imagery was collected. The imagery will attempt to classify vegetation on each site in conjunction with ASD spectral data. The vegetation composition on each site was determined by line transect samples. Woody vegetation will be grouped by species; herbaceous broadleaves will be grouped together; and grasses, rushes, and sedges will be grouped together. The information obtained from this study will provide managers with a tool to make management decisions. This tool will provide a more exact account of vegetation composition.

KUDZU ERADICATION & CONVERSION TO NATIVE GRASSES WITH TRANSLINE HERBICIDE ON THE CHEROKEE NAT FOREST - A THREE YEAR CASE STUDY COOPERATIVE PROJECT BETWEEN DAS AND THE USFS. W.N. Kline, Dow AgroSciences, Duluth, GA & S. Brocato, US Forest Service, Cleveland, TN.

ABSTRACT

Historical Background

The USFS Conasauga River Watershed Project in Eastern Tenn & NW Georgia is considered a high priority for the US Forest Service and is high on the Washington, DC agenda. The watershed located in the Cherokee NF has very high public visibility & use, contains unique vegetation types & cultural areas and has many endangered fish & mussel species.

In spring 1998, Dow AgroSciences (DAS) was invited to provide input for a proposed kudzu eradication project, as part of the Conasauga River project. An Agreement between USFS, Univ of TN - Dept of Ecology & DAS was signed in 1998 and the first Transline application was made in Summer 1998. The Kudzu eradication site is an abandoned, 3 acre CCC work camp that is located adjacent to the main Forest Service road that serves the watershed area and is about 150 feet above Sheeds Creek (a primary tributary to the Conasauga). The CCC "patch" was a well established, & nearly complete kudzu (Pueraria lobata - PUELO) monoculture that was estimated at about 40 years old. Prior efforts to manage this area was primarily with winter control burns - which were not effective in eliminating any of the kudzu.

Transline Herbicide Eradication Program

Year One - 1998: Transline Herbicide applications were initiated on July 28, 1998. Broadcast applications of 21 fl oz/acre (1/2 lb clopyralid/ac) in 100 gallons water, were made from a tractor mounted handgun sprayer. Vines were cut from below on very large "tree draped" edge trees. Backpack application crews returned to the site in late Aug 1998, treating skips, escapes and cut/resprouting vines from the large "tree draped" edge trees. Backpacks contained 1 fl oz of Transline per gallon of water. All Transline Herbicide mixtures contained 1/2 % (v/v) non-ionic surfactant in the water carrier.

Year Two - 1999: Because this was a very old patch, kudzu vines from a few remaining large tuberous roots, had generally covered the site by late July 1999 - one full year following the first Transline Herbicide application. As planned in the Program eradication approach - Broadcast Transline Herbicide applications were repeated in late July 1999. Applications were 21 fl oz/acre (1/2 lb clopyralid/ac) in 100 gallons water, from a tractor mounted handgun sprayer. Backpack application crews returned to the site in early Sept 1999, treating only small escapes. Backpacks contained 1 fl oz Transline/gallon of water + surfactant.

Year Three - 2000: By mid-season 2000, very few new vines were present, indicating that most of the root systems were dead. By late August a few (mostly lacking vigor) small vines were present on the site. Again, as planned in the Program eradication approach - Backpack application crews returned to the site in late Aug 2000, treating the few small escapes. "Mop-up" backpack crews will return each year for 2-3 more years in August of each year to spot treat, until these surveys cease to locate any living kudzu vines.

This kudzu eradication project has been a successful part of the USFS Conasauga River Watershed Project. A key reason for the success is the fact that Transline Herbicide contains the active ingredient Clopyralid, is a very narrow spectrum & species specific herbicide compound that is active on only a small group of plant species. Legumes are one of the species that are very sensitive to clopyralid and kudzu is a legume. Because of this selectivity, applications at the USFS Conasauga River kudzu site were made over desirable grasses, shrubs and trees. The

herbicide treatment kills the kudzu and releases desirable species under the “kudzu canopy” or desirable trees that are covered by kudzu encroachment.

Eradication of the kudzu is was a very important part of this project, however, conversion back to native species is the ultimate goal and is the key to the success of this project. During the summer of 2000, the Conasauga River kudzu site was control burned & over-seeded with a mixture of native grasses and wild flowers to speed the process of conversion of this area to native “prairie” site types. Annual “spot treatments” with Transline to kudzu vine escapes will not effect any of the native grasses that are establishing on this site - these will effectively be selective grass release treatments.

Environmental Fate Results

Water samples were collected before (baseline measurement) and 3 times after the 1998 herbicide application (over a 3 month period) from sampling locations directly below the 3 acre kudzu patch (at the outflow); at points above & below where the outflow from the kudzu patch reaches Sheeds Creek; and below where Sheeds Creek enters the Conasauga River. All water samples were sent to an independent testing laboratory - Quality Mgt & Analytical Services in Walhalla, ND. No detectable residues of clopyralid (active ingredient in Transline Herbicide) were detected in any of the water samples.

Environmental Impact Results

As part of the Agreement signed in 1998, Dr. David Etnier (University of Tennessee, Dept of Ecology & Evolutionary Biology, Knoxville, TN) agreed to provide - A Survey of Benthic Macroinvertebrates in the Sheeds Creek Watershed before and after Treatment of Kudzu with Herbicide Transline. Benthic macroinvertebrates were sampled both above and within/below the herbicide treatment area in June 1998, prior to the herbicide application and in late Sept, after the herbicide application. The Sheeds Creek site (experimental control) yielded 86 benthic macroinvertebrate taxa in the June sample and 90 taxa in the September sample. The kudzu patch test site yielded 91 taxa in June and 94 taxa in September.

Conclusions from Dr Etnier’s Report - No noticeable impact on this fauna due to the herbicide treatment….slight differences in total fauna (highest at test site) & EPT taxa (highest at the exp control site) were present before the treatment, and persisted after the treatment. These results conclusively demonstrate a complete lack of herbicidal impacts on the benthic macroinvertebrate community residing in Sheeds Creek.

APPLICATION TIMING RESPONSE OF POST HERBICIDES IN GLYPHOSATE-TOLERANT SOYBEAN. C.L. Brommer, C.H. Slack, and A.T. Lee, Department of Agronomy, University of Kentucky, Lexington, KY 40546.

ABSTRACT

Kentucky soybean weed control was enhanced with the release of glyphosate-tolerant soybean varieties. Glyphosate provides a POST, non-selective weed control treatment. Several different formulations of glyphosate have been made available to producers for use in glyphosate-tolerant soybeans. These products include sulfosate(Touchdown), glyphosate plus imazethapyr (Extreme), and glyphosate (Roundup UltraMax), and glyphosate(Glyphomax). Each of these products should provide similar control of weeds but the different formulations used by each company could lead to different levels of control. Producers have increasing demands placed on their time. This has made it difficult, along with weather problems, to make herbicide applications at the ideal time for weed control. Often, producers will miss their application window and end up treating weeds, which are much larger, then recommendations allow. This study monitored the efficacy of four different POST glyphosate products applied to three weed heights (10, 20,and 30 cm) and to three problem weeds of Kentucky (Common Lambsquarters, Common Cocklebur, and Giant Foxtail.

Control of each weed species was greater than 90%, with no statistical differences among treatments or weed height, 2 WAT. At 4 WAT there were no differences in control for giant foxtail. Common cocklebur control was greater for all 10 cm treatments and 20 cm Glyphomax treatment were greater than Touchdowon or Glyphomax at the 30 cm weed height, 93% versus 86%, respectively. Touchdown applied to 20 cm weeds provided greater control then Touchdown or Extreme applied to 30 cm weeds, 85% versus 74%, respectively. 4 WAT 10 cm treatments had greater control of common lambsquarters then RoundupMax applied at 30 cm, 86% versus 68%, respectively. 8 WAT Extreme at 10 cm had greater control then any application to 30 cm weeds, except for Glyphomax, which was the same as Extreme. Yield was significantly higher for Touchdown and Glyphomax treatments applied to 20 cm weeds then to the Glyphomax treatment applied to 10cm weeds, 6376, 6342 versus 4057 Kg/ha respectively. Other treatments were not significantly different.

FIELD AND GREENHOUSE EVALUATION OF SULFONAMIDE HERBICIDE GRASS ACTIVITY. W.B. Henry, D.R. Shaw, and C.T. Leon, Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

This experiment was designed to determine the efficacy of sulfonamide herbicides on several grass species. Field studies were conducted at the Plant Science Research Center, Starkville, MS (Marietta fine sandy loam), and the Brown Loam Branch Experiment Station, Raymond, MS, (Reidtown silt loam). The greenhouse component was conducted in Starkville with a Marietta silty loam soil. In the greenhouse study, all herbicides were applied PRE on the following grass species: barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.], broadleaf signalgrass [*Brachiaria platyphylla* (Griseb.) Nash], goosegrass [*Eleusine indica* (L.) Gaertn.], johnsongrass [*Sorgum halepense* (L.) Pers.], large crabgrass [*Digitaria sanguinalis* (L.) Scop.], and red rice (*Oryza sativa* L.). The full rates of the herbicide treatments included 70 g ai/ha flumetsulam, 26 g ai/ha diclosulam, 44 g ai/ha cloransulam-methyl, 35 g ai/ha cloransulam-methyl + 5 g ai/ha flumetsulam, and 140 g ai/ha imazaquin as a comparison treatment. Sulfonamide herbicides were also examined at 1/2X rates. In the field studies, a reduced rate of cloransulam-methyl, 18 g ai/ha, was tank-mixed with glyphosate and applied POST on large crabgrass and johnsongrass.

In the greenhouse, the sulfonamide treatments generally exhibited grass control equal to, and at times greater than, imazaquin. At 5 weeks after planting, large crabgrass, barnyardgrass, and johnsongrass were all controlled at least 66% by treatments containing cloransulam-methyl or cloransulam-methyl + flumetsulam. Increasing the rate of sulfonamide from a half rate to a full rate provided, on average, approximately 12% greater control of grass species. In one of the field studies, cloransulam-methyl + glyphosate applied POST provided extended control of johnsongrass to 92% at 8 weeks after application. Glyphosate alone controlled only 74%. In another field study, large crabgrass was controlled at both 3 and 8 weeks after application, approximately 32% better by tankmixtures containing cloransulam-methyl + glyphosate than by a single appliation of glyphosate. At 8 weeks after application, cloransulam-methyl tank-mixed with glyphosate controlled large crabgrass approximately 72%. At 8 weeks after application, fomesafen + glyphosate or imazaquin + glyphosate controlled large crabgrass only 50%.

Sulfonamide herbicides applied PRE offered limited grass activity in addition to broadleaf activity. Cloransulam-methyl tank-mixed with glyphosate also extended the control of johnsongrass and large crabgrass. These data suggest that application of sulfonamide herbicides may expand the application window for early-season control of grasses.

PREEMERGENCE WEED CONTROL WITH VALOR IN SOYBEAN. D.K. Miller, P.R. Vidrine, J.L. Griffin, D.R. Lee, and A.L. Perritt, Louisiana State University Agricultural Center, Baton Rouge, LA 70803.

ABSTRACT

In 2000, field studies were conducted at the Northeast Research Station in St. Joseph, LA on a silty clay loam soil, pH 6.1. PRE treatments in the first study included Valor (flumioxazin) at 3 oz/A (0.094 lb ai/A) in combination with Classic (chlorimuron) at 3 oz/A (0.047 lb ai/A) or 1.9 oz/A (0.03 lb ai/A), Valor at 1.5 oz/A (0.047 lb ai/A) in combination with Firstrate (cloransulam-methyl) at 0.6 oz/A (0.031 lb ai/A), Canopy (metribuzin plus chlorimuron) at 6.0 oz/A (0.28 lb ai/A), and Canopy XL (sulfentrazone plus chlorimuron) at 6.8 oz/A (0.24 lb ai/A). All treatments were followed with an EPOST application of Roundup Ultra (glyphosate) at 2 pt/A (1.0 lb ai/A). A nontreated check was included for comparison. The second study included PRE applications of Valor at 3 oz/A, Classic at 3 oz/A, and Firstrate at 0.6 oz/A followed by EPOST application of Roundup Ultra at 2 pt/A. Additional treatments included the following total POST programs: S-3153 at 0.5 oz/A (0.018 lb ai/A), Resource (flumiclorac) at 4 oz/A (0.027 lb ai/A), or Cobra (lactofen) at 6 oz/A (0.094 lb ai/A) in combination with Roundup Ultra at 2 pt/A plus AMS at 2.5 lb/A, Cobra at 8 oz/A (0.125 lb ai/A) in combination with Classic at 0.5 oz/A (0.008 lb ai/A) or Firstrate at 0.3 oz/A (0.016 lb ai/A) plus Python (flumetsulam) at 0.12 oz/A (0.006 lb ai/A), and a sequential treatment of Roundup Ultra at 2 followed by 1 pt/A. A nontreated check was included for comparison. Asgrow 5901 RR soybean was planted on May 9 after which PRE herbicides were applied. EPOST application in the first study was applied June 2. In the second study, EPOST treatments were applied on May 29 to plots receiving no PRE treatment and June 2 where PRE treatments were applied. Experimental design was a randomized complete block with four replications. Herbicide treatments were applied broadcast at 15 GPA to all rows of each 13.33' x 25', four row plot. Weed control and crop injury were visually rated early and mid-season and yield was determined by harvesting the center two rows of each plot.

In the first study, all treatments resulted in 90 to 94, 93 to 95, 76 to 85, 84 to 91, 91 to 94, and 95 % early season control of barnyardgrass (*Echinochloa crus-galli*), johnsongrass (*Sorghum halepense*), hemp sesbania (*Sesbania exaltata*), sicklepod (*Senna obtusifolia*), pitted morningglory (*Ipomoea lacunosa*), and entireleaf morningglory (*Ipomoea hederacea*), respectively. Valor/Classic combinations resulted in 8 and 14% visual injury, which was greater than all other treatments (<4%). Mid-season, herbicide programs provided 86 to 93, 89 to 95, 74 to 83, 80 to 90, 94 to 95, and 95% control, respectively, of the above listed weeds. Soybean injury was not evident at this later rating. Valor in combination with Firstrate PRE followed by Roundup Ultra EPOST resulted in a yield of 21 bu/A,

which was equal to all treatments except Valor in combination with Classic at the lowest rate (12 bu/A) and the nontreated check (10 bu/A).

In the second study, Valor PRE provided 94, 95, 89, 91, 89, and 85% early season control of pitted and entireleaf morningglory, johnsongrass, barnyardgrass, hemp sesbania, and sicklepod, respectively, which was greater than or equal to control with Classic or Firstrate. Valor did however, result in 15% visual injury compared to no injury for other PRE herbicides. At mid-season, programs including PRE herbicides resulted in 90 to 91, 95, 95, 84 to 91, 75 to 86, and 81 to 84% control of pitted and entireleaf morningglory, johnsongrass, barnyardgrass, hemp sesbania, and sicklepod, respectively. With the exception of hemp sesbania, the sequential Roundup Ultra program provided equal weed control to the Valor PRE program. Early season soybean injury was not evident mid-season. Severe drought mid to late season resulted in poor soybean yield. Valor PRE followed by Roundup Ultra EPOST resulted in a soybean yield of 11 bu/A, which was greater than all other treatments (1 to 7 bu/A).

In conclusion, Valor PRE can provide effective early season weed control. Early visual injury was observed in these studies, however symptoms were not evident by mid-season and were not manifested in reduced soybean yield.

EVALUATION OF HARVADE FOR POSTEMERGENCE DIRECTED WEED CONTROL IN COTTON.
D.R. Lee, D.K. Miller, P.R. Vidrine, and A.L. Perritt, Louisiana State University Agricultural Center, Baton Rouge, LA 70803.

ABSTRACT

Research was conducted in 2000 at the Northeast Research Station in St. Joseph, LA to evaluate Harvade (dimethipin) postemergence directed (PD) in Roundup Ready and conventional weed control programs in cotton. Experimental design was a randomized complete block with four replications. Herbicide treatments consisted of PD application of Harvade at 10 oz/A (0.39 lb ai/A) or 6 oz/A (0.23 lb ai/A) in combination with either Roundup Ultra (glyphosate) at 2 pt/A (1 lb ai/A) or 1.5 pt/A (0.75 lb ai/A) plus crop oil concentrate at 1 pt/A or MSMA at 2.4 pt/A (2 lb ai/A) plus crop oil concentrate at 1 pt/A. Additional treatments included Harvade at 6 oz/A in combination with Roundup Ultra at 2 pt/A without crop oil concentrate and Roundup Ultra alone at 2 pt/A. PD application was 44 days after planting to 8 to 10 inch cotton and 2 to 5 inch weeds. DP 5415 Roundup Ready cotton was planted on April 26. Herbicide treatments were applied broadcast with a layby sprayer at 15 GPA to all rows of each 13.33' x 40', four row plot. Weed control was visually rated 14 and 28 days after PD application (DAT). Cotton yield was determined by harvesting the center two rows of each plot.

At 14 DAT, Roundup Ultra alone at 2 pt/A resulted in 91% control of barnyardgrass (*Echinochloa crus-galli*), which was equal to control with Harvade in combination with Roundup Ultra at 2 pt/A (84 to 89%), and greater than control with Harvade plus Roundup Ultra at 1.5 pt/A (75 and 83%) or MSMA (28 and 67%). Smooth pigweed (*Amaranthus hybridus*), pitted morningglory (*Ipomoea lacunosa*) and entireleaf morningglory (*Ipomoea hederacea*) control was at least 88, 90, and 94%, respectively, and equal for all treatments. Hemp sesbania (*Sesbania exaltata*) control was equal for all Harvade/Roundup Ultra combinations (83 to 88%) and Roundup Ultra alone (85%). Harvade/MSMA combinations resulted in no greater than 75% hemp sesbania control. Sicklepod (*Senna obtusifolia*) control ranged from 90 to 95% for all treatments.

At 28 DAT, barnyardgrass control was equal for all Harvade/Roundup Ultra combinations and Roundup Ultra alone ranging from 79 to 88%. Harvade/MSMA combinations provided no greater than 41% control. Smooth pigweed was controlled equally by all treatments (80 to 93%). With the exception of Harvade at the 6 oz/A rate in combination with MSMA, all treatments provided equal control of sicklepod (89 to 95%), pitted morningglory (88 to 95%), and entireleaf morningglory (88 to 95%). The low rate of Harvade in combination with MSMA provided 81, 71, and 71% control of these respective weeds. All Harvade/Roundup Ultra combinations and Roundup Ultra alone provided similar control of hemp sesbania ranging from 71 to 83%. Harvade/MSMA combinations resulted in no greater than 51% control.

Equivalent seedcotton yield ranging from 2771 to 3334 lb/A was observed for all Harvade/Roundup Ultra combinations and Roundup Ultra alone. Harvade/MSMA combinations resulted in yields of 2175 and 2371 lb/A, which was equal to the nontreated check (1865 lb/A).

In conclusion, yield was maximized with Harvade/Roundup Ultra versus Harvade/MSMA combinations due to greater control of hemp sesbania and barnyardgrass. Harvade at 6 oz/A in combination with Roundup Ultra at 1.5 pt/A resulted in equivalent weed control and yield to that observed for higher rate combinations of Harvade and Roundup Ultra and Roundup Ultra alone at 2 pt/A.

SMARTWEED INTERFERENCE AND SEED-RAIN DYNAMICS IN COTTON. S.D. Askew, W.E. Thomas, and J.W. Wilcut, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

Smartweed species comprise a major weed complex prevalent in cotton (*Gossypium hirsutum*) on the mid-Atlantic Coastal Plain. Some of the more common species include Pennsylvania smartweed (*Polygonum pensylvanicum*), pale smartweed (*P. lapathifolium*), and ladysthumb (*P. persicaria*). Newly marketed postemergence herbicides allow growers to utilize economic thresholds for smartweed management in cotton. Weed seed is a concern among growers and other agricultural personnel. Smartweed are not as wide spread as many other weed species and economic threshold management may contribute to proliferation and spread to new areas. No studies have evaluated interference relationships or seed-rain dynamics of these three smartweed species in cotton. Therefore, studies were conducted to evaluate the competitiveness of these three smartweed species and determine seed rain production when plants are grown at several densities in cotton.

Separate studies (RCBD, 3 replications) were conducted for each smartweed species at Clayton, NC in 1998, 1999, and 2000. Data were only collected in 1998 and 2000 because smartweed were lost to drought in 1999. Each species was planted 10 cm from the cotton row at 0, 0.1, 0.2, 0.4, 0.9, 1.7, and 3.5 plants m^{-1} crop row. An additional treatment had no cotton and one smartweed plant 9.1 m^{-1} of row to simulate a non-competitive environment. Undesirable weeds were removed throughout the season. Height of four cotton and weed plants $plot^{-1}$ were determined bi-weekly throughout the season. Just before cotton harvest, all seed remaining on four plants in each plot were hand harvested. All weeds were then carefully removed and fresh and dry weights of four weeds $plot^{-1}$ were obtained. To account for seed fallen prior to harvest, seed on the ground were counted within four randomly placed 80-cm^2 rings in each plot. Cotton was then harvested and lint yield determined. Bi-weekly height data were fit to the Gompertz growth equation by plot and estimated parameters and year effects were evaluated by multivariate analysis of variance (Proc MANOVA) in SAS statistical software. Orthogonal polynomial contrasts were used to completely partition sums of squares for comparison of the no-competition control to the seven density treatments in cotton for the dependent variables dry biomass $plant^{-1}$ and seed production $plant^{-1}$. For other dependent variables, ANOVA was conducted with sums of squares partitioned to test for linear and nonlinear effects of weed density and year effects. Regression analysis (linear or nonlinear depending on ANOVA) was used for the seven densities in cotton and trends with significant correlation coefficients were interpreted.

Smartweed did not influence trends in cotton growth at any density. Cotton gained a height advantage early in the season and was taller than smartweed until 9 weeks after planting. Generally, from 9 to 14 weeks after planting, smartweed plants tripled in height during the transition from vegetative to reproductive growth stages. Pale smartweed a maximum height of 185 cm from pale smartweed. Density-dependent effects also were not significant for smartweed dry biomass when plants were grown with cotton. Contrast comparison between plants grown without competition and the average biomass $plant^{-1}$ when grown with cotton were significant ($P<0.0001$). Above-ground biomass of ladysthumb, pale smartweed, and Pennsylvania smartweed was 2690, 1850, and 2035 g $plant^{-1}$, respectively when grown alone and 475, 300, and 280 g $plant^{-1}$ when grown with cotton at densities between 0.1 and 3.5 plants m^{-1} crop row. The relationship between weed biomass m^{-1} crop row and cotton lint yield ha^{-1} was linear and indicated lint yield reductions of 720, 870, and 1110 kg ha^{-1} with each kg m^{-1} increase in above ground dry biomass of ladysthumb, pale smartweed, and Pennsylvania smartweed, respectively. The hyperbolic function ($Y=IX/(1+(IX/100))$), with asymptote constrained to 100%, explained the relationship between smartweed density and percent yield loss. The order of competitiveness between species from least to most competitive was indicated by estimated values of *I,* which were 23, 26, and 46 for ladysthumb, pale smartweed, and Pennsylvania smartweed, respectively. An economic threshold for application of bromoxynil ($35.00 ha^{-1} for chemical plus application) would be 1 plant in every 29, 18, and 15 m of crop row for ladysthumb, pale smartweed, and Pennsylvania smartweed, respectively. Results indicate that these three smartweed species are less competitive than common cocklebur (*Xanthium strumarium*), jimsonweed (*Datura stramonium*), and velvetleaf (*Abutilon theophrasti*); equivalent to tropic croton (*Croton glandulosus*); and more competitive than prickly sida (*Sida spinosa*). Smartweed seed production was explained by the rectangular hyperbola equation. At the aforementioned economic threshold plant densities, seed production would be 53, 12, and 38 million seed ha^{-1} from ladysthumb, pale smartweed, and Pennsylvania smartweed, respectively. Pennsylvania smartweed reached anthesis and full bloom earlier than the other two species and thus more Pennsylvania smartweed seed had matured and fallen at cotton harvest. Growth trends indicate that these smartweed species grow slowly early in the season but attain considerable biomass due to rapid late-season growth. This growth habit may explain lack of smartweed competitiveness compared to other broadleaf weeds of cotton which grow rapidly early in the season. Seed production indicates that even at 1% germination in the subsequent season, smartweed would exist at a minimum of 50 plants m^{-2} following seed rain of an economic-threshold plant population. Thus, economic-threshold management in cotton would result in continual replenishment of smartweed seed.

WEED CONTROL AND COTTON TOLERANCE WITH TANKMIX APPLICATIONS OF ROUNDUP ULTRA AND COMMAND. A.L. Perritt, D.K. Miller, P.R. Vidrine, and D.R. Lee, Louisiana State University Agricultural Center, Baton Rouge, LA 70803.

ABSTRACT

Research was conducted in 2000 at the Northeast Research Station in St. Joseph, LA on a silt loam soil, pH 6.8, to evaluate weed control and cotton tolerance to tankmix postemergence directed (PD) applications of Roundup Ultra (glyphosate) and Command (clomazone). Experimental design was a randomized complete block with a factorial arrangement of herbicide program and application timing replicated four times. Herbicide treatments consisted of Roundup Ultra at 1.5 pt/A (0.75 lb ai/A) applied alone or in combination with Command at 2 pt/A (0.75 lb ai/A) or 2.67 pt/A (1.0 lb ai/A). Treatments were applied to DP 5415 Roundup Ready cotton at the 4 to 6 or 8 to 10 node growth stage. Weed size ranged from 2 to 4 inches and 4 to 6 inches for the respective timings. Herbicide treatments were applied broadcast with a layby sprayer at 15 GPA to all rows of each 13.33' x 40', four row plot. Weed control and crop injury were visually rated 15 and 45 days after application (DAT). Cotton yield was determined by harvesting the center two rows of each plot.

For the 15 DAT rating, a significant herbicide by application timing interaction was noted for all evaluations. Command at 2.67 pt/A in combination with Roundup Ultra resulted in 18% bleaching at the 4 node application, which was greater than the 11% for the same treatment at the 8 node timing. Command at 2 pt/A resulted in no greater than 5% bleaching at either application timing. Smooth pigweed (*Amaranthus hybridus*), pitted morningglory (*Ipomoea lacunosa*), entireleaf morningglory (*Ipomoea hederacea*), broadleaf signalgrass (*Bracharia platyphylla*), and hemp sesbania (*Sesbania exaltata*) control was equal with either Command/Roundup Ultra combination and significantly greater for both rates applied at the 4 compared to the 8 node stage. Control was at least 95, 89, 94, 95, and 89% for these respective weeds with Command/Roundup Ultra combinations applied at the 4 node timing. Control was no greater than 51% for any weed for these combinations applied at the 8 node timing. Roundup Ultra alone at 1.5 pt/A provided equivalent control of at least 86% for all weeds regardless of application timing.

At 45 DAT, a significant herbicide by application timing interaction was noted only for broadleaf signalgrass and smooth pigweed control. Broadleaf signalgrass was controlled equally at the 4 node stage with Command applied at 2 pt/A (95%) or 2.67 pt/A (94%) in combination with Roundup Ultra. Control with these rates at the 8 node timing was no greater than 55%. Roundup Ultra alone provided equal control of at least 89% regardless of application timing. Smooth pigweed was controlled 91 and 95% with Command at 2.0 or 2.67 pt/A, respectively, in combination with Roundup Ultra at the 4 node timing. Control at the 8 node timing for these respective rates was 80 and 62%. Roundup Ultra alone controlled smooth pigweed at least 85% at both timings. Averaged across herbicides, barnyardgrass control was greatest at the 4 node application timing (89 vs. 73%). Averaged across application timings, Command/Roundup Ultra combinations resulted in 87 and 91% control, which was greater than Roundup Ultra alone (73%). Averaged across herbicides, greatest control of pitted morningglory occurred at the 4 node application timing (93% vs. 86%). Averaged across application timings, all herbicides resulted in equal control ranging from 88 to 91%. Hemp sesbania was controlled 82 to 88% and equally across all herbicides and timings. Averaged across herbicides, entireleaf morningglory control was greatest at the 4 node timing (88 vs. 93%). Averaged across timings, control was equal for all herbicides (88 to 91%).

Averaged across herbicides, seedcotton yield was maximized with herbicide application at the 4 node timing (2653 vs. 2123 lb/A). Averaged across application timings, all herbicides resulted in equivalent yield ranging from 2255 to 2605 lb/A.

In conclusion, Command applied PD at 2.67 pt/A resulted in 18 and 11% bleaching 15 DAT at the 4 and 8 node application timings, respectively. Bleaching was not evident at the 45DAT rating and was not manifested in reduced yield. Weed control was generally greater and yield was maximized with herbicide application at the 4 node timing. At the 15 DAT rating, weed control was reduced at the 8 node timing with Command/Roundup Ultra tank mixes compared to Roundup Ultra applied alone, indicating possible antagonism when applied to larger weeds possibly necessitating a higher Roundup Ultra rate for adequate control.

COMPARING RATE RANGES OF OUSTAR HERBICIDE WITH INDUSTRY STANDARDS. J.A. Earl* and R.A. Williams, Arkansas Agricultural Experiment Station and School of Forest Resources, University of Arkansas at Monticello, 71656.

ABSTRACT

First-year loblolly pine seedlings planted in an old field were treated in April with four rate ranges of the new product Oustar, as well as two industry standard rates of Oust plus either Velpar or Arsenal AC. Survival, height, and groundline diameter were measured both before treatment and at the end of the first growing season. Every 30 days (until 120 days after treatment), random locations were evaluated for percent bare ground and brownout. Around July 1, herbaceous vegetation was clipped to identify major competitors and to give some idea of the amount

of biomass produced. Overall survival at the end of year one was 74 percent, and there were no statistical differences among treatments. Heights and diameters showed significant differences, and the best overall growth performance for both was found in the 10 oz, 13 oz, and 19 oz Oustar treatments. All treatments showed the same efficacy after 30 days, but between 60 and 90 days the higher rates of Oustar were the most effective in controlling herbaceous competition.

INTRODUCTION

The use of herbicides to enhance the establishment of young pine plantations is a fairly common practice for southern pines. Typically, applications are made early in the growing season for the first couple of years, and allow the pines to outgrow their herbaceous competition. Many studies have shown that the young seedlings exhibit improved growth and survival over untreated trees (1, 2, 3).

Oustar is a new product from DuPont that combines Velpar and Oust in the form of a dispersible granule. There are two modes of action to inhibit growth and photosynthesis of susceptible plants: 1) direct contact with the foliage, or 2) uptake through roots. Best results are expected after emergence of weeds, but before root systems are fully developed. Control can be expected to last from late spring to mid-summer. For treatment during the first growing season, the recommended rate is between 12 and 16 ounces per treated acre (4).

In this study, we wanted to test four different rate ranges of the new Oustar herbicide and compare those with two industry standard rates using Oust plus either Velpar or Arsenal. With the study site being an old agricultural field, there might be some concern that the Oust could injure pine seedlings because the pH old field might be higher than in a forest soil. Another potential problem could be the build up of agricultural herbicides after years of crop rotations, but a previous study found no such effects (5).

MATERIALS AND METHODS

The selected study area is a 17-acre tract in western St. Francis county, Arkansas. Soils are a Loring silt loam and are moderately well drained with a fragipan at a depth of 24 to 30 inches (6). Prior history of the site shows that before the early 1960's, the land was either in pasture or cotton. From that point to 1999, the tract was in either fescue (*Festuca* spp.) or soybeans. Improved loblolly pine (*Pinus taeda* L.) seedlings were machine-planted in the winter of 1999-2000 on an approximate spacing of 10' x 10'. 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 seven treatments, meaning that 28 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. Ideally, we would have kept all the plots together, but there was not enough space. The south end of the tract has 22 plots, while the remaining six are on the north side, and in between is a shallow drainage that was avoided. Treatments were randomly assigned to all 28 plots, meaning the experiment is a Completely Randomized Design (CRD) with 7 treatments and 4 replications.

Seven herbicide treatments were selected for comparison. There were four rates of Oustar using 10, 13, 16, and 19 ounces a.i./ac, respectively. The two industry standards were 2 oz Oust + 32 oz Velpar *and* 2 oz Oust + 4 oz Arsenal AC. 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 in a 5-foot band using a twin-nozzle spray boom attached to a four wheeler in mid-April of 2000. Ideally, this timing would have been pre-emergent, but most herbaceous vegetation was already growing.

Heights (cm) and groundline diameters (mm) were measured before treatment and after the first growing season. Initial measurements were evaluated using the Shapiro-Wilkes test to make sure the data were normal before analysis. The incremental growth was analyzed with Proc GLM (7) as a Completely Randomized Design (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 28 plots were tallied for survival, both before treatments were applied and at the end of the 1st growing season. 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 120 DAT, and then again at the end of the 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. Percent bare ground data was taken into SAS and analyzed as a CRD. Means were separated using Tukey's Studentized Range test at an alpha level of 0.05. Around July 1st, 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

Height and diameter growth

A stunting effect was observed early in the growing season for herbicide-treated plots. Terminal buds were slow to begin their flush when compared to the untreated control. Severe drought conditions in mid-summer also reduced both height and diameter growth for the pines. The greatest average height growth was 33 cm (13 in) for the 10 oz Oustar treatment, which was significantly greater than any other treatment. The poorest height growth was the Oust + Arsenal treatment at 23.8 cm (9.5 in); however, two of the four plots for this treatment suffered high mortality (> 75%) and so the sample size was smaller than most. While the untreated control performed comparatively well in height growth, it was clearly the worst performer in groundline diameter growth (Table 1). The greatest diameter growth was 3.1 mm, but the control only grew half that much. The best diameter growth occurred in 13 oz Oustar, 19 oz Oustar, and the Oust + Arsenal treatments. The best overall performance for height and diameter growth combined were found in the 10 oz, 13 oz and 19 oz Oustar treatments.

Survival

Survival at the time of application was excellent at ninety-eight percent. By the end of the first growing season, however, the drought of 2000 had taken its toll and the measurement trees were surviving at a rate of only seventy-five percent. It was peculiar that two-thirds of the plots survived very well, but 5 of the 28 plots had mortality rates from sixty to ninety-two percent. Table 1 shows that regardless of survival rates, there were no significant differences among treatments using Duncan's multiple range test at an alpha level of 0.05. Three of the Oustar treatments survived the best, ranging from eighty to ninety-four percent.

Herbicide efficacy

There were no differences among treatments for bare ground percentages at 30 DAT (Table 2). However at 60 DAT, differences were beginning to show as the vegetation that was browned out at 30 DAT started to die. The most effective treatments during this time were the higher rates of Oustar and the Oust + Arsenal mixture. After 90 DAT, other late-season vegetation began to creep back in, but two of the Oustar treatments were still providing excellent control. By 120 DAT and later, there were once again no differences in treatments except for the untreated control. Most herbaceous competition was effectively treated in the early growing season. Some of the vines such as peppervine (*Ampelopsis arborea* L. Koehne) were resistant to herbicide.

Herbaceous competition

Major herbaceous competitors include horseweed (*Conyza canadensis* L. Cronq.), fleabane (*Erigeron strigosus* Muhl. ex Willd, wooly croton (*Croton capitatus* Michx.), broomsedge (*Andropogon virginicus* L.), panic grass (*Panicum* sp.), and flatsedge (*Cyperus odoratus* L.). Wooly croton was not present early, but was very dominant starting 60 DAT. The sampled control plots gave an estimate of 1.08 tons/ac (2437.3 kg/ha) based on oven dry weights of the clipped biomass.

CONCLUSIONS

Overall, the treated plots had better height and diameter growth over the untreated check. Within the herbicide treatments, three of the four Oustar treatments (16 oz Oustar being the exception) performed equally as well or better than the two industry standards. Stunting of growth was noticed early in the growing season for the herbicide treatments, possibly due to the use of Oust on a basic soil. Survival was not statistically different on any of the six treatments or control. The Oustar rates (particularly the higher ones) seem to do a better job of brownout through about 90 DAT. The drought conditions that occurred from July to November most likely have influenced the results of this investigation, and for that reason we await the results from the second growing season.

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Table 1. Comparison of height growth (cm), groundline diameter growth (mm), and survival (%) after one growing season

	1st Seasons Growth[1]		Survival[1]	
Treatment[2]	Ht	GLD	Init	Year 1
1. 10 oz Oustar	33.4 a	2.7 ab	100.0 a	94.0 a
2. 13 oz Oustar	27.8 bc	2.9 a	97.0 a	80.0 a
3. 16 oz Oustar	25.3 cd	2.3 c	95.0 a	72.0 a
4. 19 oz Oustar	29.7 b	3.1 a	98.0 a	90.0 a
5. 2 oz Oust + 32 oz Velpar	26.8 bcd	2.5 bc	99.0 a	62.0 a
6. 2 oz Oust + 4 oz Arsenal AC	23.8 d	3.1 a	99.0 a	45.0 a
7. Untreated control	26.6 bcd	1.5 d	99.0 a	77.0 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

Table 2. Bare ground (%) comparison throughout the first growing season

	Days After Treatment[1]				
Treatment[2]	30	60	90	120	270
1. 10 oz Oustar	35 a	73 b	46 bc	63 a	95 a
2. 13 oz Oustar	48 a	98 a	83 a	78 a	96 a
3. 16 oz Oustar	25 a	91 a	33 cd	70 a	98 a
4. 19 oz Oustar	45 a	93 a	94 a	71 a	90 a
5. 2 oz Oust + 32 oz Velpar	31 a	71 b	40 bc	69 a	83 a
6. 2 oz Oust + 4 oz Arsenal AC	36 a	89 a	66 ab	60 a	80 ab
7. Untreated control	24 a	23 c	6 d	51 b	65 b

[1]Survival means within a column sharing the same letter are not significantly different (Tukey's Studentized Range Test, p=0.05)

[2]Product per acre

INTEGRATING IMIDAZOLINONE-TOLERANT RICE IN LOUISIANA PRODUCTION PRACTICES.
R.J. Levy, Jr., E.P. Webster, and S.D. Linscombe, Louisiana State University AgCenter, Baton Rouge, LA.

ABSTRACT

A study was established in 2000 at the Rice Research Station near Crowley, Louisiana to evaluate weed control, crop response, and yield of Clearfield Rice (*Oryza sativa* L.) 'CF-2431' to imazethapyr applications under different cultural practices. The experimental design was 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. Imazethapyr was applied at 0.063 lb ai/A or 0.094 lb/A on the soil surface prior to planting followed by 0.063 lb/A imazethapyr postemergence (POST) on 4 to 5 leaf rice. Rice injury and weed control were visually evaluated at 7, 14, 21, and 35 days after postemergence treatment (DAT). Only the 14 DAT results are presented. Weeds evaluated included barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.], Amazon sprangletop [*Leptochola panicoides* (Presl) Hitchc.], and Indian jointvetch (*Aeschynomene indica* L.).

At 14 DAT, barnyardgrass control was above 95% regardless of seeding method, tillage system, or herbicide treatment. Amazon sprangletop control was 81 to 90% for all treatments. Amazon sprangletop control was reduced in a drill-seeded conventional-tillage system regardless of herbicide program. Indian jointvetch control was only 39 to 50% regardless of seeding method, tillage system, or herbicide treatment. No injury was observed at 14 DAT.

Rice rough grain yield was above 4500 kg/ha in a minimum-tillage water-seeded production system regardless of herbicide treatment. Overall, rice yields were low due to the application of low rates of nitrogen. There was no lodging in any of the minimum tillage treatments; however, the nontreated conventional tillage treatments were prostrate due to heavy weed pressure and were unable to be mechanically harvested.

In conclusion, imazethapyr has excellent potential for controlling a broad-spectrum of weeds under different production systems. This research indicates that an imidazolinone-tolerant rice production system can be implemented in a variety of production systems allowing producers the flexibility to choose the appropriate system for the conditions that exist at planting.

EVALUATION OF SITE-SPECIFIC WEED MANAGEMENT USING HADSS. F.E. LaMastus, D.R. Shaw, and W.B. Henry, Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

A major concern of producers has always been how to reduce the amount of inputs required for crop production while maintaining or improving yields. One area of research addressing this issue is site-specific management. The objective of this research was to evaluate the possibility of using site-specific herbicide applications to reduce overall production costs when weed populations of the entire field are known. Weed populations of three soybean fields (East Field, South Field, North Field), located at the Black Belt Branch Experiment Station, Brooksville, MS, were estimated in 1998 and 1999. Preemergence applications of 85 g ai/ha flumetsulam + 3.1 kg ai/ha metolachlor in 1998 and 85 g ai/ha flumetsulam + 698 g ai/ha pendimethalin in 1999 were applied to reduce overall weed infestations. Sampling occurred July 8 – 9, 1998 (8 weeks after planting), and June 30 – July 1, 1999 (6 WAP). An established 10-m x 10-m UTM grid coordinate system was used to divide the fields into 100-m^2 cells, with the sample point being located in the center of each cell. Weed populations were estimated by recording the number of weeds present in a 0.58-m^2 quadrate at each node. Estimates were determined for the eight most abundant weed species in each field. Optimal herbicide recommendations were obtained for each sample location within each field by subjecting the weed information to the Herbicide Application Decision Support System (HADSS). A $0.22/kg selling price for soybean and a weed free yield of 2350 kg/ha were used in HADSS. An average of the weed populations for the entire field was also subjected to HADSS to obtain an optimal recommendation for a broadcast application for comparison purposes.

Data from 1998 resulted in 45% of the area not requiring herbicide treatment for the South Fields and the North Field when compared to the whole-field recommendations to receive broadcast treatments. However, the East Field received a "no treatment" recommendation for the whole-field analysis. This was attributed to the sicklepod population exceeding a level deemed economically controllable by HADSS. However, when site-specific recommendations were generated, only 20% of the field received this recommendation, while 80% resulted in a herbicide application as the optimal choice. In 1999, glyphosate-resistant transgenic soybean was used, thereby increasing the POST herbicide treatment options available in HADSS. Herbicide treatment recommendations resulted in 97, 80, and 58% of the total area requiring herbicide treatments for B-E, B-S, and B-N, respectively.

Comparison of yield loss per hectare after herbicide treatment in 1998 ranged from 130 to 1106 kg/ha for site-specific applications and from 111 to 1348 kg/ha for broadcast applications. In 1999 site-specific yield loss ranged from 87 to 668 kg/ha and from 111 to 432 kg/ha for broadcast applications. However, these values can be deceiving, since whole-field yield loss estimates assume a uniform distribution across the fields. This was not the case, and a true estimate of the yield loss was not determined for those areas receiving a recommendation other than

that of the whole-field recommendation. A better estimate of the value of site-specific management can be developed by comparing the projected net returns for each field. In 1998, data from the East Field resulted in an estimated $78.81 net return/ha, but due to the "no herbicide application" recommendation a projected net return was not returned from the software for the broadcast application. North Field data results estimated $184.39/ha increase in net returns with site-specific applications over broadcast applications and a $67.86/ha increase in net returns with site-specific management in the South Field. Net returns for 1999 resulted in $180.65/ha increase in net returns over the broadcast applications for the North Field. The South and East Fields data resulted in a $50.62 and $13.53/ha net increase for the broadcast application over the site-specific. However, net returns for the broadcast applications may not always accurately reflect the full impact of site-specific management, since there are areas of the field where the broadcast application recommendation was not the same as the site-specific recommendation and therefore possibly over estimated net returns. The expenses of site-specific management such as sampling and technology costs are not included in the net returns calculations and, when included, would reduce the difference between site-specific management and conventional methods. This research has demonstrated the potential value of site-specific weed management from an economic standpoint; environmental benefits through reductions in herbicide applications are also apparent.

BROADLEAF WEED MANAGEMENT DEMONSTRATIONS IN TENNESSEE PASTURES. G.K. Breeden and G.N. Rhodes, Jr., University of Tennessee.

ABSTRACT

Pastures and hay crops are essential, highly valuable resources for beef cattle and dairy operations in the Midsouth. In Tennessee, hay production alone is valued at $195 million. Some of the more easily controlled weeds in Tennessee pastures include buttercups (*Ranunculus spp.*), cocklebur (*Xanthium strumarium*), pigweeds (*Amaranthus spp.*) and musk thistle (*Carduus nutans*). Recently, more difficult to control perennials such as buckhorn plantain (*Plantago lanceolata*) and horsenettle (*Solanum carolinense*) have become more prevalent. Management of all of the previous weeds and others is complicated by lack of management intensity, expense of herbicides, damage to pasture legumes, and proximity of sensitive crops such as cotton, tobacco, and tomatoes and other vegetables. Research and educational efforts with the objectives of improving the efficiency of weed management in Tennessee pastures and hay fields have increased in recent years.

