CD Contents for 2003

PROCEEDINGS

SOUTHERN WEED SCIENCE SOCIETY

INVASIVE WEEDS: Real or Imagined Threat?

56th Annual Meeting

Servicing Agriculture In:

ALABAMA
ARKANSAS
FLORIDA
GEORGIA
KENTUCKY
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OKLAHOMA
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TENNESSEE
TEXAS
VIRGINIA
PUERTO RICO

January 27, 28, and 29, 2003
Adams Mark Hotel
Houston, Texas

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PREFACE

These PROCEEDINGS of the 56th Annual Meeting of the Southern Weed Science Society contain papers and abstract of presentations made at the annual meeting. These papers and abstracts are indexed according to subject matter and authors. A list is also included giving the common and trade or code names, chemical names and manufacturers of all herbicides mentioned in the publication. Other information in these PROCEEDINGS includes: biographical data of recipients of the SWSS Distinguished Service, Outstanding Educator, Outstanding Young Weed Scientist, and Outstanding Graduate Students awards; the RESEARCH REPORT; lists of officers and committee members; minutes of all business meetings; and lists of registrants attending the annual meeting, sustaining members, charter members, and contributors to the SWSS Endowment Foundation.

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

Authors are required to submit an original abstract according to the instructions available in the "Call for Papers" and on the SWSS web site (http://www.swss.ws). Templates are available in Word and WordPerfect to help ensure an acceptable format was followed.

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 2003 PROCEEDINGS and of some prior year editions of the PROCEEDINGS AND RESEARCH REPORTS are available. Also, copies of the SWSS RESEARCH METHODS IN WEED SCIENCE (3rd edition, 1986), and the SWSS WEED IDENTIFICATION GUIDES are available. This document is also available in PDF format at the SWSS web site (www.swss.ws). For information concerning the availability and cost of these publications, contact Mr. R. A. Schmidt, Business Manager, Southern Weed Science Society, 1508 West University Avenue, Champaign, IL 61821-3133.

Peter A. Dotray, Editor
Southern Weed Science Society
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. Persons wishing to present a paper(s) at the conference must first electronically submit a title to the SWSS web site (http://www.swss.ws/) by the deadline announced in the "Call for Papers".

2. Only papers presented at the annual conference will be published in the Proceedings. An abstract or paper must be submitted electronically to the SWSS web site by the deadline announced at the time of title submissions.

3. Facilities at the conference will be provided for LCD-based presentations only!

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 or trade names may be used. Chemical names will no longer be printed in the annual program. 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.

5. Where visual ratings of crop injury or weed control efficacy are reported, it is suggested that they be reported as a percentage of the untreated check where 0 equals no weed control or crop injury and 100 equals complete weed control or complete crop kill.

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

7. Papers and abstracts must be prepared in accordance with the instructions and form provided in the "Call for Papers" and on the SWSS web site. Papers not prepared in accordance with these instructions will not be included in the Proceedings.

Instructions to Authors

Instructions for title submissions, and instructions for abstracts and papers will be available in the "Call for Papers" and on the SWSS web site (http://www.swss.ws/) at the time of title or abstract/paper submission. Word and WordPerfect templates will be available on the web to help ensure the proper format is followed. Because a CD ROM containing all electronically submitted abstracts and papers will be the only form of publication available in the Abstract Collections room, it is important that submission deadlines are carefully followed.

Typing Instructions-Format

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

2. Content:

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

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

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

Pertinent comments regarding some of these sections are listed below:

Title - All in capital letters and bold. 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 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 the page) or the bottom of the first page of papers.

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

Table and Figures - Place these after literature citations. Single space all tables. Tables should be positioned vertically on the page. Charts and figures must be in black and white.

2003 Distinguished Service Award -Academia

James L. Griffin

James L. "Jim" Griffin is the Lee F. Mason LSU Alumni Associated Professor in the Department of Agronomy at Louisiana State University in Baton Rouge, LA. He grew up on a row crop and livestock farm in Greenville, Mississippi and as a youth as 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 project leader at the Rice Research Station in Crowley, LA where his research program emphasized crop and weed management in soybean, rice, gain sorghum, and wheat. In 1988 he joined the Department of Plant Pathology and Crop Physiology with responsibility for weed management research in soybeans, sugarcane, and corn, and in 2001 moved to the Department of Agronomy. His research interests include integrated weed management, weed-crop competition, weed biology, herbicide persistence, and weed-pathogen-herbicide and weed-insect interactions.

Jim's 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 grand funding from USDA, EPA and Louisiana Department of Environmental Quality. Over the last 19 years, he has generated over 2 million dollars in extramural support. He holds a joint appointment with the Louisiana Agricultural Experiment Station and the College of Agriculture (25% teaching) and is a Full Member of the LSA Graduate Faculty. Jim has served or is serving as major professor of 27 graduate students and as a member of the advisory committee of 26 others. He currently advises two 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 included a portion of a team-taught undergraduate pest management course and course in introductory weed science and field research methods. Jim was actively involved in the development of the undergraduate Environmental Management Systems Curriculum, which now has an enrollment of more than 85 students. He served as Chairmen of the College of Agriculture Courses and Curricula Committee and was actively involved in developing undergraduate Agricultural Pest Management and Urban Entomology degree programs 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 Teacher in the College of Agriculture at Louisiana State University. Jim was recognized as the Outstanding Teacher by the Weed Science Society of America in 2000 and was named the Outstanding Educator by the Southern Weed Science Society in 2001.