Field research was initiated at Sale Creek, TN in 1999-2000 and at Alcoa and Madisonville, TN in 2000 on natural infestations of horsenettle and buckhorn plantain in permanent grass (tall fescue) pastures. Treatments at Sale Creek in 1999 were Remedy (2 and 4 pt/A), Remedy + 2,4-D ester (2+2 pt/A), Remedy + 2,4-D amine (2+2 pt/A), Crossbow (2 and 4 pt/A),Banvel (2 and 3 pt/A) and Banvel +2,4-D amine (2+2 pt/A). An experiment was conducted in 2000 immediately adjacent to the one in 1999, treatments were Redeem R&P (2 and 3 pt/A), Redeem R&P + 2,4-D (2+2 pt/A), Remedy (2 and 3 pt/A), Banvel (2 and 3 pt/A) and Grazon P+D (2 and 3 pt/A). Grazon P+D is not currently registered in Tennessee. The treatments for both Alcoa and Madisonville in 2000 were 2,4-D amine (1 and 2 pt/A), Banvel (2 pt/A), Weedmaster (3 pt/A), Redeem R&P (1, 1.5, 2 and 3 pt/A), Ally (0.2 oz/A), Crossbow (2 pt/A) and Remedy (2 and 3 pt/A). Grazon P+D was not included at these locations due to the proximity of tobacco. Experimental units were 10 ft. wide by 30 ft. long. Treatments were replicated 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 was evaluated visually utilizing a 0 to 99% scale.

At Sale Creek in 1999, excellent (90% or greater) top kill of horsenettle was observed at 5 weeks after treatment (WAT) with all treatments except Crossbow (2 pt/A). By 9 WAT, top kill from all treatments was at least 90%, with the highest level provided by Crossbow (4 pt/A). In September 1999, permanent markers were established to allow evaluation of any treatment effects on regrowth in 2000. Evaluations in June 2000 revealed no differences from the untreated check. Reinfestation was likely due to lack of rhizome kill in 1999 and seed germination in 2000. In 2000 at 5 WAT, Remedy (3 pt/A), Banvel (3 pt/A) and Grazon P+D (2 or 3 pt/A) gave 95% or greater top kill. Results were similar when the plots were evaluated 2 weeks later. At Madisonville the research revealed that a minimum of 1.5 pt/A of Redeem R&P was required for commercially acceptable (85% or greater) horsenettle top kill. The highest level of top kill (95% or greater) at 7 WAT was provided by Remedy (2 or 3 pt/A) and Weedmaster (3 pt/A). The 2000 experiments for both Sale Creek and Madisonville will be evaluated in 2001.

At Alcoa, early evaluations (4 WAT) on buckhorn plantain showed that all treatments with the exception of Banvel (2 pt/A), Ally (0.2 oz/A) and the low rate of Redeem R&P (1 pt/A) gave commercially acceptable control. By 10 WAT, regrowth was evident in several treatments. This was most noticeable with 2,4-D amine (1 pt/A), Redeem R&P (1 or 1.5 pt/A), and Remedy (2 or 3 pt/A). It appears that a minimum of 2 pt/A of Redeem R&P is required for acceptable control of buckhorn plantain. Established white clover was present at Alcoa which allowed for evaluation of treatments for damage to a desirable legume. Damage was extensive from all treatments with the exception of 2,4-D. No damage was observed from treatment with 2,4-D at 1 pt/A; 25% damage was observed from 2 pt/A.

Although effective horsenettle top kill was achieved with numerous treatments, preliminary results indicate that heavily infested pastures will likely need retreatment the following year. Grazon P + D gave excellent initial control

of horsenettle and it provides the greatest potential for lasting control based on results in other states. It is not labeled for use in Tennessee primarily due to sensitivity of tobacco.

SPECIES DIFFERENTIATION WITH SPECTRAL IMAGES. D.G. Wilson, E.L. Sanders, L.M. Bruce, and D.B. Reynolds. Mississippi State University, Mississippi State, MS.

Abstract

Experiments were conducted in 2000 at the Plant Science Research Center, Starkville, MS, to evaluate the use of spectral data in classifying different crop and weed species. The experiment was designed as a randomized complete block with 4 replications. Velvetleaf (*Abutilon theophrasti)* , redroot pigweed (*Amaranthus retroflexus*), johnsongrass (*Sorghum halepense*), broadleaf signalgrass (*Brachiaria platyphylla*), cotton (*Gossypium hirsutum*), and corn (*Zea mays*) were planted in 12 ft^2 plots. Each species was maintained free of other species and hyperspectral data were taken with a handheld spectroradiometer on two week intervals. Although spectral data were taken from 350-2500 nanometers (nm) discrete bandwiths were selected to correspond with available airborne sensors. The discrete bands selected were: Green 545-555 nm; Red 670-680 nm; and Near Infrared 835-845 nm. The following commonly used vegetation indices were computed using the selected bands: Normalized difference vegetation index (NDVI); Green normalized difference vegetation index (NDVIg); Global Environmental Monitoring Index; Near Infrared (NIR); Red vegetation Index (RVI); and Difference vegetation index (DVI). The computed indices and band widths were evaluated with PROC DISCRIM in SAS. This is a linear discriminant analysis technique where the dependent variable is categorized. Both the cross-validation (leave one out testing) and resubstitution options were used for analysis. As one would expect the resubstitution option resulted in greater overall classification than cross-validation. The cross-validation technique resulted in 91, 63, 63, 100, 46, and 33% correct classification of velvetleaf, redroot pigweed, broadleaf signalgrass, cotton, johnsongrass, and corn, respectively. Generally, broadleaf species are more easily differentiated from each other than grass species. These preliminary data indicate that spectral data holds promising potential in discriminating among species.

CONTROLLING VOLUNTEER ROUNDUP READY CROPS IN ROUNDUP READY COTTON AND SOYBEAN. G.L. Steele, C.H. Tingle, B.V. Ottis, and J.M. Chandler. Texas Agricultural Experiment Station, Texas A&M University, College Station, TX

ABSTRACT

Greenhouse experiments were conducted in the fall of 2000 to evaluate herbicide tank mixes for control of volunteer glyphosate tolerant crops in Roundup Ready cotton, corn, and soybean. Cotton (DPL 436RR), corn (DK 580RR), and soybean (DPL 4344RR) were planted into 6-inch pots using a peat/vermiculite potting mix. Pots were placed in a greenhouse and provided with adequate water and fertilization for optimal growth. After emergence, plants were thinned to a uniform population. The experiment was designed as a randomized complete block with 3 replications. Treatments consisted of eight herbicide combinations applied to each crop approximately three weeks after planting. Pyrithiobac (0.063 lb a.i./A), sulfosulfuron (0.02 lb/A), dimethipin (0.31 lb/A), fomesafen (0.50 lb/A), primisulfuron (0.04 lb/A), cloransulam (0.036 lb/A), and clethodim (0.015 lb/A) were applied over-the-top in a tank mix with glyphosate (Roundup Ultra) at 1.0 lb/A. Application volume was 20 gal/A, and no additional adjuvant was used. Visual ratings of percent control/injury were taken 14 days after treatment (DAT) on a scale of 0 to 100 where 0 equals no visible injury and 100 equals complete plant death. Plants were harvested 21 DAT and fresh weights recorded. Data was subjected to ANOVA and means separated with Duncan's MRT at the 0.05 level of significance.

Clethodim and pyrithiobac tank mixes with glyphosate did not significantly injure cotton. Pyrithiobac controlled soybean and corn 89 and 93%, respectively. Clethodim did not significantly injure soybean, but corn control was 99% with this combination. Cotton was controlled 75%, with no corn or soybean injury, following glyphosate plus dimethipin application. Glyphosate plus primisulfuron controlled cotton and soybean at least 87% with no significant corn injury. Dimethipin also significantly injured cotton and soybean without injuring corn. Glyphosate plus sulfosulfuron or fomesafen controlled cotton 73 and 96%, respectively. Corn injury was below 35% with both of these combinations, and soybean was not significantly injured. Plant fresh weight data supports these findings.

Glyphosate tank mixes may provide an option for controlling volunteer glyphosate tolerant crops in Roundup Ready cotton, corn, and soybean. By applying these herbicides in combination with glyphosate, treatment can be incorporated into a Roundup Ready herbicide program without requiring an additional application. However, some of these combinations discussed conflict with label directions. For this reason, further research is needed before these combinations should be considered for commercial use.

GRASS CONTROL WITH SELECT AND CADRE IN PEANUT. I.C. Burke, S.B. Clewis, and J.W. Wilcut, North Carolina State Univeristy, Raleigh, NC 27695.

ABSTRACT

The effectiveness of imazapic on small grass, broadleaf, and perennial sedge weeds, and clethodim on annual and perennial grass weeds make the use of these herbicides applied postemergence (POST) either sequentially or in tank mixtures a good option for broad spectrum weed control in peanut (*Arachis hypogaea*). However, members of the imidazolinone herbicide family, such as imazethapyr or imazaquin, have antagonized graminicides, including clethodim, causing a reduction in grass control. Research was initiated at the Rocky Mount and Clayton Research Stations in North Carolina to evaluate mixtures of clethodim and imazapic to determine whether antagonism occurs, and if so what would be the appropriate method of application for the two herbicides. In each study, clethodim and imazapic were applied alone, in mixture, and sequentially. For sequential applications, an application of imazapic was followed by clethodim applications at 1, 3, 7, or 14 d intervals, and an application of clethodim was followed by CGA 362,622 applications at 1, 3, 7, and 14 d intervals. Each test included a non-treated control. Clethodim was applied at 140 g ai/ha and imazapic at 70 g ai/ha. Crop oil concentrate at 1.0% (v/v) was included in all treatments.

The expected response for herbicide combinations and sequential treatments was calculated according to Colby's method. Expected and observed values were compared using the appropriate least significant difference (LSD) value at the 5% level. If the observed response for the herbicide combination or sequential treatment was either significantly less than or greater than the expected value, the treatment was declared either antagonistic or synergistic, respectively. Combinations or sequential treatments were considered to be additive (i.e., no interaction) when differences between observed and expected responses were not significant.

Clethodim provided >92% control of goosegrass, [*Eleusine indica* (L.) Gaertn.], fall panicum [*Panicum dichotomiflorum* (L.)], and large crabgrass [*Digitaria sanguinalis* (L.) Scop.]. Imazapic provided <76% control of the same weeds. When the two herbicides were applied in mixture, control of large crabgrass decreased to <66%. Antagonism of clethodim activity in large crabgrass at Clayton occurred when celthodim was applied 1 d before or up to 3 d after an application of imazapic. At Rocky Mount, however, control of large crabgrass with sequential applications was not antagonized by imazapic, although control was numerically reduced. When the two herbicides were applied as a tank mixture, control of goosegrass decreased to 54% at Clayton, 58% at Lewiston, and 79% at Rocky Mount. Clethodim activity was antagonized in goosegrass at Clayton when applied up to 3 d before and up to 7 d after an application of imazapic. At Rocky Mount control of goosegrass was antagonized only when clethodim followed imazapic by one day. Good control of small and/or erratic goosegrass at Lewiston was seen with no differences among treatments. Clethodim and imazapic controlled fall panicum >99% and <37%, respectively. The tank mixture of clethodim and imazapic decreased control from the expected >99% to 54%. Imazapic followed by clethodim 1 d later provided similar control as the tank mixture of fall panicum at 51%. Antagonism was noted when clethodim was applied on fall panicum up to 3 d before and up to 3 d after imazapic. Therefore, while antagonism was variable, it occurred when <7 d separated applications of clethodim and imazapic.

WEEDMAK-A DECISION AID FOR HERBICIDE TREATMENT SELECTION IN WATER QUALITY SENSITIVE AREAS OF KENTUCKY. J.D. Green, W.W. Witt, J.R. Martin, and M. Marshall, Extension Professor, Professor, Extension Professor, and Research Specialist, Department of Agronomy, University of Kentucky, Lexington, KY 40546.

ABSTRACT

The options for weed control in field crops vary from herbicides with a high potential to impact water quality in sensitive areas to those that are not likely to cause an impact. Herbicides most likely to contaminate waters have the following properties: low adsorptivity to soil clays and organic matter in conjunction with relatively high water solubility, persist for several weeks or months, and are used widely on a significant acreage. Therefore, alternative weed management choices should be used in water quality sensitive areas to minimize the potential for ground and surface water contamination. The purpose of this project was to develop a computerized selection tool for making environmentally sound weed management decisions. This decision aid was designed to integrate environmental impact parameters with herbicide efficacy and treatment costs so that crop producers can make more informed management decisions.

The computer program outputs are dependent on site-specific characteristics and crop production parameters supplied by the user. These inputs include the crop growth stage and row spacing, soil type (soil series name), soil texture, soil pH, organic matter, tillage system (no-till, minimum, or conventional), and previous crop grown (i.e. used to estimate percent residue on the soil surface). These parameters are required to calculate and provide a general rating of the herbicide leaching and surface run-off potentials of each treatment. Entry of weed species present, relative weed size, and crop growth stage are used to create a list of weed control options that could be used based on these specific site characteristics.

The output treatments are ranked first by an overall rating index for their effectiveness on the weed species that are included. A program feature allows the user to sort and rank these treatments by their herbicide leaching potentials (HLP), herbicide runoff potentials (HRP), and by estimated treatment costs. After a review of the treatment list, the program then allows further evaluation of an individual treatment. This second output screen lists the individual components within the treatment selected. Based on the input information, this output screen includes the specific herbicide rate recommendation, the cost per unit for each herbicide, and the HLP and HRP rating for each herbicide included in a treatment. The final output screen allows for selection on a specific herbicide which will then list the active ingredient(s), the HLP and HRP rating for each active ingredient, and other detailed information about each herbicide. The HLP and HRP ratings for each product and treatment are based on the herbicide active ingredients with the highest potential to contaminate surface or ground water.

This decision aid provides a tool for making weed management decisions based on efficacy, economics, and potential environmental impact. Such a method does not exist in any form because of the complexity of integrating all the data. Furthermore, this decision aid is in a format that should be readily adopted by integrated pest management practitioners because of the specific output information that the program delivers.

IMPACT OF VARYING APPLICATION RATE AND TIMING OF IMAZETHAPYR FOR WEED CONTROL IN CLEARFIELD* RICE (*Oryza sativa* L.). B.V. Ottis, G.N. McCauley, G.L. Steele, C.H. Tingle, and J.M. Chandler, Texas Agricultural Experiment Station, Texas A&M University, College Station, TX 77843.

ABSTRACT

Studies were conducted in 2000 near Beaumont and Eagle Lake, TX to evaluate imazethapyr for weed control in Clearfield* rice (*Oryza sativa* L.) on two different soil types. Application timings evaluated were single and sequential applications made preplant incorporated (PPI), preemergence (PRE) and early postemergence (EPOST). Imazethapyr rates evaluated PRE and PPI in Beaumont were 0.063 and 0.078 lb a.i./A followed by (fb) EPOST rates of 0, 0.016, 0.024, 0.032, 0.047 and 0.063 lb/A. In Eagle Lake, because of coarser soils, PRE and PPI rates evaluated were 0.032 and 0.047 lb/A fb EPOST rates of 0, 0.016, 0.024 and 0.032 lb/A. Red rice (*Oryza sativa* L.) control was evaluated at Beaumont, while broadleaf signalgrass [*Brachiaria platyphylla* (Griseb.) Nash] control was evaluated at Eagle Lake.

Red rice control at Beaumont 20 days after treatment (DAT) with sequential applications at all rates was greater than 88%, while less than 65% control was observed with a single PPI application at 0.063 lb/A. Single PRE applications at 0.078 lb/A achieved 85% control. Broadleaf signalgrass control at Eagle Lake 14 DAT was greater than 87% with a sequential application.

Crop injury following PRE and PPI applications was less than 5% at both locations. Injury, 7 DAT of EPOST applications in Beaumont, was greater than 20% with sequential applications. In Eagle Lake, injury 7 DAT was greater than 30% with all treatments having 0.032 lb/A applied EPOST following a PRE or PPI application at all rates. Injury was reduced to less than 5% with all treatments 7 days after permanent flood was established in Beaumont, while up to 15% injury remained in Eagle Lake 7 days after flood.

Adequate red rice control is best achieved with sequential applications of imazethapyr. Lower rates of imazethapyr in sequential applications provide broadleaf signalgrass control on coarse soils. Rice yields in all treatments were greater than 6000 lb/A with no significant losses correlating to early season injury.

COMPARISON OF GLYPHOSATE TO CONVENTIONAL POSTEMERGENCE HERBICIDES FOR COTTON. J.A. Ferrell and W.K. Vencill, University of Georgia, Athens, GA 30602

ABSTRACT

A three year study was initiated in Athens, GA in 1996 to determine the efficacy of Roundup Ready® technology as related to standard weed control practices. It was also determined to compare net returns associated with each herbicide treatment. The experimental design was a randomized complete block with six replications. Common cocklebur (*Xanthium strumarium*) and ivyleaf morningglory (*Ipomoea hederacea*) were the dominant weed species at this location. Weed control data was gathered via visual evaluation and all treatments were taken to yield each year.

Statistical analysis allowed data in 1996 and 1997 to be pooled across years; however, data collected in 1998 will be reported separately. No differences in cocklebur control were detected among treatments in 1996-1997. However, in 1998 one treatment, which contained no glyphosate, resulted in statistically less cocklebur control than all other treatments. Additional differences among treatments were not detected in 1998. Ivyleaf morningglory control was similar for all treatments in 1996-1997 and 1998, therefore, no differences were detected among treatments. Analysis of yield and return per dollar of herbicide detected few differences among treatments in any year.

However, treatments that contained MSMA generally yielded less and had lower net return values than treatments not containing MSMA.

From these data it was determined that treatments that contained roundup not only provided better weed control than the traditional treatments, but also gave superior yield and net returns.

RESPONSE OF NON-TUBEROUS SEDGES WITH PREEMERGENT HERBICIDES. J.L. Belcher and R.H. Walker. Alabama Agricultural Experiment Station, Auburn University, AL

ABSTRACT

Laboratory and field studies were conducted to determine the response of non-tuberouse sedge species to preemergence-applied (PRE) herbicides. In the field experiment, annual sedge (*Cyperus compressus*) was evaluated for differential responses to PRE herbicides over a 9-wk period. Only oxadiazon provided excellent control (>90%) for the entire period. Good control (>80%) was also obtained with dithiopyr and prodiamine over the course of the study while sulfentrazone and s-metolachlor gave 84% and 96% control, respectively, up to 7 weeks after treatment (WAT).

In the laboratory experiment, seeds of green kyllinga (*Kyllinga brevifolius*), globe sedge (*C. globulosus*), cylindric sedge (*C. retrorsus*), and annual sedge were placed into an acrylamide copolymer growth medium containing selected PRE herbicides at concentrations ranging from 0.0 to 4.0 ppm. Sulfentrazone, oxadiazon, and s-metolachlor generally provided the greatest reduction (50-70%) in average shoot fresh weights for all species across concentrations. Percent reduction in shoot fresh weights provided by imazaquin, dithiopyr, prodiamine, and simazine varied depending on species and concentrations.

TANKMIXES WITH ROUNDUP ULTRA OR TOUCHDOWN FOR MORNINGGLORY CONTROL IN GLYPHOSATE-TOLERANT SOYBEANS. D.M. Ovesen* and W.T. Willian; Western Kentucky University, Bowling Green, Kentucky 42101

Abstract

A field experiment was established in 2000 at the Agricultural Research and Education Complex in Bowling Green, Kentucky to evaluate the efficacy of tankmixes with glyphosate and sulfosate for ivyleaf morningglory control. Soybeans (cv. Pioneer 9492) were planted May 22 in a conventionally tilled Pembroke silt loam soil with a pH of 6.4. Glyphosate (Roundup Ultra®) and sulfosate (Touchdown®) were applied alone and in combination with other herbicides. A randomized complete block design was utilized with each treatment replicated three times. Plots consisted of four 76 cm rows, 9.1 m in length. The two center rows of each plot were treated, with the outside row of each plot serving as a weedy check. Crop response, weed control, and grain yield data were collected.

Soybean injury 4 days after treatment (DAT) ranged from 6 to 17%, with the addition of fomesafen resulting in greater injury than chloransulam-methyl or glyphosate pluz imazethapyr. Glyphosate and sulfosate provided < 66% control 14 DAT while the addition of fomesafen provided greater control of ivyleaf morningglory 14 DAT. Visual evaluations of weed control at 29 DAT and 42 DAT indicated little to no advantage of tankmix partners. Soybean grain yield ranged from 2.4 Mg/ha to 3 Mg/ha and was not influenced by herbicide treatment.

SOIL PERSISTENCE OF DICLOSULAM AND IMAZAPIC IN GEORGIA. K.L. Johnson and W.K. Vencill, University of Georgia, Athens.

ABSTRACT

Greenhouse studies were established to evaluate the effect of soil amendments on the bioavailability of diclosulam and imazapic. Montmorillonite, kaolinite, organic mater, and anion exchange resin amendments to washed quartz sand were used. Montmorillonite reduced bioavailability of both diclosulam and imazapic more than the other amendments. Kaolinite amendments reduced diclosulam and imazapic bioavailability the least of the soil amendments. Bio-K_d of diclosulam and imazapic were calculated by a ratio of reduced herbicide available in the amended soil to the unamended quartz sand. Bio-K_d's were generally higher than diclosulam for montmorillonite and kaolinite, possibly due to imazapic's slightly lower pK_a value. Organic matter reduced bioavailability less than montmorillonite but more than kaolinite. Adsorption on the anion exchange resin was high for both herbicides.

EFFECT OF GLYPHOSATE ON ATRAZINE DEGRADATION IN SOIL. L.J. Krutz*, S.A. Senseman, and R.L. Haney, Soils and Crop Science Department, Texas A & M University, College Station, TX 77843

Abstract

Tank mixing pesticides and the use of prepackaged mixtures have become common agricultural practices. However, few studies have evaluated pesticide degradation in multi-pesticide systems. The objective of this study was to determine if enhanced microbial activity associated with glyphosate mineralization influences atrazine degradation. Atrazine was added to treatments at a rate of 3.86 mg ai kg^{-1} soil based on a 58-mm atrazine-soil interaction depth. The isopropylamine salt of glyphosate was added at rates of 0, 43, 86, 129, 172, and 215 mg ai kg^{-1} soil based on an assumed 2-mm glyphosate-soil interaction depth. Soils were incubated for 4, 8, 12, 16, 20, 24, 28, and 32 d. A strong linear relationship (r^2 = 0.99) between CO_2-C evolved and glyphosate C added indicates microbial activity was enhanced by glyphosate additions. In the treatment without glyphosate, 87% of the atrazine was degraded by 8 d. Soil amended with 1, 2, 3, 4, and 5x rates of glyphosate degraded 77, 69, 60, 61, and 52% of the atrazine during the same period. Atrazine degradation approached 97% for all treatments after 12 d of incubation and differences among treatments were no longer observed. The percent atrazine remaining was inversely related to microbial activity at 8 and 12 d, respectively. Results from this study indicate that glyphosate enhances microbially activity while simultaneously retarding atrazine degradation.

PURIFICATION AND CHARACTERIZATION OF TWO RICE GLUTATHIONE *S*-TRANSFERASE ISOZYMES INVOLVED IN HERBICIDE DETOXIFICATION. F. Deng* and K.K. Hatzios, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061.

ABSTRACT

Glutathione S-transferases (GSTs) are key metabolic enzymes catalyzing the detoxification of several herbicides in many plants. Rice (*Oryza sativa* L.) GSTs catalyze the conjugation of the herbicide pretilachlor with glutathione and this reaction is enhanced following treatment with the safener fenclorim. In our ongoing studies to characterize rice GSTs, we have isolated two GSTs from etiolated shoots of Teqing (indica type) rice and purified them by means of fast protein liquid chromatography (FPLC) using the following steps: ammonium sulfate precipitation; phenyl superose HR5/5 column; superose 12 HR gel column; GSTrap affinity column; MonoQ column; and MonoP column. The two GST isozymes were purified to homogeneity and partially characterized. Kinetic analysis, molecular mass analysis by native and SDS-PAGE gel chromatography, isoelectric focusing analysis, optimum pH analysis, substrate specificity and inhibitor analysis revealed the existence of two different GST isozymes in shoots of Teqing rice. Both GST isozymes exhibited homoglutathione *S*-transferase and glutathione peroxidase activity. The first GST isozyme designated as *Os*GST I-I was found to be a constitutively expressed homodimer composed of two copies of a 30 kD subunit (GST I). The second GST isozyme designated as *Os*GST II-III is a heterodimer composed of one 28 kD (GST II) and one 25 kD subunit (GST III). Constitutive expression of the *Os*GST II-III isozyme is very low, but it is induced considerably by the herbicide safener fenclorim. *Os*GST II-III appears to play an important role in the safening action of fenclorim, which protects rice against injury caused by the herbicide pretilachlor.

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USING IMAGE ANALYSIS TO ASSESS WEED STRESS IN SOYBEAN. A.B. Grant, D.R. Shaw, F.E. LaMastus, T.H. Koger and R.L. King, Department of Plant and Soil Sciences and Department of Electrical and Computer Engineering, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

The use of remotely sensed imagery and global positioning system technologies are proving to be a valuable tool for agricultural producers. These tools can be used for site-specific crop management. This type of management, in its simplest form, can identify problematic areas within fields, immediately followed by a visit from the grower or consultant to determine the causal agent and prescribe remedial actions. However, a goal for utilizing this technology is identification of the cause of imagery changes from the imagery itself, rather than simple identification of change. The objective of this research was to evaluate weed population detection capability using the Normalized Difference Vegetation Index (NDVI).

Three soybean fields were used for this study. The fields were 7, 15, and 16 ha in size, located at the Black Belt Branch Experiment Station near Brooksville, Mississippi. After planting, a Trimble Ag 132 backpack GPS unit was used to navigate to sample locations established on an 80-m UTM coordinate grid system (LaMastus et al 2000). The sample locations were marked with a numbered flag to allow for collection of weed estimations at later times in the growing season. Weed populations were estimated by recording the number of each species present in a representative 0.58-m^2 area at each sample location. For this analysis the total number of weeds present was used to compare with the various vegetation indices. ERDAS Imagine software was used to create vegetation index data

from a 2-m resolution multispectral aerial image collected on August 18, 2000. The data were used to derive the indices{NDVI=NIR-Red/NIR+Red; RVI=NIR/Red; SAVI= NIR-Red/NIR+Red +L;Green NDVI=NIR-Green/NIR+Green}. The map was then imported into ArcView and the data were spatially joined with the closest neighbor that contained data. This was done to attempt to quantify a relationship between vegetation indices and weed population. A linear discriminant analysis with cross validation was conducted to determine the correlation between vegetation index values and weed populations.

Using an NDVI image alone, the only field with a significant correlation between NDVI value and weed population was Brooksville-S, with a correlation coefficient of 0.27. The correlation coefficient for Brooksville-E and Brooksville-N was only 0.15. In another analysis, the three fields were analyzed separately and as one group. This method used a combination of RVI, SAVI and NDVIg data as classifiers.This was accomplished using a linear discriminant function with cross-validation of data. Weed populations in one test were divided into two groups. One group was 0-8 weeds/0.58-m^2 and the other group was greater than 9 weeds/0.58-m^2. Using these three vegetation indices, the low weed population points were classified accurately 65% of the time, and the high weed population was correctly classified 73% of the time. The NDVIg and the SAVI correctly classified the weed populations 75% when used alone. The SAVI and NDVIg were similar in their weed classification capabilities. The SAVI may be a better tool when used earlier in the growing season due to its correction for the soil interference. NDVIg could be the index of choice from the middle to end of the growing season, assuming canopy closure is good.

Individual VI's varied greatly in their utility for weed detection. The SAVI and NDVIg provided the best classification of weedy areas in this study.Early-season weed detection may rely more heavily on other VI's. NDVI alone was a poor indicator of weed presence.

GENETIC CHARACTERIZATION OF RED RICE (*ORYZA SATIVA*) AND RICE (*O. SATIVA*) USING RAPD PRIMERS. L.E. Estorninos, Jr., N.R. Burgos, D.R. Gealy, R.E. Talbert, J.M. Stewart, and C.H. Sneller. Department of Crop, Soil, and Environmental Sciences. University of Arkansas, Fayetteville, AR 72701 and USDA-ARS, Dale Bumpers National Rice Research Center, Stuttgart, AR 72160.

ABSTRACT

A study was initiated to analyze the genetic relationships within and between 23 red rice populations and three cultivated rice by DNA fingerprinting. Polymerase chain reaction (PCR) with fifteen 10-mer RAPD primers and genomic DNA template was used to generate amplified DNA fragments. The 15 RAPD markers produced a total of 111 reproducible bands, 89 of which were polymorphic among red rice and cultivated rice populations, 78 were polymorphic among red rice, and 45 between cultivated rice.

Clustering based on multidimensional scaling (MDS) showed general distribution of the 26 populations. Bengal, a medium grain rice cultivar, was categorized as Group I. The awned blackhull red rice, AR1994-8 and MS 1996-7, and awnless strawhull red rice, ARKaty-RR and AR 1996-1 were grouped as II, V, III, and IV, respectively, because they were genetically distant to each other and to the other clusters. The sixth group were the strawhull, awnless-type populations consisting of AR1994-7, MS1996-5, LA1995-12, AR-15A, AR1995-7, and ARSgt-S. Group VII consisted of awned blackhull red rice AR-17C and AR1995-1. Group VIII were awned strawhull types MS-4, LA-3, AR-11D, and LA1995-14, and awned blackhull types AR1995-4, AR-10A, AR-19A, AR-5A, and LA1995-13. Group IX consisted of small long grain cultivated rice Katy and Kaybonnet. Group X contained the awned blackhull ecotypes TX-4 and ARSgt-B. These results were in agreement with the general morphological groupings of most of the red rice accessions indicating that RAPD assay could be useful in discriminating among closely related species. The RAPD assay did not show clear evidence of outcrossing between rice and cultivated rice.

DIMETHENAMID DISSIPATION IN NO-TILLAGE AND CONVENTIONAL TILLAGE SOIL IN MISSISSIPPI. M.A. Locke, R.M. Zablotowicz, and K.N. Reddy, USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS 38776.

ABSTRACT

An increasing number of farmers are using conservation management practices in crop production systems. Information on the impact of these management practices on the environment is lacking. The chloroacetamide dimethenamid is a relatively new preemergence herbicide used in soybean (*Glycine max*) and corn (*Zea mays*) production. It is therefore important to assess factors determining its dissipation in soil and evaluate whether differing crop management practices alter risk to the environment. This study was conducted to evaluate the effect of tillage and plant residue management on dissipation of dimethenamid in soil.

A field study was established in 1984 to evaluate two soybean tillage systems, no-tillage (NT) and conventional tillage (CT). Alachlor was applied as a preemergence for eleven years, then flumetsulam-metolachlor was applied from 1995 through 1998. Dimethenamid was used for preemergence weed control in 1999 and 2000, the years of interest for the present study. Each year, soil was collected from the surface to 2 cm and 2 to 10 cm depths periodically during the growing season (0 to 63 days after application). Soil samples were frozen until extraction with methanol and analyzed by HPLC. Dimethenamid sorption was evaluated using standard batch methodology for the 1999 baseline soil samples.

Dimethenamid sorption in the surface of the NT soil (Kd 4.51) was greater than that of CT (Kd 1.67). Sorption in the NT surface was also greater than the subsurface (Kd 1.36). In both cases, the enhanced sorption in the NT surface can be attributed to a greater organic matter level. Only slight differences were observed between the CT surface and subsurface (Kd 1.51) due to mixing of organic residues in soil during tillage. In the NT soil, the surface was never disturbed, thus limiting migration of organic material to the subsurface. This resulted in the NT subsurface having the least dimethenamid sorption. The half-life for dimethenamid in the surface soil was rapid, ranging between 9 days in 1999 and 6 days in 2000. First-order k values for dimethenamid dissipation in the two tillage systems indicated little difference in dissipation due to tillage. Dimethenamid was detected in the subsurface, but there were no consistent trends due to tillage. Despite a rapid rate of dimethenamid dissipation, control of annual weeds was sufficient to support narrow row soybean production regardless of tillage treatment.

These studies indicate that although enhanced organic matter in the NT surface may increase herbicide binding, adoption of long-term NT practices should have minimal effect on the overall persistence of dimethenamid in Mississippi Delta soils.

EVALUATION OF ALTERNATIVE HERBICIDES FOR CONTROL OF DICLOFOP-RESISTANT ITALIAN RYEGRASS IN VIRGINIA. I.V. Morozov, E.S. Hagood, and P.L. Hipkins. Virginia Polytechnic Institute & State University, Blacksburg, VA 24061-0331.

ABSTRACT

Italian ryegrass (*Lolium multiflorum* Lam.) is an annual, cool-season grass which grows vigorously in winter and early spring. Mature plants reach 1.2 m in height, and dispersal is via seed. Over the years it became a competitive weed in small grains, especially in NW and SE United States, causing yield reductions, field abandonment and expense of cleaning seed. Diclofop has generally been used for Italian ryegrass control in small grains. In Virginia, the first diclofop-resistant biotype was reported in 1993. Subsequently, there has been a significant decline in grower's satisfaction with diclofop efficacy for Italian ryegrass control. In 1998, greenhouse tests with several ryegrass biotypes collected from various locations in the state were conducted. Italian ryegrass response to diclofop varied among biotypes and across a range of application rates. During the initial screen, at least one biotype exhibited resistance to 16 times the normal rate of diclofop, and 31% of the biotypes evaluated exhibited resistance at 8X rates. The threat of the spread of diclofop-resistant Italian ryegrass prompted the search for alternative control methods.

Field evaluations of the efficacy of various herbicides for Italian ryegrass control were conducted. Preemergence treatments included varying rates and application timings of flufenacet plus metribuzin, flufenacet plus metribuzin plus chlorsulfuron plus metsulfuron-methyl, BAY MKH 6561, BAY MKH 6562, metolachlor, chlorsulfuron, chlorsulfuron plus metsulfuron-methyl, diclofop-methyl, pendimethalin, metribuzin, and two acetochlor formulations, which were applied to plots arranged in a randomized complete block design with four replications. The safety of preemergence treatments on barley was evaluated and yield data was compared among the treatments. Significant differences were observed in Italian ryegrass control and crop response to herbicide treatments. Flufenacet plus metribuzin resulted in significantly higher Italian ryegrass control and barley yields. While barley yields from plots treated with metolachlor and two acetochlor formulations were not different from those from plots treated with flufenacet plus metribuzin, crop tolerance was of concern and Italian ryegrass control was slightly below commercially acceptable levels. Other treatments were generally either ineffective in ryegrass control or resulted in unacceptable levels of crop injury.

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MANAGING *AKEBIA QUINTATA* AT THE JAMES MADISON LANDMARK FOREST: AN EVALUATION OF HERBICIDES AND THE TIMING OF APPLICATION. P.L. Burch and S.M. Zedaker. Dow AgroSciences, LLC, Christiansburg, VA 24073; VA Tech, Blacksburg, VA 24061.

ABSTRACT

Akebia quinata, also known as chocolate vine, is a twining woody vine in the mostly tropical Lardizabalaceae family. Fiveleaf akebia grows so quickly that, if left unmanaged, can overtop and displace existing ground level vegetation, understory shrubs and trees, and even some canopy trees. Once established, its dense growth prevents seed germination and seedling establishment of native plants. To control invasive species, techniques must be

utilized that control the invasive plant while encouraging native plants to become reestablished on affected sites. A series of trials were installed to determine: (1) How does triclopyr compare to glyphosate when applied to akebia? 2) How is the control of akebia and the response of native plants affected by the timing of application?

Spray treatments were installed on 1/13/00, 2/29/00, 5/31/00, and 10/23/00. Each herbicide treatment was applied in 40 gallons of water per acre including 0.5% v/v of non-ionic surfactant. Treatments were applied using a CO_2 powered backpack sprayer. The nozzle used was an 8010E flat fan held at a height so as to apply a 6-foot band. Each plot was 6 by 70 feet in size with a 3-foot untreated buffer between each plot.

Results from seasonal timings evaluated, shows triclopyr is more active than glyphosate on akebia. A rain event less than 1 hour after the final plot application in the May, in all probability washed the glyphosate treatment off of the leaves. The triclopyr treatments, applied under these same conditions, appeared unaffected by the rain event. Because akebia is partially evergreen in the Virginia climate, it is sensitive to the herbicide applications during the winter season when most of the native plants are dormant. Native plants are least adversely affected by herbicide applications during the dormant season.

MANAGING *AILANTHUS ALTISSIMA* AT THE SHENANADOAH NATIONAL PARK: AN EVALUATION OF HERBICIDE TANK MIXES FOR LOW VOLUME BASAL APPLICATIONS. P.L. Burch and S.M. Zedaker. Dow AgroSciences, LLC, Christiansburg, VA 24073; VA Tech, Blacksburg, VA 24061.

ABSTRACT

Ailanthus altissima (tree-of-heaven) is an invasive exotic weed tree that has become established throughout North America. The state of Virginia is currently experiencing a rapid invasion of *Ailanthus* along highway and utility right-of-ways, pastures and disturbed forest sites. *Ailanthus* forms pure stands that shade out understory species and decreases native plant diversity. *Ailanthus* stands also obstruct vistas along roadways as well as creating a safety hazard by limiting the view of drivers. A successful control method must effectively eliminate both stems and roots of *Ailanthus*, while selectively allowing the reestablishing native vegetation on these sites. This trial was established to determine how Garlon 4 plus Tordon K herbicides compare to Garlon 4 alone and Garlon 4 plus Stalker herbicide?

Test plots were established and treated in June 1997. The plots were located along Skyline Drive at the US 33 interchange, and across from mile marker 101 in Shenandoah National Park. Nine treatments were applied: eight low volume basal herbicide treatments, plus a manual cutting. Four replicate plots were established for each treatment. Each plot consisted of a five meter by five meter square; containing a targeted minimum of 10 established *Ailanthus* saplings or trees. A buffer was left between plots to avoid effects from surrounding plots. Herbaceous cover was visually estimated both pre- and post-treatment over the entire plots for the 3 most dominant herbaceous species as well as a species count (presence/absence) of the remaining species on each plot. Each *Ailanthus* tree was tagged within the 5m plot, and diameter breast height (DBH) was measured for each tree. Six weeks after treatment, visual estimations of defoliation were made to quantify short-term treatment effects. One year after treatment diameters were measured of remaining live trees to determine mortality and control. Dead trees and manually cut trees were examined for stump sprouting. All *Ailanthus* stems within the plots were counted 2 years after treatment to assess live stem counts.

All of the treatments were effective in controlling the target stems (1-year after treatment). The only treatments that had <95% control of target stems included Garlon + Stalker, however, no significant differences were detected. All herbicide treatments significantly reduced second year stem counts over hand cutting. Assessment of second year stem counts also indicates that treatments containing Tordon K mixtures reduce stem counts much more effectively than Garlon 4 alone and Garlon 4 + Stalker mixes. Stalker alone at 9% v/v (labeled rate for stand-alone treatment) provided moderate stem count reductions but was not as cost effective when compared to Tordon K mixes. There was no clear indication that any herbicide treatment significantly affected the dominant post herbaceous species mix.

THE USE OF CGA 362 IN COTTON WEED CONTROL PROGRAMS. J.C. Sanders, K.M. Bloodworth, and D.B. Reynolds. Mississippi State University, Mississippi State, MS, 39762.

ABSTRACT

CGA 362 is a new acetolactate synthase (ALS) inhibiting herbicide under development by Syngenta. It can be safely applied postemergence at low use rates in cotton for control of a broad spectrum of troublesome weed species. CGA 362's spectrum of control includes troublesome weeds such as sicklepod, morningglory spp., yellow nutsedge, and common cocklebur. The use of Buctril in BXN and Roundup Ultra in Roundup Ready cotton weed control programs results in adequate control of most troublesome weeds; however, Buctril is ineffective on sicklepod and Roundup is weaker on morngingglory and hemp sesbania. CGA 362 provides effective control of these species thus its use may complement Buctril and Roundup Ultra use in their respective weed control programs. The objectives of this research were to 1.) compare CGA 362 to other common treatments within Roundup Ready and BXN weed

control systems and 2.) determine if CGA 362 could adequately control sicklepod in BXN cotton and morningglory in Roundup Ready cotton.

Experiments were conducted at the Blackbelt Branch Experiment Station near Brooksville, MS during 1999 and 2000. Plots were 12.7' by 40' in a randomized complete block experimental design. The cotton varieties planted were Stoneville BXN 47 and Paymaster 1560 BG/RR. Morningglory and sicklepod control were evaluated in both the BXN and Roundup Ready control systems. Treatments in the BXN systems consisted of: 1.) Cotoran 1.25 lbs ai/A (PRE) 2.) Cotoran 1.25 lbs ai/A (PRE) fb CGA 362 2.02 g ai/A (POT) 3.) Cotoran 1.25 lbs ai/A (PRE) fb CGA 362 2.02 g ai/A + Buctril 0.75 lb ai/A (POT) 4.) Cotoran 1.25 lbs ai/A (PRE) fb Staple 1.0 oz ai/A (POT) 5.) Cotoran 1.25 lbs ai/A (PRE) fb Buctril 0.75 lb ai/A (POT) 6.) CGA 362 2.02 g ai/A (POT). Treatments in the Roundup Ready system consisted of: 1.) Cotoran 1.25 lbs ai/A (PRE) fb CGA 362 2.02 g ai/A (POT) 2.) Cotoran 1.25 lbs ai/A (PRE) fb CGA 362 2.02 g ai/A + Roundup 0.75 lb ai/A (POT) 3.) Cotoran 1.25 lbs ai/A (PRE) fb Staple 1.0 oz ai/A (POT) 4.) Cotoran 1.25 lbs ai/A (PRE) fb Roundup 0.75 lb ai/A (POT). In the BXN system, Cotoran alone (PRE) provided less sicklepod and morningglory control than all other treatments among which control was similar. The application of Cotoran (PRE) + Staple (POT) in the Roundup Ready system gave less sicklepod control than all other systems while morningglory control did not differ among treatments. Cotoran alone (PRE) and CGA 362 alone (POT) had lower yields than all other treatments in the BXN system. The yields were similar in the Roundup Ready system except for Cotoran (PRE) + Roundup (POT) which had much higher yields. In conclusion, CGA 362 controlled sicklepod as well as Roundup and morningglory as well as Buctril and Staple. Thus it offers the potential to complement weaknesses in BXN and Roundup Ready weed control systems on these troublesome weeds.

VALIDATION OF COTTON HADSS IN GEORGIA. T.M. Webster, USDA-ARS, Tifton; A.S. Culpepper and G.B. Hardison, University of Georgia, Tifton; G.G. Wilkerson and A.C. Bennett, North Carolina State University, Raleigh.

ABSTRACT

Many factors that affect weed-crop interactions can not, as of yet, be predicted early in the growing season. Currently, the best method to estimate potential crop yield loss involves quantifying weed densities. Using grower supplied weed densities, the Herbicide Application Decision Support System (HADSS) provides growers with an interface to information on the competitiveness of and herbicide efficacy against a weed complex. HADSS has the potential to be a valuable tool in teaching, designing, and implementing weed management systems. However, there are two questions that must be addressed prior to the implementation of Cotton HADSS in Georgia: 1. How accurate is the system in selecting an appropriate treatment? and 2. Do we have to count every weed?

Field studies were conducted in 1999 (2 locations) and 2000 (4 locations) in south Georgia. At each location, weed counts were made just prior to the 4-leaf stage of cotton and then at 10- to 14-day intervals, for a total of three postemergence herbicide applications. Weed control ratings were evaluated at the conclusion of the season and cotton yield was measured. In general, weed control was excellent in both HADSS and the expert plots. HADSS selects a weed control treatment based upon Net Return. Net return accounts for the value of the cotton yield, cost of weed control, weed control efficacy, and expected crop yield loss due to non-controlled weeds. Net returns from our expert recommendations were compared to those from HADSS. Equivalent net returns were found 49% of the time; differences of ≤15% in net return were found 83% of the time. While there was consensus between the experts and HADSS in most instances, some discrepancies in net return occurred. Inspection of recommendations revealed that weed efficacy data in HADSS were underestimated for morningglory and bermudagrass with several herbicides. As a result, the estimated net return from several of the expert recommendations was grossly underestimated by HADSS (i.e. plots with morningglory and/or bermudagrass), thus the skewed tail (>25% difference).

HADSS uses total competitive load to predict crop losses due to weeds. Weed competitiveness is approximated through weed interference studies and placed on a scale of 0 (least competitive) to 10 (most competitive). The number of weeds per 100 ft^2 for each species are multiplied by the competitive index value for that particular weed, producing the competitive load. HADSS estimates yield loss based on the sum of the competitive loads for each species, or the total competitive load. The relation between crop yield loss and total competitive load is a rectangular hyperbole : $y = (1.7\ TCL)/(1+((1.7*TCL)/79))$. Each incremental competitive load value reduces cotton yield 1.7% at low weed densities and approaches a maximum yield loss of 79%.

Understanding the mechanism by which the system makes weed control recommendations may shed some light on the required accuracy when making weed counts. In field validation of this model, the number and speciation of each weed was recorded in each plot in an area of 100 ft^2. This was a laborious chore that we thought most weed managers would not attempt. An alternative class system was part of an earlier version of HADSS (called HERB). The class system grouped weeds into density categories, for broadleaf weeds these density categories were low (<2 weeds/100 ft^2), medium (≥2 to <5 weeds/100 ft^2), high (≥5 to <10 weeds/100 ft^2), and very high (≥10 weeds/100 ft^2). For grass species these categories were low (<10 weeds/100 ft^2), medium (≥10 to <50 weeds/100 ft^2), high (≥50 to <100 weeds/100 ft^2), and very high (≥100 weeds/100 ft^2). The mean of each category (1, 3, 7.5, and 10 broadleaf weeds/100 $ft^2$and 5, 25, 75, and100 grassweeds/100 ft^2, respectively) was then used as an estimate of density in

HADSS. Weed densities were categorized and recommendations in HADSS compared for the count and class data. There was a linear relation between total competitive load based on class data and count data (r^2 = 0.85). Evaluation of Net Return from class and count data indicated a very strong linear relation with a slope of 1.0 (r^2 = 0.99). Based on these findings, we conclude that estimating weed densities by categorization into low, medium, high, and very high would have been accurate enough in our fields to recommend the correct weed control program.

Conclusions: 1. The HADSS database in Georgia has been improved to the point that it recommends treatments that are within 15% of the net return for the experts 83% of the time.; 2. Efficacy data will need to be further refined in this database prior to release of Cotton HADSS, especially for morningglories and bermudagrass; 3. In our studies, it appears that accurate estimations of weed densities based on density classes accurately reflected the actual weed densities and provided a similar total competitive load and net return.

GUAR [*CYAMOPSIS TETRAGONOLOBA* (L.) TAUB.] TOLERANCE TO THREE POSTEMERGENCE HERBICIDES. T.A. Baughman, P.A. Dotray, R.B. Westerman, B.L.S. Olson, J.W. Sij, J.D. Everitt, J.W. Keeling, C.L. Trostle, D.T. Smith, and D.S. Murray. Texas A&M University, Vernon, Lubbock, and College Station; and Oklahoma State University, Stillwater.

ABSTRACT

Guar [*Cyamopsis tetragonoloba* (L.) Taub.] produces a binder and stabilizer used in numerous food products and industrial materials. The only guar processing facility in the United States is located near Vernon, TX. During the early 1970's, guar production exceeded 100,000 acres in the Rolling Plains region of Texas and Southwestern Oklahoma. However, this acreage diminished due to cheaper imports from the Indo-Pakistan subcontinent. However, recent developments have resulted in favorable production economics for growers to reconsider guar as part of their overall cropping system. The added benefit of guar is that it works well as a rotational crop with cotton and wheat in the semi-arid southwest. Currently there are no postemergence broadleaf herbicides labeled in guar. The objective of this research was to evaluate guar tolerance to three postemergence herbicides that are currently labeled in soybean [*Glycine max* (L.) Merr.]. Experiments were established as a factorial arrangement of treatments in a randomized complete block design at three locations: Chillicothe and Lubbock, TX, and Perkins, OK. The factors were herbicide [2,4-DB, Pinnacle (thifensulfuron), and Raptor (imazamox)] and rate (1X, 2X, and 4X of the current labeled use rate in soybean). The application rates for 2,4-DB were 0.25, 0.5, and 1.0 lb ai/A; Pinnacle 0.004, 0.008, and 0.016 lb ai/A; and Raptor 0.04, 0.08, and 0.16 lb ai/A. All herbicides were applied with crop oil concentrate and Pinnacle and Raptor were also applied with ammonium sulfate. All plots received an overlay of trifluralin and were maintained weed-free throughout the growing season. Herbicides were applied 4 weeks after emergence. Guar was evaluated for injury 14 and 28 days after postemergence treatment (DAPT). Plant heights and yield were documented also.

There was an interaction between locations, herbicides, and rate for crop injury. Crop injury consisted mainly of stunting. At Chillicothe, injury 14 DAPT was less than 10% with all 2,4-DB rates. Injury was 15% or greater with all rates of Pinnacle and the 2X and 4X rates of Raptor. At 28 DAPT, injury was less than 10% with all treatments except Pinnacle at 4X. Crop injury at 14 DAPT was greater than 50% with all rates of Pinnacle and Raptor, and at least 20% with all rates of 2,4-DB at Lubbock. Injury 28 DAPT was 20% or greater with Pinnacle regardless of rate and with the 2 and 4X rate of Raptor. At Perkins, crop injury 14 DAPT was 15% or greater with all rates of Pinnacle, the 2 and 4X rate of Raptor, and the 4X rate of 2,4-DB. At 28 DAPT, only Pinnacle resulted in injury of 15% or greater. Plant height and yield were not effected by herbicide rate therefore data were combined over herbicide rate. At all locations, Pinnacle was the only herbicide that reduced plant height when compared to the weed-free control. 2,4-DB reduced heights at both Lubbock and Perkins, and Raptor reduced heights at Lubbock. No yield reductions were observed with any of the treatments applied at Chillicothe. All herbicides resulted in yield losses at Lubbock and Perkins when compared with the weed-free control. Guar yields were quite low at all three locations. Conditions were extremely hot and dry during the 2000-growing season and most likely contributed to yield loss. It is assumed that poor growing conditions following herbicide application prevented adequate recovery from early season injury. Future experiments will be conducted with these herbicides as well as other potential postemergence broadleaf herbicides in guar.

EFFECT OF PLANTING DATE AND ROW SPACING ON GROUP IV SOYBEAN WEED CONTROL. R.M. Griffin, D.R. Shaw, D.H. Poston, and A.B. Grant, Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762, and Delta Research and Extension Center, Stoneville, MS 38776.

ABSTRACT

Four field studies were conducted at the Black Belt Branch Experiment Station near Brooksville, MS, to evaluate soybean production under different environmental and weed interference conditions using conventional herbicides, glyphosate, and tankmixtures of glyphosate with conventional herbicides. A glyphosate-tolerant Maturity Group IV soybean was planted April 20 and May 1 in 19-cm and 76-cm rows. Herbicide applications were made PRE and POST based on weed sizes ranging from 5 to 10 cm. POST treatments were made to the April 20 planted studies 5

WAP and the May 1 planted studies 3.5 WAP. A crop oil concentrate (COC) was used at 1.0% (v/v) with lactofen + chlorimuron. No surfactant was used with any treatment containing glyphosate. Visual evaluations were collected every two weeks after application (WAA).

Twelve herbicide treatments were evaluated in each test including: an untreated check, 1.1 kg ai ha^{-1} glyphosate POST, 0.56 kg ha^{-1} glyphosate + 9 g ai ha^{-1} cloransulam + 71 g ai ha^{-1} acifluorfen POST, 1.1 kg ai ha^{-1} pendimethalin + 220 g ai ha^{-1} sulfentrazone + 40 g ai ha^{-1} chlorimuron PRE, 0.84 kg ha^{-1} glyphosate POST followed by 0.56 kg ha^{-1} glyphosate POST-2, 1.1 kg ha^{-1} pendimethalin + 220 g ha^{-1} sulfentrazone + 40 g ai ha^{-1} chlorimuron PRE followed by 0.56 kg ha^{-1} glyphosate POST, 0.56 kg ha^{-1} pendimethalin + 220 g ha^{-1} sulfentrazone + 40 g ai ha^{-1} chlorimuron PRE followed by 0.56 kg ha^{-1} glyphosate + 9 g ha^{-1} cloransulam + 71 g ha^{-1} acifluorfen POST, 0.56 kg ha^{-1} glyphosate + 9 g ha^{-1} cloransulam + 71 g ha^{-1} acifluorfen POST followed by 0.56 kg ha^{-1} glyphosate POST-2, 0.56 kg ha^{-1} glyphosate POST followed by 0.56 kg ha^{-1} glyphosate POST-2 followed by 0.56 kg ha^{-1} glyphosate POST-3, and 3 treatments utilizing MSU-HERB: a single POST application decided by MSU-HERB, 740 g ai ha^{-1} flumetsulam + 0.56 kg ha^{-1} pendimethalin PRE followed by a single POST application decided by MSU-HERB, and 740 g ha^{-1} flumetsulam + 0.56 kg ha^{-1} pendimethalin followed by a reduced rate of a single POST application decided by MSU-HERB.

At 5 WAA, neither hemp sesbania nor pitted morningglory control was affected by row spacing or planting date. Control was similar among the same herbicide treatments in all four studies, with the most efficacious treatments ranging from 84 to 90% and 76 to 90% control, respectively. However, herbicide treatments were not required until 5 WAP in the April 20th-planted study, but within 3.5 WAP in the May 1st-planted study. Thus, the application window for postemergence control of hemp sesbania and pitted moningglory was shortenend with later planting dates. Drought conditions reduced canopy closure in narrow rows, thus negating the benefit of narrow rows in these particular studies. By extending the application time for postemergence herbicides, soybean can become more competitive and herbicide applications can be made to smaller, more susceptible weeds for a longer period. If multiple POST applications are necessary because of the shortened window of application, economic returns would be reduced. By being able to target weeds while they are most susceptible, reduced rates of herbicides may be more effectively utilized with earlier planting dates.

USE OF VALOR (V-53482) AS A STALE SEEDBED PREEMERGENCE AND BURNDOWN HERBICIDE IN SOYBEAN. T.H. Koger, D.R. Shaw, and R.M. Griffin, Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Inconsistent weed control and increased occurrence of weed resistance with the use of ALS-inhibiting herbicides has resulted in the need for herbicides with different modes of action to control troublesome weeds in soybean (*Glycine max* L.). Also, herbicides commonly used in soybean for burndown weed control such as glyphosate and paraquat have no residual activity, thus a PRE and/or early POST herbicide is typically required to control weeds early in the growing season. Valor (flumioxazin) is a protoporphyrinogen oxidase-inhibiting herbicide labeled in peanut and currently in the labeling process for burndown and PRE use in soybean. Flumioxazin has residual activity on grass and broadleaf weeds, and has excellent activity on troublesome broadleaf weeds such as prickly sida (*Sida spinosa* L.), common waterhemp (*Amaranthus rudis* Sauer), and morningglory species (*Ipomoea* spp.). The objective of this research was to evaluate the potential burndown and PRE use of flumioxazin in soybean production systems.

Two field studies evaluating burndown treatments were conducted at Starkville, MS, and four studies evaluating PRE treatments were conducted at Starkville, Brooksville, Newton, and Raymond, MS, in 2000. Soil type and pH at the Starkville, Newton, Brooksville, and Raymond locations were clay loam, sand loam, silt loam, and silt loam, and 7.8, 6.6, 6.2, and 7.2. The burndown treatments flumioxazin, glyphosate, and paraquat at 90, 1121, and 706 g ai/ha, respectively, were applied stale seedbed in early March. Crop oil concetrate (1.0% v/v) was added to flumioxazin and a NIS (0.25%, v/v) to the paraquat treatment prior to application. PRE treatments included flumioxazin (105 g ai/ha), flumioxazin + chlorimuron (105 + 52 g ai/ha), flumioxazin + cloransulam (105 + 34 g ai/ha), metribuzin + metolachlor (431 + 1811 g ai/ha), pendimethalin (841 g ai/ha), and imazaquin + pendimethalin (139 + 842 g ai/ha). A stale seedbed was present prior to applying PRE treatments in early May at Starkville and Brooksville, while conventional tillage was used at Newton and Raymond, respectively. Visual control ratings for corn buttercup (*Ranunculus arvensis* L.), henbit (*Lamium amplexicaule* L.), and annual bluegrass (*Poa annua* L.) were estimated five weeks after treatment (WAT) with the burndown herbicides. For PRE experiments, soybean injury and visual control ratings for sicklepod [*Senna obtusifolia* (L.) Irwin and Barnaby], pitted morningglory (*Ipomoea lacunosa* L.), and johnsongrass [*Sorghum halepense* (L.) Pers.] were estimated 3, 5, and 7 weeks after PRE application.

Burndown applications of flumioxazin controlled corn buttercup and henbit as well as glyphosate and paraquat, with more than 90% control at 5 WAT. Annual bluegrass control ranged from 75% with flumioxazin to 88% with glyphosate. PRE applications of flumioxazin alone controlled sicklepod and pitted morningglory better than pendimethalin and imazaquin + pendimethalin, with 85% control of both species at 3 WAT. Pendimethalin and imazaquin + pendimethalin controlled sicklepod 55 and 48%, and pitted morningglory 65 and 58%, respectively, at 3 WAT. Tank-mixing chlorimuron or cloransulam with flumioxazin did not improve control of sicklepod or pitted morningglory, with the tank-mix treatments controlling sicklepod 70 to 80% by 3 and 5 WAT, and pitted morningglory 88 to 92%. By 7 WAT, sicklepod control was more than 50% and pitted morningglory control more than 74% for all treatments except Prowl. Johnsongrass control was more than 80% for all treatments at 3 and 5 WAT. However, by 7 WAT johnsongrass control ranged from 50% with flumioxazin to 92% with flumioxazin + chlorimuron. Soybean injury at 3 WAT ranged from 5% with flumioxazin to 14% with flumioxazin + chlorimuron. By 7 WAT, soybean injury was less than 5% for all treatments.

ALTERNATIVES TO CYANAZINE FOR LAYBY WEED CONTROL IN COTTON. W.K. Vencill, University of Georgia, Athens.

ABSTRACT

Experiments were conducted at the Southwest Georgia Branch Experiment Station near Plains and the Plant Science Farm near Athens to evaluate new chemistries for post-directed weed control in conventional and Roundup Ready cotton. Roundup Ready cotton ('PM 1218 BG/RR') was planted. Glyphosate was applied broadcast to the test area at the 2-leaf stage and directed at the 15 cm stage of cotton. Flumioxazin (Valor), sulfosulfuron, halosulfuron, cloransulam, amicarbazone, pyrithiobac, bispyribac, trifloxysulfuron (CGA 342622), rimsulfuron, flufenacet, flufenapyr, carfentrazone, and diuron were compared to cyanazine for cotton injury and weed control when applied to cotton at the 35-40 cm post-directed.

Sulfosulfuron, amicarbazone, bispyribac, flufenacet, and rimsulfuron caused greater than 25% cotton injury so probably would not be suitable for post-directed weed control in cotton because of excessive crop injury. The other herbicides caused less than 15% cotton injury 14 days after treatment (DAT). All of the herbicides examined provided >95% Palmer amaranth (*Amaranthus palmeri*) control 30 DAT. Cloransulam, trifloxysulfuron, flufenapyr, flumioxazin, and diuron provided sicklepod (*Senna obtusifolia*) control similar to cyanazine whereas halosulfuron, pyithiobac, and carfentrazone provided less control than cyanazine.

In a separate study, flumioxazin was applied at 15-20 cm, 20-25 cm, 25-30 cm, and 30-35 cm cotton post-directed with a non-ionic surfactant or crop oil concentrate as well as a tank-mix with glyphosate. Flumioxazin with a non-ionic surfactant tended to cause less cotton injury than when crop oil concentrate was added regardless of application timing. Injury decreased when flumioxazin was applied after the 15-20 cm stage of cotton.

Yields were reflective of cotton injury and weed control. Treatments that caused the most injury produced the least yield. Of those treatments causing minimal injury to cotton, yields were similar to cyanazine.

SITE SPECIFIC WEED MANAGEMENT IN GYPHOSATE-TOLERANT SOYBEAN (*Glycine max*).
S.C. Troxler, A.J. Price, S.D. Askew, S.B. Clewis, J.W. Wilcut, and W.D. Smith. North Carolina State University, Raleigh, NC 27695.

ABSTRACT

Field studies were conducted in 1999 and 2000 at Kinston, NC to evaluate the Patchen™ weed-sensing hooded sprayer for weed control, yield, and reduction in herbicide costs and application in conventional soybean production. The experimental design was a randomized complete block design with four replications. Herbicide systems evaluated consisted of 1) an untreated check, 2) chlorimuron at 0.70 kg ai/ha plus dimethenamid at 1.4 kg ai/ha plus metribuzin at 0.35 kg ai/ha broadcast PRE fb glyphosate broadcast POST at 1.12 kg ai/ha, 3) chlorimuron at 0.70 kg/ha plus dimethenamid at 1.4 kg/ha plus metribuzin at 0.35 kg/ha PRE 46 cm band fb glyphosate POST at 1.12 kg/ha applied with the Patchen™ hooded sprayer, where weed detection under the hood simulated glyphosate application on the drill, 4) chlorimuron at 0.70 kg/ha plus dimethenamid at 1.4 kg/ha plus metribuzin at 0.35 kg/ha PRE 46 cm band fb glyphosate POST at 1.12 kg/ha applied with the Patchen™ hooded sprayer, where glyphosate was applied automatically on the drill, 5) glyphosate POST at 1.12 kg/ha applied with the Patchen™, where weed detection under the hood simulated glyphosate application on the drill, and 6) glyphosate POST at 1.12 kg/ha applied with the Patchen™, where glyphosate was applied automatically on the drill. Spray dye was used to assess accuracy of weed detection and to simulate a decision on the drill. Economic analysis was based on production costs including: cultural and pest management procedures, equipment and labor, interest on operating capital harvest operations, and general overhead costs. The cash price received for soybean was based on the average soybean prices for 2000, or at $5.15/Bu.

Greater than 94% weed control was achieved with each herbicide system. Weed control was based on percent of broadleaf signalgrass (*Brachiaria platyphylla*), smooth pigweed (*Amaranthus hybridus*), sicklepod (*Senna obtusifolia*), entireleaf morningglory (*Ipomoea hederacea* var. *integruiscula*), and ivyleaf morningglory (*Ipomoea hederacea*) controlled. POST applicatons of glyphosate by the Patchen™ hooded sprayer provided weed control equivalent to herbicide treatments using PRE and POST broadcast applications. Weed detection under the hood fb simulation of spray on the drill provided equivalent weed control compared to glyphosate application automatically on the drill. Yields did not differ between treatments. Thus, systems involving the Patchen™ hooded sprayer

produced equivalent yields compared to standard broadcast applications. The use of the Patchen™ hooded sprayer increased net returns by an average of $84/ha compared to standard broadcast PRE and POST applications. Repeated applications of glyphosate with the Patchen™ produced similar net returns as systems using PRE-banded herbicides in combination with the Patchen™ hooded sprayer. EPOST applications of glyphosate were reduced 46 to 65%, and LPOST were reduced 88 to 92% with the Patchen™ hooded sprayer. Although PRE-banded herbicides reduced the amount of glyphosate used in early and late POST applications, net returns were not increased compared to total POST systems. These data suggest use of glyphosate with the Patchen™ hooded sprayer is an effective and economically benefical weed management system. Weed occurrence in the row middle was related to weed presence in the drill, thus utility of the Patchen™ sprayer can be increased.

INTERACTION OF PYRITHIOBAC AND MSMA ON YELLOW NUTSEDGE. S.L. Price and W.K. Vencill. University of Georgia, Athens.

ABSTRACT

Greenhouse experiments were conducted to evaluate the efficacy and the interaction of pyrithiobac and MSMA applied preemergence and postemergence on yellow (*Cyperus esculentus* L.) Yellow nutsedge was treated with pyrithiobac applied at 0, 9, 18, 35, 53, 70, and 140 g ha^{-1} and MSMA applied at 0, 560, 840, 1120, 1680, and 2240 g ha^{-1} as pyrithiobac applied preemergence followed by MSMA applied postemergence 30 days after planting (DAP) and pyrithiobac plus MSMA applied postemergence on yellow nutsedge 15 days after planting and 30 days after planting. Pyrithiobac applied alone as a preemergence treatment on yellow nutsedge provided better control than applying pyrithiobac alone postemergence 15 DAP or 30 DAP. As a sequential following PRE pyrithiobac, MSMA tended to be synergistic at rates above 1500 g/ha following rates of pyrithiobac applied at 8-32 g/ha.When applied as a mixture early POST with pyrithiobac, MSMA tended to be synergistic with pyrithiobac at rates <63 g/ha at MSMA rates >1000 g/ha. MSMA tended to be antagonistic with pyrithiobac when applied POST on yellow nutsdge.

CONTROL OF VOLUNTEER ROUNDUP READY SOYBEAN (*GLYCINE MAX*) WITH POSTEMERGENCE COTTON (*GOSSYPIUM HIRSUTUM*) HERBICIDES. A.S. Culpepper, Department of Crop and Soil Sciences, University of Georgia, Tifton, GA 31793; H.L. Crooks and A.C. York, Crop Science Department, North Carolina State University, Raleigh, NC 27695-7620.

ABSTRACT

Roundup Ready soybean and Roundup Ready cotton are grown on approximately 70% of the acreage in the Southeast. Volunteer soybean is rarely a problem. However, flooding from Hurricane Floyd devastated crops in eastern North Carolina in the fall of 1999, and thousands of acres of soybean were not harvested. Problems with volunteer soybean in cotton were not widespread in 2000, but extension personnel did receive several calls on how to control volunteer Roundup Ready soybean in Roundup Ready cotton.

Most Roundup Ready cotton growers apply either no soil-applied herbicides or only Prowl. Additionally, most Roundup Ready cotton is not cultivated. Under these conditions, volunteer soybean will grow faster than cotton. By the time growers apply their typical directed sprays, the soybean is too large for effective spray coverage and control. Control of volunteer Roundup Ready soybean in Roundup Ready cotton will require a herbicide mixed with Roundup applied overtop of small cotton.

Two experiments were conducted near Goldsboro, NC in 2000 to determine the effectiveness of Staple, CGA 362622, MSMA, and combinations of Staple plus MSMA and CGA 362622 plus MSMA on Roundup Ready soybean. Soybean 'AG 5901 RR' was planted in 30-inch rows in plots four rows by 20 feet. Treatments in both experiments consisted of a factorial arrangement of Staple 85 DF and CGA 362622 75 DF options by MSMA 6.6 L rates and were replicated three times in a randomized complete block design. In Experiment 1, Staple and CGA 362622 options were Staple 0.6 and 1.2 oz/A, CGA 362622 0.1 oz/A, and no Staple or CGA 362622. MSMA rates were 0 and 1 pt/A. In Experiment 2, Staple was applied at 0.6 and 1.2 oz/A, CGA 362622 at 0.05, 0.075, and 0.1 oz/A, and MSMA at 0, 1, and 2 pt/A. Treatments were applied to soybean in the three-trifoliate (Experiment 1) or four-trifoliate (Experiment 2) stage. All treatments in both experiments received Roundup Ultra 2 pt/A. Staple, CGA 362622, and MSMA were tank mixed with Roundup Ultra. All treatments containing Staple, CGA 362622, or MSMA included a nonionic surfactant at 0.125% (v/v).

In Experiment 1, MSMA controlled soybean only 13% 35 DAT (days after treatment). Staple was more effective than MSMA, and it controlled soybean 63 and 86% when applied at 0.6 and 1.2 oz/A, respectively. CGA 362622 controlled soybean 99%. Mixtures of Staple and MSMA were antagonistic. Adding MSMA 1 pt/A to Staple 0.6 oz/A reduced control from 63 to 20% 35 DAT. Control by Staple 1.2 oz/A decreased from 86 to 36% when MSMA was added. Minor antagonism also was noted when MSMA was mixed with CGA 362622. Soybean control decreased from 99 to 92%.

Similar results were noted in Experiment 2, although MSMA alone was more effective than in Experiment 1. MSMA at 1 and 2 pt/A controlled soybean 42 and 74%, respectively, 35 DAT. Staple at 0.6 and 1.2 oz/A controlled soybean 58 and 68%, respectively. Adding MSMA at 1 pt/A to Staple 0.6 and 1.2 oz/A reduced control 13 and 29%, respectively. Control by Staple plus MSMA 2 pt/A was similar to control by Staple alone, but this mixture was still antagonistic. CGA 362622, even at 0.05 oz/A, controlled soybean at least 99%. Mixtures of CGA 362622 plus MSMA were antagonistic, but control by CGA 362622 at all rates plus MSMA exceeded control by either Staple alone or Staple plus MSMA.

BROADSPECTRUM WEED CONTROL WITH NEWPATH COMBINATIONS IN RICE. K.J. Pellerin, E.P. Webster, and J.A. Masson. Louisiana State University AgCenter, Baton Rouge, LA 70803.

ABSTRACT

A study was established in drill-seeded rice in 2000 at the Rice Research Station near Crowley, LA to evaluate weed control and crop response of imidazolinone-tolerant (Clearfield) rice (*Oryza sativa*) to NewPath (imazethapyr) applied in combination with other herbicides. The design was a randomized complete block with a 3 factor-factorial arrangement of treatments with four replications. Factor A consisted of NewPath at 5 oz/A applied preplant incorporated (PPI), preemergence (PRE), or no soil application. Factor B consisted of an early postemergence (EPOST) application of one of the following herbicides: 1 oz/A Londax (bensulfuron), 0.67 pt/A Grandstand (triclopyr), 6 pt/A Arrosolo (propanil + molinate), 1 oz/A Aim (carfentrazone), 1.5 pt/A Storm (bentazon + aciflurofen), 1 oz/A Permit (halosulfuron), 0.4 oz/A Regiment (bis-pyriobac sodium), or no EPOST. Factor C consisted of a late postemergence (LPOST) application of NewPath at 3 oz/A or no LPOST. Visual ratings of barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.], hemp sesbania [*Sesbania exaltata* (Raf.) Cory], and Indian jointvetch (*Aeschynomene indica* L.) control as well as rice injury were evaluated at 33 days after LPOST treatment (DALPOST). Rice was harvested and yield was adjusted to 12% moisture.

When no soil application of NewPath was made, barnyardgrass control never exceeded 40%, except with the addition of Arrosolo or Regiment EPOST. Barnyardgrass control was 57 and 47% with a single application of 5 oz/A NewPath PPI or PRE, respectively. However, when NewPath was applied PPI fb any herbicide EPOST and a LPOST NewPath application barnyardgrass control increased to 85 to 95%. Arrosolo or Regiment applied EPOST fb NewPath LPOST, with or without a PPI or PRE application, controlled barnyardgrass 90 to 95%. Hemp sesbania control was equal to or greater than 80% regardless of soil application of NewPath fb Grandstand, Arrosolo, Aim, Storm, Permit, or Regiment. NewPath PPI at 5 oz/A fb an EPOST application of Arrosolo, Permit, or Regiment, resulted in 95% control of hemp sesbania. Hemp sesbania control was less than 65% with all other treatments evaluated. NewPath applied PPI or PRE fb Arrosolo, Permit, or Regiment controlled Indian jointvetch 85 to 95%. Control of Indian jointvetch was 50 to 80% with Londax, Aim, and Storm EPOST regardless of soil treatment.

Rice injury was not observed at 33 DALPOST. Rice yield was 2910 to 5700 lb/A for all treatments. Rice yield was above 5400 lb/A with all treatments containing Arrosolo and Regiment. When Arrosolo or Regiment were not included in a weed control program a soil application of NewPath is need to obtain similar yields.

In conclusion, NewPath PPI fb a LPOST application of NewPath can adequately control barnyardgrass. In this study the addition of Arrosolo or Regiment into a NewPath weed control program adequately controls hemp sesbania and Indian jointvetch. This research indicates when broadleaf weeds are present, NewPath applications must be supplemented with other herbicides to achieve acceptable control of troublesome weeds.

WEED CONTROL AS INFLUENCED BY SQUADRON AND TIMING OF SEQUENTIAL ROUNDUP APPLICATIONS. G.R.W. Nice, N.W. Buehring, and R.R. Dobbs, North Mississippi Research & Extension Center, Verona, MS; Mississippi State University.

ABSTRACT

Soybean producers in Northeast Mississippi have expressed an interest in determining whether the use of a PRE herbicide in a Roundup (glyphosate) only weed control program is necessary. Therefore, a study was initiated in 2000 at the North Mississippi Research & Extension Center to determine the effects of a single or sequential Roundup applications in combination with or without a PRE application of Squadron (imazaquin + pendimethalin) at 0.87 lb ai/ac on weed control in low and high infestations of pitted (*Ipomea lacunosa*) and entireleaf morningglor (*I. herderacea* var *integriuscula*) and sicklepod (*Senna obtusifolia*). Roundup applications at 1.0 lb ai/A were made 14, 21, and 28 days after planting (DAP) or at 1.5 lb ai/A 35 DAP. In the sequential applications, Roundup at 1.0 lb ai/A was applied 14, 21, 28 DAP or 1.5 lb ai/A DAP followed by 0.5 lb ai/A 14 days after initial application.

Weed infestation level had no effect on late season morningglory and sicklepod control, harvest foreign matter, or soybean yield. There also was no benefit for late season sicklepod control from a PRE with any Roundup sequential or 28 DAP single applications. The PRE with 14, 21, and 35 DAP single Roundup applications increased sicklepod control. Morningglory control was similar; however, the PRE did increase control in the 21 DAP sequential.

Sequential applications reduced harvest foreign matter except the 28 DAP single with or without a PRE and 35 DAP single with a PRE. A PRE application increased soybean yield in all single and sequential Roundup applications. The PRE applications increased mid-season weed control ratings (60 DAP) for both morningglory and sicklepod control by 10%. This increased early season weed control possibly influencing soybean yield. The study will be repeated in 2001.

CYHALOFOP-BUTYL FOR POSTEMERGENCE GRASS WEED CONTROL IN DIRECT AND WATER SEEDED RICE. D.M. Simpson, V.B. Langston, R.B. Lassiter and R.K. Mann. Dow AgroSciences, Greenville, MS; 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 provide broad-spectrum grass control when applied alone or it maybe tank-mixed with a residual grass herbicide or a broadleaf herbicide to meet the weed control needs. In 2000, trials were conducted to evaluate cyhalofop-butyl performance in water-seeded rice compared to commercial standards for the control of 2-3 lf and 4-6 lf barnyardgrass (*Echinochloa crus-galli*) and sprangletop (*Leptochloa* spp). At the recommended rates of 210 g ai/ha for 1-3 lf grasses and 280 g ai/ha for 4–6 leaf grasses, cyhalofop-butyl provided grass control equal to or better than propanil, quinclorac, bispyribac-sodium or fenoxaprop + AEFO4360. Cyhalofop-butyl based programs were tested in 1999 and 2000 for weed control in dry-seeded rice production. The programs tested were classified as fitting one of two categories: non-residual programs, which consisted of two pre-flood applications of non-residual herbicides 10-14 days apart; or residual programs in which the first pre-flood application contained a knockdown plus a residual grass herbicide followed by no herbicide, or triclopyr +/- cyhalofop-butyl 10-14 days after the first application. At some locations, clomazone applied PRE followed by either triclopyr +/- cyhalofop-butyl applied at the second pre-flood timing were evaluated. The non-residual programs that contained cyhalofop-butyl in the first application provided better season long control of barnyardgrass and sprangletop than those that did not. In the residual programs, cyhalofop-butyl + pendimethalin programs provided barnyardgrass control equal to propanil + quinclorac and clomazone programs. Cyhalofop-butyl + pendimethalin programs provided 95% control of sprangletop which was better than the propanil + pendimethalin and quinclorac programs. Studies were initiated in 2000 to evaluate the efficacy of post-flood applications of cyhalofop-butyl on large tillered barnyardgrass, sprangletop, and broadleaf signalgrass (*Brachiaria platyphylla*). Cyhalofop-butyl at 280 g ai/ha provided barnyardgrass control equal to bispyribac-sodium and quinclorac and better than fenoxyprop + AEFO4360; sprangletop control better than fenoxaprop, bispyribac-sodium and quinclorac and equal to BAS 625H; and broadleaf signalgrass control better than BAS 625H and bispyribac, and equal to quinclorac and fenoxaprop + AEFO4360. Across all the trials, rice exhibited excellent tolerance to cyhalofop-butyl regardless of production system or application timing.

CLEARFIELD VS. LIBERTY: A COMPARISON OF TWO RICE TECHNOLOGIES THAT OFFER SELECTIVE RED RICE CONTROL. G.A. Ohmes, J.A. Kendig, R.L. Barham, and P.M. Ezell, University of Missouri Delta Center, Portageville, MO 63873.

ABSTRACT

The development of Liberty Link (glufosinate-) and Clearfield (imazethapyr-tolerant) rice will offer producers selective in season red rice control. However, preliminary research has demonstrated weaknesses in both herbicides in controlling common rice weeds such as barnyardgrass and hemp sesbania. The objectives of this study were to compare red rice and barnyardgrass control with Clearfield and Liberty Link varieties and evaluate different weed control programs implementing these new technologies.

The study was conducted on a silt loam soil and a clay soil near Portageville, MO. A randomized block design with 4 replications and a split-plot treatment arrangement, with rice varieties as the whole plots and herbicide treatments as the subplots was utilized. Standard weed science methods were used to apply treatments. Newpath (imazethapyr) treatments included: 1) single applications pre-plant incorporated (PPI) and preemergence (PRE) at 0.078 and 0.094 lb ai/A; 2) PPI and PRE applications at 0.078 and 0.094 lb ai/A followed by a 2- to 3-leaf grass postemergence (EPOST) application at 0.032 and 0.047 lb ai/A, respectively; and 3) sequential POST applications at 0.032 lb ai/A. Blazer at 0.25 lb ai/A was added to POST Newpath applications for hemp sesbania control. Liberty (glufosinate) treatments included: 1) single EPOST, pre-flood (PREFLD), and post-flood (POSTFLD) applications at 0.375 lb ai/A; 2) sequential applications EPOST followed by PREFLD or POSTFLD at 0.375 lb ai/A; 3) all three timings at 0.375 and 0.25 lb ai/A; and 4) EPOST followed PREFLD application at 0.75 lb ai/A. For comparison purposes Stam + Facet was applied to both varieties as a red rice check. Weeds evaluated included red rice (*Oryza sativa*) and barnyardgrass (*Echinochloa crus-galli*). Weed control ratings were taken 5, 8, 10 (clay location) and 14 weeks after planting (WAP).

No crop injury was observed with either herbicide at either location. Two applications of both herbicides provided more consistent control of barnyardgrass and red rice compared to single applications. Single soil applications of

Newpath at 0.078 and 0.094 lb ai/A provided <85% barnyardgrass and red rice control 8 WAP. Single PPI and all sequential applications at the silt loam location provided 70% to 88% barnyardgrass control while single PPI (clay location) and PRE (both locations) applications provided <60% barnyardgrass control. Single PPI at 0.094 lb ai/A and sequential applications of Newpath at the silt loam location provided 80% to 90% control of red rice. At 14 WAP, all single applications fell below 70% and 60% control of barnyardgrass and red rice, respectively. Red rice control from sequential applications fell below 80% at 14 WAP. Grass weed control was less; however, similar trends were observed at the clay location.

A single POSTFLD application of Liberty did provide control similar to selected multiple applications. However, a single late season application was not an optimal timing for beneficial weed control. Although there were treatments with equivalent control, three applications at 0.375 lb ai/A provided >85% control of barnyardgrass and >90% control of red rice at both locations, 8 WAP (silt loam) and 10 WAP (clay). At the clay location, sequential treatments that included a POSTFLD application provided 100% control of red rice 10 WAP. These data suggest and support our previous research which indicates that multiple applications, which include a POSTFLD application, will be necessary for control of barnyardgrass and red rice.

In conclusion, both of these technologies can provide producers in season red rice control. Multiple applications of Newpath and Liberty will be necessary to control both red rice and barnyardgrass. However, there are still inconsistencies in overall weed control with both technologies even when multiple applications are made. Newpath weed control programs will have to include a broadleaf compound for control of hemp sesbania. These data suggest that a PPI application followed by a pre-flood or a total postemergence program may be the best option for producers. Liberty weed control programs will require multiple applications. These data suggest that a post-flood application will be necessary for late season weed control. Three applications have provided the most consistent control of both red rice and barnyardgrass.

EFFECTS OF OPENING SIZE AND SITE PREPARATION METHOD ON VEGETATION DEVELOPMENT AFTER IMPLEMENTING GROUP SELECTION IN A PINE-HARDWOOD STAND.

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ABSTRACT

Three opening sizes (0.25, 0.625, and 1.0 ac) and three site preparation methods (herbicides, mechanical, and an untreated control) were tested in a pine-hardwood stand dominated by loblolly and shortleaf pines (*Pinus taeda* L. and *P. echinata* Mill.) and mixed oaks (*Quercus* spp.) that was being converted to uneven-aged structure using group selection. The study was a 3x3 factorial in a randomized complete block design with three replicates. Site preparation in the openings was delayed for 2 years after harvest until an adequate pine seed crop was forecast. At 3 years after the group-selection cut and 1 year after site preparation, pine seedling stocking was higher (P=0.01) in the 0.25-ac openings (89%) when compared to the 0.625-ac openings (71%) or the 1.0-ac openings (66%). Mechanical site preparation resulted in higher (P=0.03) pine seedling density (5,272 stems/ac) compared to the control (2,490 stems/ac) or chemical site preparation (3,044 stems/ac), but both the mechanical and chemical treatments had better (P=0.03) stocking (82%) of pine seedlings than the control (61%). Both mechanical and chemical site preparation were effective in reducing (P<0.01) the density (85% less) and stocking (75% less) of nonpine woody saplings compared to the control, but size of opening had no effect on density of nonpine woody seedlings or saplings at 1 year after site preparation.

INTRODUCTION

Group selection is an uneven-aged reproduction cutting method that is reputed to favor the more shade-intolerant species by creating larger openings than single-tree selection. However, less is known about group selection than about any of the other natural reproduction cutting methods (5). The goal of group selection is to create or maintain an uneven-aged stand by making a number of openings during each cutting cycle, in addition to thinning the residual stand as needed. The regeneration effort is focused within these distinctive openings that are usually #1 ac. If group selection is applied over several cutting cycles, a fragmented stand composed of small even-aged groups should result. The larger openings provided with group selection do not appear to be needed for pine regeneration when traditional stocking guidelines for single-tree selection are followed (1). However, group selection seems to have merit when a significant hardwood component is desired because the larger openings provide the higher light intensities needed by the shade-intolerant pines and the intermediate-tolerant oaks.

The environmental requirements for regeneration of targeted species are critical to setting suitable opening sizes. Experience suggests that large openings will favor the establishment and development of the more shade-intolerant species, but large openings are perceived to have poor visual qualities by some forest users. Thus, the optimum opening size would be the smallest one that provides a favorable environment for regenerating targeted species. This study was installed in north central Louisiana to provide information on suitable opening sizes and site preparation methods for applying the group selection system in pine-hardwood stands; first-year results after site preparation are presented in this paper.

METHODS

Study Area

The study was installed in a 120-ac, second growth pine-hardwood stand located on the Winn Ranger District of the Kisatchie National Forest in Grant Parish, LA. Soils in the study area were mapped as the Cadeville series (Albaquic Hapludalfs) with smaller amounts of the Metcalf series (Aquic Glossudalfs) (4). These soils are somewhat poorly drained and have a loamy surface layer with a clayey subsoil. Based on measurement of 20 dominant and codominant loblolly pines on the study area, site index averaged 91 ft for loblolly pine at 50 years; the trees had a mean age of 59 years.

Before harvesting, merchantable (>3.5 inches dbh) basal areas averaged 74 ft^2/ac for loblolly and shortleaf pines and 54 ft^2/ac in midcanopy hardwoods. Oaks (*Quercus* spp.) were the dominant hardwood species, accounting for 66% of hardwood basal area. Pines in designated openings averaged 3,000 ft^3/ac in total merchantable volume and 2,850 ft^3/ac and 14,000 bd ft/ac (Doyle) in sawlog volume. Hardwoods averaged 1,120 ft^3/ac in merchantable volume.

Study Design and Treatment Implementation

Three blocks were established that were approximately 40 ac in area. The blocking factor was proximity to an intermittent drainage. Treatments were opening size and site preparation. Within each block, boundaries were located for nine circular openings with areas of 0.25, 0.625, and 1.0 ac. Diameters for these openings would be about 1.2, 2.0, and 2.5 times the height of the dominant pines which averaged 95 ft tall in the surrounding stand. Openings were to be systematically located so that adjacent openings were separated by at least 100 ft, but the opening area was randomly assigned. Openings of a block were then randomly assigned to one of the three site preparation methods (chemical, mechanical, or untreated control). About 14% of the total area of a block would be in openings. After boundaries were established for each opening, all merchantable pines and hardwoods occurring within the area were marked for harvest. The stand between the openings was marked to leave 70 ft^2/ac in pine basal area; marking was for an improvement cut focusing on the pine sawtimber component. No hardwoods or pine pulpwood were harvested outside the openings.

Harvesting was completed during October 1991. The only restriction imposed on loggers was that no trees from one opening could be skidded through another opening; this prevented greater traffic from occurring in the openings near landings. The loggers removed pine sawtimber first and then pine and hardwood pulpwood. Inspection of pine tops after harvest indicated very few mature cones and virtually no conelets, suggesting that the next two pine seed crops would be inadequate for natural regeneration. Thus, it was decided to delay site preparation until an adequate seed crop was predicted by counting the number of cones on bordering trees, which occurred 2 years later in 1993.

Chemical site preparation consisted of a broadcast application of glyphosate[**] (2% in a water base with a surfactant) using backpack sprayers to wet unwanted vegetation in late July 1993. Existing pine seedlings were not intentionally treated. An average of 21 gal/ac of solution were applied in openings; application time averaged 1.9 person-hr/ac. Within openings, residual hardwoods $1 inch dbh were stem injected at waist height with triclopyr (50% in a water base) using the hack-and-squirt method in late September 1993. Hard-to-kill species, such as red maple (*Acer rubrum*) and blackgum (*Nyssa sylvatica*), were frilled edge-to-edge, placing 1 ml of solution in each cut. Other species were treated by making frills at 3-inch intervals and placing 1 ml of solution in each cut. An average of 222 stems/ac with a basal area of 7.0 ft^2/ac was treated with herbicide, and this took an average of 1.5 person-hr/ac and used 1.3 qts/ac of solution.

Mechanical site preparation was applied in mid-September 1993. Residual hardwoods $3 inches dbh were chain-saw felled in advance of using a John Deere® 450C dozer to remove smaller hardwoods and to scarify the soil where logging debris and herbaceous vegetation occurred; no attempt was made to concentrate or pile debris. The dozer operator was instructed to avoid any patches of advanced pine regeneration that were visible. Chain-saw felling took an average of 0.8 person-hr/ac and the dozer 1.2 hr/ac. The number of sawn stems was not counted, but based on the tally for injection work, there were 54 stems/ac with a basal area of 5.6 ft^2/acre. No site preparation treatment was imposed on control plots.

Measurements

Pine seed production was monitored for 3 winters (1991, 1992, 1993) from October through February using three 0.9-ft^2 seed traps (2) per opening; traps were located 20 ft from the opening center in a triangular pattern. Seeds were collected during the middle and end of each October-to-February period. Seed viability was determined by splitting seeds and inspecting the contents. Seeds with full, firm, undamaged, and healthy tissue were judged to be potentially viable and were recorded as sound seeds.

Within each opening, permanent points were systematically located after harvesting to monitor regeneration and seedbed conditions. There were 9, 13, and 17 points in each of the 0.25-, 0.625-, and 1.0-ac openings, respectively.

[**] This publication reports research involving herbicides. It does not contain recommendations for their use, nor does it imply that the uses discussed here have been registered. All uses must be registered by appropriate State and/or Federal agencies before they can be recommended. The use of trade or firm names in this publication is for reader information and does not imply endorsement by the U.S. Department of Agriculture of any product or service.

The sample points were located so that each represented an equal area, which prevented any bias caused by bordering trees. One point was located at the opening center. The remaining points were located along eight radii, beginning at 0° (north) and repeated at 45° intervals.

In mid-September 1993, circular 0.001-ac subplots (3.72 ft radius), centered around the permanent points, were evaluated for coverage of understory vegetation and seedbed condition. Coverage of living vegetation was visually estimated by the following groups: grasses, forbs, vines, hardwoods, shrubs, pines, and total vegetation. Seedbed conditions were evaluated on control and mechanical treatments; the percentage of subplot area was visually estimated as follows: undisturbed litter, slightly disturbed litter or dead vegetation, fine slash (<1.0 inch from either site preparation or harvesting), large slash ($1.0 inch from either site preparation or harvesting), exposed mineral soil, and piled vegetative debris ($2.0 inches in depth) which was often intermixed with soil and logging slash.

Regeneration inventories were conducted at the permanent points during mid-August 1994, 1 year after site preparation. Woody plants in the seedling size class (#0.5 inches dbh) were counted as pines or nonpines in 0.001-ac circular subplots centered around each permanent point. Seedlings with multiple stems were tallied as one rootstock. Stems of woody plants in the sapling size class (0.6 to 3.5 inches dbh) were counted by 1-inch dbh classes as pines or nonpines in 0.01-ac circular plots (11.78 ft radius) around each permanent point.

Data Analysis

Mean values were calculated across subplots for each opening. Subplots were considered stocked by pine or hardwood regeneration if at least one seedling or sapling represented the species or species group.

Analysis of variance for a 3x3 factorial, randomized, complete block design was used to test for differences in factors. Because of so few significant interactions between opening size and site preparation, only the main effects are presented here. Differences among factors were isolated using the Ryan-Einot-Gabriel-Welsch Multiple Range Test (6) at the 0.05 probability level (*P*). Percentage data were arcsine transformed before analysis, but only nontransformed means are presented.

RESULTS AND DISCUSSION

Seedbed Conditions

Mechanical site preparation modified the existing seedbed conditions by exposing mineral soil and redistributing slash and logging debris. With mechanical treatment, undisturbed seedbed conditions were reduced ($P<0.01$) by 73 percentage points compared to control plots (Table 1). The best seedbed conditions for natural pine regeneration were exposed mineral soil and the presence of fine slash. These two conditions were enhanced ($P<0.01$) by 48 percentage points on mechanically treated plots versus control plots. In general, the smaller the opening, the greater the incidence of disturbance to the seedbed. For example, 37% of the area in 0.25-ac openings had fine litter or mineral-soil exposure as compared to 27% of the area in 1.0-ac openings.

Pine Seed Supply

An average seed crop needed for loblolly and shortleaf pines to produce an adequate stand of seedlings is $40,000 sound seeds/ac (3). In this study, an adequate pine seed crop did not occur until the third year after the group-selection harvest; therefore, site preparation was timed to coincide with that seed crop. During the third winter, seed production averaged about 500,000 sound seeds/ac. Although there were no significant differences ($P>0.05$) in seed production among group openings, the dispersal of sound seeds tended to decrease from the smaller (0.25 ac) to the larger openings (1.0 ac), as distance from the seed source increased.

Regeneration Density and Stocking

Size of opening had no effect on pine seedling density, which averaged 3,602 stems/ac 1 year after site preparation (Table 2). However, stocking of pine seedlings in 0.25-ac openings exceeded ($P=0.01$) that in the larger openings by 20 percentage points. Because of improved seedbed conditions, mechanical site preparation resulted in 91% more ($P=0.03$) pine seedlings than the mean of control and chemically treated plots (Table 2). Still, both chemical and mechanical site preparation improved ($P=0.03$) the stocking of pine seedlings by 21 percentage points over untreated controls. Some pine regeneration was already in place before the group-selection cut, and the density and stocking of saplings were not affected by size of opening or site preparation at 3 years after harvest (Table 2).

Across openings, woody nonpine seedlings averaged about 8,000 rootstocks/ac with 98% stocking 1 year after site preparation, and there were no differences (*P*$0.63) among the openings (Table 3). Chemical site preparation was effective in reducing ($P<0.01$) the density of woody nonpine seedlings by 38% compared to control plots, but stocking of these seedlings was not affected by site preparation and averaged 98%. Density of woody nonpine saplings averaged 61 stems/ac. As with seedlings, sapling numbers were not affected ($P=0.06$) by size of opening, but control plots had from six to eight times more ($P<0.01$) hardwood saplings than did chemically- or mechanically-treated plots, respectively. Stocking of hardwood saplings was lowest on the 0.25-ac plots and was 21 percentage points less ($P=0.01$) than on the 1.0-ac plots. Both mechanical and chemical site preparation had similar impacts on stocking of hardwood saplings 1 year after treatment by reducing their distribution by 39 percentage points over untreated control plots.

Vegetation Ground Cover
For individual vegetation components, opening size had no significant effect (*P*$0.15) on ground cover at 1 year after site preparation (Table 4). Yet, total ground cover in 1.0-ac openings was 4 percentage points higher (*P*=0.04) than in 0.25-ac openings. With the exception of forbs and vines, control plots tended to have more ground cover from vegetation than site-prepared plots. Although chemically-treated plots had less (*P*=0.01) grass cover than mechanically-treated plots, these two site-preparation techniques were comparable in the degree of cover from other vegetation components. Compared to control plots, ground cover from shrubs and hardwoods was reduced (*P*<0.01) by both chemical and mechanical site preparation.

CONCLUSIONS

Smaller openings generally had less disturbance from logging than larger openings but somewhat more pine seeds dispersed to the interior of smaller openings. Since increases in both disturbance and seed supply tend to favor the establishment of pine regeneration, their opposing relationship with opening size essentially cancelled out so that opening size had little net effect on pine regeneration. On the other hand, pine seed crop failures during the 2 years following group-selection harvesting allowed enough time for competing vegetation to encroach in the openings and potentially impede the future development of established pine regeneration. From that standpoint, both mechanical and chemical site preparation were generally effective in reducing the density and stocking of woody, nonpine seedlings and saplings when compared to areas where no site preparation was used in advance of pine seed dispersal.

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Table 1. Percent of area disturbed in openings 2 years after a group selection harvest and 4 weeks after mechanical site preparation.

Seedbed condition	Site preparation treatment: Control	Site preparation treatment: Mechanical	Mean square error	*P>F*
	--------*Percent*--------			
Undisturbed	90a[1]	17b	0.0192	<0.01
Slightly disturbed	0b	17a	0.0006	<0.01
Mineral soil exposed	1b	18a	0.0128	<0.01
Fine slash[2]	7b	38a	0.0035	<0.01
Large slash[3]	2b	7a	0.0021	<0.01
Piled slash[4]	0b	3a	0.0068	<0.01

[1] Row means followed by the same letter are not significantly different at the 0.05 level.
[2] Slash <1.0 inch in diameter.
[3] Slash $1.0 inch in diameter.
[4] Mound ($2.0 inches in depth) of competing vegetation and/or fine slash.

Table 2. Density and stocking of natural pine seedlings and saplings 3 years after a group selection harvest and 1 year after site preparation.

Treatment and statistics	Pine seedlings		Pine saplings	
	Density	Stocking	Density	Stocking
Opening size (ac)	*Stems/ac*	*Percent*	*Stems/ac*	*Percent*
0.25	4,691a[1]	89a	6a	4a
0.625	3,376a	71b	30a	5a
1.0	2,739a	66b	18a	7a
P>F	0.17	0.01	0.50	0.79
Site preparation				
Control	2,490b	61b	12a	6a
Chemical	3,044b	83a	38a	8a
Mechanical	5,272a	81a	5a	3a
P>F	0.03	0.03	0.24	0.51
Mean square error	4.51E06	0.047	1753	0.041

[1] Columnar means followed by the same letter within treatments are not significantly different at the 0.05 level.

Table 3. Density and stocking of woody, nonpine seedlings and saplings 3 years after a group selection harvest and 1 year after site preparation.

Treatment and statistics	Woody nonpine seedlings		Woody nonpine saplings	
	Density	Stocking	Density	Stocking
Opening size (ac)	*Rootstocks/ac*	*Percent*	*Stems/ac*	*Percent*
0.25	7,840a[1]	98a	44a	16b
0.625	7,538a	98a	56a	26ab
1.0	8,484a	99a	82a	37a
P>F	0.63	0.67	0.06	0.01
Site preparation				
Control	9,844a	100a	140a	52a
Chemical	6,101b	97a	25b	15b
Mechanical	7,917ab	98a	17b	11b
P>F	<0.01	0.22	<0.01	<0.01
Mean square error	4.37E06	0.013	993	0.038

[1] Columnar means followed by the same letter within treatments are not significantly different at the 0.05 level.

Table 4. Percent ground cover from vegetation components 3 years after a group selection harvest and 1 year after site preparation.

T reatment and statistics	Vegetation components						
	Grasses	Forbs	Vines	Shrubs	Hardwoods	Pines	Total[1]
Size of opening (ac)	------------------------------------Percent cover------------------------------------						
0.25	26a[2]	13a	34a	11a	11a	4a	82b
0.625	25a	17a	32a	9a	12a	4a	85ab
1.0	28a	17a	29a	9a	14a	3a	86a
P>F	0.73	0.15	0.54	0.82	0.17	0.65	0.04
Site preparation							
Control	32a	9b	32a	16a	17a	5a	89a
Mechanical	29a	17a	29a	7b	11b	3a	83b
Chemical	18b	21a	34a	6b	9b	3a	81b
P>F	0.01	<0.01	0.49	<0.01	<0.01	0.22	<0.01
Mean square error	0.0104	0.0054	0.0113	0.0094	0.0020	0.0050	0.0013

[1] Within rows, the sum of individual cover components can exceed 100% because of multi-layered vegetation.
[2] Columnar means followed by the same letter within treatments are not significantly different at the 0.05 level.

APPLICATION ACCURACY IN GLP RESEARCH. MP. Braverman, J.S. Corley, D.C. Thompson, M. Arsenovic, V.R. Starner, K.W. Dorschner, K.S. Samoil, F.P. Salzman, D.L. Kunkel, and J.J. Baron, IR-4 Project, Rutgers University, North Brunswick, N J. 08902-3390

ABSTRACT

Research on the efficacy, phytotoxicity, dissipation and magnitude of residues of pesticides all involve the application of a test substance. Good Laboratory Practices require that adequate information be collected to verify the accuracy of the application. At IR-4, an Excel® spreadsheet has been developed to assist in verifying the accuracy of application. This report concerns the analysis of a database on application data collected from University, USDA-ARS and Industry researchers in 22 states. Included in this analysis were 984 applications from University/USDA and 711 applications from industry for a total of 1,695 applications. Information entered in the database included plot length, number of nozzles, nozzle spacing, the number of passes, pass time, volume of test substance, volume of carrier, volume of adjuvant, boom discharge rate, formulation concentration, and the protocol (target) rate. Using these data, the spreadsheet was organized to calculate the swath width, plot area, total spray volume, delivery rate of the pesticide mixture, the actual rate of test substance applied, and percent deviation from the target rate. Currently, for IR-4 studies an application is considered to be within protocol if it is between 5% below to 10% above the target rate. Ninety-five percent of all 1,695 applications fell within this range. Of the 5% that fell outside the acceptable application range, 34% were below target and 66% were above the target rate. Application accuracy ranged from 52% below the target rate to 140% above the target rate. Factors that resulted in applications being outside the acceptable range included miscalculations,(26% of errors) variation in pass time (14 % of errors) and improper swath width (60% of errors). Several researchers commented that keeping track of their application accuracy helped to improve their research program by knowing where potential problems could arise.

EFFECTS OF DICLOSULAM ON POTENTIAL CROP ROTATIONS FOLLOWING PEANUT PRODUCTION IN TEXAS. C.A. Gerngross and W.J. Grichar, Texas Agricultural Experiment Station, Yoakum; and S.A. Senseman. Texas Agricultural Experiment Station, College Station.

ABSTRACT

Diclosulam is used to control broadleaf weeds in peanut (*Arachis hypogaea*) and soybean (*Glycine max*) 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 at Yoakum in 2000 to evaluate the persistence of diclosulam and its potential injury to rotational crops of peanut. The peanut variety planted was 'GK-7'. Rotational crops planted included corn ('Dekalb 580RR' and 'Dekalb 668'), grain sorghum ('Pioneer 8313') and cotton ('DeltaPine 436RR'). Preplant incorporated (PPI) treatments made in 1999 were 0.024 lb a.i./A, 0.048 lb/A and 0.072 lb /A. These rates represented 1X, 2X and 3X of the labeled rates, respectively. Two preemergence (PRE) treatments made in 1999 were 0.024 lb/A (1X) and 0.048 lb/A (2X). Plots sprayed in 1999 were quantified by

comparing with a new set of plots established in 2000 that represented a standard curve from crop response. Percent injury, plant height measurements and dry weights were taken during the growing season and after harvest.

No significant differences were seen in either variety of corn or in cotton plant heights and dry weights. Grain sorghum dry weight was significantly lower in the 2X rate applied PRE, but results at the 3X rate did not follow this same trend. Thus, it can be concluded for the given year and conditions, diclosulam did not cause injury to these specific rotational crops.

GLYPHOSATE AND BIOHERBICIDE INTERACTION FOR CONTROLLING KUDZU (*PUERARIA LOBATA*), REDVINE (*BRUNNICHIA OVATA*), AND TRUMPETCREEPER (*CAMPSIS RADICANS*). C.D. Boyette *, K.N. Reddy, R.E. Hoagland, and D. Chachalis. USDA-ARS, Southern Weed Science Research Unit, Stoneville, Mississippi.

ABSTRACT

The bioherbicidal fungus *Myrothecium verrucaria* (Alb. & Schwein.) Ditmar:Fr. was tested alone, in combination with, prior to, and following treatment with glyphosate for control of kudzu [*Pueraria lobata* (Willd.) Ohwi], redvine [*Brunnichia ovata* (Walt.) Shinners], and trumpetcreeper [*Campsis radicans* (L.) Seem. ex Bureau] at controlled environments of 20, 30, and 40^{0}C. At all temperatures that were tested, kudzu was most adversely affected by the fungus, followed by trumpetcreeper and redvine, as indicated by greater mortality rates and reduced dry weights. Trumpetcreeper and redvine mortalities and dry weight reductions were synergized when the fungus was applied 7 days after the glyphosate treatment. Application of the fungus combined with or prior to glyphosate treatment resulted in reduced weed control. Disease development was favored by higher temperatures (30 and 40^0 C) when compared to 20^{0}C, although pathogenesis and mortality also occurred at 20^{0}C. Infected weeds of each species exhibited similar disease symptomatology within 12 h following treatment at incubation temperatures of 30 and 40^{0}C. 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 reisolated. These results suggest that it may be possible to use combinations of glyphosate to improve the bioherbicidal control potential of *M. verrucaria* for controlling kudzu, redvine, and trumpetcreeper.

ASSESSMENT OF NEW CORN HERBICIDES IN SOUTH TEXAS. K.D. Brewer, W.J. Grichar, and B.A. Besler. Texas Agricultural Experiment Station, Yoakum, TX 77995.

ABSTRACT

Field studies were conducted in south and south-central Texas during the 1999 and 2000 growing seasons to evaluate several new corn herbicides for weed control and corn response. Axiom (Flufenacet + metribuzin) caused corn stunting and yield reductions in soil with > 80% sand. In soils with < 80% no corn injury with Axiom was noted. Texas panicum (*Panicum texanum*) control varied from 43 to 88% with Axiom at 8 to 18 oz/A. Palmer amaranth (*Amaranthus palmeri*) control ranged from 56 to 100% while ivyleaf morningglory (*Ipomoea hederacea*) control ranged from 41 to 98% with Axiom. Weed control with Epic was similar to Axiom. Corn stunting with Epic was observed with higher rates under sandy soil conditions. ZA-1296 alone did not control annual grasses (< 60%) but provided good to excellent broadleaf weed control (75 to 95%). When Fultime was added to ZA-1296 annual grass control improved 20 to 30%. Celebrity Plus and Distinct provided good to excellent Texas panicum and broadleaf weed control (80 to 98%). Leadoff applied PRE followed by Accent + Matrix + Hornet applied POST or Leadoff applied PRE followed by Basis Gold applied POST resulted in 12 to 25% corn stunting in soils with > 80% sand and 3 to 12% stunting in soils with $\leq$ 50% sand. When compared with Axiom or Distinct, corn yields were reduced up to 73% with leadoff followed by POST herbicides in sandy soils.

ANALYSIS OF COMPETING VEGETATION IN MID-ROTATIONAL PINE PLANTATIONS USING REMOTE SENSING TECHNOLOGY. T.C. Knight, A.W. Ezell, D.R. Shaw, J.D. Byrd, Jr., and D.L. Evans. Mississippi State University, Mississippi State, MS.

ABSTRACT

The southern United States accounts for 40 percent of the nation's total timberland area. Due to social, economic, and governmental changes in the last ten years, much of the demand for softwood (pine) production has shifted from the Northwest to the Southeast. To meet the demand for this increased production, more intensive forest management practices have been implemented. Although one of the more useful of these practices is the control of competing vegetation, the methods have to be examined within the budget framework, so costs must be minimized. One method to lower costs of competition control is to decrease *in situ* measurements for preparation of competition control prescriptions. Reducing or eliminating much of this labor-intensive exercise by use of alternative methods is desirable for most forest managers. One way to reduce on-site labor costs could be to develop a methodology to

predetermine areas in need of competition control without fieldwork. This study is designed to develop just such a methodology using remote sensing techniques to locate and identify competitive species within mid-rotational pine plantations. Using multispectral data taken from airborne or satellite carried instruments, a method is under development to use an automated system to identify competitive species, estimate total area occupied, and output the results in a form which compares favorably with *in situ* results. It is anticipated this method will include using spectral signatures of plant species to electronically separate species. The spectral signatures may be classified statistically as a means to separate unique reflectance of differing species. In addition, image texture may provide additional discriminatory power. The method will be applied to several current pine plantations growing in differing soil and topographical types within the State of Mississippi and will be tested by the use of *in situ* measurements of plots in a completely randomized design with numerous replications. Success with this study will permit foresters to make accurate, cost-effective, and site- specific decisions based on remotely acquired data.

TOLERANCE OF SWITCHGRASS TO HERBICIDES. J.D. Nerada, W.J. Grichar, W.R. Ocumpaugh, K.A. Cassida, G.W. Evers, J.N. Rahmes, and V.B. Langston. Texas Agricultural Experiment Station, Yoakum, Beeville, and Overton, University of Arkansas, Hope, and Dow Agrosciences, The Woodlands, TX.

ABSTRACT

Switchgrass (*Panicum virgatum* L.) is a native North American grass with potential uses in forage production, soil stabilization, and biofuel generation. However, establishment of switchgrass is difficult. Seeds are very small and seedlings are not competitive with weeds that can frequently smother new plantings. Currently, there are no herbicides labeled for use with this crop.

Various preemergence (PRE) and postemergence (POST) herbicides were field tested during the 1999-2000 growing seasons to determine switchgrass tolerance. In Arkansas, Atrazine at 2.0 lb ai/A and Caparol at 1.01 lb ai/A applied PRE resulted in $\geq$ 50% stand establishment when rated 9 months after treatment. Switchgrass stands in the untreated check were 6%. POST herbicides did not affect switchgrass stand scores 4 months after application. Only Pursuit at 0.032 lb ai/A produced higher seedling densities than untreated check. However, 7 month after application Manage and MSMA both at 1.0 lb ai/A had significantly better stands than untreated check.

At Overton, methyl bromide provided significantly higher switchgrass seedling density numbers than First Rate or Paramount. Methyl bromide also produced taller switchgrass plants than any herbicide.

At Yoakum, First Rate at 0.3 and 0.6 oz/A produced > 70% switchgrass stand establishment while Atrazine at 1.0 lb ai/A produced 50% stand establishment. The untreated check had 40% stand. Switchgrass yields were significantly better than the untreated check with Atrazine at 2.0 lb ai/A and First Rate at 0.6 oz/A.

NEW HERBICIDE CHEMISTRIES FOR WEED CONTROL IN SUGARCANE. B.J. Viator *, J.L. Griffin, J.M. Ellis, and C.A. Jones. Louisiana State University Agricultural Center, Baton Rouge, LA.

ABSTRACT

Preemergence (PRE) herbicides are applied in sugarcane after planting in late summer, overtop emerging sugarcane in the spring, and semi-directed underneath the sugarcane canopy in May/June as a layby treatment. Sugarcane growers are limited to herbicides with only two modes of action for PRE weed control - the photosynthetic inhibitors (atrazine, diuron, metribuzin, terbacil, hexazinone) and the mitotic inhibitors (trifluralin, pendimethalin). Postemergence (POST) weed control is limited to 2,4-D and dicamba, both of which are susceptible to off-target movement, and asulam, a costly and sometimes inconsistent treatment. Recent efforts have been made to evaluate potential of new herbicide chemistries with alternative modes of action for weed control in Louisiana sugarcane.

Registration is expected in 2001 for azafeniden (Milestone), a protoporphyrinogen oxidase (PPOase) inhibiting herbicide developed by DuPont Company. This herbicide has PRE and POST activity on both grass and broadleaf weeds including itchgrass (*Rottboellia cochinchinensis*), seedling johnsongrass (*Sorghum halepense*), morningglories (*Ipomoea* spp.), and several winter annuals. Azafeniden applied in February with paraquat has shown promising results as a burndown/residual combination. Injury symptoms consist of a general reddening and desiccation of contacted sugarcane foliage. Root uptake by sugarcane results in reddened midveins with red discoloration extending outward into the leaf. Injury is negligible when applied prior to crop emergence following planting in August and September. However, injury from azafeniden applied POST to sugarcane in the spring has ranged from 12 to 53% (8 oz ai/A rate in 14 experiments). Variety tolerance experiments indicated increased injury could occur when azafeniden is applied POST to early emerging varieties in late spring; however, no reductions in sugarcane or sugar yield have been detected.

Another PPOase inhibitor, sulfentrazone (Spartan) from FMC Corporation received a Section 18 (Emergency Use Exemption) in the 2000 season for morningglory control at layby and was well received by growers. The strength of sulfentrazone is PRE and POST morningglory activity, making it particularly useful for application at layby. In

studies conducted since 1996, low rates of sulfentrazone (2 to 4 oz ai/A) have consistently provided equal or better control of morningglory species, including red morningglory, than atrazine. Visual crop injury with sulfentrazone is similar to azafeniden only much less pronounced and short-lived (0 to 12% with 6 oz ai/A in 4 experiments).

Developed by Valent USA, flumioxazin (Valor) is a PPOase inhibiting herbicide with both PRE and POST activity. Strengths are its excellent POST morningglory activity, making it a viable alternative to 2,4-D as a directed application at or following layby. Preemergence activity on morningglories is comparable to atrazine, providing approximately 80% control at 3 to 4 oz ai/A. Sugarcane injury consists of a bronzing of contacted foliage, and has ranged from 27 to 48% (3 oz ai/A applied POST in 3 experiments). No reductions in late-season stalk height or number resulting from flumioxazin treatments have been observed, but yield data is not available.

Trifloxysulfuron-sodium (CGA-362622), developed by Syngenta (formerly Novartis), is an ALS inhibitor currently being evaluated in several crops. This herbicide does not have significant PRE activity, but can provide POST control of several important broadleaf weeds, some grasses, and nutsedges. Early indications are that this herbicide controls rhizome johnsongrass and itchgrass, making it a possible alternative to asulam. Sugarcane injury consists of chlorosis in the form of bands or "patches" on treated leaves and when applied in March, injury has ranged from 3 to 16% (0.22 to 0.44 oz ai/A in 3 experiments). Research with this herbicide in sugarcane is in early stages and rate response data for specific weeds in regard to application timing and for crop tolerance is lacking.

Clomazone (Command), an FMC Corporation product, received a Section 18 in 2000 for use after planting of sugarcane to suppress bermudagrass prior to emergence. Bermudagrass (*Cynodon dactylon*) suppression has been enhanced when applied with diuron. Clomazone is a PRE herbicide with activity on seedling johnsongrass and itchgrass, but has limited activity on many broadleaf weeds. Crop injury consists of generalized bleaching of foliage and has ranged from 14 to 40% (1.0 lb ai/A in 5 experiments). Injury is most severe when sugarcane foliage is contacted at application, but injury from root uptake following rainfall events can occur. In research conducted to date, no reductions in late-season stalk height or number resulting from clomazone applications have been documented.

WEED CONTROL IN TEXAS PANHANDLE GRAIN SORGHUM UTILIZING PARAMOUNT. M.W. Rowland and B.W. Bean; Texas Agricultural Extension Service, Amarillo, TX 79106.

ABSTRACT

Field experiments were conducted to evaluate the effectiveness of Paramount herbicide for control of field bindweed (*Convolvulus arvensis*) and barnyardgrass (*Echinochloa crus-galli*) in grain sorghum. A three year experiment being conducted near Canyon, TX is in the second year of evaluation for short-term and long-term control of field bindweed. The experiment was a randomized complete block design with four replications. Plot size was 6-30 inch rows wide and 25 ft. long. Treatments applied in the first year included Paramount alone @ 0.25 lb ai/ac and 0.38 lb ai/ac, Paramount at the previous rates tank mixed with either 2,4-D amine 4 @ 0.25 lb ai/ac or Clarity @ 0.125 lb ai/ac, 2,4-D amine 4 alone @ 0.5 lb ai/ac, and Clarity alone @ 0.25 lb ai/ac. Treatments applied in the second year were the same as year one except all Paramount rates were cut in half. All treatments for years one and two were applied to the same plots so that long-term evaluations can be made. Year two treatments will be applied again in year three. In both years treatments were applied to approximately 12 inch grain sorghum and 16 inch field bindweed in bloom. Ratings were made at 2 and 4 WAT in year one to evaluate short-term control of field bindweed. Prior to treatments in year two, ratings were made again to evaluate any carry-over control. Following treatments in year two, ratings were taken at 3 and 6 WAT to evaluate short-term control.

In year one Paramount @ 0.25 lb ai/ac provided 63% control at 2 WAT while the 0.38 lb ai/ac rate provided 75% control. Control increased for each rate at 4 WAT with 0.25 lb ai/ac and 0.38 lb ai/ac providing 84% and 89% control, respectively. Control of field bindweed was better when Paramount was tank mixed with either Clarity or 2,4-D amine. Ratings for Paramount at either rate plus Clarity or 2,4-D amine were over 86% at 2 WAT and over 93% at 4 WAT. Clarity alone provided good control at both ratings with 70% and 86% at 2 and 4 WAT, respectively. 2,4-D alone had even better control with 93% and 95% control at 2 and 4 WAT, respectively. In year two carryover control ratings were taken prior to application. Paramount alone at 0.25 lb ai/ac maintained only 26% control while the 0.38 lb ai/ac rate maintained 41% control. When tank mixed with Clarity, control with the 0.25 lb ai/ac rate was 41% while the 0.38 lb ai/ac rate had 63%. When tank mixed with 2,4-D, control was 60% and 55% for the 0.25 lb ai/ac and 0.38 lb ai/ac rates, respectively. Ratings taken at 3 WAT showed that Paramount alone @ 0.25 and 0.38 lb ai/ac provided 49% and 59% control, respectively. Control increased to 65% and 78%, respectively, at 6 WAT. Paramount @ 0.25 lb ai/ac tank mixed with Clarity provided 80% control at 3 WAT and 94% control at 6 WAT. Results were similar with the 0.38 lb ai/ac rate which provided 74% control at 3 WAT and 93% control at 6 WAT. When tank mixed with 2,4-D amine, Paramount @ 0.25 lb ai/ac provided 87% at 3 WAT and 95% control at 6 WAT. With Paramount @ 0.38 lb ai/ac, the 2,4-D tank mix provided 88% control at 3 WAT and 94% control at 6 WAT. Clarity alone provided 83% and 88% control at 3 and 6 WAT. 2,4-D amine provided 90% and 91% control at 3 and 6 WAT.

A one year study was conducted near Hereford, TX to evaluate in season control of barnyardgrass. The experiment was a randomized complete block design with four replications. Plot size was 4-30 inch rows and 25 ft. long. Treatments included Paramount @ 0.25 lb ai/ac and 0.38 lb ai/ac plus either COC or MSO as an additive. COC was applied @ 1 qt/ac and MSO @ 1 % v/v. Applications were made to 6 inch grain sorghum and 1-2 inch barnyardgrass. Ratings were taken at approximately 2 and 4 WAT to evaluate crop injury and weed control.

Ratings taken at 2 WAT showed no difference between any of the treatments. Paramount @ 0.25 lb ai/ac provided 62% control with COC and 63% control with MSO. Paramount @ 0.38 lb ai/ac provided 65% control with COC and 62% with MSO. Ratings at 4 WAT were slightly improved but were not different. Paramount @ 0.25 lb ai/ac provided 68% control with both COC and MSO. Paramount @ 0.38 lb ai/ac provided 67% control with both COC and MSO.

FACTORS AFFECTING SPROUTING AND PROPAGULE EMERGENCE FROM ROOTSTOCK IN REDVINE (*BRUNNICHIA OVATA*) AND 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

Redvine and trumpetcreeper are perennial, woody dicot, shrubby, difficult-to-control weeds found in row crops of the Mississippi Delta. Propagation is mostly vegetative under normal agronomic practices, but these species produce numerous seeds in noncultivated areas. Both species have extensive deep root system with numerous adventitious root buds that are underground regenerative organs capable of producing shoots. Information on factors affecting sprouting and propagule emergence from rootstock is lacking. The objectives of this research were: 1) to study the effects of temperature, length of rootstock segment, and depth of planting on sprouting and propagule emergence in redvine and trumpetcreeper and 2) to determine extent of translocation of glyphosate from the treated-shoot (attached to one end of the rootstock) to the untreated end of a 35-cm rootstock in redvine.

Redvine and trumpetcreeper rootstocks were collected in 1999 from field-grown plants near the Southern Weed Science Research Unit Farm, Stoneville, MS. Rootstocks were planted in soil in plastic trays or pots and were kept for 6 weeks in a greenhouse [35/25 C (± 3 C) day/night temperature, 14-h photoperiod] for sprouting. The length of rootstock segments used was 8-cm unless otherwise stated. Segments were planted at approximately 3-cm deep in soil unless otherwise stated. To study the effect of temperature on sprouting, rootstock segments were placed in growth chambers set at various temperature regimes. Translocation of ^{14}C-glyphosate from a treated-shoot attached to one end of the rootstock to untreated end of 35-cm rootstock in redvine was studied using standard procedures.

Redvine sprouts exhibited a strong apical dominance, whereas trumpetcreeper had no apical dominance. The mass of dominant propagule was two-fold higher in trumpetcreeper than in redvine due to faster propagule development. Sprouting was higher in trumpetcreeper than in redvine rootstocks across all temperature regimes (15 to 40 C). At 15 C, redvine sprouting was totally inhibited, whereas trumpetcreeper had 12% sprouting. Emergence of propagules from 28-cm depth of planting was inhibited in redvine, whereas trumpetcreeper had 23% emergence. Emergence was highest in 3-cm depth of planting in redvine, and 3- to 9-cm depth in trumpetcreeper compared to planting deeper than 18-cm. In redvine, the length of rootstock segment was critical for sprouting. Root segments of <2-cm had no sprouts in redvine, whereas trumpetcreeper had more than 13%. In redvine, rootstocks >4-cm length had a better chance of sprouting than <4-cm. In redvine, ^{14}C-glyphosate applied to the shoot attached to one end of a 35-cm long rootstock did translocate to the untreated end of rootstock. However, slightly lower amounts moved farther and farther away from the treated end of the rootstock. These results indicated that trumpetcreeper produced foliage more rapidly than redvine. Under field conditions, redvine rootstocks present at depths below 28-cm have limited potential to sprout and emerge compare to trumpetcreeper.

WEED POPULATION SHIFTS IN THE MISSISSIPPI DELTA MANAGEMENT SYSTEMS EVALUATION AREA. C.T. Bryson and J.E. Hanks, USDA-ARS, Southern Weed Science Research Unit and Application and Production Technology Research Unit, Stoneville, MS 38776.

ABSTRACT

Despite current knowledge of weed control methods, cumulative weed losses exceed $4.1 billion annually in the United States. The Mississippi Delta Management Systems Evaluation Area (MSEA) was established as a consortium of several federal, state and local agencies to improve water quality and incorporate safe and effective innovative agricultural management systems. At Deep Hollow, Leflore County, MS, one of the MSEA sites, the use of a hooded sensor-controlled sprayer provided excellent weed control, reduced herbicide usage significantly, improved water quality, and increased farmer profits without adversely affecting crop yields. A total of 195 plant species (58 monocots and 137 dicots) were present in cropland (cotton and soybean) at Deep Hollow; however, only 76 species (24 monocots and 52 dicots) were present in both cotton and soybean. In cropland areas, 29 species (2 monocots and 27 dicots) were detected in cotton exclusively, while 90 species (32 monocots and 58 dicots) were

present in soybean exclusively. Thus, more plant species were detected in soybean (166 species) than in cotton (105 species). In cotton, 26 species were monocots and 79 were dicots, while in soybean, 56 species were monocots and 110 were dicots. Likewise, the number of species (25 including 9 monocots and 16 dicots) was greater on the edge of soybean fields than species (15 including 6 monocots and 9 dicots) on the edge of cotton fields. No conifers or fern species were found in crop areas. Of the 195 plant species detected in reduced-tillage cotton and soybeans at Deep Hollow, only 25 to 30 were considered troublesome weed problems. Over a 5-yr period, the number of weed species in reduced-tillage was 3- to 4-fold greater than weedy species in conventional planted cotton and soybeans, respectively. When compared to conventional cropping systems, four types weed shifts were detected in reduced tillage and transgenic cotton and soybean production systems at the Deep Hollow MSEA Project Area: 1) populations decreased in cotton and soybean such as crabgrass (*Digitaria* sp.) and honeyvine milkweed; 2) populations increased in cotton and soybean such as barnyard grass [*Echinochloa crus-galli* (L.) Beauv.]; 3); populations increased initially and then decreased such as ivyleaf morninglory and trumpet creeper; and 4) populations increased in one crop while remaining constant or decreasing in the other crop such as goosegrass [*Elucine indica* (L.) Gaertn.] and pigweed (*Amaranthus* sp.). In glyphosate-resistant soybean and bromoxynil-resistant cotton, many of the most troublesome grass, sedge, and broadleaf weeds were effectively controlled. However, weed populations of certain annual species including pigweeds in bromoxynil-resistant cotton and some perennial species, especially woody and viney species, in transgenic and reduced-tillage cropping systems increased. Where these perennial weeds species increased, acceptable control was obtained by the use of a hooded-sensor sprayer or by rotation of other herbicides.

BIOLOGY AND ECOLOGY OF WETLAND NIGHTSHADE (*SOLANUM TAMPICENSE*). C.T. Bryson and S.J. Usnick, USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS 38776.

ABSTRACT

Wetland nightshade (*Solanum tampicense* Dunal) (WNS) is a perennial shrub of warm climates and high rainfall tropical regions. It can produce impenetrable thickets along waterways that are composed of hundreds of plant shoots up to 3 m long. Since its introduction from Central America into Florida, WNS has spread to natural areas and threatened waterways and agricultural areas slowing water flow by detaining debris. In 1999 and 2000, WNS plants were grown in the greenhouse in 10 cm-diameter pots in a mixture of a Bosket sandy loam (Mollic Hapludalfs) soil and Jiffy Mix (50/50 v/v). The greenhouse was maintained at temperatures of 20/30 C night/day. Several seeds were planted per pot and thinned to one plant per pot after emergence. Plants were transferred to growth chambers at 1 week after emergence. Growth chambers were maintained at temperatures of 26/36, 20/30, 14/24, and 8/18 ($\pm$ 0.5) C night/day and 14 h of daylight. Plant height, number of nodes, and number of leaves were recorded at weekly intervals. Plants were clipped at the soil surface, oven dried, and weighed at 11 weeks after the plants were transferred into the growth chambers. Days to first flower were recorded. At 11 weeks after transfer into the growth chambers (=12 week old), average WNS heights were 58, 45, 48, and 4 cm; number of nodes were 24, 21, 21, and 12/plant; numbers of leaves were 62, 31, 36, and 21/plant; plant dry weights were 7.1, 3.9, 5.1, and 0.3 g/plant at temperatures of 26/36, 20/30, 14/24, and 8/18 C night/day, respectively. Flowering occurred at 0, 0 to 85, 0 to 85, and 0 to 79 days after emergence at 8/18, 14/24, 20/30, and 26/36 C night/day, respectively. No fruits were produced on WNS plants under growth chamber conditions (without insect pollination). From these data, maximum growth was obtained at temperatures of 26/36 C night/day. WNS growth is adequate for flowering and fruit production in additional areas of the southeastern United States with summer night/day temperatures $\geq$ 14/24 C. Control measures should be continued in Florida to prevent the spread of this pernicious weed into new areas in the southern United States.

EFFECT OF DRIFT CONTROL ADJUVANTS WITH ROUNDUP ULTRA®. J.E. Hanks, J.A. Garr and G.D. Wills, USDA-ARS, Stoneville, MS, Garrco Products, Inc., Converse, IN and Delta Research and Extension Center, Stoneville, MS.

ABSTRACT

Preliminary studies were conducted at Stoneville, MS to determine the effect of drift retardant polymers on spray droplet size, spray patterns and efficacy when used with Roundup Ultra®. Drift retardant polymers were developed to minimize the potential of drift with spray applications by modifying the spray droplet size. Although developed to reduce drift, these adjuvants may also alter spray patterns, efficacy and/or sprayer calibration. This characteristic is not unique to drift retardant adjuvants; any change to an original spray solution has the potential of altering the output of a spray system. Each component that makes up a spray solution can potentially cause deviations from normal spray characteristics observed with water alone. As an applicator changes from one herbicide to another, changes the rate of certain herbicides, or changes the spray adjuvant used for a particular application then the characteristics of the spray output are potentially altered. The objective of these studies was to investigate the effects of three commercially available and one experimental drift retardant adjuvant on spray droplet size, spray pattern and efficacy.

Plots consisted of four rows spaced 1-m apart by 12-m long planted with 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 and Control were the three 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. Ammonium sulfate was added to Control since it was contained in all the other products. Roundup Ultra® was applied with and without ammonium sulfate added. Visual ratings (0-100) were recorded 3 WAT. Solutions were mixed in large enough quantities to allow the field, patternator and droplet analysis to be conducted without having to re-mix solutions. The same nozzles were used for all three studies.

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.

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 235 mm above the laser beam and the entire width of the spray traversed through the laser beam. Droplet analyses were repeated three times for each solution.

All treatments provided excellent control of velvetleaf with only the Roundup Ultra® with no additional adjuvant being significantly lower than all other treatments. There were no significant differences among treatments with any type additional adjuvant, including the addition of only AMS to Roundup Ultra®. Since all treatments included AMS except for the one treatment with Roundup Ultra® alone, indications are that the addition of AMS had more effect on velvetleaf control than addition of the drift retardant adjuvants. The only drastically distorted spray patterns were with the three commercially available products used at higher rates. Very little distortion occurred with the remaining mixtures. Spray droplet analyses indicated all drift retardant adjuvants increased the volume median diameter and reduced the percentage of spray volume in droplets less than 144 microns. Increased rates of each further reduced the percentage of spray volume in droplets less than 144 microns, but with distorted spray patterns for the three commercially available products. For the four adjuvants tested at the lower rates, the percentage of spray volume in droplets less 144 microns ranged from 16% to 22%, as compared to water at 28%. Roundup Ultra® and Roundup Ultra® with AMS added produced droplets similar to water.

GPS/GIS FOR WEED MAPPING IN ROW-CROP PRODUCTION. J.E. Hanks and C.T. Bryson, USDA-ARS, Stoneville, MS.

ABSTRACT

Studies were conducted in cotton and soybean fields as part of the Mississippi Delta Management Systems Evaluation Area (MDMSEA) project. Production practices were conservation tillage for crops in the MDMSEA watershed area and conventional tillage in one adjacent cotton field. Crops were planted with an 8-row planter on rows spaced 38” apart. The total acreage in the project included approximately 125 acres of cotton and 100 acres of soybeans. Data collection points were initially setup in each field with all points being in the middle of every eighth set of planted rows (approx. 200 feet) and spaced 200 feet apart in the direction of the rows. Each field and reference points within each field were labeled with specific identification numbers. Field boundaries and data collection points were geo-referenced with a Starlink Model DNAV 212 GPS interfaced with a Rockwell Vision Computer Display (VCD) mounted on an ATV. Geo-referenced data were processed and maps generated using Vision GIS software. Data collection points for the second year were setup in the field by downloading the geo-referenced data and navigating to each point.

Weed counts by specie were collected at each geo-referenced point throughout the growing seasons in 1997 and 1998. Data were processed in the GIS software, which allowed maps to be generated by field, crop, weed specie or any combination.

GPS/GIS systems are excellent tools for collecting, storing and presenting field data. The geo-referenced data allows information to be viewed in relation to the field boundary, making it easy to visually see variations within a field. Data and/or maps can be downloaded to the VCD allowing navigation to specific points of interest. The GIS processed data can also be used to generate prescription application maps that provide properly equipped spray applicators with required information to apply herbicides only where weeds were present or vary herbicides depending on the concentration of weeds. Although these technologies provide significant advances for weed control, methods of collecting data must be improved to fully utilize the technologies to their utmost benefit. Grid sampling for weed data is very labor intensive and probably would not be an attractive method for producers.

Methods of collecting the geo-reference data must be improved and will be in the near future with technology such as remote sensing.

EVALUATION OF GLYPHOSATE AND SIX COMMERCIAL ADJUVANTS WITH A LOW VOLUME, AIR-ASSISTED SPRAYER. W.H. Faircloth, M.G. Patterson, and C.D. Monks. Auburn University, Auburn, AL.

ABSTRACT

Field studies were conducted on the Alabama Agricultural Experiment Station near Shorter, AL, from 1998-2000 to evaluate the effect of glyphosate mixed with six commercial spray adjuvants on pitted morningglory (*Ipomoea lacunosa* L.) and cotton (*Gossypium hirsutum* L. 'Paymaster® 1220 BR') when applied with a conventional and an air-assisted sprayer. Treatments consisted of a 2 (glyphosate rate) x 6 (adjuvant type) x 2 (sprayer type) factorial in a randomized complete block design, with four replications. Glyphosate rates were 0.28 and 0.56 kg ai/ha of Rodeo® (glyphosate without surfactant). Adjuvants were: 1) Prime Oil®, a paraffin-based crop oil concentrate; 2) Activate Plus®, a nonionic spreader/activator; 3) Quest®, a water conditioning agent and activator; 4) Kinetic®, a nonionic wetter/spreader/penetrant; 5) LI 700®, a nonionic surfactant/penetrant/acidifier; 6) ammonium sulfate (AMS), a fertilizer and herbicide activator. A low volume (18.7 L/ha solution), air-assisted sprayer was compared to a conventional high volume (93.5 L/ha solution) sprayer. Both spray systems were mounted on an all-terrain vehicle and designed to spray one row of two row plots. Applications were made to 2 leaf pitted morningglory growing in glyphosate-tolerant cotton.

Data taken included visual estimations of weed control and crop injury (on a scale of 0-100 where 0=no injury or control and 100=crop death or complete weed control), weed biomass estimations, and seed cotton yield. Early season (7 days after treatment – DAT) pitted morningglory control was more dependent upon the rate of glyphosate applied than on a particular adjuvant or sprayer. Late season control of pitted morningglory (21 DAT) also reflected an increase in weed control (9%) with an increase in rate, but also exhibited an adjuvant main effect. AMS resulted in increased weed control (7-10%) over the other adjuvants and equal to weed control provided by Roundup Ultra®, the current formulation included as a comparison. Mean control of pitted morningglory did not exceed 71% for the three year study. This confirms findings by others suggesting that pitted morningglory control with glyphosate is marginal at best. Weed biomass estimations reflect trends seen in weed control data, with 25% reductions in biomass occuring with an increase in rate (0.28 to 0.56 kg ai/ha). Roundup Ultra® and AMS resulted in decreased biomass in 1999. Seed cotton yields also increased as glyphosate rate increased.

SPRAY CHARACTERISTICS OF DRIFT REDUCING ADJUVANTS WITH GLYPHOSATE HERBICIDE. G.D. Wills, J.E. Hanks, E.J. Jones, and R.E. Mack, Delta Research and Extension Center, USDA Application Production Technology Research Unit, Delta Research and Extension Center, Stoneville, MS, and Helena Chemical Company, Memphis, TN.

ABSTRACT

A combination of field and laboratory studies were conducted to determine the effect of eight drift reducing adjuvants (Table 1) on the efficacy, spray pattern, and droplet size of glyphosate (Rodeo®) herbicide spray solutions. The herbicide was applied in the field at 0.33 lb ai in 10 gpa 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 to four rows of three trifoliolate stage soybeans (*Glycine max* L.) 'ASGROW 5901RR' spaced 38 inches apart, 40 feet long and interspaced with 4- to 8-inch-tall barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.], 5- to 7-inch-tall pitted morningglory (*Ipomoea lacunosa* L.), 4- to 8-inch-tall smooth pigweed (*Amaranthus hybridus* L.), and 6- to 8-inch-tall nodding spurge (*Euphorbia nutans* Lag.) replicated four times arranged in a randomized complete block design. Efficacy was determined by visual ratings, 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.

Spray patterns were determined using a single nozzle by applying 600-ml volumes of spray mixtures at 43 psi, similar to that of field applications, to a slanted sheet of corrugated metal with troughs spaced 2.5 inches apart and collecting in 100-ml graduated cylinders. Spray droplet size was determined using an Insitec Measurement Systems laser particle analyzer at 40 psi.

Results of the field studies at 2 weeks after treatment showed no effect on soybeans from any treatment. Barnyardgrass, pitted morningglory, smooth pigweed, and nodding spurge were controlled 65 to 85% with glyphosate alone. Over all these weedy species, the percent control was decreased to 58 to 75% with the addition of HM9950 0.5% v/v, not affected by HM 9861-A 0.5% v/v and HM 9850 0.5 lb/100 gal and increased to 83 to 99% with the remaining drift reducing compounds in this study. In the laboratory studies, the spray width of the different treatment mixtures ranged from 30 to 45 inches. There was no correlation between the spray width and the percent control of the weedy species.

Spray droplet size, as expressed as the percent of the total spray volume in droplets larger than 144 microns, was 49% for glyphosate alone and 47 to 69% with the combinations of glyphosate and the drift retardants used in this study. The most desirable drift reducing adjuvants were those which produced the greater volume of larger (≥60%), less driftable spray droplets (greater than 144 microns) and also resulted in the greatest percent of herbicidal phytotoxicity. Drift retardant mixtures which resulted in ≥60% of the total spray volume in droplet size above 144 microns diameter and ≥94% over-all weed control at 2 weeks after treatment were HM 9752 9 lb/100 gal, HM 2004 3 lb/100 gal, and HM 2006 9 lb/100 gal.

Table 1. Drift retardants and rates applied.

HM9752	Proprietary blend of polymeric viscosity modifiers and ammonium sulfate (9 lb/100 gal)
HM9850	Proprietary blend of polymers, ammonia salts, and buffering agents (0.5 and 1 lb/100 gal)
HM9861-A	Proprietary blend of ammonia salts and polyacrlamide polymers (0.5 % and 1% v/v)
HM9950	Proprietary blend of ammonium polyacrylates, hydroxy carboxylates, sulfates, and polymeric deposition aids (0.5 and 1% v/v)
HM2004	Proprietary blend of nonionic water soluble organic polymers and ammonium salts (2 and 3 lb/100 gal)
HM2005	Proprietary blend of nonionic water soluble organic polymers and ammonium salts (4.5 and 9 lb/100 gal)
HM2006	Proprietary blend of nonionic water soluble organic polymers and ammonium salts (9 lb/100 gal)
HM2007	Proprietary blend of nonionic water soluble organic polymers and ammonium salts (9 lb/100 gal)

TORPEDOGRASS (*Panicum repens*) EFFICACY FOLLOWING DRIVE® AND DRIVE® PLUS ILLOXAN® TREATMENTS. J.S. Weinbrecht*, G.L. Miller, and L.B. McCarty. University of Florida, Gainesville, Clemson University, S.C.

ABSTRACT

Two greenhouse pot studies – fall and subsequent spring – were initiated to compare torpedograss efficacy responses following Drive® (quinclorac) applied alone, and Drive® plus Illoxan®(doclofop-methyl). A four replicate, RCB, set of treatments included: Drive at an initial 2.7 lb/A, followed by two additional 1.3 lb/A treatments; Drive applied three times at 0.67 lb/A; Drive applied twice at 1.0 lb/A; and Drive plus Illoxan applied twice at 1.0 lb/A and 1.4 qt/A, respectively. All sequential applications were applied at three-week intervals, with all treatments, including the untreated control (UTC), containing methylated seed oil at 2.0 pt/A.

The Drive plus Illoxan treatment demonstrated significant injury within three to five days (33% and 50%, fall and spring respectively), and equaled or bettered (88% and 83%, fall and spring respectively) any Drive treatment applied alone (≤89% and ≤65%, fall and spring, respectively) nine weeks after initial treatment (WAIT). By week twelve, injury symptoms relative to all treatments subsided, as treatment recovery became increasingly evident. In terms of new shoot emergence at 12 WAIT, all treatments were similar in providing ≥86% or ≥52% reduction, fall and spring, respectively, compared to the UTC. As expected, the fall response was greater than the spring.

Twelve weeks following all Drive and Drive plus Illoxan treatments, all shoot and below-ground biomass (BGB) harvested 12 WAIT were significant in revealing ≥61% and ≥27% shoot reductions, as well as ≥45% and ≥36% BGB reductions, fall and spring, respectively. Reductions in the rhizome component of the BGB – an essential organ to perennial survival – were greatest following the three-way split application of Drive totaling 5.3 lb/A (≈56%, fall and spring) and Drive plus Illoxan (63% and 46%, fall and spring, respectively).

All multiple Drive treatments applied alone were generally similar in injury, shoot emergence, and biomass reductions. Drive plus Illoxan demonstrated a short-term enhanced initial injury response over the Drive treatments applied alone, with limited enhancements with regard to long-term injury symptoms, new shoot emergence, or BGB and rhizome component reductions. However, Drive plus Illoxan, with the highest shoot biomass values following fall application, resulted in one of the most significant rhizome component reductions. Further research will evaluate if fall and subsequent spring applications of Drive plus Illoxan results in significant rhizome component reductions over other multiple Drive treatments applied alone.

PHYTOTOXICITY OF CGA 362622 AND QUINCLORAC ON TORPEDOGRASS (*PANICUM REPENS*) WITH ROOT VERSUS FOLIAR EXPOSURE. W.A. Williams, G.R. Wehtje, and R.H. Walker. AL Agric. Exp. Stn., Auburn University.

ABSTRACT

Greenhouse studies were conducted in 2000 to determine the response of torpedograss (*Panicum repens*) to selective placement and various rates of trifloxysulfuron-Na and quinclorac. Three selective application treatments were included: foliar only, soil only, and foliar + soil. Torpedograss rhizomes were planted in cups containing 650 grams of Kalmia loamy sand with a pH of 5.8. After establishment by the torpedograss, trifloxysulfuron-Na at rates of 0.020, 0.035, 0.050, and 0.065 lb ai/A and quinclorac at rates of 0.50, 0.70, 0.90, and 1.10 lb ai/A were applied. At 4 weeks after treatment, all foliage was clipped near soil surface, separated into chlorotic versus non-chlorotic tissue, and weighed. Torpedograss was allowed to regrow for 3 weeks and clipped again. Torpedograss was allowed to grow for an additional 3 weeks and again harvested a final time. Entire experiment was reported over time. Data collected were expressed in percent relative to a non-treated control.

Results varied over time. Consequently, results from the two trials are presented separately. As expected, the two herbicides varied in efficacy and are presented separately.

In trial one, trifloxysulfuron-Na produced more chlorotic tissue with soil application, however a distinct rate response was not evident. The soil only and application was the most effective on regrowth suppression. Again a rate response was not evident. Results in trial two were similar, however, no clear distinction between the three application methods was evident for regrowth suppression. In summary, trifloxysulfuron-Na was more effective when applied to soil. Rates of at least .050 lb ai/A was required for >46% suppression of regrowth.

In trial one, quinclorac produced more chlorotic tissue with soil + foliage applications. A distinct rate response was not evident. Soil only and soil + foliar applications were effective on tissue growth. Once again a clear rate response was not evident. In trial two, a slight distinction could be made for applications in regrowth suppression. The soil + foliar application suppressed more regrowth than the other applications.

In summary, soil only applications of trifloxysulfuron-Na and soil + foliar applications of quinclorac appear to be the best application methods due to the level of chlorotic tissue and regrowth suppression. Overall, rates of trifloxysulfuron-Na suppressed regrowth more consistently than similar rates of quinclorac.

INFLUENCE OF DIFFERENT BIOECOLOGICAL FACTORS ON GERMINATION. M. Singh and S.D. Sharma. University of Florida-IFAS, Citrus Research and Education Center, Lake Alfred, Florida

ABSTRACT

The effects of various bio-ecological factors e.g. temperatures, photosynthetic photon flux density (PPFD), pH, osmotic potential, planting depth, and simulate flooding on the germination of phaseybean (*Macroptilium lathyriodes* L.) and guineagrass (*Panicum maxicum* Jacq.) seeds were examined. Healthy seeds were surface sterilized by immersion in 0.5% solution of sodium hypochlorite for 10 min. The sterilizing solution containing the seeds was filtered through Whatman #4 filter paper; were washed with several flushes of distilled water and allowed to dry at room temperature. All laboratory experiments consisted of four replicates each of 25 sterilized seeds placed on two sheets of filter paper in 9-cm petri dishes, were conducted in controlled growth cabinets and were repeated. The filter paper was moistened initially with 5 ml of test solution. If necessary, 1 to 3 ml of the appropriate solution was added to maintain adequate moisture. All petri dishes were sealed with parafilm to slow down desiccation. Germination studies were conducted in controlled environment growth cabinets. Alternating day and night temperatures were maintained for 12 h each. Fluorescent lamps produced a photosynthetic photon flux density of 150 :E.m^{-2}s^{-1}. Petri dishes assigned to dark treatments were wrapped in two layers of aluminum foil and remained unopened until final day of the experiment. Germination of seed exposed to light was monitored for 7 or 14 days depending on the experiment. A seed was considered germinated when the radical protruded 1 mm from the seed coat.

Significantly higher germination of phaseybean was obtained at 20, 30, and 35EC under alternating light/dark than continuous dark conditions. The germination was maximum with a photoperiod of 8/16 h in phasey bean and 12/12h in guineagrass. Single exposer periods of 10 h in phaseybean and 12 h in guineagrass during the first 24 h of incubation also obtained maximum germination. The increase in photosynthetic photon flux density (PPDF) did not have much effect on phaseybean germination but in guineagrass maximum germination occurred at 50 FE.m^{-2}s^{-1} PPDF. The optimum pH for guineagrass seed germination was 7.0. No difference in the germination of guineagrass under any osmotic buffers was recorded although it was significantly lower than distilled water. Significantly higher germination occurred when the seeds of phaseybean and guineagrass were planted at 1 cm and 2 cm depth, respectively; increasing planting depth delayed and significantly reduced the germination. Similarly, the germination of both seeds was reduced significantly with simulated flooding. Therefore, mechanical manipulation e.g. flooding and burying seed by deep plowing and cross plowing might effectively reduce the emergence of weed seeds.

TRADITIONAL VERSUS SENSOR MEASUREMENT OF WINTER WHEAT CULTIVARS' COMPETITIVENESS. A.E. Stone, T.F. Peeper, E.G. Krenzer, M.L. Stone, J.B. Solie, and J.C. Stone. Oklahoma State University, Stillwater, OK, 74078.

ABSTRACT

In the winter wheat production regions of the United States, Jointed Goatgrass (*Aegilops cylindrica*) is a serious weed problem. It has been reported to infest 2 million hectares of farmland. Currently, there are no labeled herbicides for the selective control of jointed goatgrass, and cultural control is not very effective. Previous research has established that substantial variation exists in competitive ability in wheat as determined by reductions in jointed goatgrass attributes (yield, spike and spikelet production, and height). Physical measurements of certain wheat characteristics correlated to jointed goatgrass attributes have been the standard for determining competitive ability. However, we now have electronic technology that can rapidly sense the wheat's health and growth. By using this technology, it may be possible to estimate competitiveness of wheat faster and with less labor. To ascertain whether an electronic device could be used to measure competitiveness, an Oklahoma State University sensor was used to record incident and reflected light from the spectral bands centered at 670 ($\pm$ 6nm) and 780 nm ($\pm$ 6nm). These bands were then used to calculate NDVI. In the 1999-2000 growing season, 24 winter wheat cultivars were planted with and without jointed goatgrass. The first spectral signatures were recorded twelve days after planting, using the two band OSU sensor (red and near infrared). Spectral readings were recorded once a week, except during inclement weather.

Correlations with physically measured wheat characteristics and individual NDVIs where calculated. The negative correlations indicate that there is an inverse relationship between wheat characteristic or NDVI a jointed goatgrass attribute. So, when a wheat characteristic or NDVI increases, a jointed goatgrass characteristic decreases. Correlations of jointed goatgrass attributes were higher with NDVI than with wheat characteristics, indicating that the sensor is more capable of estimating competitiveness. In addition, early NDVI recordings have a more negative correlation than later in the season, denoting that early biomass may be important in competitive ability of a wheat cultivar.

WEED MANAGEMENT IN NO-TILLAGE WHEAT. J.R. Martin, L.W. Murdock, J.H. Herbek, J. James, and D. Call [1]. Department of Agronomy, University of Kentucky, Princeton, KY 42445.

ABSTRACT

University of Kentucky and various groups have been involved in a number of initiatives regarding the adoption of no-tillage practices in wheat production. One particular initiative is an ongoing experiment that began in the fall of 1992 to investigate several factors including weed control.

This long-term study involves a rotation sequence of wheat/double-cropped soybeans/corn. No-tillage and conventional tillage practices are compared in the wheat rotation, whereas no-tillage practices are used exclusively in the other two rotational crops.

Weed management programs varied depending on tillage practices and herbicides. The five weed management programs compared in this study are: CT = conventional tillage with spring-applied prepack of thifensulfuron plus tribenuron; NT-1 = no-tillage with fall-applied prepack of thifensulfuron plus tribenuron only; NT-2 = no-tillage with spring-applied prepack of thifensulfuron plus tribenuron only; NT-3 = no-tillage with paraquat applied preplant followed by spring-applied prepack of thifensulfuron plus tribenuron; and NT-CK = no-tillage non-treated check. Paraquat was applied at 0.47 lb ai/A plus nonionic surfactant at 0.25% v/v and the prepack formulation of thifensulfuron plus tribenuron was applied at 0.25 plus 0.125 oz ai/A, respectively, plus nonionic surfactant at 0.25 % v/v. Control of broadleaf and grass species was evaluated in late spring and was based on ratings of ground cover occupied by plants in the row middles beneath the wheat canopy. Wild garlic control was also evaluated in late spring and was based on plant counts made within one row middle.

Twenty-nine species have been observed thus far with purple deadnettle and common chickweed being the most common weeds present. The ground cover in row middles occupied by broadleaf weeds and grasses was less than 15% during late spring in the CT treatment and was similar to that observed in the NT-1 and NT-3 treatments. The level of ground cover of broadleaf weeds and grasses in the NT-2 treatment was 23% compared with 60% ground cover in the NT-CK treatment. Wild garlic densities observed in the spring did not differ among any treatments with the thifensulfuron plus tribenuron prepack and were very low compared with the densities in the NT-CK treatment. Wild garlic seldom produced aerial bulblets at wheat harvest, including plants that were counted in the spring in the NT-CK plots.

No-tillage wheat yields were 5.5 to 13 bu/A greater where herbicide programs were used compared with plots that were not treated with a herbicide. Wheat yields tended to be greater where conventional tillage practices were utilized than where no-tillage practices were used; however, the differences were not statistically significant when

no-tillage plots received a fall-applied treatment of either paraquat for burndown control at planting or thifensulfuron plus tribenuron prepack for control of emerged weeds after wheat emergence.

[1] The authors express appreciation to Dwight Wolfe for assisting with the statistical analysis of these data.

PEANUT RESPONSE TO PREPLANT APPLICATIONS OF 2,4-D, CLARITY, AND HARMONY EXTRA.
E.P. Prostko *, E.F. Eastin, T.L. Grey, and W.C. Johnson, University of Georgia/USDA-ARS, Tifton, GA 31793 and W.J. Grichar, B.A. Besler, and K.D. Brewer, Texas Agricultural Experiment Station, Yoakum, TX 77995.

ABSTRACT

Roundup (glyphosate) and Gramoxone (paraquat) are burndown herbicides that are typically used in reduced tillage peanut production systems. Although these herbicides provide good to excellent control of most weeds, they do not provide consistent control of certain winter annuals including cutleaf eveningprimrose (*Oenothera laciniata*). In other reduced tillage production systems, herbicides such as 2,4-D, Clarity (dicamba), and Harmony Extra (thifensulfuron + tribenuron), can be tank-mixed with glyphosate or paraquat to improve their spectrum of control. However, the response of peanuts to these herbicides has not been adequately addressed and their use in reduced tillage peanut production systems is ambiguous. The objective of this research was to evaluate the response of peanuts to preplant applications of 2,4-D, Clarity, and Harmony Extra.

Field trials were conducted at 4 locations in Georgia (Attapulgus, Griffin, Plains, and Tifton) and 1 location in Texas (Yoakum). Herbicide treatments including 2,4-D amine and ester (0.5 lb ai/A), Clarity (0.25 lb ai/A), and Harmony Extra (0.028 lb ai/A) were applied 30, 15, 7, and 0 days before planting (DBP). Prior to the 30 DBP applications, the seedbeds were prepared using conventional tillage methods and no additional tillage operations were performed. A randomized complete block design was used at each location and all treatments were replicated 3-4 times. The plot areas were maintained weed-free to avoid the effects of weed competition. All locations received supplemental irrigation when necessary. Data collected included visual injury ratings, plant populations, yield, and grade. Yields were obtained using commercial digging and harvesting equipment. All data were subjected to ANOVA and means were separated using Duncan's Multiple Range Test ($P = 0.05$) when appropriate.

At the Attapulgus and Plains locations, Clarity applied 7 DBP and 0 DBP caused significant crop injury (stunting) 14-21 days after planting. In Griffin, significant crop injury was observed with 2,4-D amine and ester applied 0 DBP, all timings of Clarity, and Harmony Extra applied 7 DBP. Plant population data were obtained from the Attapulgus and Yoakum locations. The only treatment that caused a significant reduction in plant population was Clarity applied 0 DBP at the Yoakum location.

Peanut yields were not influenced by any preplant application of 2,4-D, Clarity, or Harmony Extra in Georgia. In Yoakum, peanut yields were significantly reduced by Clarity applied 0 DBP and Harmony Extra applied 7 DBP. Clarity was applied at 0.5 lb ai/A at this location which may account for the differences between the Georgia and Texas locations. It is the authors' opinion that the yield reductions caused by Harmony Extra applied 7 DBP may be a data anomaly. Peanut grades (total sound mature kernels and other kernels) were obtained from the Attapulgus, Tifton, and Yoakum locations. Grades were not affected by any preplant herbicide treatment.

Generally, peanuts have acceptable tolerance to preplant applications of 2,4-D, Clarity, and Harmony Extra. These herbicides could be used in combination with other burndown herbicides in reduced tillage peanut production systems to improve the control of difficult weeds. Of the 3 herbicides evaluated, Clarity has the greatest potential to injure peanuts. Consequently, Clarity (0.25 lb ai/A) should be applied a minimum of 15 DBP in order to reduce visual injury symptoms and prevent yield loss. Taking a conservative approach, 2,4-D (0.5 lb ai/A) and Harmony Extra (0.028 lb ai/A) can be applied a minimum of 7 DBP without concern for peanut injury. Additional research will be conducted in 2001 to confirm these results.

TEXAS PANICUM CONTROL IN STRIP-TILLAGE PEANUT PRODUCTION. W.C. Johnson, III. USDA-ARS, Coastal Plain Experiment Station, Tifton, GA 31793.

ABSTRACT

Strip-tillage peanut production presents unique challenges for managing Texas panicum (*Panicum texanum* Buckl.). Preplant incorporated applications of dinitroaniline herbicides are not possible. These herbicides can be applied preemergence, but require activation with either irrigation or timely rainfall. Chloracetamide herbicides are commonly used for grass control in conservation tillage systems for other crops, but these herbicides do not adequately control Texas panicum. Postemergence graminicides effectively control Texas panicum and are widely used in the southeastern U. S. to control escaped grasses. Chloracetamide herbicides and postemergence graminicides are more costly than dinitroaniline herbicides. Studies were conducted in 1999 and 2000 in Georgia to develop cost-effective systems to manage Texas panicum in strip-tillage peanut production. Rye was seeded as a cover crop in November the preceeding year and killed with glyphosate (1.1 kg ai/ha) in early-April. Seedbeds were

prepared 3 wk after cover crop kill with a KMC® 2-row strip-till implement, that features in-row subsoiling, fluted coulters, and ground-driven crumblers to prepare a tilled 30 cm seedbed. 'Georgia Green' peanut were seeded with Monosem® vacuum planters immediately after seedbeds were prepared. The experimental design was a split-plot with four replications. Main plots were preemergence herbicides for annual grass control; ethalfluralin (0.8 kg ai/ha), pendimethalin (1.1 kg ai/ha), metolachlor (2.2 kg ai/ha), alachlor (3.4 kg ai/ha), dimethenamid (1.3 kg ai/ha), and a nontreated control. All plots were irrigated immediately after preemergence herbicide application to activate treatments. Sub-plots were postemergence graminicides applied 28 days after peanut emergence; sethoxydim (0.22 kg ai/ha), clethodim (0.10 kg ai/ha), and a nontreated control. Postemergence graminicides were applied with a crop oil concentrate at 1.0% by vol. Neither dinitroaniline nor chloracetamide herbicides alone effectively controlled Texas panicum in strip-till peanut production, even under optimum conditions for herbicide efficacy. Both sethoxydim and clethodim consistently controlled Texas panicum, either alone or sequentially following preemergence herbicides. While postemergence graminicides effectively control Texas panicum in strip-till peanut production, their use to the exclusion of a dinitroaniline herbicide will leave dicot weeds uncontrolled, such as Florida pusley (*Richardia scabra* L.). Peanut growers who choose to use strip-till peanut production must plan to use a properly timed postemergence graminicide for Texas panicum control in addition to traditional dinitroaniline herbicides, and this additional input needs to be factored into crop production budgets.

INTERACTION OF PEANUT VARIETY, DICLOSULAM RATE, AND TEMPERATURE ON SEED GERMINATION. W.J. Grichar [1], C.A. Gerngross [2], R.L. Lemon [3], S.A. Senseman [2], B.A. Besler [1], and V.B. Langston[4]. Texas Agricultural Experiment Station, Yoakum[1] and College Station[2], TX; Texas Agricultural Extension Service, College Station, TX[3], and Dow AgroSciences, The Woodlands, TX[4].

ABSTRACT

Rotation restrictions following diclosulam use in peanut include 10 mo for cotton, 18 mo for corn and grain sorghum, and 30 mo for all other crops. Since cotton is rotated with peanut in much of the west Texas area, diclosulam is a perfect herbicide for that rotation scheme. No problems in peanut tolerance were noted in previous years, but in 1999 and again in 2000, slow emergence as well as severe stunting were noted in certain fields in west Texas. Several factors were thought to be a part of this problem including herbicide rates, soil pH, temperature, peanut variety, and water quality.

Three separate germination studies were conducted in Percival® growth chambers. Diclosulam rates and peanut varieties remained constant throughout the studies; however, temperature did vary. Diclosulam rates were 0.006 lb ai/A (1/4X), 0.012 lb ai/A, (1/2X) 0.024 lb ai/A (1X) and 0.048 lb ai/A (2X) compared with the untreated check. Peanut varieties included FL-458 (a high oleic variety commonly used in west Texas), Georgia Green, GK-7, and 301-1-18 (a new cultivar soon to be released with root-knot nematode resistance.

In Study 1, when averaged across temperature and diclosulam rate, peanut variety response was significant. 301-1-18 had > 90% germination while Georgia Green had 55%. FL-458 and GK-7 had < 40% germination. 301-1-18 seed were selected from breeder's stock while other cultivars were taken from commercial seed lots while contained seed of various sizes and quality. As the rate of diclosulam increased, peanut seed germination decreased. Interaction of temperature x variety resulted in < 32% germination for FL-458, Georgia Green, and GK-7 at 50°F while 301-1-18 had 94% germination. At 65°F, FL-458 and GK-7 had < 55% germination while Georgia Green and 301-1-18 had 78 to 83% germination. At 80°F, only 301-1-18 had > 95% germination.

In Study 2, as temperature increased germination increased. Germination of 301-1-18 was 80% while FL-458 and Georgia Green was < 70%. GK-7 had < 60% germination.

In Study 3, at 50°F, peanut germination was < 20% while at 65°F and 80°F germination was > 65%. FL-458 and 301-1-18 germination was > 60% while germination of Georgia Green and GK-7 was $\leq$ 40%. Interaction of temperature and variety was significant. The highest germination (>90%) was 301-1-18 at 65°F and 80°F while lowest germination (< 20%) was at 55°F with all three varieties.

In conclusion, diclosulam rate was a factor in only one of three studies; therefore, problem associated with poor seedling emergence and vigor are mainly the result of other factors. Temperature did cause a reduction in peanut germination especially at the lowest temperatures. Also peanut variety was a factor. Seed selected by the peanut breeder germinated better at lower temperatures than commercially available seed stock. Therefore, poor seed quality can reduce germination.

RESIDUAL WEED CONTROL FOR PEANUT (*ARACHIS HYPOGAEA*) WITH IMAZAPIC, DICLOSULAM, FLUMIOXAZIN, AND SULFENTRAZONE IN ALABAMA, GEORGIA, AND FLORIDA: A MULTI-STATE AND YEAR SUMMARY. T.L. Grey, D.C. Bridges, E.F. Eastin *, E.P. Prostko *, and W.K. Vencill **, Department of Crop and Soil Science, The University of Georgia, Griffin, GA 30223, Tifton*, and Athens**; W.C. Johnson, Jr., USDA-ARS Tifton GA; B.J. Brecke, G.E. MacDonald, and J.A. Tredaway, Agronomy Department, University of Florida; J.W. Everest and G.R. Wehtje, Agronomy and Soils Department, Auburn University; and J.W. Wilcut, Department of Crop Science, N.C. State University.

ABSTRACT

Peanut development and maturity require a long growing season and thus, the residual activity of herbicides applied early season may not provide effective season-long weed control if no additional herbicides are applied. Therefore, residual weed control is an important part of peanut production. This is illustrated by the fact that paraquat is often tank-mixed with bentazon EPOT, but it is rarely used alone, that is in the absence of other weed control treatments because of the lack of residual control.

During the 1980's and 1990's, the development and introduction of PPI, PRE, and POST herbicides emphasized the control of broadleaf, nutsedge, and grass species. Lack of extended residual activity, variation in weed control spectrum, rotational restrictions, and cost are factors in herbicide selection. Until recently, these factors have limited the domination of any one particular herbicide in the Southeastern United States peanut market.

Imazapic POST was registered in 1996, diclosulam for PPI or PRE application in peanut in 2000, and flumioxazin PRE and sulfentrazone PPI or PRE are currently under registration review for peanut. To summarize current and future weed control options for peanut producers, extension, and the agriculture chemical industry, a review was conducted for these residual herbicides. Weed control data from research conducted from 1990-2000 by The University of Georgia, University of Florida, and Auburn University was compiled, reviewed, and summarized.

Georgia scientists compiled data from over 100 experiments to conduct this review. Included were imazapic POST (71 g·ha^{-1} a.i.), diclosulam PPI and PRE (18 and 26 g·ha^{-1} a.i.), flumioxazin PRE (70, 87, and 104 g·ha^{-1} a.i.), sulfentrazone PRE (168, 224, and 280 g·ha^{-1} a.i.) and a standard, paraquat + bentazon. Paraquat and paraquat-tank mixtures were applied to 110% of the 1998 Georgia peanut crop. Therefore, paraquat + bentazon was chosen as the standard treatment. Twelve regionally important weeds were selected: sicklepod (*Senna obtusifolia*), Florida beggarweed (*Desmodium tortuosum*), purple and yellow nutsedge (*Cyperus rotundus* and *C. esculentus*, respectively), morningglory species (*Ipomoea* species), smallflower morningglory (*Jacquemontia tamnifolia*), bristly starbur (*Acanthospermum hispudum*), wild poinsettia (*Euphorbia heterophylla*), common cocklebur (*Xanthium strumarium*), prickly sida (*Sida spinosa*), common ragweed (*Ambrosia artemisiifolia*), and tropic croton (*Croton glandulosus*). Weed control was averaged across test and years to report average weed control, standard deviation, and number of tests for each of the 12 weeds when each herbicide was applied alone and in combination with paraquat + bentazon for a total of 23 treatments.

All weed control ratings reflect mid-season weed control (July) except for Florida beggarweed, which are from late-season ratings (September). Sicklepod control with imazpic alone was 86%; 73% with paraquat + bentazon; and, <69% with other herbicides alone. Florida beggarweed control was 90% with flumioxazin (104 g·ha^{-1} a.i. PRE); 79% with diclosulam (26 g·ha^{-1} a.i. PPI); 76% with imazapic and sulfentrazone (280 g·ha^{-1} a.i. PRE); and 70% with paraquat + bentazon. Purple nutsedge control was 93% with imazapic; 70% with sulfentrazone (280 g·ha^{-1} a.i. PRE); and, <69% with other herbicides applied alone. Yellow nutsedge control was 93% with imazapic; 98% with sulfentrazone (280 g·ha^{-1} a.i. PRE); 83% with diclosulam (26 g·ha^{-1} a.i. PRE); and <69% with flumioxazin and paraquat + bentazon. Control of other species varied by treatment when herbicides were applied alone. When herbicides were applied in combination with paraquat + bentazon weed control generally improved.

The following is noteworthy: only imazapic controlled sicklepod; only flumioxazin controlled Florida beggarweed greater than 90%; imazapic controlled purple and yellow nutsedge greater than 90%; sulfentrazone controlled yellow nutsedge greater than 90%; all herbicides gave good-excellent morningglory control; diclosulam provided nearly 90% bristly starbur control at all rates and application timings.

PERFORMANCE OF FLUMIOXAZIN (VALOR™) IN TEXAS PEANUT. J.R. Karnei *, P.A. Dotray, J.W. Keeling, B.L. Porter, T.A. Baughman, W.J. Grichar, and R.G. Lemon. Texas Tech University, Lubbock, Texas Agricultural Experiment Station, Lubbock and Yoakum, and Texas Agricultural Extension Service, College Station and Vernon.

ABSTRACT

Flumioxazin (Valor™) is a developmental herbicide by Valent USA for use in peanut, soybean, sugarcane, and other crops. It is a low use-rate herbicide that inhibits protoporphyrinogen oxidase (PPO), which leads to cell membrane disruption in susceptible weed species. Flumioxazin applied PRE has been reported to have good activity on many troublesome weeds in peanut, including black nightshade (*Solanum nigrum*), common lambsquarter (*Chenopodium*

album), eclipta (*Eclipta prostrata*), Eastern blacknightshade (*Solanum ptycanthum*), golden crownbeard (*Verbesina encelioides*), ivyleaf morningglory (*Ipomoea hederacea*), Palmer amaranth (*Amaranthus palmeri*), redroot pigweed (*Amaranthus retroflexus*), smallflower morningglory (*Jacquemontia tamnifolia*), smooth pigweed (*Amaranthus hybridus*), tall morningglory (*Ipomoea purpurea*), tall waterhemp (*Amaranthus tuberculatus*), tumble pigweed (*Amaranthus albus*), Venice mallow (*Hibiscus trionum*). Good peanut safety has also been reported across the peanut belt. Flumioxazin has rotational flexibility that allows cotton, corn, and other grain crops to be planted the following growing season. The objectives of this study were to determine flumioxazin activity on a number of troublesome weeds in Texas peanut production and evaluate peanut tolerance to flumioxazin applied PRE at a variety of Texas peanut locations. Traditional small plot equipment was used at all locations. Flumioxazin was applied PPI and PRE at 0.063 and 0.094 lbs ai/A in experiments from 1997 to 2000. Weed control and peanut injury was monitored throughout the season. Flumioxazin did not injure peanuts in these experiments. Flumioxazin PRE at 0.063 controlled Palmer amaranth 100% (Yoakum and Frio County), Texas panicum 81% (Frio County), eclipta at least 82% (Lavaca and Frio Counties), and ivyleaf morningglory <40% (Lelia Lake). Flumioxazin PRE at 0.094 controlled golden crownbeard and shining tickseed (Corispermum nitidum) 100% (Union) and lanceleaf sage (Salvia reflexa) 78% (Lorenzo). Flumioxazin applied PPI or PRE did not control pitted morningglory, yellow nutsedge, or purple nutsedge. The availability of flumioxazin in 2001 will provide southwestern peanut growers a new tool for broad spectrum weed control with good crop safety.

DICLOSULAM AND FLUMIOXAZIN FOR PEANUT RESIDUAL WEED CONTROL IN POSTEMERGENCE PROGRAMS. C.L. Main, J.A. Tredaway, and G.E. MacDonald, University of Florida, Gainesville, FL.

ABSTRACT

Experiments were conducted at Marianna, FL in 1999 and 2000 to evaluate diclosulam and flumioxazin for broadleaf weed control in Florida peanut (*Arachis hypogaea*). Ethalfluralin was applied at 841 g ai/ha PPI to the entire test for small seeded broadleaf and annual grass control. Georgia Green peanuts were planted in May 1999 and 2000 in 91 cm rows at a depth of 6 cm and 112 kg/ha. The experimental design was a randomized complete block with four replications. Plots consisted of four rows 6.1 meters in length. Diclosulam and flumioxazin were applied pre-plant incorporated (PPI) and preemergence (PRE), respectively. All treatments included either no PPI or PRE herbicide, diclosulam PPI at 27 g ai/ha, or flumioxazin PRE at 105 g ai/ha. Postemergence (POST) treatment combinations evaluated with each PPI or PRE herbicide include 1) paraquat at 157 g ai/ha plus bentazon at 280 g ai/ha plus 2,4-DB at 224 g ai/ha early postemergence (EPOST) (the standard EPOST treatment), 2) paraquat at 157 g ai/ha plus bentazon at 280 g ai/ha plus 2,4-DB at 224 g ai/ha EPOST fb 2,4-DB at 224 g ai/ha mid-postemergence (MPOST), 3.) paraquat at 157 g ai/ha plus bentazon at 280 g ai/ha plus 2,4-DB at 224 g ai/ha EPOST fb chlorimuron at 9 g ai/ha plus 2,4-DB at 224 g ai/ha LPOST, 4) paraquat at 157 g ai/ha plus bentazon at 280 g ai/ha plus 2,4-DB at 224 g ai/ha EPOST fb imazapic at 71 g ai/ha MPOST, and 5) imazapic at 71 g ai/ha MPOST. A weed free check and weedy check were included for comparison. Weed free plots were maintained by hand hoeing. Treatments were applied with either CO_2 pressurized backpack sprayer, or a CO_2 pressurized tractor-mounted sprayer calibrated to deliver 187 L/ha. Visual evaluations of crop injury, and efficacy were recorded 14, 28, and 56 days after treatment (DAT) and prior to harvest. Peanuts were inverted at maturity and harvested after 5 days.

Peanut injury was insignificant for all treatments evaluated. Florida beggarweed (*Desmodium tortuosum*) was controlled both years greater than 87% by treatments containing flumioxazin PRE. Treatments containing diclosulam provided >75% control of Florida beggarweed, except for diclosulam alone in 2000. Control of Florida beggarweed in a total POST system was increased by the addition of chlorimuron + 2,4-DB (LPOST) and imazapic (MPOST) to greater than 83%. Neither diclosulam PPI or flumioxazin PRE provided season long sicklepod (*Senna obtusifolia*) control. Timely POST applications are needed to achieve adequate sicklepod control. All herbicide treatments controlled pitted morningglory (*Ipomoea lacunosa*) greater than 80% except diclosulam PPI, and the standard EPOST treatment in 1999. Similar to 1999, in 2000 diclosulam PPI fb the standard EPOST treatment fb imazapic, flumioxazin PRE fb the standard EPOST treatment fb imazapic, flumioxazin PRE fb imazapic MPOST, Flumioxazin PRE fb the standard EPOST treatment fb 2,4-DB MPOST, the standard EPOST treatment, fb chlorimuron + 2,4-DB LPOST, diclosulam PPI fb the standard EPOST treatment, fb chlorimuron + 2,4-DB LPOST, the standard EPOST treatment fb imazapic MPOST, and imazapic MPOST all controlled pitted morningglory greater than or equal to 85%. All other herbicide treatments provided less than 78% control. Purple nutsedge (*Cyperus rotundus*) was present only in 2000. Treatments containing imazapic MPOST controlled purple nutsedge 94% or greater. The addition of diclosulam PPI or flumioxazin PRE did not increase purple nutsedge control. Peanut yields for all treatments except the untreated check, diclosulam PPI, the standard EPOST treatment fb 2,4-DB MPOST, the standard EPOST treatment fb chlorimuron + 2,4-DB, and flumioxazin PRE fb the standard EPOST treatment fb chlorimuron + 2,4-DB were not different from the weed free check.

THE EFFECT OF CGA-362622 APPLICATIONS ON WEED CONTROL AND COTTON YIELD. J.C. Holloway, JR. *, J.W. Wells, J.R. James, W. Bachman, G. Cloud, B. Minton, S. Moore, D. Porterfield, and H.R. Smith, Novartis Crop Protection, Greenville, MS; Greensboro, N. C. and other locations.

ABSTRACT

CGA 362622 is a new Novartis Crop Protection sulfonylurea herbicide developed for post-emergence weed control in cotton. The proposed ISO name is Trifloxysulfuron Sodium and the mode of action is an ALS inhibitor. It controls a wide spectrum of weeds, including broadleaves, grasses, and sedges. The use rates of CGA 362622 are extremely low and vary between 0.1 – 0.25 oz/A in cotton. CGA 362622 can be applied over the top of cotton at the early post application, (maximum of 0.1 oz/A, minimum of 3 leaf cotton), as well as post directed at the post, late post, and lay by application timings, (maximum of 0.25 oz/A). Do not exceed 0.4 oz/A per season. CGA-362622 will be formulated as a 75 WDG and can be applied to conventional, RR, and BXN cotton.

CGA 362622 controls most troublesome weeds in cotton. Some weeds, which are controlled include redroot pigweed (*Amaranthus retroflexus*), tall waterhemp (*Amaranthus tuberculatus*), smooth pigweed (*Amaranthus hybridus*), sicklepod (*Senna obtusifolia*), hemp sesbania (*Sesbania exaltata*), pitted morningglory (*Ipomoea lacunosa*), and ivyleaf morningglory (*Ipomoea hederacea*). Suppression of yellow nutsedge (*Cyperus esculentus*), and purple nutsedge (*Cyperus rotundus*), is achieved with a single application and control of yellow nutsedge is achieved with a sequential application of CGA 362622.
CGA 362622 controls key weeds, both small and large in cotton. Cotton phytotoxicity is 13% or less following an early post application of CGA 362622, (0.1 oz/A), and 6% or less with all directed application timings. All visible cotton injury is gone within 14 days after application under normal growing conditions. Cotton yields are not affected by applications of CGA 362622.

BROADLEAF WEED CONTROL IN ULTRA NARROW ROW BXN COTTON WITH BROMOXYNIL MIXTURES. K.N. Reddy, USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS 38776.

ABSTRACT

Weed control in ultra narrow row (UNR) cotton production depends primarily on preemergence (PRE) and postemergence (POST) herbicides since cultivation and post-directed or hooded herbicide sprays are not possible. Bromoxynil-resistant (BXN) cotton provides an option to manage weeds with bromoxynil POST, but bromoxynil is active only on certain broadleaf weed species. Bromoxynil mixtures with pyrithiobac or MSMA can overcome low bromoxynil activity on certain weeds. This study examines the efficacy of bromoxynil-based weed control programs on seven difficult-to-control broadleaf weeds in UNR BXN cotton.

A 2-yr field experiment was conducted in 1999 and 2000 on a Dundee silt loam at Stoneville, MS. Cotton 'BXN 47' was planted on 3 May 1999 and 21 April 2000 at 312,000 seeds/ha in 25-cm rows with a Monosem NG Plus precision planter. Experimental plots consisted of sixteen rows, 25 cm apart and 13.7 m long. The experiment was conducted in a randomized complete block design with four replications. Herbicide programs consisted of bromoxynil EPOST (0.56 kg ai/ha), bromoxynil EPOST and LPOST (0.56 + 0.56 kg ai/ha), pyrithiobac EPOST (0.11 kg ai/ha), MSMA EPOST (1.12 kg ai/ha), bromoxynil plus pyrithiobac EPOST, and bromoxynil plus MSMA EPOST with no PRE or following fluometuron PRE (1.12 kg ai/ha); pendimethalin PRE (1.12 kg ai/ha) fb bromoxynil EPOST; fluometuron plus pendimethalin PRE fb bromoxynil EPOST or bromoxynil plus pyrithiobac EPOST; fluometuron plus pendimethalin PRE fb pyrithiobac EPOST as a conventional standard, and a non-treated control. PRE herbicides were applied broadcast at planting. EPOST and LPOST herbicides applied 3-4 and 5-6 wk after planting, respectively.

Single or sequential bromoxynil POST-only programs provided variable control of broadleaf weeds: common purslane (<9%), sicklepod (<35%), Palmer amaranth (<46%), prickly sida (>75%), hyssop spurge (>79%), hemp sesbania (>96%), and pitted morningglory (100%) at 4 wk after EPOST (WAT). The broadleaf weed control greatly improved with PRE herbicides followed by bromoxynil POST programs. Control of these weeds in general decreased at harvest compared to 4 WAT, and decrease was greater in bromoxynil POST-only programs compared to bromoxynil POST following PRE programs. Bromoxynil mixed with pyrithiobac was antagonistic to hyssop spurge control and synergistic to common purslane control and bromoxynil mixed with MSMA was antagonistic to prickly sida control only at 4 WAT and with no PRE herbicides. All other bromoxynil plus pyrithiobac or MSMA combinations provided additive effects regardless of PRE herbicides. Seed cotton yield with bromoxynil POST-only programs was lower (400 to 2,810 kg/ha) compared to bromoxynil POST programs following PRE herbicides (2,150 to 3,720 kg/ha) due to higher cotton stand reduction and lower open bolls per plant in bromoxynil POST-only programs. These results indicated that common purslane, hyssop spurge, prickly sida, sicklepod, and Palmer amaranth control and cotton yields were consistently higher with bromoxynil-based POST programs following fluometuron or fluometuron plus pendimethalin PRE compared to no PRE herbicides.

APPLICATION TIMING FOR PROWL AND DUAL IN STRIP-TILL ROUNDUP READY COTTON. A.C. York, Crop Science Department, North Carolina State University, Raleigh; A.S. Culpepper, Department of Crop and Soil Sciences, University of Georgia, Tifton; and H.L. Crooks, Crop Science Department, North Carolina State University, Raleigh.

ABSTRACT

Strip-till cotton production is being rapidly adopted in North Carolina and other southeastern states. The popularity of this practice is related to commercialization of Roundup Ready cotton which has given growers the tools to successfully manage weeds in a reduced-tillage system. Strip-till Roundup Ready producers have eliminated most soil-applied herbicides, although many continue to apply Prowl (pendimethalin) preemergence. Because of its low water solubility and the difficulty in getting it adequately activated when surface-applied, growers have asked if application of Prowl during the burndown herbicide application a few weeks ahead of planting would improve consistency of performance. Dual Magnum (S-metolachlor) is registered for postemergence application to cotton, and growers have expressed interest in mixing it with Roundup applied overtop of cotton in hopes of obtaining residual control of annual grasses and pigweed species.

Two experiments were conducted in the coastal plain of North Carolina during 1999 and 2000 to determine the potential benefits of Prowl or Dual Magnum in a Roundup-based management system for strip-tilled cotton, and to determine the most appropriate time to apply Prowl or Dual Magnum. In each experiment, a wheat cover crop was killed about 3 weeks ahead of planting. A 14-inch band over the row was tilled, and Roundup Ready cotton was planted the same day. Treatments in experiment 1 included a non-treated check, Prowl 3.3L at 2.4 pt/A EPP (early preplant), Prowl 1.2 pt/A EPP followed by 1.2 pt/A PRE (preemergence), and Prowl 2.4 pt PRE. Prowl EPP was mixed with Roundup Ultra (glyphosate) used to kill the cover crop 3 weeks ahead of planting. Roundup Ultra was applied overtop 3-leaf cotton and Caparol (prometryn) plus MSMA was directed to 12-inch cotton.

Treatments in experiment 2 included Prowl or Dual Magnum application timings and lay-by herbicides arranged factorially. Prowl at 2.4 pt/A or Dual Magnum at 1.3 pt/A was applied PRE, POST (postemergence) to 4-leaf cotton, or directed at lay-by to 20-inch cotton. Lay-by options were Roundup Ultra at 2 pt/A and Caparol 2pt/A plus MSMA 2 pt/A. All treatments except the non-treated check received Roundup Ultra at 1 and 1.5 pt/A applied overtop 1- and 4-leaf cotton, respectively. Dual Magnum and Prowl applied POST or lay-by were mixed with the Roundup or Caparol plus MSMA.

In experiment 1, Prowl was generally more effective on broadleaf signalgrass (*Brachiaria platyphylla*), large crabgrass (*Digitaria sanguinalis*), goosegrass (*Eleusine indica*), smooth pigweed (*Amaranthus hybridus*), and slender amaranth (*Amaranthus viridus*) when applied PRE as compared with EPP or EPP + PRE application. Prowl had no effect on cotton yield in 1999 but increased yield 22 to 33% in 2000 when applied PRE or EPP + PRE.

In experiment 2, there was not a Dual/Prowl application timing by lay-by herbicide interaction. Main effects were significant for some variables. No crop injury was noted from Dual or Prowl regardless of time of application. Large crabgrass and goosegrass were controlled 94% late in the season, smooth pigweed 95%, common lambsquarters (*Chenopodium album*) 100%, and pitted morningglory (*Ipomoea lacunosa*) and tall morningglory (*Ipomoea purpurea*) 96% in systems without Dual or Prowl. Dual increased large crabgrass and goosegrass control to 98% regardless of time of application. Neither Prowl nor Dual affected control of the other species, and neither herbicide affected cotton yield regardless of time of application. Pooled over Prowl/Dual treatments, a difference in lay-by treatments was noted only for pitted and tall morningglory control, where late-season control was 94 and 98% with Roundup Ultra and Caparol plus MSMA, respectively. There were no differences in yield.

EFFECT OF GENERIC GLYPHOSATE PRODUCTS ON ROUNDUP READY COTTON. S.T. Kelly and J.W. Barnett. Louisiana State University AgCenter, Scott Research, Extension, and Education Center, Winnsboro, LA 71295.

ABSTRACT

Experiments were conducted in 2000 to evaluate the effect of generic glyphosate products on Roundup Ready Cotton (*Gossypium hirsutum*). Both experiments were conducted on producer fields. Location one was an irrigated site in Franklin Parish, Louisiana on a Gigger silt loam soil. Treatments were applied on May 22 in a final volume of 14 gallons per acre (gpa). Experimental design was a randomized complete block with three replicates. Treatments included Roundup Ultra Max (26 oz/A), Roundup Ultra, Glyphosate Original, Dupont Glyphosate, or Glyphomax Plus, each at 1 qt/A. Injury was evaluated at 7 and 14 days after treatment (DAT). No injury was observed at either evaluation date. A final plant map at harvest revealed no differences in boll retention between any of the glyphosate products. Location two was a strip trial conducted in Caddo Parish, Louisiana in the Red River Valley. Treatments were applied on June 1, 2000. Treatments at this location included Glyphosate Original, Glyphomax Plus, and Roundup Ultra each applied at 1qt/A, Roundup Ultra Max (26 oz/a), and Dupont Glyphosate + Staple (1 qt/A + 0.6 oz/A, respectively), and Roundup Ultra + Staple (1qt/A+ 0.8 oz/A, respectively). Entireleaf morningglory (*Ipomoea hederacea* var. integriuscula L.) and smellmelon (*Cucumis melo* L. var. dudaim Naud.) were

evaluated at 7 and 21 DAT. All treatments controlled entireleaf morningglory and smellmelon equally at 7 DAT . By 21 DAT, those treatments containing Staple controlled entireleaf morningglory 80%, compared to 50% with those glyphosate treatments that did not contain Staple. Overall, no differences in weed control or cotton injury were observed.

FLUMIOXAZIN (VALOR) APPLIED LAYBY 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

Flumioxazin (Valor) was evaluated a decade ago as V-53482 on cotton and soybean in Arkansas. Experiments on soybean were continued, but preemergence use in cotton was abandoned because of severe cotton injury. In the past few years, Valent USA Corp. has been developing Valor as a preemergence herbicide for soybean, peanut, and sugarcane. It is also being evaluated preplant and postemergence in cotton. It is of special interest as a cotton layby treatment since we are losing the option of cyanazine for post-directed use. Because of potential cotton injury, however, Valor application is restricted to cotton at least 12 inches tall. The spectrum of activity of Valor at 0.063 to 0.094 lb ai/A includes morningglory species (*Ipomoea* spp.), prickly sida (*Sida spinosa* L.), pigweed species (*Amaranthus* spp.), and several other broadleaf species common to cotton grown in the mid-South. The objective of this research was to evaluate Valor applied layby following a standard, early-season herbicide program.

Experiments were conducted in 1999 and 2000 at Fayetteville and Marianna, AR, and in 2000 at Rohwer (all silt loam soils). Cotton was planted June 3 and May 22 at Fayetteville, May 19 and May 11 at Marianna (1999 and 2000, respectively), and May 24 at Rohwer. Each experiment was an RCB with four replications. Plot size at Marianna and Rohwer was four, 38-in. rows by 27 ft., and Fayetteville plots were one, 40-in. row by 27 ft. All plots were treated with standard PRE (preemergence) and POST (postemergence) treatments to suppress weeds until layby: trifluralin PPI (preplant incorporated) fb (followed by) fluometuron PRE fb fluometuron + MSMA DIR (post-directed) at 3- to 6-in. cotton at Fayetteville (1999 only) and Marianna; glyphosate at 1-leaf over-the-top and 6-leaf DIR at Fayetteville in 2000; and trifluralin PPI at Rohwer. Valor at 0.063 was applied at layby alone or with MSMA at 2.0 lb ai/A or glyphosate at 1.0 lb ai/A. Layby treatments were applied July 29 and July 13 at Fayetteville (1999 and 2000, respectively), July 12 and July 5 at Marianna, and July 11 at Rohwer. Valor treatments were applied with 1% crop oil concentrate in 1999 and 0.25% non-ionic surfactant in 2000. Herbicides were applied in 15 gal/A output. Visual weed control and cotton injury ratings were collected 1 to 4 weeks after layby treatments (WAT). Two-week ratings are discussed. Cotton yield was harvested only at Rohwer. Data were analyzed by analysis of variance, and means were separated by LSD (0.05).

Annual grass control, primarily broadleaf signalgrass [*Brachiaria platyphylla* (Griseb.) Nash] at Fayetteville and Marianna and barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.] at Rohwer, ranged from 80 to 100%. Control with Valor plus glyphosate was better than with Valor alone or with MSMA at Rohwer. Control of smooth pigweed (*Amaranthus hybridus* L.) and pitted morningglory (*Ipomoea lacunosa* L.) was good to excellent (90 to 100%) with all treatments. As with annual grasses, prickly sida, was controlled better with Valor plus glyphosate than with Valor alone at Rohwer. Velvetleaf (*Abutilon theophrasti* Medicus) control depended on good spray coverage that included the terminal of the plants. Yellow nutsedge (*Cyperus esculentus* L.) was suppressed by Valor alone (66%), and control was increased with the addition of MSMA and glyphosate (84 and 85%, respectively). Cotton tolerance to Valor treatments was good, with only 3 to 14 % injury at 1 and 2 WAT, manifested as leaf desiccation and slight stem discoloration where contacted by spray. Yield at Rohwer was not affected. In summary, Valor is promising as a layby treatment in cotton for its contact and residual activity. It is a viable replacement for cyanazine at layby, but cannot be applied on cotton less than 12 inches tall. Glyphosate and MSMA are good tank-mix companions for Valor.

EVALUATION OF VALOR (FLUMIOXAZIN) IN LOUISIANA COTTON. P.R. Vidrine and D.K. Miller. Louisiana State University Agricultural Center, Baton Rouge, LA 70894.

ABSTRACT

Broadleaf weeds can become serious problems prior to planting and in late-season cotton. Current herbicides are limited in their ability to control larger weeds in conventional and transgenic cotton, especially at layby. Flumioxazin, formerly known as V-53482, is a new herbicide being developed by Valent USA Corporation for broadleaf weed control in cotton, peanuts, and sugarcane. Flumioxazin is a N-phenylphthalimide derivative and the mode of action of this family is inhibition of protoporphyrinogen oxidase (PPO). Flumioxazin can be applied preemergence for controlling weeds and can be applied postemergence, either post-directed or layby, in cotton. When applied as a post-directed treatment, hooded or shielded sprayers should be used to prevent cotton injury. Based on field studies to date, flumioxazin should be an excellent herbicide for weed control in cotton once registered. The objectives were to evaluate flumioxazin for use as a preplant herbicide in stale seedbed cotton and for use as a layby post-directed treatment on cotton at least 12 inches tall.

Field studies were conducted at Alexandria and St. Joseph, Louisiana, in 2000. In one study at Alexandria, flumioxazin was applied at 0.063 and 0.125 lb ai/a as a burndown treatment in mixture with glyphosate at 1.0 lb ai/a at 28 and 14 days before planting (DBP) and at planting (AP). Summer annual weeds were not present when the 28 DBP treatments were applied. At 14 DBP weeds consisted of entireleaf morningglory (IPOHE), hophornbeam copperleaf (ACCOS), smellmelon (CUMMD), palmer pigweed (AMAPA), sicklepod (CASOB), and seedling johnsongrass (SORHA). At 14 DBP weeds ranged from 2 to 8 inches with 2 to 8 leaves. AP weeds ranged from 2 to 12 inches with 2 to 10 leaves. In another study at Alexandria flumioxazin was applied layby at 0.063 lb/a in mixture with a surfactant (AG-98 at 0.25% v/v), crop oil concentrate (Agri-Dex at 1 qt/a), MSMA at 2.0 lb/a, MSMA + surfactant, and glyphosate at 1.0 lb/a. Weeds consisted of entireleaf morningglory, hophornbeam copperleaf, smellmelon, browntop millet (PANRA), and seedling johnsongrass. Weeds ranged from 2 to 12 inches with 4 to 12 leaves. In a study at St. Joseph, flumioxazin at 0.063 lbs/a was applied in mixture with a crop oil concentrate at 1.0% v/v. Weeds consisted of purple nutsedge (CYPRO) and horse purslane (TRTPO) and ranged in size from 2 to 7 inches.

In the burndown study at Alexandria, flumioxazin at 0.063 and 0.125 lbai/a in mixture glyphosate at 28 DBP controlled 70 to 90% of all weeds evaluated, indicating good to excellent preemergence weed control when rated 4 weeks following treatment. At 14 DBP and AP weed control ranged from 92 to 98%, indicating excellent burndown activity. Glyphosate applied alone controlled entireleaf morningglory, hophornbeam copperleaf, and smellmelon 63 to 78%. Cotton injury (<20%) was noticed following AP treatments of flumioxazin applied at 0.125 lb ai/a.

In the layby study at Alexandria, when rated 4 weeks after application, no differences were noted between additives in mixture with flumioxazin at 0.063 lb ai/a and control of broadleaf weeds ranged from 85 to 96%. Weed control following flumioxazin in mixture with either MSMA or glyphosate ranged from 80 to 98%. Glyphosate applied alone controlled broadleaf weeds 78 to 92% whereas MSMA applied alone controlled 65 to 90%. Efficacy of flumioxazin was similar to standard treatments and enhanced weed control when in mixture. Cotton injury following flumioxazin application was no greater than 25% as was seen only in plots where the spray mixture contacted the upper parts of the cotton plants.

In the layby study at St. Joseph, four weeks following application, purple nutsedge control following flumioxazin at 0.063 lb ai/a + a crop oil concentrate was only 24%, whereas glyphosate at 1.0 lb ai/a provided 83% control. However,control of horse purslane following flumioxazin was 86% and only 36% following glyphosate. Future studies should include a mixture of flumioxazin and glyphosate to control the spectrum of weeds seen at this location.

EFFECTS OF A FOLIAR NITROGEN SOURCE TANK-MIXED WITH ROUNDUP ULTRA™ IN ROUNDUP READY™ COTTON. M.M. Kenty and J.M. Thomas III, Helena Chemical Company, Memphis, TN 38120.

ABSTRACT

The increased cost of cotton (*Gossypium hirsutum* L.) production paired with low commodity prices necessitates the combining of production practices. Foliar fertilization as a component of a complete fertility is widely used in cotton. The use of Roundup Ready cotton varieties has increased tremendously throughout the Cotton Belt due to the weed control advantages that Roundup Ultra (glyphosate) offers producers. Research has documented the effects of glyphosate on Roundup Ready cotton when applied topically after the label recommendations. However, there is very little published information regarding the effects of glyphosate and foliar fertilizer tank-mixes on Roundup Ready cotton. Therefore, the objectives of this study were to evaluate the effect of CoRoN® 25-0-0 (HM9310) and CoRoN® 10-0-10 Plus B (HM9827) applied with Roundup Ultra in Roundup Ready cotton.

Small plot replicated studies were established in Arkansas, Mississippi, Tennessee, and Texas to evaluate the foliar application of a nitrogen source (HM9310 and HM9827) tank-mixed with Roundup Ultra. Treatments consisted of Roundup Ultra at 1.5 qt./A (1.5 lb. ai/A), HM9310 at 2.0 qt./A, and HM9827 at 2.0qt./A alone and tank-mixed with applications made at the 4-leaf and 6-leaf stage. Locally adapted varieties and agronomic practices were utilized. Weed control ratings, crop response, plant mapping data, and yield were collected.

The Arkansas and Tennessee locations were maintained as weed free. Weed control ratings were taken in Mississippi and Texas on the indigenous species prevalent at the time of rating. HM9310 or HM9827 plus glyphosate had little effect on weed control as compared to glyphosate alone at both locations except for the 4-leaf stage in Texas. No phytotoxicity was detected in either the 4-leaf or 6-leaf application at 7 and 14 DAT. Standard plant mapping data was collected for all treatments at all locations. The plant mapping data demonstrated that there was very little difference between the treatments. The two weed free locations were averaged to evaluate the effect glyphosate and the tank-mixes had on yield. Although yields were not significantly different (P=0.05, Duncan's New MRT) from the untreated check at both application timings, yield losses of 7.6 – 11.2% were observed as a result of the off label (6-leaf) application of glyphosate alone or tank-mixed.

Yield was collected from all locations. All treatment yields were compared to a single untreated check except the Arkansas location which had two check plots. The statistical differences in yields observed at the individual locations were probably due to weed competition or the off label application of glyphosate. No significant differences (P=0.05, Duncan's New MRT) were detected when the yields were averaged across all locations. Glyphosate + HM9310 at both application timings yielded more cotton than glyphosate alone. Glyphosate + HM9827 yielded slightly less than glyphosate at the 4-leaf timing, but substantially more at the 6-leaf timing.

No adverse effects to Roundup Ready cotton were observed from the application of the tank-mix of glyphosate and HM9310 or HM9827. There was no loss of weed control by glyphosate tank-mixed with HM9310 or HM9827 on most weed species evaluated. Based on this study it appears that glyphosate tank–mixed with HM9310 or HM9827 can be safely applied to Roundup Ready cotton at labeled applications.

COMPARISON OF YIELD DIFFERENCES AND FIBER PROPERTIES BETWEEN ROUNDUP READY VARIETIES AND SIMILAR TYPES. S.T. Kelly and J.W. Barnett, LSU AgCenter, Winnsboro, LA 71295.

ABSTRACT

The major concerns with Roundup Ready cotton varieties are questions of yield performance and fiber quality. While several reports indicate that there is no yield drag associated with Roundup Ready cotton, comparisons are often made between varieties that are not similar. In order to determine if these varieties are equal in performance to similar types, comparisons must be made between the modified variety and it's closest relative possible. Another compounding factor is the limited data available that is consistent across time about yield or fiber quality.
The objectives were to compare yield and fiber quality of "stacked gene" transgenic varieties to similar type cottons containing only the Bt gene for insect resistance.

Experimental design was a randomized complete block with at least three replicates. Plot sizes varied. These were on-farm replicated experiments planted and managed by the producers. Roundup Ready and non-Roundup Ready cottons were planted intermingled and treated with conventional weed control methods. The producer's spindle pickers were used for harvest and each plot weighed.

Yield data was analyzed by ANOV and means separated by LSD at the 5% level of significance. Percent turnout was determined from grab samples taken from the picker basket and ginned on the research station gin. Fiber properties were determined by the LSU AgCenter Fiber Lab using HVI classing methods.

Overall, there were no differences in yield or fiber quality between similar types at any location. At the location in Franklin parish (1999), D&PL 458 B/R yielded less cotton lint than D&PL 33B (943 lb/A vs 1086 lb/A, respectively). The fiber properties of the D&PL varieties evaluated in 2000 were similar. The Deltapine 451 B/RR did have slightly higher micronaire.

In 2000, the two Stoneville varieties yielded equivalent amounts of lint on an irrigated silt loam soil, or a non-irrigated clay soil. The Stoneville 4892 B/RR did have slightly higher strength and micronaire compared to the Stoneville 4691B.

HERBICIDE CONCENTRATIONS ASSOCIATED WITH MISSISSIPPI DELTA OXBOW LAKES. R.M. Zablotowicz [1], M.A. Locke [1], R. Lerch [2], and S.S. Knight [3], USDA-ARS, [1]SWSRU, Stoneville, MS; [2]CSWQRU, Columbia, MO; and [3]NSL, Oxford, MS.

ABSTRACT

The Mississippi Delta Management Systems Evaluation Area (MSEA) Project was established as a watershed-based study to evaluate the effects of agricultural management practices on water quality. Three watersheds (Beasley and Thighman in Sunflower county, and Deep Hollow in Leflore County) that drain into small oxbow lakes were evaluated. In this study, herbicides were monitored from 1996 to 1998 with water samples concentrated by solid phase extraction and analyzed by HPLC with fluorescence detection (fluometuron) and GC-MS detection (atrazine and metolachlor). Herbicide concentrations observed reflected lake characteristics, cropping patterns (herbicide use) and to a certain extent, management practices. In 1996 and 1997, all three watersheds were primarily planted to cotton, and maximum fluometuron concentrations ranged from 5.4 to 12.7 :g L^{-1}, with the highest concentrations of fluometuron observed in Thighman Lake. In 1998, corn replaced much of the cotton acreage in Beasley and Thighman watersheds. As a result of altered herbicide use, maximum concentrations of atrazine detected in lake water were 2.5 and 15.0 :g L^{-1}, in Beasley and Thighman respectively. Likewise, maximum concentrations of metolachlor detected in water samples were 1.8 and 7.2 :g L^{-1} in Beasley and Thighman lakes, respectively. Patterns of herbicide appearance and dissipation from lakes can be explained by differences in watershed hydrology and best management practices used. Understanding the movement of herbicides to adjacent surface water is key to addressing water quality issues, especially in complying with total maximum daily load (TMDL) regulations.

INHIBITION OF OROBANCHE SEED GERMINATION AND RADICLE GROWTH BY AQUEOUS EXTRACT OF OLIVE POMACE IN VITRO. K.M. Hameed and C.L. Foy, Department of Applied Biological Sciences, Jordan University of Science and Technology, Irbid 22110, Jordan and Department of Plant Pathology, Physiology and Weed Science, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061.

ABSTRACT

Activity of olive pomace ('jift') extract against branched broomrape (*Orobanche ramosa* L.) and (*Orobanche crenata* Forssk.) seed germination, and growth of their radicles, was investigated by utilizing two laboratory procedures: a petri-dish sandwich technique (PDST) and a water agar plate diffusion approach.

Results with the PDST showed that olive pomace extract inhibited seed germination and infection of host plant roots, when applied at ratios of 1:5, 1:6, and 1:8, pomace to sand, in contrast to the control (no pomace applied), which showed 14, 2, and 4.5 attachments (tubercles) per plant for tomato, pea, and broadbean, respectively.

Also, using the agar plate approach, the pomace extract inhibited germination and the growth of the radicles of the germinated seeds at a distance of 1 cm (zone A) around the center well where the extract was applied, after 72 h of incubation. Percent germination of the control (water only in the well), and in zones B and C, for all plates was about 60% in the case of *O. ramosa* and about 40% for *O. crenata*. However, it was only 17% and 10% for each of these seeds in zone A, respectively. The radicles of germinated seeds in zone A stopped growing and turned brown.

These results support previous reports on the potential utilization of olive pomace as a bio-herbicide against *Orobanche* under field conditions.

EVALUATION OF DITHIOPYR FORMULATIONS FOR PREEMERGENCE CONTROL OF CRABGRASS. R.S. Wright, G.E. Coats, J.M. Taylor, and J.C. Arnold. Mississippi State University, Mississippi State, MS.

ABSTRACT

Two experiments were initiated on February 24, 2000 to evaluate dithiopyr formulations for preemergence control of southern crabgrass. In the first experiment, 0.18 to 0.25 lb ai/A dithiopyr on two experimental fertilizer granule carriers (0.164 G) were compared to a commercially available 40 WP formulation and 3.0 lb ai/A oxadiazon (2 G). Additional 44-0-0 urea nitrogen was applied as needed to provide equivalent rates of nitrogen for each plot. The composition of the two experimental dithiopyr formulations was confidential and they were designated FG XF-1 and FG XF-2. The XF-1 formulation at either rate controlled southern crabgrass equivalent to the WP dithiopyr formulation or oxadiazon from 91 through 217 days after treatment (DAT). Control with these treatments ranged from 83 to 90% throughout this period. Either rate of the XF-2 formulation did not provide adequate control at any evaluation date. The XF-2 dithiopyr formulation at 0.18 lb/A did not control southern crabgrass more than 23% at any rating date while the 0.25 lb/A rate controlled southern crabgrass 68% at 91 DAT and 25% or less at later rating dates. By 217 DAT, bermudagrass density averaged less in the XF-2 plots and the untreated compared to the other treatments. Bermudagrass density was 65% or less with the XF-2 treatments compared to 90% with the other treatments. In the second experiment, two liquid dithiopyr formulations which were designated PE-1 and PE-2 were compared to dithiopyr commercially available 1 EC or 40 WP formulations and a 0.164 G dithiopyr on fertilizer formulation. All dithiopyr formulations were applied at 0.25 or 0.38 lb/A and were compared to 3.0 lb/A oxadiazon. All treatments provided acceptable southern crabgrass control through 217 DAT (85% or greater). Bermudagrass density ratings were generally equivalent during the same rating dates.

COMPARISON OF SAMPLE PRESERVATION METHODS FOR EPA METHOD 525. A.S. Sciumbato, K.H. Carson and S.A. Senseman, Texas Agricultural Experiment Station, College Station, Texas 77843 and T.C. Mueller, Department of Plant and Soil Sciences, University of Tennessee, Knoxville, TN 37901.

ABSTRACT

EPA method 525 is commonly used to analyze for organic compounds in water. This method recommends acidifying the water samples to pH less than 2 to preserve organic compounds in solution. The precipitation of organic particulates in this acidic environment may cause difficulties in herbicide extraction, ultimately leading to reduced recovery of target compounds. This study was done to determine the stability of the herbicides atrazine, cyanazine, simazine, alachlor and metolachlor under storage conditions of 4C and to determine how treating the water samples with acid or sodium hypochlorite affects herbicide recovery.

The addition of acid had no effect on the recovery of alachlor or metolachlor, although the recoveries of atrazine, simazine and cyanazine were reduced. Similarly, the addition of sodium hypochlorite did not affect alachlor or metolachlor recoveries, but decreased the recovery of atrazine, simazine and cyanazine. This suggests that

acidifying water samples may be detrimental when analyzing for triazine herbicides. Moreover, the addition of sodium hypochlorite does not enhance sample stability.

AUTOMATED CLASSIFICATION OF COGONGRASS (*IMPERATA CYLINDRICA*) USING HYPERSPECTRAL REFLECTANCE DATA. D.B. Mask [1], J.D. Byrd, Jr. [1], J.W. Barnett, Jr. [1], L.M. Bruce [2], and Y. Huang[2]. Departments of [1] Plant & Soil Sciences and [2]Electrical & Computer Engineering. Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

An experiment was established to determine the accuracy of hyperspectral reflectance data in classifying cogongrass (*Imperata cylindrica*) from other grasses, such as bermudagrass (*Cynodon dactylon*), vaseygrass (*Paspalum urvillei*), centipedegrass (*Eremochloa ophiuroides*), and bahiagrass (*Paspalum notatum*). Hyperspectral reflectance data were collected monthly from October, 1999 until August, 2000 using an Field Spec Pro FR portable spectroradiometer (Analytical Spectral Device) at sixteen locations, ranging from south Mississippi to central Mississippi. Spectral data was collected at 4 to 5 randomly selected areas within each location with ten to twenty subsamples in each area. The resulting hyperspectral reflectance curves consist of 2151 bands ranging from 350 nm to 2500 nm. For this study, the first 1000 bands were utilized. A fully automated detection system was designed and evaluated to determine its performance for the use of detecting cogongrass. The automated system utilizes classic statistical feature reduction and classifiers. This system is unique for one-dimensional discrete wavelet transform (DWT) for feature extraction from hyperspectral reflectance curves. The root-mean-square energy of the wavelet coefficients at each decomposition level is calculated and used as a feature. These features are linearly combined using Fisher's discriminant method, and the classification of test data is completed using a minimum Euclidean distance with the class means. Since the data samples of this study were limited, a leave-one-out test was conducted to evaluate the performance of the system.

The experimental results indicate that the discrimination performance does vary with the change in the year, but is very promising for any of the months that were collected. The results for comparing cogongrass to other grass species, using the Haar mother wavelet, for October showed that both species could be detected 100% of the time. Using the same testing procedure as above and for the rest of the months, the month of February was 95.9% for cogongrass, and it 100% accurate in detecting all other species. Results for April where somewhat lower than the previous months, with cogongrass being detected 83.1% of the time and all the other species 75% of the time. As for the results for July, all species were correctly identified 100% of the time. In comparing these results to principal component analysis, the overall results for October were 48.2%, February 86.2%, April 68.8%, and for July 93.1%. The experimental results show a promising discriminant ability of the wavelet-based automated detection system. All classifications accuracies are over 80%, with some 100% accurate. This is encouraging considering the difficult discriminant situation where cogongrass is being detected from a mixture of several different grass species with somewhat of a similar appearance.

AUTOMATED CLASSIFICATION OF KUDZU (*Puerariau montana*) USING HYPERSPECTRAL REFLECTANCE DATA. J.W. Barnett, Jr. [1], J.D. Byrd, Jr. [1] , L.M. Bruce [2], A.W. Ezell [3], J. Li [2], D.B. Mask [1], and B.F. Montgomery [3]. Departments of [1]Plant and Soil Sciences, [2] Electrical and Computer Engineering, and [3] Forestry. Mississippi State University, Mississippi State, MS. 39762

ABSTRACT

Experiments were conducted in 2000 at three locations, to evaluate hyperspectral reflectance data as a remote sensing tool to distinguish kudzu (*Pueraria montana*) from other weed species including tropical soda apple (*Solanum viarum*), dogfennel (*Eupatorium capillifolium*), horseweed (*Conyza canadensis*), and sicklepod (*Senna obtusifolia*). Spectral data were taken with a Field Spec Pro FR ASD (analytical spectral device) equipped with and 8-degree foreoptic. Data was collected at 3 to 4 different areas within each location with 10-20 sub-samples in each area. Each location was sampled monthly from June through September. A fully automated detection system was designed and evaluated to determine the feasibility of kudzu detection. The automated detection system used the Haar wavelet analysis of weed reflectance curves. Fischer's discriminant analysis is used to reduce the feature vector to an optimized feature scalar. The leave-one-out test based on the nearest mean classifier is used to evaluate the classification performance of the system. The confidence interval is computed to show the reliability of classification accuracy. Results from individual species classification separated kudzu with 100% accuracy, tropical soda apple with 93.3% accuracy, dogfennel with 66.7% accuracy, horseweed with 57.1% accuracy, and sickelpod with 100% accuracy. The overall accuracy for these 5 weeds was 90.2% ± 4.4%. When kudzu was separated from all other species combined, analysis indicated 100% accuracy. Kudzu was also compared to each species individually. Results indicated 100% accuracy for separating kudzu from each weed species, except horseweed. For the 2-class system, a perfect classification accuracy of 100% was obtained which indicated that the system can perfectly detect kudzu from these other weeds.

BIOLOGY OF CUTLEAF EVENINGPRIMROSE. S.B. Clewis, S.D. Askew, and J.W. Wilcut, North Carolina State University, Raleigh, NC 27695-7620.

ABSTRACT

The successful elimination of vegetation prior to planting cotton (*Gossypium hirsutum*) in reduced-tillage production is critical for adequate stand establishment, eliminating early-season weed interference, and maintaining yields. Unfortunately the reduction in fall and winter tillage allows for the establishment of cool-season species, including cutleaf eveningprimrose (*Oenothera laciniata*). In March and April, the presence of diverse cool-season annual weed complexes make it hard to identify some species. Cutleaf eveningprimrose is becoming a hard-to-kill winter annual and is one of the most prevalent spring weeds on the Coastal Plain of North Carolina. Of the broadleaf weeds commonly found at burndown, cutleaf eveningprimrose and horseweed (*Conyza canadensis*) are the most troublesome. These weeds are usually spread across entire fields and can be difficult to control, particularly on silt or sandy loam soils. Cultural and chemical control practices targeted at weed management depend on knowledge of the basic growth characteristics and life cycle of the weed in question. To date there is no research data concerning cutleaf eveningprimrose growth and development.

Experiments were conducted at the Upper Coastal Plain Research Station (Location 1) and the Fountain Research Farm (Location 2), Rocky Mount, NC. A completely randomized design was employed with fifty cutleaf eveningprimrose seedlings selected at the 4-leaf growth stage and monitored from October to early April prior to planting. Dependent variables included leaf number, whole-plant diameter, leaf area, and above-ground dry biomass per plant and were determined bi-monthly. Statistical analysis was performed on data collected from the four harvested plants (4 reps) at each timing. Data were subjected to ANOVA with sums of squares partitioned to evaluate linear and nonlinear effects of time. Location was considered random and time effects were tested by the appropriate interaction with the random variable. Regression analysis was used to describe the growth trends over time.

Cutleaf eveningprimrose leaf number increased exponentially over time. Lack of location effect ($P>0.05$) indicates that cutleaf eveningprimrose leaf number is not environmentally dependent. Cutleaf eveningprimrose diameter increased exponentially over time, but variation existed between locations. Location 1 is adjacent to a swine farm and had a higher fertility rate. This location is sprayed by lagoon effluent and thus future work will investigate cutleaf eveningprimrose growth under different soil nitrogen fertility regimes. Cutleaf eveningprimrose leaf area increased exponentially over time. Although leaf number per plant was not environment dependent, the rate of leaf expansion was much greater in the location of higher fertility and may explain trends in whole-plant diameter. Cutleaf eveningprimrose above-ground dry biomass also exhibited an exponential trend similar to leaf area. Trends indicate that most of the above-ground biomass can be attributed to leaf material. This is not uncommon for rosette-forming plants, like cutleaf eveningprimose, in the vegetative stage. Cutleaf eveningprimrose growth exhibited an exponential trend from October to early April. The normal sigmoidal growth trend likely did not occur because field preparation halted growth during the linear phase and prevented an asymptotic response. The growth rate is slow between October and mid-February and the rapid linear phase of growth occurs after this period. Thus reduced-tillage fields planted late are more likely to be problematic with large cutleaf eveningprimrose plants. Leaf area, whole-plant diameter, and above-ground dry biomass did exhibit environmental dependency, but leaf number was not effected by location effects.

DIGITAL IMAGING FROM AGRICULTURAL AIRCRAFT - RESOLUTION AND WEED CLASSIFICATION ISSUES USING ENVI 3.2. S.J. Thomson and C.T. Bryson, USDA-ARS, Application and Production Technology Research Unit, Southern Weed Science Research Unit, Stoneville, MS 38776.

ABSTRACT

Several classification techniques available in the ENVI 3.2 image analysis software were compared to classify images obtained from a Sony digital video camera, mounted in a spray plane. Preliminary attempts were made to classify weeds, crop, and soil. An Air Tractor AT-402 spray plane was configured with a remotely controlled digital video camera (Sony DCR TRV-103) and a special adapter to accommodate narrow-band optical filters. An on-board GPS (Lowrance Airmap 100) sent NMEA GPS data to the audio track of videotape via Red Hen Systems VMS 200 video mapping hardware. In the lab, images of interest were captured using a Sony DV capture card and notebook computer. The VMS software illustrated GPS data associated with each image, by which altitudes could also be obtained. Remotely sensed images were imported to ENVI 3.2 for analysis.

Comparisons between classification methods were made on several fields, along with a comparison of four methods on early cotton. The green band of a non-filtered image was analyzed. The two supervised classification methods used (Parallelepiped and Mahalanobis Distance) successfully separated Johnsongrass, hyssop spurge, and cotton in an image taken early in the season. The Mahalanobis Distance method with properly programmed parameters detected more hyssop spurge, consistent with field scouting. In cases where Johnsongrass was highly visible, bidirectional effects accounted for most of the system's ability to distinguish between Johnsongrass and crop. This was due to the higher reflectance of Johnsongrass in its orientation with respect to sun and observation angle. Simple

thresholding, supervised, and unsupervised (Isodata) methods all worked well in these cases. The Isodata method was unable to distinguish between weeds and crop when bidirectional effects were not pronounced, as did simple thresholding in many cases. Shading around the edges of some images was apparent, so the effective area suitable for analysis should be considered carefully when using this type of image acquisition method.

The digital video system worked well for this preliminary study, although image resolution could be improved to discriminate between smaller weed patches early in the season. An alternative might be to fly at lower altitudes for greater resolution. We found, however, that separation of classes suffered when flying low, as areas approached greater homogeneity. This is probably because the camera averages light intensity from the entire scene to set the aperture. Using the digital video camera, classification yielded better results for the unfiltered images (green band) than pre-filtered NIR (near-infrared) images. When using ENVI, simple thresholding seemed to be appropriate for analyzing gray-scale NIR images. A Duncan MS3100 3-channel high-resolution camera (1392 X 1040) has been purchased in a CIR (color-infrared) configuration for possible use in the spray plane. This camera splits the light beam internally using a prism so three filtered channels of information (green, red, NIR) can be obtained simultaneously. Additional research is needed to determine suitability of this system for weed discrimination, and if information from multiple bands will enhance discrimination ability.

WEED CONTROL SYSTEMS WITH TOUCHDOWN® 5 IN GLYPHOSATE TOLERANT SOYBEANS.
J.N. Lunsford *, C.V. Greeson, J.D. Smith, and J. Mink. Zeneca Ag Products, Enterprise, AL, Pikeville, NC, Jackson, TN, and Leland, MS.

ABSTRACT

Touchdown® 5 herbicide, sulfosate (glyphosate-trimesium), was evaluated in glyphosate tolerant soybeans as postemergence spray applied alone, following preemergence herbicides, and tank-mixed with other broadleaf herbicides. The trials were conducted during the 1998 and 1999 growing seasons. Canopy®, Canopy® XL, Squadron®, Prowl® 3.3 EC, Scepter®, FirstRate*, Broadstrike* and Dual Magnum™ were used preemergence at recommended rates for the soil type. Postemergence broadleaf tank-mix treatments included Flexstar®, Reflex®, FirstRate*, and Classic® applied at rates lower than the recommended rates of the products applied alone. Common cocklebur (XANST), bristly starbur (ACHNI), Florida beggarweed (DEDTO), or redroot pigweed (AMARE) were very susceptible to postemergence applications of Touchdown® 5 alone at .75 or 1.0 lb ai/A. Control of those species was not improved when Touchdown® 5 was applied postemergence following the preemergence treatments. However, control of pitted morningglory (IPOLA), ivyleaf morningglory (IPOHE), sicklepod (CASOB), hemp sesbania (SEBEX), Florida pusley (RCHSC), tall water hemp (AMATU), velvetleaf (ABUTH), prickly sida (SIDSP), and yellow nutsedge (CYPES) was improved when Touchdown® 5 was applied postemergence over the preemergence herbicide. Preemergence herbicides, Canopy® and Canopy® XL tank-mixtures provided the highest levels of overall weed control.. Sequential applications of Touchdown® 5 at .75 or 1.0 lb ai/A provided weed control similar to that observed with preemergence herbicides followed by Touchdown 5 (except for hemp sesbania). Sicklepod, cocklebur, Florida pusley, large crabgrass (DIGSA), and barnyardgrass (ECHCG) control was not improved when Touchdown® 5 at .75 and 1.0 lb ai/A was tank-mixed with Flexstar®, Reflex®, FirstRate*, or Classic®. Common lambsquarters and velvetleaf control was increased when Touchdown® 5 was tank-mixed with FirstRate*. Smallflower morningglory (IAQTA), ivyleaf morningglory, pitted morningglory, common lambsquarters, prickly sida and common ragweed (AMBEL) control was increased when Touchdown® 5 was tank-mixed with Flexstar® or Reflex®. Flexstar® was more active than Reflex® at a lower rate.

TIMING OF GLYPHOSATE APPLICATION ON IRRIGATED AND DRYLAND ROUNDUP READY® COTTON.
M.R. Woods, C.D. Monks, D.P. Delaney, C. Norris, C. Burmester, and G.R. Wehtje, Auburn University, and Alabama Agricultural Experiment Station.

ABSTRACT

Field experiments were conducted at the Tennessee Valley Research and Education center located at Belle Mina, AL, in 1999 and 2000. These experiments were conducted to evaluate the effects of Roundup Ultra® (glyphosate) applications and irrigation on crop response, maturity, yield, and lint quality. Delta and Pine Land® 458 BG/RR® seed was planted in a completely randomized experimental design with a 2x4 factorial arrangement of treatments, with irrigation/dryland and glyphosate application/timing as factors. Each plot individually irrigated or not irrigated. Application timing treatments included 4-leaf, pre-bloom, combination 4-leaf and pre-bloom, and an untreated control. Glyphosate was applied at a rate of 1 qt/a of Roundup Ultra. Visual ratings, height measurements, plant mapping, and boll counts were conducted. Lint quality was determined from 30 consecutive plants collected from the two center rows of an 8-row plot.

There was no visual crop injury recorded from any treatment compared to the untreated control. Herbicide treatments had no effect on boll counts or seed cotton yield in irrigated or non-irrigated plots. It was found that irrigation had the most influence on boll counts, seed cotton yield, and lint quality. Irrigated cotton averaged 17 percent open compared to 65 percent open in the non-irrigated plots both years. Non-irrigated plots yielded 1655

Lbs/acre seed cotton compared to 3464 Lbs/acre in irrigated plots. Irrigation also had an influence on micronaire, length, and strength fiber qualities.

CLASSIFICATION OF RED RICE BASED ON SSLP MARKERS. L.K Vaughan [1], B.V. Ottis [2]*, A.M. Prazak [1], C.A. Conaway-Bormans [1], C.H. Sneller [3], J.M. Chandler [2], W.D. Park [1]. [1]Department of Biochemistry and Biophysics, Texas A&M University, College Station, TX 77843-2128. [2]Department of Soil and Crop Sciences, Texas A&M University, College Station, TX 77843-2474. [3]Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72703.

ABSTRACT

Traditionally, red rice infesting commercial rice in the United States has been classified as *Oryza sativa* and is often considered to belong to the *indica* subspecies. A collection of red rice from different locations in the southern United States was examined with a set of Simple Sequence Length Polymorphism (SSLP) markers in an effort to test this assumption. The 18 SSLP markers used are distributed across all 12 chromosomes and can be used to distinguish between sibling cultivars. The results clearly demonstrate that the traditional classification of red rice is inadequate. Some red rice is closely related to cultivated rice, *Oryza sativa* ssp. *indica*. However, other red rice is more closely related to *Oryza sativa* ssp. *japonica*. Most importantly, some red rice samples collected from Arkansas, Louisiana, Mississippi and Texas are very closely related to the noxious weed, *Oryza rufipogon* accession IRGC 105491. Previous DNA analysis suggests that this particular accession of *Oryza rufipogon* is more distantly related to *Oryza sativa* than most other *Oryza rufipogon* accessions.

The SSLP data were also used to investigate the diversity of red rice in the southern United States. Molecular analysis revealed that different classes of red rice are intermingled across the southern United States rice belt. Red rice samples that belong to the same DNA maker class can be found in different locations. Within individual production fields, *Oryza sativa* ssp. *indica*-like rid rice and *Oryza rufipogon*-like red rice can be found within a single 9-m^2 collection site. The classification of red rice as *Oryza sativa* ssp. *indica*, *Oryza sativa* ssp. *japonica* or *Oryza rufipogon* using DNA markers is generally in agreement with classification based on simple morphological traits. However, readily observed morphological traits alone are not sufficient to reliably classify red rice. Since red rice is much more diverse than previously assumed, this diversity must be considered when developing red rice management strategies.

FLUTHIAMID PLUS METRIBUZIN AND CHLORSULFURON PLUS METSULFURON CONTROL ITALIAN RYEGRASS (*Lolium multiflorum*). W.A. Bailey, H.P. Wilson, and T.E. Hines. Virginia Polytechnic Institute and State University, Eastern Shore Research and Extension Center, Painter, VA 23420.

ABSTRACT

Italian ryegrass (*Lolium multiflorum* L.) is a common and troublesome species in winter wheat (*Triticum aestivum* L.) that threatens profitable wheat production in the South. Diclofop-methyl has been the standard herbicide for Italian ryegrass control since its introduction in the early 1980's. However, the repeated use of this herbicide has selected Italian ryegrass biotypes that show various levels of tolerance to diclofop as well as other herbicides with similar modes of action. Therefore, herbicides with modes of action unlike that of diclofop are necessary in order to prevent economic losses in wheat due to competition from Italian ryegrass.

Field experiments were conducted in 2000 and continue in 2001 to evaluate wheat response and Italian ryegrass control from fluthiamid plus metribuzin (Axiom®) and chlorsulfuron plus metsulfuron (Finesse®). In fluthiamid plus metribuzin experiments, a factorial treatment arrangement was used with fluthiamid plus metribuzin applied at 470 or 560 g ai/ha preemergence (PRE) or at the one-leaf stage of wheat emergence (SPIKE). Diclofop at 840 g ai/ha was included as a commercial comparison in both application timings. In chlorsulfuron plus metsulfuron experiments, these herbicides were applied at 26 g ai/ha alone and in combination with fluthiamid plus metribuzin (190 g/ha) PRE, or at 21 g/ha alone or in combination with fluthiamid plus metribuzin (190 g/ha) to 2-leaf Italian ryegrass. Diclofop at 840 g/ha was included as a commercial comparison.

Fluthiamid plus metribuzin controlled Italian ryegrass 84 to 89% 2 mo after treatment in 2000 regardless of the rate or application timing used. However, wheat injury from fluthiamid plus metribuzin ranged from 27 to 37% with both rates PRE and at 470 g/ha SPIKE and increased to 63% at 560 g/ha SPIKE. Wheat injury from fluthiamid plus metribuzin at any rate or application was substantially higher than that from diclofop PRE or SPIKE. Substantial wheat injury from fluthiamid plus metribuzin PRE or SPIKE resulted in significant decreases in wheat yield (18 to 30%) when compared to diclofop PRE and did not improve yield compared to the nontreated control. Abnormally dry conditions at the time of and following PRE applications resulted in decreased levels of wheat injury and Italian ryegrass control in 2001 compared to 2000. Italian ryegrass control from fluthiamid plus metribuzin PRE was comparable to diclofop PRE and was higher with SPIKE applications. Chlorsulfuron plus metsulfuron alone and in combination with fluthiamid plus metribuzin controlled Italian ryegrass 64 to 75% 2 mo after PRE applications and generally increased to 82 to 90% with 2-leaf applications in 2000. However, wheat injury ranged from 15 to 16% with PRE applications and 36 to 40% with 2-leaf applications. Wheat treated with chlorsulfuron plus metsulfuron

alone produced yields that were comparable to those from diclofop and higher than the nontreated control. However, treatments that contained fluthiamid plus metribuzin did not significantly improve wheat yield above those of the nontreated control. In 2001, chlorsulfuron plus metsulfuron alone and in combination with fluthiamid plus metribuzin resulted in decreased wheat injury and Italian ryegrass control when compared to 2000 due to dry conditions that occurred at and following PRE applications. Alone and in combination with fluthiamid plus metribuzin, chlorsulfuron plus metsulfuron treatments controlled Italian ryegrass an average of 32% when applied PRE and 80% when applied to 2-leaf Italian ryegrass. Both fluthiamid plus metribuzin and chlorsulfuron plus metsulfuron alone and in combination were generally effective in controlling Italian ryegrass. However, lack of timely rainfall following herbicide applications in wheat may limit the utility of PRE applications making early postemergence applications more effective.

SYMPOSIUM

PINE PLANTATION COMMUNITIES: HOW DO WE BEGIN TO MANAGE FOR PLANT DIVERSITY?

J.H. Miller, USDA Forest Service, Southern Research Station, Auburn University, AL

ABSTRACT

Conservation of biological diversity is becoming a flagship issue on public and private forests worldwide while productivity increases are demanded. As concern for diversity maintenance escalates, increasing pressure is being placed on the forestry community to understand the effects of intensifying silvicultural treatments on biodiversity and its sustainable management. Intensity of management must increase to supply commodities demanded by the growing world population. Biodiversity conservation in intensively managed forested regions will depend (at least partially) on species growing in tree plantations, their margins, streamside management zones, and right-of-ways. Within the Southeast, pine plantation acreage is projected to double by 2040, mainly replacing natural pine forests. Replacement and/or establishment of plantations occur through intensive harvesting, using herbicides and mechanical treatments, burning, planting closely-spaced genetically-improved seedlings, and often fertilizing. The singular or additive effects of all these treatments are often assumed to limit plant species richness and diversity, yet little has been documented to support or refute these assumptions. More in-depth research is required by forest vegetation management scientists and other researchers from allied disciplines. To learn more about diversity changes following herbicide treatments for site preparation and release, I have led two teams in conducting both a region-wide research project at 13 locations in 7 states, and a study series in Central Georgia on 7 locations in 3 provinces. The following generalizations come from the findings of these studies as well as from other's related research.

- The Southeast is biologically rich with over 3,000 species of forest-associated plants.
- The richness and diversity of plants associated with pine plantations varies considerably across the region and its numerous physiographic provinces.
- A common flora does exist of species that range across the region, about 500 species.
- Non-native invasive plants are increasingly impacting this floristic diversity, about 120 species.
- Southeastern forests are naturally very resilient because the plant species have evolved through 20 million years of drastic climate-change and more recent episodes of frequent burning, clearing for row crops, old-field succession, and several timber harvests.
- In the Southeast, pine plantations mostly occur within a rich landscape matrix of other land uses.
- Most of the flora is composed of perennials that are capable of residing as underground parts, while both perennials and annuals persist in a rich soil seed bank replenished by continuous seed rain, which fosters resiliency.
- Plant species richness and diversity rebound rapidly after treatments with forestry herbicides, mechanical treatments and burning, with short and long-term compositional shifts according to the selectivity in species control by treatments.
- Total species richness and diversity are only temporarily reduced after most herbicide treatments.
- In the long term (10+ years) only perennial woody and semi-woody plants appear to be influenced by herbicide treatments, not total species richness.
- The density of the pine and/or hardwood canopy eventually dictates the abundance and spatial pattern of understory plants and their development.
- Little is known about how plantation flora compares with that of less managed forests.

INTRODUCTION

The conservation of biological diversity has gained global recognition as one of the top concerns for sustainable forest management. As concerns for diversity maintenance continue to escalate, more pressure will be placed on forest industry and public forestry to develop a greater understanding of the effects of silvicultural treatments on biodiversity and its sustainable management. In the Southeast, pine plantations are increasingly being reestablished on prior plantations or through replacement of existing natural forest communities. Replacement occurs through: harvesting of most trees; treatments using herbicides and mechanical means to suppress regrowing vegetation and improve rooting environment; planting closely-spaced genetically-improved seedlings; and often using fertilization to stimulate tree growth. The singular or additive effects of all these treatments have been assumed to limit plant species richness and diversity.

Pine plantation acreage in the southeast is projected to almost double by 2040, mostly through conversion of natural pine stands (1). At present, herbicide and fertilizer treatments are each applied in the region to over one million acres annually, mostly to aid pine plantation establishment. Because of this rapid move toward plantations, it is imperative that we gain a scientific understanding and document the influences of plantation management treatments on diversity and habitat as well as productivity.

The dramatic changes in stand structure that occur by converting a natural forest to a plantation lead many to assume that corresponding changes in composition and abundance of plant species and wildlife uses will also occur. However, in the few research studies in Mississippi that have compared intensive mechanical and herbicide site prep to adjacent pine hardwood forests, very little differences were found in total number of species (although compositional changes were not reported)(9). Thus, many species are conserved, although questions on composition and structural changes still remain.

MANAGING PLANT DIVERSITY

Resiliency of Southeastern Forests

Southeastern forest communities are naturally very resilient and represent fairly new assemblages, because most have underwent frequent burning for 10,000+ years, natural reforestation after clearing and replacement with row crops and pastures over a 200 year period, several timber harvests of increasing intensity, and most recently the cessation of regular burning. The more recent harvests were often followed by intensive mechanical land clearing and tree planting. Because of this history, these communities are considered fire sub-climax and are composed of very robust species. Most of the flora is comprised of perennial plants (9, 12), which can subsist as underground plant parts, or in the soil seed bank following burning or blow-down disturbance. Although poorly studied and understood, the continuous replenishment of soil seed banks is critical for sustained resiliency (11). This natural resiliency also limits the efficacy of competition suppression treatments. The spatial and temporal patterns of operational forestry herbicide treatments also encourage plant reinvasions from surrounding untreated or non-forested lands, margins, and right-of-ways. If future management concentrates tree plantations in confined areas then the lack of landscape diversity may lead to other outcomes.

Southeastern Forests are Rich and Diverse

The richness and diversity of plants associated with pine plantations varies considerably across the southeastern forest region and its numerous physiographic provinces. Distinct forest communities inhabit each physiographic province and vary within each province according to topographic and landform variation. However, a common flora does exist of species that range throughout the region, especially in the provinces where pine plantations are predominantly grown (14). Special plant species, often rare or endangered, do occur in each sub-region and state, especially in unique habitats (e.g., bogs, marshes, bays, estuarine margins, glades, etc.). There is a pressing need to understand the micro- and macro-effects of plantation establishment on biodiversity in all the situations where they occur.

Plantation Management Impacts on Richness and Diversity

The influence of plantation establishment on floristic diversity has only been studied in a few situations and in general not well reported. To learn more about diversity changes following herbicide treatments for site preparation and release, I have led two teams in conducting both a region-wide research project at 13 locations in 7 states and a study series in Central Georgia on 7 locations (3, 12, 13). The following generalizations come from these studies as well as from the research of others. Because herbicides treatments are often used in conjunction with other silvicultural treatments they are also briefly discussed.

<u>Forest communities regrow after all intensities of herbicide treatments</u>, either operational or lengthy-intensive experimental treatments (2, 4, 5, 9, 12, 17, 19, 20, 21,22). Perennials plants temporarily reside underground as rootstocks, thickened lateral roots (runners), rhizomes, bulbs, and corms, while both perennial and annual plants can persist in a rich soil seed bank. The vigor of sprouting and root sprouting of woody plants is influenced by the season of herbicide application as well as the season of cutting and burning (7). Spring burns and cuttings result in the least vigor, and each herbicide has an optimum timing window for maximum efficacy. Wind, surface waters, and activities of birds and mammals are continuously moving and depositing seeds into the soil seed bank (11). Seed germination can occur immediately after release, over the first growing season, or over a 10-to-50-year period (10). The soil seed bank extends to a depth of 6 or more inches with the majority of seeds at about 1 to 3 inches. Many notable seed bank species in the Southeast are ragweed (*Ambrosia artemisiifolia*), blackberries (Rubus sp.), pokeweed (*Phytolacca Americana*), fireweed (*Erechtites hieracifolia*), horseweed (*Conyza canadensis*), beautyberry (*Callicarpa americana*), and many asters (Aster sp.)(12). The rate of regrowth of vegetative cover is influenced by application rate, site productivity, herbicide resistant species and their regeneration strategies (19).

<u>Mechanical treatments have the most direct influence on the underground plant parts</u>. These treatments can displace many plants when windrowing or destroy them through exposure by disking. However, even the most intensive, rootrake-pile treatments leave many underground parts in place, and often only mix the surface soil seed bank (5).

<u>Most forest herbicides by design are either short-lived at toxic levels in the soil (from one to six months), or have no residual soil activity (15)</u>. Once inside plants, herbicides can continue to assert control activities over an extended period, often over several years at sub-lethal levels, causing growth suppression or partial damage. These damaged plants can recover and regrow, and often become a sizable component of associated woody plants in pine plantations (3, 13). Plants not harmed by treatment may also regrow faster if available resources (moisture, nutrients, and light) increase after the treatment. Plants that are damaged will recover or decline depending upon competitive position and advantage, and stressors such as drought.

Herbicide selectivity alters the long-term composition of perennial plants (3, 8, 13). The composition of the plant community associated with pine plantations will be altered by the specific selectivity of the herbicide(s) used and the efficacy of treatment. For example, Arsenal™ generally enhances the occurrence of legumes and blackberries (Rubus sp.), while Tordon™ and Garlon™ reduce legumes and blackberry. Accord™ controls huckleberries (Vaccinium spp.), while Velpar™ releases these commonly occurring shrubs. These changes in composition can greatly influence wildlife habitat value.

Plant succession continues within pine plantations. In general, after any type of disturbance, forbs dominate first-year revegetation and usually start to decline after the first or second year, with perennial grasses becoming their replacements in the ground-layer (9, 12, 19). Vines and blackberry species continue to increase in abundance, with blackberry peaking from ages 10 to 15 years. The growth of hardwoods and pines eventually suppress shrub abundance during the same timeframe (22).

There were no differences in overstory or understory plant species richness and diversity, 10 to 11 years after treatments with the commonly used site preparation and release herbicides in Central Georgia (3, 13). The proportion of pines to hardwoods was increased and selected woody species were less abundant or absent where herbicides were initially effective in control.

Pine canopy development eventually regulates successional trends in plantations (13, 22). The development in density of pine and/or hardwood canopy eventually dictates the density and spatial pattern of understory plants and their development. Very dense pine canopies can in certain micro-sites essentially eliminate understory plants. The spatial patterns of understory richness, layer development, and overall abundance are dictated by topographic, micro-site, and stand variability. Our research with different forestry herbicides has found that at the time of plantation canopy closure, wide variations in pine-hardwood proportions did not influence the understory composition as would be assumed (3, 13). However, woody plant diversity has been shown by others to be different after a wider range of site preparation treatments, from chainsaw felling to rootraking-herbicides-fertilization (8).

Fertilization influences on understory vegetation have been little studied**.** Fertilization increases the amount and speed of vegetation regrowth not reduced or eliminated by concomitant herbicide treatments (17). Rapid canopy closure after fertilization, even with thinning, results in reduced understory vegetation (18). Toxic effects of some fertilizers have been reported to retard understory vegetative regrowth (18). Fertilization can result in increased ground-layer abundance, but there is little documented information on species changes (17).

Burning shifts the composition of the plant community due to the top killing of woody plants and the stimulation of other herbaceous plants to germinate and to grow faster, due to available post-burn mineralized nutrients. Top killed woody plants also can create structure to accommodate woody vine development. The absence of follow-up prescribed burning in developing stands permits maximum development of residual and invading vines and woody plants. Season of burning influences the size of woody plants killed and their resprouting vigor (7) as well as plant seed germination (6).

Diversity Decreased by Invasions of Non-native Plants

Non-native and native invasive plants are decreasing floristic diversity increasingly in the region and especially in pine plantations (16). Initially, invasive non-native plants add to richness by their entry, but then restrict richness and diversity due to their exclusive invasive habits. Herbicide applications with establishment of pine plantations are in many instances our most effective means of combating exotic invasive plants. Exotic plant spread is probably the greatest foreseeable threat to native plant diversity in the Southeast besides human development.

RECOGNIZED WAYS TO MAINTAIN DIVERSITY

There is emerging some recognized principles for maintaining or enhancing diversity that can be applied to plantation management, which are:

- Survey for diversity and include diversity management in plans
- Treat stands differently using a range of treatments.
- Treat adjoining stands differently through time.
- Identify and specifically manage special areas of high diversity or those that are habitat for threatened, rare, or endangered species.
- Leave and protect ample streamside management zones, buffers, and stand margins.
- Manage within-forest right-of-ways (ROW's) for diversity and habitat features.
- Do not plant exotics and contain or eliminate exotics within the forest.
- Regularly patrol ROW's, landings, and streamsides for exotic plants and control when present.
- In vegetation management treatments, target only competitors and leave noncompetitive plants.
- Plant trees using wide spacing.
- Leave standing and down wood to encourage the biotic webs of organisms that inhabit coarse woody debris.

SUMMARY

Pine plantations will play an increasing role in biodiversity conservation within the landscape matrix of natural and conservation forests, right-of-ways, and urban-suburban community forests. Yet little is known about the conserving capabilities of pine plantations as they interplay with other land uses, as well as the benefits of coexisting plants to the long-term health and sustainability of forestlands. It is known that plants associated with pine plantations influence nutrient increment and conservation, wildlife diversity and productivity, wildfire intensity, and the pine productivity of a stand. More short- and long-term, detailed research is needed on species changes following herbicide, mechanical, burning, and fertilization treatments for pine plantation management. Developments in plant diversity management are essential in order to protect species richness for future generations with their unknown needs, to sustain and improve soil health and productivity, and to contribute to the maintenance of life-critical processes.

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WILDLIFE HABITAT ENHANCEMENT IMPROVES FINANACIAL POTENTIAL OF NON-INDUSTRIAL FOREST LAND. T.R. Clason, Louisiana State University Agricultural Center, Hill Farm Research Station, Homer, LA 71040.

ABSTRACT

In moderately stocked mixed pine-hardwood forests, intermediate harvests and understory vegetation manipulation can sustain adequate timber growth, generate periodic timber income, and create an additional marketing resource. Intermediate harvesting did not increase timber growth, but removing periodic growth provided a short-term cash flow and enhanced the wildlife habitat. Altering stand understory improved habitat quality and created an additional short-term cash flow. Thus, vegetation management practices afford landowners an opportunity to improve the financial potential of their forest land investment.

INTRODUCTION

The economic potential of non-industrial forest land in Louisiana is virtually untapped. Timber management is a cost-effective financial option on most non-industrial land because it can sustain timber production continuity and create an environment conducive for hunting, recreation, or grazing. Since there are no general prescriptions for developing a highly productive forest resource, each tract must be treated as a unique entity based on biological conditions and landowner investment goals.

Many landowners perceive timber management as a cost prohibitive option. Low stumpage prices and a belief that short-term investment goals conflict with long-term management requirements spurred this misconception. Although stumpage prices have increased dramatically in recent years, it is a commitment to management that will sustain the investment potential of a forest resource. Periodic timber removal without adequate management guidelines affects ecological development by altering vegetative composition in favor of less desirable species causing a value reduction in goods and services. Therefore, vegetation management practices can be used to achieve investment goals by maintaining forests at an economic stage of ecological development.

METHODS

A study to evaluate the potential of using timber management practices to improve investment potential of small-tracts of non-industrial forest land was conducted in northwest Louisiana. The research area was a 30-year-old, 240-acre mixed pine-hardwood forest having a mean site index at age 50 of 84 feet. Nine, 20-acre treatment plots were established by identifying boundary lines and inventorying the existing timber. Inventory data were used to separate the nine plots into blocks of three plots. Subsequently, three management option treatments, which differed by investment goals and management intensity, were assigned randomly to one plot in each block. Management treatments included: 1) No Thin, allow initial timber value to accrue with no management intervention; 2) Thin, provide periodic revenue from intermediate harvests; and 3) Thin & Release, provide periodic revenue from intermediate harvests and hunting lease income. Intermediate harvests were completed on the Thin and Thin & Release treatments at ages 30 and 38. Wildlife habitat enhancement was initiated in at age 32 with a hardwood suppression treatment, and was continued with prescribed burns at ages 35, 38, 41, and 44.

Treatment plot growth and development was evaluated from age 30 to age 45. Tree growth data were collected from 20, 0.1-acre measurement plots per treatment plot at age 30 prior to treatment application, and at ages 38 and 45. Cost and revenue data were maintained to determine the cost efficiency of each treatment. The financial evaluation for each treatment was based on the following assumptions: 1) mean investment assets at age 30 totaled $543.87 for timber only, no land value was included; 2) 15-year investment period encompassing January 1984 through December 1998; 3) cost values during the investment period were obtained from actual or published data; 4) product stumpage values for ages 30, 38, and 45 were pulpwood $19, $23, and $27 per cord; chip-n-saw $44, $35, and $86 per cord; and sawtimber $178, $ 213, and $ 375 per 1000 board feet; 5) annual hunting lease averaged $5.00 per acre and the lessee assumed liability insurance costs; 6) all costs and revenues were discounted annually at 8 percent; and 7) financial evaluations were based on before tax dollars.

TREATMENT GROWTH AND DEVELOPMENT

No Thin Treatment: Age 30 stand stocking, tree diameter, tree height, and stand volume averaged 147 trees per acre, 8.9 inches, 65 feet, and 17.4 cords per acre. Between ages 30 and 38, tree mortality reduced stand stocking by 9 trees per acre, while stand volume growth averaged 8.6 cords per acre (Fig. 1 & 2). Periodic stand mortality and growth from age 38 to 45 averaged 9 trees and 2.4 cords per acre (Fig. 1 & 2). Total mean stand volume growth was 11.0 cords per acre. Final harvest volume was 28.4 cords per acre with distribution among wood product classes averaging 9.6 cords for pulpwood, 1.5 cords for chip-n-saw, and 4,360 board feet of sawtimber (Table 1).

Thin Treatment: Age 30 stand stocking, tree diameter, tree height, and stand volume averaged 143 trees per acre, 9.1 inches, 65 feet, and 17.2 cords per acre. The first intermediate harvest reduced stand stocking and volume by 83 trees and 7.6 cords per acre (Fig. 1 & 2). No tree mortality occurred between ages 30 and 38, and stand volume growth averaged 7.9 cords per acre. Following the second intermediate harvest, stand stocking and volume averaged 30 trees per acre and 10.5 cords per acre (Fig.1 & 2). From age 38 to 45, there was no mortality and stand growth averaged 1.8 cords per acre (Fig. 1 & 2). Total stand volume growth was 9.7 cords per acre. Intermediate and final harvest volumes were 14.6 and 12.3 cords per acre with distribution among wood product classes averaging 7.1 cords for pulpwood, 4.2 cords of chip-n-saw, and 4,000 board feet of sawtimber (Table 1).

Thin & Release Treatment: Age 30 stand stocking, tree diameter, tree height, and stand volume averaged 141 trees per acre, 9.1 inches, 65 feet, and 16.9 cords per acre. The first intermediate harvest reduced stand stocking and volume by 81 trees and 7.4 cords per acre (Fig. 1 & 2). No tree mortality occurred between ages 30 and 38, and stand volume growth averaged 8.9 cords per acre. Following the second intermediate harvest, stand stocking and volume averaged 30 trees per acre and 11.1 cords per acre (Fig. 1 & 2). From age 38 to 45, there was no mortality and stand growth averaged 2.1 cords per acre (Fig. 1 & 2). Total stand volume growth was 11.0 cords per acre. Intermediate and final harvest volumes were 14.7 and 13.2 cords per acre with distribution among wood product classes averaging 7.1 cords for pulpwood, 4.0 cords of chip-n-saw, and 4,200 board feet of sawtimber (Table 1).

Wildlife habitat enhancement on the Thin & Release option was designed to increase accessibility, improve visibility, and enrich understory plant diversity in the stand. The first intermediate harvest limited equipment movement to designated skid trails placed at 50-foot intervals in a parallel manner within the stand, and all overstory hardwood, except mast producing species, were removed. At age 32, a hardwood suppression treatment was applied with ground mobile equipment traveling along the existing skid trails. Triclopyr ester at 2 lbs. ai/acre was applied to suppress the growth of hardwood sprouts, and pine and hardwood seedlings, while minimizing damage to the residual mast trees. The understory vegetation cover was maintained by initiating a triennial burning schedule at age 35, which continued through age 44.

During the 15-year investment period, intermediate harvests were used to remove periodic volume growth, provide short-term revenue, and enhance stand market potential. The age 30 harvest removed 7.6 and 7.4 cords per acre from Thin and Thin & Release treatments. Volume distribution among product classes was similar for each option, pulpwood and chip-n-saw accounted for 45% and 55% of the volume (Table 1). Harvest yields at age 38 were 7.0 and 7.3 cords per acre for the respective treatments options. Treatment pulpwood volume was similar at 2.4 cords per acre, while sawtimber volume was 1,280 and 1,365 board feet per acre for the Thin and Thin & Release treatments (Table 1). Total stand volume production, which is the sum of final and intermediate harvest volumes, for No Thin, Thin, and Thin & Release treatments was 28.4, 26.9, and 27.9 cords per acre (Table 1). Although final harvest sawtimber volume differed among treatments, sawtimber production during the investment period for the respective options was 4,360, 4,000, and 4,200 board feet per acre.

TREATMENT INVESTMENT POTENTIAL

Cost and revenue items for each investment option are presented in Table 2 by year incurred and value. Actual management costs for the No Thin, Thin, and Thin & Release treatments were 15.27, 46.73, and 131.72 dollars per acre (Table 2). Wildlife habitat enhancement accounted for 65 percent of the Thin & Release option management costs. Actual costs were discounted annually at 8 percent and combined with initial stand value to derive the respective investment treatment costs, which were 537.81, 582.69 and 636.56 dollars per acre (Fig. 3).

Actual total revenue from the No Thin treatment exceeded the Thin and Thin & Release by 382.70 and 255.75 dollars per acre (Table 2). However, the discounted revenues for the respective treatments were 631.49, 754.84, and 810.50 dollars per acre (Fig. 3). Hunting lease revenues from the Thin & Release treatment provided 5 percent of the discounted revenues and surpassed the discounted habitat enhancement costs by 30 percent.

Net present values at age 45, discounted revenues less discounted costs, show that the investment potential for all treatments exceeded a discount interest rate of 8 percent (Fig. 3). Although the Thin & Release treatment accrued the highest management costs, its net present value exceeded by 68.48 and 1.76 dollars per acre. The internal rate of return, which is the interest rate where the difference between discounted revenues and costs equal zero, for the investment period was 9.2, 9.8, and 9.8 for the No Thin, Thin, and Thin & Release treatments.

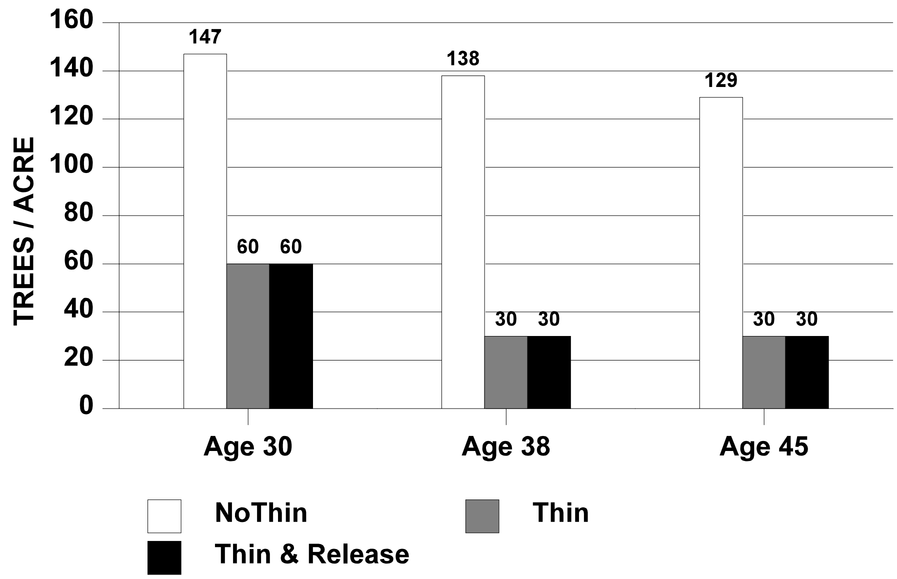

Figure 1. Residual stand stocking by treatment at ages 30, 38 and 45.

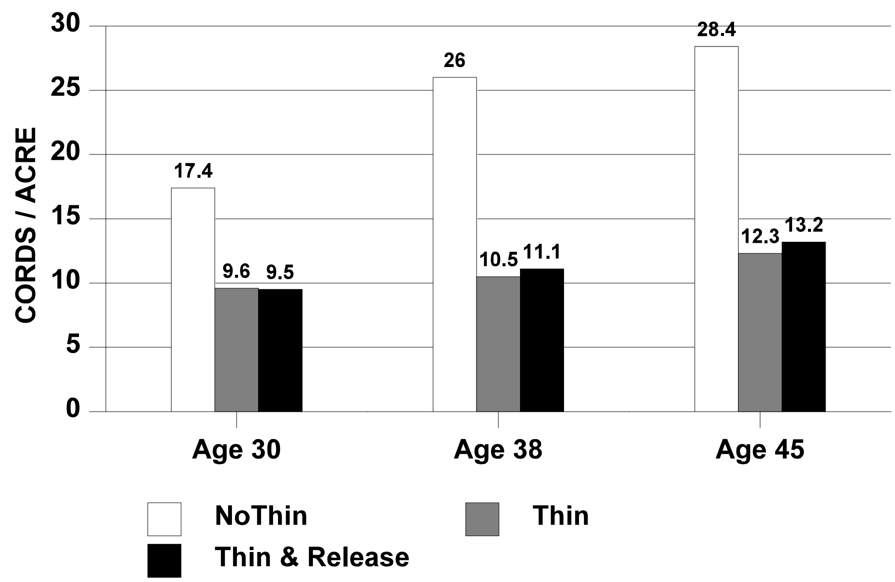

Figure 2. Residual stand volume by treatment at ages 30, 38 and 45

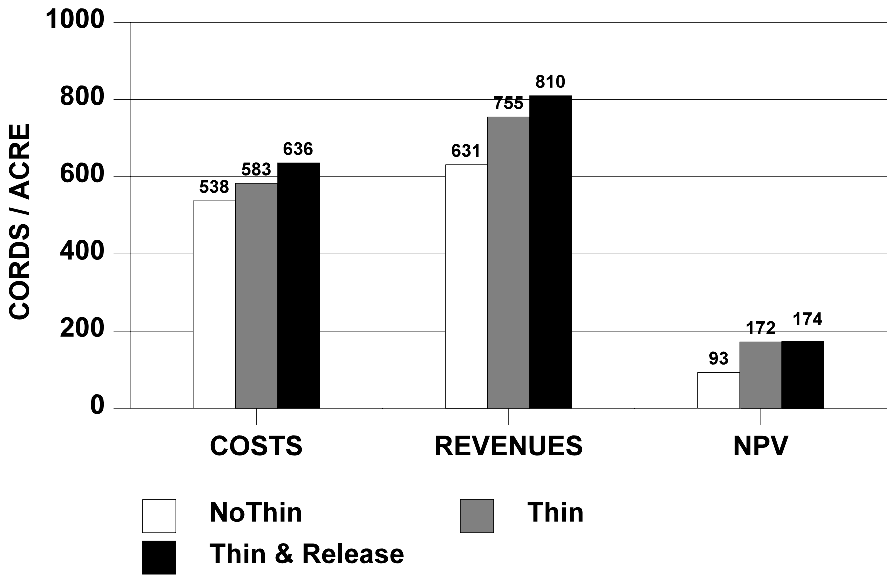

Figure 3. Fifteen year financial investment comparison by treatment for costs, revenues, and net present value.

Table 1. Stand harvest volume and product distribution by management option

		Product Volumes		
Treatments	Total Volume	Pulpwood	Chip-N-Saw	Sawtimber
	----------------------cords/acre----------------------			board feet/acre
	---------------------------Age 30 Harvest---------------------------			
Thin	7.6	3.4	4.2	-----
Thin & Release	7.4	3.4	4.0	-----
	---------------------------Age 38 Harvest---------------------------			
Thin	7.0	2.4	-----	1,280
Thin & Release	7.3	2.4	-----	1,360
	----------------------------Final Harvest----------------------------			
No Thin	28.4	9.6	1.5	4,360
Thin	12.3	1.7	-----	2,720
Thin & Release	13.2	1.7	-----	2,840

Table 2. Actual treatment costs and revenues in dollars per acre

Management Item	Age	No Thin	Thin	Thin & Release
		----------------------------Costs------------------------------		
Stand Value	30	533.00	553.42	545.20
Harvest Costs				
First Thinning	30	-----	16.21	16.21
Second Thinning	38	-----	15.25	15.25
Final Harvest	45	15.27	15.27	15.27
Habitat Management				
Stand Release	32	-----	-----	58.16
Prescribed Fire	35	-----	-----	4.20
Prescribed Fire	38	-----	-----	5.00
Prescribed Fire	41	-----	-----	7.63
Prescribed Fire	44	-----	-----	10.00
		-----------------------------Revenues---------------------------		
Final Harvest	45	2,003.19	1,044.14,	1,088.18
Intermediate Harvests				
First Thinning	30	-----	248.62	239.76
Second Thinning	38	-----	327.73	344.50
Hunting Lease	31 - 45	-----	-----	75.00

INTEGRATING FOREST MANAGEMENT AND WILDLIFE: VIEWS FROM THE STAND AND THE LANDSCAPE. K.V. Miller, Warnell School of Forest Resources, The University of Georgia, Athens, GA 30602.

ABSTRACT

The production of timber and wildlife resources requires an understanding of forestry-wildlife relationships, wildlife habitat needs, and economic tradeoffs. Habitat conditions, and the abundance of wildlife species, depend on natural site characteristics and on the manipulation of individual stands. Pine forests in various stages of succession can provide important habitat for many wildlife species. Rates of successionary change are most rapid in the earliest stages of stand development and therefore wildlife use of early successional habitats changes rapidly. Across the South, the general pattern of succession is superficially similar, although vegetative differences resulting from environmental factors such as soil type can have important impacts on the wildlife species present. The suitability of pine plantations as wildlife habitat depends on how the plantations are managed at the stand level as well as how they are incorporated in a landscape context. Management efforts that promote diverse plant communities as well as attempts to maximize the diversity in the structure, age , and types of stands typically will optimize habitat values for a number of wildlife species. However, habitat conditions for all wildlife species cannot be created in intensively managed pine systems. For example, habitat conditions favorable to several avian species characteristic of mature hardwood forests cannot occur in areas of pine culture.

Silvicultural practices that can influence the development and quality of wildlife habitat include: within-stand treatments (planting density, site-prep technique, burning, and thinnings), clearcut size and shape, retention of streamside management zones and/or other corridors, and age-class distribution of stands.

Within stand manipulations likely have the greatest impact in habitat conditions for a number of wildlife species. Type of site-preparation, timing of cutting, and planting densities can have significant impacts on the plant community that redevelops following clearcutting. If applied appropriately, woody or herbaceous release treatments provide opportunities to enhance habitat conditions, whereas indiscriminate broadcast treatments provide little. Intermediate treatments such as prescribed burning, thinnings, and fertilization likewise can affect the plant communities associated with the pine stand. Annual or biennial burning of stands is recommended for bobwhite

quail management, whereas burning on a 3-5 year cycle is recommended to maximize conditions for deer. Fertilization can result in short-tern increases in plant biomass and nutritive quality. However, these benefits may be short lived since fertilization can result in more complete canopy closure and shading of understory plants.

Generally, smaller clearcuts are utilized more heavily by wildlife than larger cuts. Smaller size and irregular shaped cuts result in a greater amount of edge beneficial to many species of wildlife. However, recent studies have suggested that while many species benefit from increased edge, others may be negatively impacted. Increasing clearcut size may enhance habitat conditions for these species.

Streamside management zones (SMZs) and other corridors can be very important for maintaining habitat diversity in pine-dominated ecosystems. Residual hardwoods can provide both hard and soft mast used by a variety of wildlife species. Avian diversity and richness generally is greater in SMZs than in adjoining pine plantations. SMZs also provide cover for white-tailed deer and nesting/roosting habitat for wild turkey. Snags and cavity producing hardwoods provide critical nesting/denning habitat for a number of species of birds and mammals. Generally. SMZs should be wide enough so that sunlight penetrating from the sides does not result in dense undergrowth.

Age class distribution should not result in adjoining stands that are similar in age. However, stands should be close enough in age to allow colonization from the adjoining stand. Allowing a minimum of a 5 - 7 year difference between adjoining stands can maximize between-stand diversity. Incorporating stands of various successionary stages across a landscape can maximize the diversity of wildlife species in an area, but may limit habitat conditions for species requiring large tracts of a single habitat type. Recent trends toward increased intensity of forest management have resulted in new challenges to the wildlife biologist, but also may provide some new opportunities. The wildlife habitat manager's goal, which must be pursued with an acute awareness of economic reality, is to arrange stands to maintain diversity in structure, age, and timber types, whiled concurrently investigating within-stand techniques that minimize negative effects of selected silvicultural techniques.

COMPARATIVE EFFECTS OF DIFFERENT HARDWOOD CONTROL METHODS FOR RESTORATION OF FIRE-SUPPRESSED LONGLEAF PINE SANDHILLS. D.R. Gordon [1], L. Provencher [2], A.R. Litt [2], G.W. Tanner [3], and L.A. Brennan [4]. The Nature Conservancy, University of Florida, Gainesville, FL 32611 USA[1], The Nature Conservancy, PO Box 875, Niceville, FL 32588-0875 USA[2], University of Florida, Gainesville, FL 32611 USA[3], Tall Timbers Research Station, Tallahassee, FL 32312 USA[4].

ABSTRACT

Longleaf pine (*Pinus palustris*) communities evolved under a frequent fire regime. When fire is suppressed, hardwoods and other less fire tolerant species proliferate, changing both the plant community and the habitat it provides for wildlife. Managers across the southeast are now working to restore the original structure of these systems for pine production, fuel reduction, and wildlife habitat or conservation reasons. As a result, we examined the relative effectiveness of three hardwood removal techniques (fire, herbicide, and mechanical) for restoration of understory and habitat components in fire-suppressed pine sandhill communities from 1994 and 1999. We measured vegetation, and wildlife variables in restoration treatment and reference sites to evaluate unintended as well as intended effects of the management methods. Similarity of variables in restored plots to those in high quality reference sites was evaluated using similarity indices. We found that all management approaches increased the similarity of structure and composition to the reference sites, but that fire was an integral part of the restoration process. Herbicide and mechanical treatments improve structure most rapidly, and those species (e.g., birds) that respond to structure responded well to all treatments. Species that also required shifts in vegetation and vegetation quality responded directly to fire rather than to the other treatments. Overall, we found that fire, applied alone or following the other management methods increased plant species richness, herbaceous vegetation density, arthropod population growth, reptile and amphibian abundance, longleaf pine dependent breeding bird detection rates, and longleaf pine seedling establishment and survival. Herbicide (ULW hexazinone) alone reduced plant species richness and densities of common understory species as well as that of the hardwoods. We recommend that herbicide or mechanical treatments be planned only if prescribed fire is the intended follow-up management where management goals include habitat improvement for other plant and animal species.

CAN BOBWHITE QUAIL AND PRODUCTION AGRICULTURE COEXIST? P.T. Bromley, Department of Zoology, North Carolina State University, Raleigh, NC 27695-7646, W.E. Palmer, Tall Timbers Research, Inc. Rt. 1, Box 678, Tallahassee, FL 32312

ABSTRACT

We conducted whole farm scale experiments in eastern North Carolina and the piedmont of Virginia to better understand the reasons for the decline of quail on farmland and to test ways to increase quail populations on farms. Exposure of quail chicks to commonly used insecticides was found to have no detectable effect on their behavior or survival. Our experiments, combined with a review of the literature on wildlife toxicology, indicated that modern pesticides, properly applied, are not likely to directly suppress quail populations. However, indirect effects of

modern farming systems through reduction of suitable nesting and brood rearing habitat may limit quail populations on farms. A survey of the farm landscape in Wilson County, NC indicated that less than 3% of farms provided adequate nesting and brood rearing cover in the early growing season. Therefore, we tested if filter strips or field border systems on all fields in 300 – 500 acre farms might be sufficient to increase quail production. We learned that farm units with field borders held and produced more quail than similar farms without field borders. Farm units with field borders also over-wintered greater densities of short-term migrant birds. A second test was made on the effects of conservation tillage on the nutritional carrying capacity for quail chicks. We learned that fields with double-cropped soybeans drilled into wheat stubble provided suitable foraging habitat for chicks, while conventionally established soybeans, corn and cotton provided insufficient forage resources. We concluded that conservation tillage could offset some of the negative impacts of modern agriculture on bobwhite quail brood habitat. With conservation payments and possibly hunting lease payments, field border systems could be economically feasible. Economic assessment of field borders indicated that crop yields were significantly lower at field edges. There has not been a whole system test of these ideas, however, and much remains to be learned before we can be certain that bobwhite quail populations and production agriculture are compatible. Some of the priority land management questions yet to be resolved include the role predation plays in determining quail populations in agroecosystms, the extent and distribution of shrub vegetation necessary for quail during winter, and the appropriate management of woodlands adjacent to fields. Of equal or perhaps greater significance to ecological challenges to increasing quail is a sociological issue. Farm landowners and managers associated with our research saw early successional vegetative cover at field edges as unprofessional and as an outright detriment to the integrity of the farm property. If wildlife agencies and quail enthusiasts are to reverse the decline in this game bird, answers to ecological questions will have to be matched with effective educational programs that will change landowner attitudes.

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

Source: Merrell Hill, Bulletin Room, Alabama Cooperative Extension System, #6 Duncan Hall, Auburn University, Auburn, AL 36849
[1]IPM Information Sheets, 110 Extension 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 ($23.00)
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[1]	
2001IPM-2	Commercial Vegetable IPM
2001IPM-8	Peach IPM
2001IPM-11	Apple IPM
2001IPM-22	Weed Control in Commercial Turfgrass
2001IPM-27	Pecan IPM
2001IPM-28	Forage Crops IPM
2001IPM-223	Noncropland IPM
2001IPM-360	Peanut IPM
2001IPM-413	Soybean IPM
2001IPM-415	Cotton IPM
2001IPM-428	Corn IPM
2001IPM-429	Grain Sorghum IPM
2001IPM-453	Christmas Tree IPM
2001IPM-458	Small Grain IPM
2001IPM-478	Small Fruit IPM
2001IPM-590	Chemical Weed Control for Home Lawns
2001IPM-978	Alfalfa IPM

State: **ARKANSAS**

Prepared by: John Boyd

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 Tredaway

Internet URL: http://hammock.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] Extension Turfgrass Specialist, 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
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-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

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	2001 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
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)

State: **GEORGIA**

Prepared by: Tim R. Murphy

Internet URL: http://www.ces.uga.edu/ and www.gaweed.com

Order from: Publications Office, 108 Hoke Smith Building, Cooperative Extension Service, The University of Georgia, Athens, GA 30602 (Contact Elinor Ruark, 706/542-2157).
[1] Ag. Business Office, Room 203, Conner Hall, The University of Georgia, Athens, GA 30602
Make check payable to: Georgia Cooperative Extension Service

Number	Title
LEAFLETS	
263	Renovation of Home Lawns
400	Musk Thistle and It's Control
425	Florida Betony Control in Turfgrass and Ornamentals
CIRCULARS	
713	Commercial Blueberry Culture
796	Roadside Vegetation Management
823	Controlling Moss and Algae in Turf
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	2001 Georgia Peach Spray and Production Guide
Pub. 377	2001 Georgia Tobacco Growers Guide
Pub. 380	2001 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)

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)

State: **LOUISIANA**

Prepared by: Reed Lensce

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] Dr. Al Rankins, Plant & Soil Sciences, Box 9555, Mississippi State, MS 39762-9555

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	2001 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]	MSHerb ($110.00)

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: Alan C. York, Fred Yelverton, and David Monks

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

Number	Title
PUBLICATIONS	
AG-37[1]	Agricultural Chemicals for North Carolina Apples
AG-146[1]	Peach and Nectarine Spray Schedule
AG-187	Tobacco Information - 2001
AG-208	Identifying Seedling and Mature Weeds in Southeastern United States ($7.00)
AG-331	2001 Peanut Information
AG-348	Turfgrass Pest Management Manual ($7.00)
AG-408	Pest Control for Professional Turfgrass Managers 2001
AG-417	2001 Cotton Information
AG-427[1]	Weed Control Suggestions for Christmas Trees, Woody Ornamentals and Flowers
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	
HIL8101[1]	Weed Control in Vegetable Gardens
HIL205B[1]	Weed Control Options for Strawberries on Plastic
HIL325[1]	Peach Orchard Weed Management
HIL380	Orchard Floor Management in Pecans
HIL643[1]	Weed Control for Bulbs in the Landscape

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: Ed Murdock

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
-----[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

2001

Broadleaf Crops Subsection

(Cotton, Peanut, Soybean, Tobacco, and Forestry)

Theodore M. Webster
Chairperson

Information in this report is provided by the following individuals:

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Florida	Joyce A. Treadway	Mary Duryea
Georgia	A. Stanley Culpepper	Eric P. Prostko
Kentucky	J. D. Green	J. R. Martin
Louisiana	Eric Webster	
Mississippi	John Byrd	
Missouri	Andy Kendig	Bill Johnson
North Carolina	Alan York	
Oklahoma	Don Murray	
South Carolina	Ed Murdock	
Tennessee	G. Neil Rhodes, Jr.	
Virginia	Scott Hagood	

Table 1. The Southern States 10 Most Common and Troublesome Weeds in Cotton.

	States		
Ranking	Alabama	Florida	Georgia
Ten Most Common Weeds			
1	Crabgrass spp.	Crabgrass spp.	Texas panicum
2	Morningglory spp.	Common cocklebur	Pigweed spp.
3	Prickly sida	Pigweed spp.	Sicklepod
4	Sicklepod	Florida beggarweed	Morningglory spp.
5	Pigweed spp.	Sicklepod	Nutsedge spp.
6	Nutsedge spp.	Florida pusley	Florida beggarweed
7	Common cocklebur	Goosegrass	Florida pusley
8	Spurge spp.	Morningglory spp.	Crabgrass spp.
9	Goosegrass	Nutsedge spp.	Common cocklebur
10	Bristly starbur	Redweed	Bristly starbur
Ten Most Troublesome Weeds			
1	Bermudagrass	Sicklepod	Nutsedge spp.
2	Morningglory spp.	Nutsedge spp.	Pigweed spp.
3	Nutsedge spp.	Morningglory spp.	Morningglory spp.
4	Sicklepod	Florida beggarweed	Texas panicum
5	Coffee senna	Wild poinsettia	Sicklepod
6	Tropic croton	Texas pancium	Wild poinsettia
7	Velvetleaf	Florida pusley	Bermudagrass
8	Spurge spp.	Pigweed spp.	Florida pusley
9	Common cocklebur	Bermudagrass	Dayflower spp.
10	Smartweed spp.	Smartweed spp.	Tropic croton

Table 1. The Southern States 10 Most Common and Troublesome Weeds in Cotton (continued).

	States		
Ranking	Louisiana	Missouri	Mississippi
Ten Most Common Weeds			
1	Morningglory spp.	Crabgrass spp.	Pitted morningglory
2	Pigweed spp.	Pigweed spp.	Ivyleaf/entireleaf morningglory
3	Nutsedge spp.	Morningglory spp.	Spotted spurge
4	Johnsongrass	Common cocklebur	Purple nutsedge
5	Redvine	Goosegrass	Bermudagrass
6	Hemp sesbania	Prickly sida	Yellow nutsedge
7	Prickly sida	Velvetleaf	Hemp sesbania
8	Bermudagrass	Spurge spp.	Common cocklebur
9	Pennsylvania smartweed	Johnsongrass	Southern crabgrass
10	Broadleaf signalgrass	Spurred anoda	Prickly sida
Ten Most Troublesome Weeds			
1	Morningglory spp.	Palmer amaranth	Spotted spurge
2	Nutsedge spp.	Morningglory spp.	Hemp sesbania
3	Pigweed spp.	Common cocklebur	Redvine
4	Bermudagrass	Velvetleaf	Pigweed spp.
5	Hemp sesbania	Prickly sida	Bermudagrass
6	Redvine	Johnsongrass	Prickly sida
7	Sicklepod	Spurge spp.	Morningglory spp.
8	Prickly sida	Perennial vines	Trumpetcreeper
9	Pennsylvania smartweed	Bermudagrass	Southern crabgrass
10	Wild okra	Goosegrass	Honeyvine milkweed

Table 1. The Southern States 10 Most Common and Troublesome Weeds in Cotton (continued).

	States		
Ranking	North Carolina	Oklahoma	South Carolina
Ten Most Common Weeds			
1	Large crabgrass	Pigweed spp.	Palmer amaranth
2	Broadleaf signalgrass	Crabgrass spp.	Southern crabgrass
3	Pigweed spp.	Texas panicum	Goosegrass
4	Common lambsquarters	Morningglory spp.	Morningglory spp.
5	Morningglory spp.	Red sprangletop	Sicklepod
6	Sicklepod	Silverleaf nightshade	Common cocklebur
7	Nutsedge spp.	Johnsongrass	Nutsedge spp.
8	Prickly sida	Common cocklebur	Prickly sida
9	Smartweed spp.	Yellow nutsedge	Tropic croton
10	Common cocklebur	Devil's claw	Johnsongrass
Ten Most Troublesome Weeds			
1	Palmer amaranth	Silverleaf nightshade	Palmer amaranth
2	Morningglory spp.	Morningglory spp.	Sicklepod
3	Nutsedge spp.	Pigweed spp.	Morningglory spp.
4	Sicklepod	Yellow nutsedge	Nutsedge spp.
5	Smartweed spp.	Common cocklebur	Velvetleaf
6	Bermudagrass	Devil's claw	Coffee senna
7	Spurred anoda	Field bindweed	Cowpea
8	Velvetleaf	Red sprangletop	Florida pusley
9	Common cocklebur	Johnsongrass	Common cocklebur
10	Tropic croton	Texas panicum	Spotted spurge

Table 1. The Southern States 10 Most Common and Troublesome Weeds in Cotton (continued).

Ranking	State Tennessee
Ten Most Common Weeds	
1	Common cocklebur
2	Morningglory spp.
3	Smooth pigweed
4	Large crabgrass
5	Johnsongrass
6	Prickly sida
7	Spotted spurge
8	Yellow nutsedge
9	Velvetleaf
10	Palmer amaranth
Ten Most Troublesome Weeds	
1	Morningglory spp.
2	Palmer amaranth
3	Smooth pigweed
4	Prickly sida
5	Spotted spurge
6	Common cocklebur
7	Velvetleaf
8	Bermudagrass
9	Yellow nutsedge
10	Trumpetcreeper

Table 2. The Southern States 10 Most Common and Troublesome Weeds in Peanut.

Ranking	States Alabama	Florida	Georgia
Ten Most Common Weeds			
1	Florida beggarweed	Crabgrass spp.	Florida beggarweed
2	Nutsedge spp.	Florida beggarweed	Texas panicum
3	Morningglory spp.	Sicklepod	Sicklepod
4	Sicklepod	Florida pusley	Florida pusley
5	Common cocklebur	Pigweed spp.	Nutsedge spp.
6	Bristly starbur	Morningglory spp.	Morningglory spp.
7	Crabgrass spp.	Nutsedge spp.	Pigweed spp.
8	Ragweed spp.	Texas panicum	Bristly starbur
9	Prickly sida	Bristly starbur	Crabgrass spp.
10	Broadleaf signalgrass	Tropic croton	Tropic croton
Ten Most Troublesome Weeds			
1	Florida beggarweed	Florida beggarweed	Florida beggarweed
2	Nutsedge spp.	Sicklepod	Nutsedge spp.
3	Horsenettle	Nutsedge spp.	Tropic croton
4	Bristly starbur	Bristly starbur	Sicklepod
5	Tropic croton	Morningglory spp.	Texas panicum
6	Ragweed spp.	Dayflower spp.	Bristly starbur
7	Sicklepod	Prickly sida	Morningglory spp.
8	Maypop passionflower	Texas panicum	Wild poinsettia
9	Wild poinsettia	Tropic croton	Citronmelon
10	Prickly sida	Wild poinsettia	Pigweed spp.

Table 2. The Southern States 10 Most Common and Troublesome Weeds in Peanut (continued).

	States		
Ranking	Mississippi	North Carolina	Oklahoma
Ten Most Common Weeds			
1	Broadleaf signalgrass	Large crabgrass	Pigweed spp.
2	Common cocklebur	Goosegrass	Prickly sida
3	Eclipta	Broadleaf signalgrass	Crownbeard
4	Cutleaf groundcherry	Morningglory spp.	Eclipta
5	Horsenettle	Prickly sida	Yellow nutsedge
6	Johnsongrass	Nutsedge spp.	Morningglory spp.
7	Pitted morningglory	Pigweed spp.	Johnsongrass
8	Pigweed spp.	Common ragweed	Crabgrass spp.
9	Prickly sida	Common lambsquarters	Texas panicum
10	Spotted spurge	Common cocklebur	Spurge spp.
Ten Most Troublesome Weeds			
1	Eclipta	Nutsedge spp.	Yellow nutsedge
2	Horsenettle	Eclipta	Eclipta
3	Spotted spurge	Common ragweed	Hophornbeam copperleaf
4	Purple nutsedge	Prickly sida	Horsenettle
5	Prickly sida	Sicklepod	Pigweed spp.
6	Cutleaf groundcherry	Carolina horsenettle	Crownbeard
7	Goosegrass	Florida beggarweed	Spurge spp.
8	Southern crabgrass	Common bermudagrass	Silverleaf nightshade
9	Johnsongrass	Texas panicum	Texas panicum
10	Morningglory spp.	Morningglory spp.	Prickly sida

Table 2. The Southern States 10 Most Common and Troublesome Weeds in Peanut (continued).

Ranking	State South Carolina
Ten Most Common Weeds	
1	Southern crabgrass
2	Sicklepod
3	Nutsedge spp.
4	Palmer amaranth
5	Goosegrass
6	Morningglory spp.
7	Florida beggarweed
8	Common ragweed
9	Broadleaf signalgrass
10	Texas panicum
Ten Most Troublesome Weeds	
1	Sicklepod
2	Florida beggarweed
3	Nutsedge spp.
4	Tropic croton
5	Broadleaf signalgrass
6	Morningglory spp.
7	Palmer amaranth
8	Goosegrass
9	Texas panicum
10	Johnsongrass

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Soybean.

	States		
Ranking	Alabama	Florida	Georgia
Ten Most Common Weeds			
1	Sicklepod	Crabgrass spp.	Sicklepod
2	Morningglory spp.	Florida pusley	Pigweed spp.
3	Pigweed spp.	Sicklepod	Crabgrass spp.
4	Crabgrass spp.	Morningglory spp.	Morningglory spp.
5	Johnsongrass	Crowfootgrass	Texas panicum
6	Prickly sida	Pigweed spp.	Common cocklebur
7	Common cocklebur	Goosegrass	Yellow nutsedge
8	Nutsedge spp.	Nutsedge spp.	Florida beggarweed
9	Ragweed spp.	Texas panicum	Florida pusley
10	Goosegrass	Florida beggarweed	Common ragweed
Ten Most Troublesome Weeds			
1	Sicklepod	Sicklepod	Sicklepod
2	Morningglory spp.	Morningglory spp.	Morningglory spp.
3	Nutsedge spp.	Nutsedge spp.	Pigweed spp.
4	Bermudagrass	Wild poinsettia	Nutsedge spp.
5	Tropic croton	Bermudagrass	Texas panicum
6	Pigweed spp.	Florida beggarweed	Common cocklebur
7	Horsenettle	Bristly starbur	Florida beggarweed
8	Balloonvine	Pigweed spp.	Bristly starbur
9	Florida pusley	Texas panicum	Common bermudagrass
10	Coffee senna	Florida pusley	Coffee senna

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Soybean (continued).

Ranking	States: Kentucky	Louisianna	Mississippi
Ten Most Common Weeds			
1	Prickly sida	Morningglory spp.	Prickly sida
2	Johnsongrass	Pigweed spp.	Pitted morningglory
3	Honeyvine milkweed	Barnyardgrass	Entireleaf morningglory
4	Iveyleaf morningglory	Hemp sesbania	Broadleaf signalgrass
5	Smooth pigweed	Johnsongrass	Nodding/hyssop spurge
6	Pitted morningglory	Prickly sida	Barnyardgrass
7	Crabgrass spp.	Sicklepod	Yellow nutsedge
8	Eastern black nightshade	Red rice	Hemp sesbania
9	Giant foxtail	Broadleaf signalgrass	Johnsongrass
10	Horseweed/marestail	Wild poinsettia	Prostrate spurge
Ten Most Troublesome Weeds			
1	Honeyvine milkweed	Morningglory spp.	Prickly sida
2	Trumpetcreeper	Red rice	Pitted morningglory
3	Common pokeweed	Wild poinsettia	Entireleaf morningglory
4	Burcucumber	Groundcherry spp.	Nodding/hyssop spurge
5	Sicklepod	Spreading dayflower	Yellow nutsedge
6	Horseweed/marestail	Texasweed	Johnsongrass
7	Eastern black nightshade	Jointvetch spp.	Trumpetcreeper
8	Ivyleaf morningglory	Sicklepod	Redvine
9	Giant ragweed	Redvine/Trumpetcreepper	Bermudagrass
10	Johnsongrass	Itchgrass	Horsenettle

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Soybean (continued).

	States		
Ranking	Missouri	North Carolina	Oklahoma
Ten Most Common Weeds			
1	Common waterhemp	Large crabgrass	Pigweed spp.
2	Giant foxtail	Broadleaf signalgrass	Common cocklebur
3	Velvetleaf	Pigweed spp.	Morningglory spp.
4	Morningglory spp.	Morningglory spp.	Crabgrass spp.
5	Common cocklebur	Sicklepod	Johnsongrass
6	Sunflower spp.	Common lambsquarters	Lambsquarters spp.
7	Shattercane	Common ragweed	Velvetleaf
8	Crabgrass spp.	Fall panicum	Prickly sida
9	Smartweed spp.	Common cocklebur	Texas panicum
10	Common ragweed	Johnsongrass	Hemp sesbania
Ten Most Troublesome Weeds			
1	Common waterhemp	Morningglory spp.	Morningglory spp.
2	Velvetleaf	Sicklepod	Pigweed spp.
3	Common cocklebur	Common lambsquarters	Common cocklebur
4	Morningglory spp.	Hemp dogbane	Velvetleaf
5	Sunflower spp.	Common milkweed	Spurge spp.
6	Shattercane	Pigweed spp.	Hemp sesbania
7	Hemp dogbane	Johnsongrass	Prickly sida
8	Common ragweed	Common ragweed	Johsnongrass
9	Palmer amaranth	Eastern black nightshade	Yellow nutsedge
10	Giant foxtail	Broadleaf signalgrass	Texas panicum

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Soybean (continued).

	States		
Ranking	South Carolina	Tennessee	Virginia
Ten Most Common Weeds			
1	Southern crabgrass	Johnsongrass	Morningglory spp.
2	Palmer amaranth	Common cocklebur	Common lambsquarters
3	Sicklepod	Large crabgrass	Pigweed spp.
4	Goosegrass	Smooth pigweed	Common ragweed
5	Morningglory spp.	Morningglory spp.	Crabgrass spp.
6	Common cocklebur	Prickly sida	Common cocklebur
7	Nutsedge spp.	Sicklepod	Jimsonweed
8	Cowpea	Hophornbeam copperleaf	Prickly sida
9	Florida pusley	Palmer amaranth	Fall panicum
10	Broadleaf signalgrass	Broadleaf signalgrass	Johnsongrass
Ten Most Troublesome Weeds			
1	Sicklepod	Sicklepod	Morningglory spp.
2	Morningglory spp.	Morningglory spp.	Common lambsquarters
3	Palmer amaranth	Palmer amaranth	Sicklepod
4	Common Bermudagrass	Prickly sida	Horsenettle
5	Nutsedge spp.	Giant ragweed	Johnsongrass
6	Cowpea	Hophornbeam copperleaf	Eastern black nightshade
7	Florida beggarweed	Common ragweed	Yellow nutsedge
8	Florida pusley	Smooth pigweed	Bermudagrass
9	Broadleaf signalgrass	Johnsongrass	Common cocklebur
10	Smartweed spp.	Trumpetcreeper	Jimsonweed

Table 4. The Southern States 10 Most Common and Troublesome Weeds in Tobacco.

	States		
Ranking	Florida	Kentucky	North Carolina
Ten Most Common Weeds			
1	Crabgrass spp.	Foxtail spp.	Large crabgrass
2	Florida pusley	Smooth pigweed	Goosegrass
3	Nutsedge spp.	Crabgrass spp.	Broadleaf signalgrass
4	Sicklepod	Ivyleaf morningglory	Pigweed spp.
5	Florida beggarweed	Common lambsquarters	Common ragweed
6	Bermudagrass	Yellow nutsedge	Common lambsquarters
7	Morningglory spp.	Johnsongrass	Nutsedge spp.
8	Bristly starbur	Common ragweed	Morningglory spp.
9	Texas panicum	Hairy galinsoga	Sicklepod
10	Pigweed spp.	Horsenettle	Fall panicum
Ten Most Troublesome Weeds			
1	Nutsedge spp.	Honeyvine milkweed	Nutsedge spp.
2	Bermudagrass	Hairy galinsoga	Morningglory spp.
3	Morningglory spp.	Ivyleaf morningglory	Sicklepod
4	Sicklepod	Yellow nutsedge	Carolina horsenettle
5	Florida beggarweed	Johnonsgrass	Common ragweed
6	Dayflower spp.	Horsenettle	Bermudagrass
7	Bristly starbur	Smooth pigweed	Broadleaf signalgrass
8	Florida pusley	Common lambsquarters	Common lambsquarters
9	Hairy indigo	Common ragweed	Fall panicum
10	Wild poinsettia	Jimsonweed	Common cocklebur

Table 4. The Southern States 10 Most Common and Troublesome Weeds in Tobacco (continued).

	States	
Ranking	South Carolina	Tennessee
Ten Most Common Weeds		
1	Southern crabgrass	Large crabgrass
2	Palmer amaranth	Smooth pigweed
3	Broadleaf signalgrass	Morningglory spp.
4	Morningglory spp.	Common ragweed
5	Nutsedge spp.	Common lambsquarters
6	Sicklepod	Common purslane
7	Goosegrass	Carpetweed
8	Common cocklebur	Carolina horsenettle
9	Common ragweed	Yellow nutsedge
10	Pennsylvania smartweed	Hairy galinsoga
Ten Most Troublesome Weeds		
1	Nutsedge spp.	Common ragweed
2	Morningglory spp.	Hairy galinsoga
3	Broadleaf signalgrass	Carolina horsenettle
4	Sicklepod	Yellow nutsedge
5	Common bermudagrass	Morningglory spp.
6	Goosegrass	Johnsongrass
7	Common ragweed	Bermudagrass
8	Common cocklebur	Large crabgrass
9	Palmer amaranth	Groundcherry spp.
10	Pennsylvania smartweed	Common cocklebur

Table 5. The Southern States 10 Most Common and Troublesome Weeds in Forestry.

	States		
Ranking	Alabama	Florida	Mississippi
Ten Most Common Weeds			
1	Dogfennel	Pawpaw-apple	Broomsedge
2	Common ragweed	Dogfennel	Johnsongrass
3	Horseweed	Common persimmon	Horseweed
4	Crabgrass spp.	Pigweed spp.	Blue vervain
5	Broomsedge	Saw palmetto	Dogfennel
6	Blackberry spp.	Sandbur spp.	Giant ragweed
7	Goldenrod spp.	Holly spp.	Sweetgum
8	Johnsongrass	Johnsongrass	Red oak
9	Kudzu	Tickberry spp.	Blackgum
10	Camphorweed	Chinese tallow	Hickory
Ten Most Troublesome Weeds			
1	Kudzu	Oak spp.	Sweetgum
2	Cogongrass	Broomsedge	Red oak
3	Broomsedge	Saw palmetto	Winged elm
4	Gallberry spp.	Dogfennel	Broomsedge
5	Honeysuckle spp.	Bracken fern	Hickory
6	Dogfennel	Blackberry spp.	Blue vervain
7	Greenbriar spp.	Greenbriar spp.	Rubus spp.
8	Goldenrod spp.	Groundelbush	Giant ragweed
9	Camphorweed	Goldenrod spp.	Ironweed
10	Sweetgum	Horseweed	Kudzu

Table 5. The Southern States 10 Most Common and Troublesome Weeds in Forestry (continued).

Ranking	State South Carolina
Ten Most Common Weeds	
1	Panicum spp.
2	Broomsedge
3	Dogfennel
4	Horseweed
5	Goldenrod spp.
6	Honeysuckle spp.
7	Sicklepod
8	Boneset
9	Morningglory spp.
10	Trumpetcreeper
Ten Most Troublesome Weeds	
1	Kudzu
2	Honeysuckle spp.
3	Bermudagrass spp.
4	Johnsongrass
5	Morningglory spp.
6	Broomsedge
7	Sicklepod
8	Lespedeza spp.
9	Trumpetcreeper
10	Tropic croton

Economic Losses Due to Weeds in Southern States

Cotton, Soybean, Peanut, Tobacco, and Forestry

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. 2000 Estimated Losses Due to Weeds in Alabama.			
	Cotton	Soybean	Peanut
Cost of Herbicides			
a. Acres	540	200	191
b. Cost/A	25.00	20.00	35.00
c. Value	13,500	4,000	6,685
Loss in Yield			
a. Acres	27	120	120
b. Cost/A	29.00	25.00	35.00
c. Value	783	3,000	4,200
Loss in Quality			
a. Acres	54	50	50
b. Cost/A	12.00	9.00	7.00
c. Value	648	450	350
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	14,931	7,450	11,235

Acres = no. X 1000; Cost/A = $/A; Value = Acres X Cost/A X 1000.

Contributing Authors:

Cotton: M. G. Patterson
Soybean and Peanut: John Everest

Table 2. 2000 Estimated Losses Due to Weeds in Florida.					
	Cotton	Soybean	Peanut	Tobacco	Forestry
Cost of Herbicides					
a. Acres	92	10	80	5	14,651
b. Cost/A	30.00	15.00	51.00	12.00	130.00
c. Value	2,760	150	4,080	60	190,463
Loss in Yield					
a. Acres	23	2	30	3	23
b. Cost/A	25.00	5.00	40.00	150.00	2
c. Value	575	10	1,200	450	46
Loss in Quality					
a. Acres	15	2	10	2	N/A
b. Cost/A	10.00	5.00	4.00	50.00	N/A
c. Value	150	10	40	100	N/A
Loss in Extra Land Preparation and Cultivation					
a. Acres	40	3	70	5	N/A
b. Cost/A	5.00	5.00	7.00	10.00	N/A
c. Value	200	15	490	50	N/A
Loss in Land Value					
a. Acres	5	2	10	0.5	N/A
b. Cost/A	10.00	5.00	40	50	N/A
c. Value	50	10	400	25	N/A
Loss in Increase Cost of Harvesting					
a. Acres	25	2	20	2	N/A
b. Cost/A	5.00	3.00	7.00	20	N/A
c. Value	125	6	140	40	N/A
Total Losses	3,860	201	6,350	725	190,509

Acres = no. X 1000; Cost/A = $/A; Value = Acres X Cost/A X 1000.

Contributing Author:

Tobacco: E. B. Whitly and J. Tredaway
Cotton, Soybean, and Peanut: B. Brecke and J. Tredaway
Forestry: J. Tredaway

Table 3. 2000 Estimated Losses Due to Weeds in Georgia.			
	Cotton	Soybean	Peanut
Cost of Herbicides			
a. Acres	1,494	180	507
b. Cost/A	34.5	15.00	50.00
c. Value	51,543	2,700	25,350
Loss in Yield			
a. Acres	400	90	289
b. Cost/A	35.00	25.00	50.00
c. Value	14,000	2,250	14,450
Loss in Quality			
a. Acres	40	16	65
b. Cost/A	20.00	3.00	10.00
c. Value	800	48	650
Loss in Extra Land Preparation and Cultivation			
a. Acres	1,195	150	464
b. Cost/A	15.00	3.00	12.00
c. Value	17,925	450	5,568
Loss in Increase Cost of Harvesting			
a. Acres	400	44	145
b. Cost/A	6.00	5.00	10.00
c. Value	2400	220	1450
Total Losses	86,668	5,668	47,468

Acres = no. X 1000; Cost/A = $/A; Value = Acres X Cost/A X 1000.

Contributing Authors:

Cotton: Stanley Culpepper
Soybean and Peanut: Eric Prostko

Table 4. 2000 Estimated Losses Due to Weeds in Kentucky.		
	Soybean	Tobacco
Cost of Herbicides		
a. Acres	1,200	220
b. Cost/A	32.00	20.00
c. Value	38,400	4,400
Loss in Yield		
a. Acres	250	30
b. Cost/A	25.00	35.00
c. Value	6,250	1,050
Loss in Quality		
a. Acres	120	10
b. Cost/A	4.00	45.00
c. Value	480	450
Loss in Extra Land Preparation and Cultivation		
a. Acres	N/A	25
b. Cost/A	N/A	6.00
c. Value	N/A	150
Loss in Increase Cost of Harvesting		
a. Acres	200	2
b. Cost/A	4.00	15.00
c. Value	800	30
Total Losses	45,930	6,080

Acres = no. X 1000; Cost/A = $/A; Value = Acres X Cost/A X 1000.

Contributing Author: J. D. Green

Table 5. 2000 Estimated Losses Due to Weeds in Louisiana			
	Cotton	Soybean	Forestry
Cost of Herbicides			
a. Acres	700	900	3,200
b. Cost/A	45.00	36.00	60.00
c. Value	31,500	32,400	192,000
Loss in Yield			
a. Acres	50	75	800
b. Cost/A	27.00	36.00	1,050.00
c. Value	1,350	2,700	840,000
Loss in Quality			
a. Acres	33	75	N/A
b. Cost/A	14.00	10.00	N/A
c. Value	462	750	N/A
Loss in Extra Land Preparation and Cultivation			
a. Acres	183	100	N/A
b. Cost/A	20.00	12.00	N/A
c. Value	3,660	1,200	N/A
Loss in Increase Cost of Harvesting			
a. Acres	83	100	800
b. Cost/A	3.00	5.00	150.00
c. Value	249	500	120,000
Total Losses	37,221	37,550	960,000

Acres = no. X 1000; Cost/A = $/A; Value = Acres X Cost/A X 1000.

Contributing Author:

Cotton and Soybean: Steve Kelly
Forestry: Don Reed

Table 6. 2000 Estimated Losses Due to Weeds in Missouri.		
	Cotton	Soybean
Cost of Herbicides		
a. Acres	400	5,000
b. Cost/A	26.00	20.00
c. Value	10,400	100,000
Loss in Yield		
a. Acres	40	500
b. Cost/A	35.00	15.00
c. Value	1,400	7,500
Loss in Quality		
a. Acres	20	150
b. Cost/A	15.00	6.00
c. Value	300	900
Loss in Extra Land Preparation and Cultivation		
a. Acres	200	2,500
b. Cost/A	5.00	5.00
c. Value	1,000	12,500
Loss in Increase Cost of Harvesting		
a. Acres	40	500
b. Cost/A	2.50	3.50
c. Value	100	1750
Total Losses	13,200	122,650

Acres = no. X 1000; Cost/A = $/A; Value = Acres X Cost/A X 1000.

Contributing Author: Andy Kendig

Table 7. 2000 Estimated Losses Due to Weeds in Oklahoma.

	Cotton	Soybean	Peanut
Cost of Herbicides			
a. Acres	220	500	85
b. Cost/A	15.00	25.00	35.00
c. Value	3,300	12,500	2,975
Loss in Yield			
a. Acres	15	300	60
b. Cost/A	25.00	25.00	40.00
c. Value	375	7,500	2,400
Loss in Quality			
a. Acres	50	200	50
b. Cost/A	10.00	3.00	5.00
c. Value	500	600	250
Loss in Extra Land Preparation and Cultivation			
a. Acres	220	200	50
b. Cost/A	10.00	10.00	8.00
c. Value	2,200	2,000	400
Loss in Increase Cost of Harvesting			
a. Acres	50	200	50
b. Cost/A	5.00	10.00	7.00
c. Value	250	2,000	350
Total Losses	6,625	25,100	6,375

Acres = no. X 1000; Cost/A = $/A; Value = Acres X Cost/A X 1000.

Contributing Authors:

Cotton: J. C. Banks
Soybean and Peanut: Ron Sholar

Table 8. 2000 Estimated Losses Due to Weeds in South Carolina.

	Cotton	Soybean	Peanut	Tobacco
Cost of Herbicides				
a. Acres	290	470	12	34
b. Cost/A	30.00	22.00	42.00	24.00
c. Value	8,700	10,340	504	816
Loss in Yield				
a. Acres	130	180	6	8
b. Cost/A	25.00	12.00	20.00	100.00
c. Value	3,250	2,160	120	800
Loss in Quality				
a. Acres	58	30	5	8
b. Cost/A	6.00	3.00	5.00	7.00
c. Value	348	90	25	56
Loss in Extra Land Preparation and Cultivation				
a. Acres	250	280	12	34
b. Cost/A	11.00	4.50	5.00	10.00
c. Value	2750	1,260	60	340
Loss in Increase Cost of Harvesting				
a. Acres	30	82	6	8
b. Cost/A	4.00	3.00	7.00	7.00
c. Value	120	246	42	56
Total Losses	15,168	14,096	751	2,068

Acres = no. X 1000; Cost/A = $/A; Value = Acres X Cost/A X 1000.

Contributing Author: Ed Murdock

Table 9. 2000 Estimated Losses Due to Weeds in Tennessee			
	Cotton	Soybean	Tobacco
Cost of Herbicides			
a. Acres	595	1,160	54.2
b. Cost/A	28.00	23.00	20.00
c. Value	16,660	26,680	1,084
Loss in Yield			
a. Acres	75	500	5
b. Cost/A	28.00	20.00	120.00
c. Value	2,100	10,000	600
Loss in Quality			
a. Acres	50	200	4
b. Cost/A	10.00	2.00	8.00
c. Value	500	400	32
Loss in Extra Land Preparation and Cultivation			
a. Acres	400	200	50
b. Cost/A	9.00	8.00	12.00
c. Value	3,600	1,600	600
Loss in Increase Cost of Harvesting			
a. Acres	100	150	4
b. Cost/A	6.00	6.50	18.00
c. Value	600	975	72
Total Losses	23,460	39,655	2,388

Acres = no. X 1000; Cost/A = $/A; Value = Acres X Cost/A X 1000.

Contributing Author:

Cotton, Soybean, and Tobacco: Neil Rhodes

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HERBICIDE NAMES AND MANUFACTURERS

Common or Code name	Trade name	Chemical name	Manufacturer
Acetochlor	Harness Surpass	2-chloro-*N*-(ethoxymethyl)- *N*-(2-ethyl-6-methylphenyl) acetamide	Monsanto Zeneca
Acifluorfen	Blazer	5-[2-chloro-4-(trifluoro- methyl)phenoxy]-2-nitro- benzoic acid	BASF
Acifluorfen + bentazon	Storm	see acifluorfen and bentazon	BASF
Alachlor	Lasso Partner	2-chloro-*N*-(2,6-diethyl- phenyl)-*N*-(methoxymethyl) acetamide	Monsanto Monsanto
Ametryn	Evik	*N*-ethyl-*N**-(1-methylethyl)- 6-(methylthio)-1,3,5-triazine- 2,4-diamine	Novartis
Asulam	Asulox	methyl[(4-aminophenyl) sulfonyl]carbamate	Rhone-Poulenc
Atrazine	AAtrex and others	6-chloro-*N*-ethyl-*N**-(1- methylethyl)-1,3,5-triazine- 2,4-diamine	Novartis
Azafenidin (DPX R6447)	Milestone	2-[2,4-dichloro-5-(2-propynyl- oxy)phenyl]-5,6,7,8-tetrahydro- 1,2,4-triazole[4,3-*a*]pyridin-3(2*H*)-one	DuPont
BAS 625H	Aura		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		Bayer	
Benefin	Balan	*N*-butyl-*N*-ethyl-2,6-dinitro- 4-(trifluoromethyl)benzeneamine	Dow AgroSciences
Bensulfuron (DPX-F5384)	Londax	2-[[[[[(4,6-dimethoxy-2- pyrimidinyl)amino]carbonyl] amino]sulfonyl]methyl]benzoic acid	DuPont
Bentazon	Basagran	3-(1-methylethyl)-(l*H*)-2,1,3- benzothiadiazin-4(3*H*)-one 2,2-dioxide	BASF
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	Rhone-Poulenc Rhone-Poulenc
Carfentrazone (FMC 8246)	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

HERBICIDE NAMES AND MANUFACTURERS

Common or Code name	Trade name	Chemical name	Manufacturer
CGA-362622			Novartis
Chlorimuron (DPX F6025)	Classic	2-[[[[(4-chloro-6-methoxy-2-pyrimidinyl)amino]carbonyl] amino]sulfonyl]benzoic acid	DuPont
Chlorimuron + sulfentrazone	Canopy XL Authority Broadleaf	see chlorimuron and sulfentrazone	DuPont DuPont FMC
Chlorimuron + thifensulfuron	Synchrony	see chlorimuron and thifensulfuron	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 chlorsulfuron and metsulfuron	DuPont
Clethodim (RE-45601)	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 Valent USA
Clomazone	Command	2-[(2-chlorophenyl)methyl]-4,4-dimethyl-3-isoxazolidinone	FMC
Clopyralid	Lontrel Stinger	3,6-dichloro-2-pyridine-carboxylic acid	Dow AgroSciences 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
Cloransulam + 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
Cyhalofop		(R)-2-[4-(4-cyano-2-fluorophenoxy) phenoxy]propanoic acid	Dow AgroSciences
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	Rhone-Poulenc Rhone-Poulenc
DCPA	Dacthal	dimethyl 2,3,5,6-tetra-chloro-1,4-benzenedicarboxylate	Zeneca
Dicamba	Banvel	3,6-dichloro-2-methoxy-benzoic acid	BASF

HERBICIDE NAMES AND MANUFACTURERS

Common or Code name	Trade name	Chemical name	Manufacturer
Dicamba + 2,4-D	Weedmaster	see dicamba + 2,4-D	BASF
Dichlobenil	Casoron	2,6-dichlorobenzonitrile	Uniroyal
Dichlorprop (2,4-DP)	Several	(±)-2-(2,4-dichlorophenoxy) propanoic acid	Rhone-Poulenc
Diclofop	Hoelon	(±)-2-[4-(2,4-dichloro-phenoxy)phenoxy]propanoic acid	AgrEvo
Diclosulam	Strongarm	*N*-(2,6-dichlorophenyl)-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
Diquat	Diquat	6,7-dihydrodipyrido[1,2-": 2',1'-*c*]pyrazinediium ion	Zeneca
Dithiopyr	Dimension	*S*,*S*-dimethyl 2-(difluoro-methyl)-4-(2-methylpropyl)-6-(trifluoromethyl)-3,5-pyridine-dicarbothioate	Rohm & Haas
Diuron	Karmex, Direx	*N*'-(3,4-dichlorophenyl)-*N*,*N*-dimethylurea	DuPont Griffin
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	AgrEvo
Fenoxaprop	Whip Bugle	(±)-2-[4-[(6-chloro-2-benzoxazolyl)oxy]phenoxy] propanoic acid	AgrEvo AgrEvo
Fluazifop-P	FusiladeDX	(*R*)-2-[4-[[5-(trifluoro-methyl)-2-pyridinyl]oxy] phenoxy]propanoic acid	Zeneca
Fluazifop + fenoxaprop	Fusion	see fluazifop and fenoxaprop	Zeneca
Flufenacet+ metribuzin+ atrazine	Axiom AT	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

HERBICIDE NAMES AND MANUFACTURERS

Common or Code name	Trade name	Chemical name	Manufacturer
Flumetsulam + clopyralid	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	Broadstrike SF + 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	Novartis Griffin
Fluroxypyr	Vista	4-amino-3,5-dichloro-6-fluoro-2-pyridyloxyacetic acid	Dow AgroSciences
Fluthiacet methyl	Action		Novartis
Fomesafen	Reflex	5-[2-chloro-4-(trifluoro-methyl)phenoxy]-*N*-(methyl-sulfonyl)-2-nitrobenzamide	Zeneca
Fosamine	Krenite	ethyl hydrogen (aminocarbonyl)-phosphonate	DuPont
Glufosinate	Ignite Liberty Rely	2-amino-4-(hydroxymethyl phosphinyl)butanoic acid	AgrEvo AgrEvo AgrEvo
Glyphosate	Accord D-Pak Roundup Ultra	*N*-(phosphonomethyl)glycine	Monsanto Monsanto Monsanto
Halosulfuron	Permit	methyl 5-[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonylamino-sulfonyl]-3-chloro-1-methyl-1-*H*-pyrazole-4-carboxylate	Monsanto
Hexazinone	Velpar	3-cyclohexyl-6-(dimethyl-amino)-1-methyl-1,3,5-triazine-2,4(1*H*,3*H*)-dione	DuPont
Imazamethabenz	Assert	(±)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-4(and 5)-methyl-benzoic acid (3:2)	American Cyanamid
Imazamox	Raptor	2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-5-(methoxy-methyl)-3-pyridinecarboxylic acid	American Cyanamid

HERBICIDE NAMES AND MANUFACTURERS

Common or Code name	Trade name	Chemical name	Manufacturer
Imazapic (AC263222) (imazameth)	Cadre Plateau	(±)-2-[4,5-dihydro-4-methyl-4-4(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-5-methyl-3-pyridine-carboxylic acid	American Cyanamid
Imazapyr	Arsenal, Chopper Stalker Habitat	(±)-2-[4,5-dihydro-4-methyl-4-(l-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-3-pyridine-carboxylic acid	American Cyanamid American Cyanamid American Cyanamid American Cyanamid
Imazaquin	Scepter Image	2-[4,5-dihydro-4-methyl-4-(l-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-3-quinoline-carboxylic acid	American Cyanamid American Cyanamid
Imazethapyr	Pursuit	2-[4,5-dihydro-4-methyl-4-(l-methylethyl)-5-oxo-1*H*-imidazol-2-yl)-5-ethyl-3-pyridinecarboxylic acid	American Cyanamid
Imazethapyr + imazapyr	Lightning	see imazethapyr and imazapyr	American Cyanamid
Isoxaben	Gallery	*N*-[3-(1-ethyl-1-methyl-propyl)-5-isoxazoyl]-2,6-dimethyl-benzamide	Dow AgroSciences
Isoxoben + oryzalin	Snapshot DF	see isoxoben and oryzalin	Dow AgroSciences
Isoxoben + trifluralin	Snapshot TG,	see isoxoben and trifluralin	Dow AgroSciences
Isoxaflutole (EXP 31130A)	Balance	5-cyclopropyl-4-(2-methyl-sulphonyl-4-trifluoromethyl-benzoyl)isoxazole	Rhone-Poulenc
Lactofen	Cobra	(±)-2-ethoxy-1-methyl-2-oxoethyl-5-[2-chloro-4-(trifluoromethyl) phenoxy]-2-nitrobenzoate	Valent USA
MCPA	Several	(4-chloro-2-methylphenoxy acetic acid	Several
Mecoprop, (MCPP)	Several	(±)-2-(4-chloro-2-methyl-phenoxy)propanoic acid	Several
Mesotrione			Zeneca
Metham	Vapam	methylcarbamodithioic acid	Zeneca
Methyl bromide	Bromo-gas	bromomethane Corp.	Great Lakes Chem.
Metolachlor	Dual Pennant	2-chloro-*N*-(2-ethyl-6-methylphenyl)-*N*-(2-methoxy-1-methylethyl)acetamide	Novartis Novartis
Metolachlor+ atrazine	Bicep	see metolachlor and atrazine	Novartis

HERBICIDE NAMES AND MANUFACTURERS

Common or Code name	Trade name	Chemical name	Manufacturer
Metribuzin	Lexone, Sencor	4-amino-6-(1,1-dimethyl-ethyl)-3-(methylthio)-1,2,4-triazin-5(4*H*)-one	DuPont 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]carbonyl]amino]sulfonyl] benzoic acid	DuPont DuPont
Molinate	Ordram	*S*-ethyl hexahydro-1*H*-azepine-1-carbothioate	Zeneca
MSMA	Several	monosodium salt of methyl-arsenic acid	Several
Napropamide	Devrinol	*N*-*N*-diethyl-2-(1-naphthalen-yloxy)propanamide	Zeneca
Nicosulfuron	Accent	2-[[[[(4,6-dimethoxy-2-pyrimidinyl) amino]carbonyl]amino]sulfonyl]-*N*,*N*-dimethyl-3-pyridinecarboxamide	DuPont
Nicosulfuron + rimsulfuron + atrazine	Basis Gold	see nicosulfuron and rimsulfuron and atrazine	DuPont
Norflurazon	Solicam Zorial Evital	4-chloro-5-(metthylamino)-2-(3-(trifluoromethyl)phenyl)-3(2*H*)-pyridazinone	Novartis Novartis Novartis
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	Rhone-Poulenc
Oxadiazon+ prodiamine	Regalstar		Regal Chemical Company
Oxasulfuron (CGA-277476)	Expert	2-[[[[(4,6-dimethyl-2-pyrimidinyl) amino]carbonyl]amino]sulfonyl] benzoic acid	Novartis
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 ozyfluorfen and ozadiazon	Regal Chemical Company
Oxyfluorfen+ pendimethalin	Ornamental Herbicide II	see oxyfluorfen and pendimethalin	The Scotts Company

HERBICIDE NAMES AND MANUFACTURERS

Common or Code name	Trade name	Chemical name	Manufacturer
Paraquat	Gramoxone Extra Starfire Cyclone	1,1'-dimethyl-4,4'-bi-pyridinium ion	Zeneca Zeneca Zeneca
Pelargonic acid	Scythe	nonanoic acid	Mycogen
Pendimethalin	Prowl Pendulum Pentagon PRE-M Corral	*N*-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzene-amine	American Cyanamid American Cyanamid American Cyanamid Lesco The Scotts Company
Pendimethalin+ imazaquin	Squadron	see pendimethalin+imazaquin	American Cyanamid
Pendimethalin+ imazaquin+ imazethapyr	Steel	see pendimethalin+imazaquin+ imazethapyr	American Cyanamid
Pendimethalin+ trifluralin	Tri-Scept	see pendimethalin+trifluralin	American Cyanamid
Picloram	Tordon	4-amino-3,5,6-trichloro-2-pyridinecarboxylic acid	Dow AgroSciences
Primisulfuron	Beacon		Novartis
Primisulfuron + dicamba	North Star	primisulfuron + 3,6-dichloro-2-methoxybenzoic acid	Novartis
Prodiamine	Barricade Factor	2,4-dinitro-N^3,N^3-dipropyl-6-(trifluoromethyl)-1,3-benzenediamine	Novartis
Prohexadione		3,5-dioxo-4-(1-oxopropyl) cyclohexanecarboxylic acid	BASF
Prometon	Pramitol	6-methoxy-*N*,*N**-bis(1-methyl-ethyl)-1,3,5-triazine-2,4-diamine	Novartis
Prometryn	Caparol Cotton Pro	*N*,*N**-bis(1-methylethyl)-6-(methylthio)-1,3,5-triazine-2,4-diamine	Novartis Griffin
Propanil	Stam, Stampede	*N*-(3,4-dichlorophenyl) propanamide	Rohm & Haas Rohm & Haas
Prosulfuron	Peak	1-(4-methoxy-6-methyl-triazin-2-yl)-3-[2-(3,3,3-trifluoropropyl)phenyl-sulfonyl]urea	Novartis
Prosulfuron + primisulfuron	Exceed	see prosulfuron and primisulfuron	Novartis
Pyridate	Tough	*O*-(6-chloro-3-phenyl-4-pyridazinyl) *S*-octyl-carbonothioate	Novartis

HERBICIDE NAMES AND MANUFACTURERS

Common or Code name	Trade name	Chemical name	Manufacturer
Pyrithiobac	Staple	2-chloro--6-[(4,6-dimethoxy-2-pyrimidinyl)thio]benzoic acid	DuPont
Quinclorac	Facet Drive	3,7-dichloro-8-quinoline-carboxylic acid	BASF BASF
Quizalofop	Assure II	(±)-2-[4-[(6-chloro-2-quinoxalinyl)oxy]phenoxy] propanoic acid	DuPont
Rimsulfuron	Titus Matrix Basis	*N*-[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]-3-(ethylsulfonyl)-2-pyridine-sulfonamide	DuPont DuPont DuPont
Sethoxydim	Poast Poast Plus Vantage	2-[1-(ethoxyamino)-butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one	BASF BASF BASF
Simazine	Princep,	6-chloro-*N*,*N*'-diethyl-1,3,5-triazine-2,4-diamine	Novartis
Sulfentrazone	Authority	*N*-[2,4-dichloro-5-[4-(difluoro-methyl)-4,5-dihydro-3-methyl-5-oxo-1*H*-1,2,4-triazol-1-yl]phenyl]-methanesulfonamide	FMC
Sulfentrazone + chlorimuron	Authority BL Canopy XL	see sulfentrazone and chlorimuron	FMC DuPont
Sulfentrazone + clomazone	One-Pass Authority	see sulfentrazone and clomazone	FMC FMC
Sulfometuron	Oust	2-[[[[(4,6-dimethyl-2-pyrimidinyl)amino]carbonyl] amino]sulfonyl]benzoic acid	DuPont
Sulfosate	Touchdown	trimethylsulfonium carboxymethylaminomethyl-phosphonate	Zeneca
Sulfosulfuron (MON 37500)	Monitor	1-(4,6-dimethoxypyrimidin-2-yl)-3-[(ethanesulfonyl-imidazo[1,2-a]-pyridine-3-yl)sulfonyl]urea	Monsanto
Tebuthiuron	Spike	*N*-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-*N*,*N** dimethylurea	DowAgroSciences
Terbacil	Sinbar	5-chloro-3-(1,1-dimethyl-ethyl)-6-methyl-2,4(l*H*,3*H*)-pyrimidinedione	DuPont
Thiafluamide+ metribuzin	Axiom		Bayer
Thiazopyr	Dimension Spindle Visor	methyl 2-(difluoromethyl)-5-(4,5-dihydro-2-thiazolyl)-4-(2-methylpropyl)-6-(trifluoro-methyl)-3-pyridinecarboxylate	Rohm & Haas Rohm & Haas Rohm & Haas

HERBICIDE NAMES AND MANUFACTURERS

Common or Code name	Trade name	Chemical name	Manufacturer
Thifensulfuron	Pinnacle	3-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino] carbonyl]amino]sulfonyl]-2-thiophenecarboxylic acid	DuPont
Thifensulfuron + tribenuron	Harmony Extra	see thifensulfuron and tribenuron	DuPont
Triasulfuron	Amber	2-(2-chloroethoxy)-*N*-[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]benzene-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
Trifluralin	Treflan, Trifluralin	2,6-dinitro-*N*-*N*-dipropyl-4-(trifluoromethyl)benzeneamine	Dow AgroSciences others
Trinexapac-ethyl	Primo Palisade	ethyl 4-(cyclopropylhydroxymethylene)-3,5-dioxocyclohexanecar=boxylate	Novartis Novartis

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