During his career Jim has published four book chapters, 84 refereed journal articles, nine Experiment Station Bulletins, and 246 abstracts co-authored with graduate student 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 1999 received the Doyle Chambers Research Award for career contributions to Louisiana Agriculture. In 2000, he was one of several scientists in the Louisiana Agricultural Experiment Station to receive the Tipton Team Research Award, which recognized team contribution in sugarcane breeding and variety development.

2003 Distinguished Service Award-Industry

Susan K. Rick

Susan Rick was born and reared near Belleville, Illinois. She received her B.S. degree in Microbiology and her M.S. degree in Plant Physiology from Southern Illinois University, Carbondale. She worked four years as a biological specialist in the Department of Physiology and Biophysics at the University of Illinois conducting research in reproductive endocrinology and two years as a research associate in the Department of Agronomy where she was involved in plant regeneration research. She then pursued her Ph.D. in weed science under the direction of Dr. Fred Slife at the University of Illinois. She worked for five yeas with DuPont Crop Protection in Ohio before being transferred to North Carolina in 1989 where she is Senior Field Development Representative.

Sue has been a member of the Southern Weed Science Society since 1989, and she has been among the most active member from industry. She has served on ten committees and the Board of Directors. She has been particularly active in the student programs. She chaired the Student Program Committee in 2001-02, she judged student papers and posters for ten years, she has assisted in the summer weed contest, and she has helped coach the N.C. State team. She was similarly active in student programs of the North Central Weed Society while living in Ohio. She has been extremely active in the Weed Science of North Carolina. In addition to chairing a number of committees and serving as Member-at-Large on the Board of Directors, she has held the offices of Secretary-Treasurer, Vice-President, and President. She has been the Society's strongest supporter of student activities. Sue also has served on several committees in the WSSA and has been particularly active on the ARPACS Certification Advisory Council.

2003 Outstanding Educator Award

Daniel B. Reynolds

Dr. Daniel B. Reynolds was born in Dermott, Arkansas. He is married to Sandra and has two children, Zach and Hannah. He earned his undergraduate and M.S. degrees from the University of Arkansas and received his Ph.D. from Oklahoma State University in 1986. He started his career at the LSU Northeast Research Station at St. Joseph and continued in 1996 at Mississippi State University. He teaches courses in Introduction to Weed Science, Herbicide Technology and Current Topics. His introductory Weed Science course has one of the largest enrollments in the nation. Dan has been involved on 38 theses/dissertation committees and as a major or co-major Professor for 15 students. Research areas focus on the impact of transgenic technologies on crop tolerance and economics of crop production. Cotton harvest aid research continues the evaluation of programs for specific growth and environmental conditions. Research is being conducted to evaluate, develop and implement weed control programs that utilize newly developed spatial technologies. He has co-authored two books and has written or co-authored 26 book chapters and refereed journal articles. In addition, 12 articles are in review/preparation. Dan cooperated in writing numerous Experiment Station publications and 167 abstracts, magazine and newspaper articles. Dan has been actively involved in weed science societies at the state, regional and national levels. He has served as the SWSS Newsletter Editor, Chair of the SWSS Graduate Student Paper Competition, Editor of the SWSS Proceedings, Web Master for the SWSS and the Secretary through President level in the Louisiana Plant Protection Association. He has served as chair of the Mississippi Weed Science Committee and this organization presented him with the Outstanding Educator Award, Outstanding Teacher Award and Distinguished Service Award. Dan has been both a participant and coach for the SWSS Weed Contest and placed in the Graduate Student Paper competition. The SWSS honored Dan with the Outstanding Young Weed Scientist Award. As one of Dan's nomination letters stated "Dan Reynolds is the type of educator upon which the future of our college rests. His contributions in all aspects of weed science, to include teaching, research, graduate advising, professional involvement, extension activities and industry involvement are exemplary. Few faculty members have accomplished so much in such a short period.

2003 Weed Scientist of the Year

John W. Wilcut

John W. Wilcut, a native of Missouri, grew up in a small town in Illinois. He received his B.S. and M.S. degrees in Botany from Eastern Illinois University at Charleston. He completed his Ph.D. in weed science-Plant Physiology at Auburn University under the direction of Dr. Bryon Truelove and Dr. Donald E. Davis. John was an extension specialist at Tidewater Agricultural Research and Extension Center, Virginia Tech from 1987 to 1990. He was with the University of Georgia at the Coastal Plain Experiment Station in Tifton from 1990 to 1994 where he had research responsibilities for all agronomic crops on the Coastal Plain with emphasis on cotton and peanut. Currently he is a Professor of Weed Science in the Crop Sciences Department at NCSU where he has a teaching and research appointment. His commodity responsibilities include cotton, peanuts, and tobacco.

John has developed a comprehensive research program for weed management systems that maintain and improve crop quality and profitability while enhancing environmental quality. He is nationally and internationally recognized for his research on cotton and peanut. John is senior author of 28 refereed journal articles, 10 bulletin/reports, 5 book chapters, and 83 abstracts. He is also co-author of 86 refereed journal articles, 6 bulletins/reports, and 242 abstracts. His undergraduate weed science class has grown from 25 to almost 50 students. During the current year, Dr. Wilcut has published 14 refereed journal articles, has 14 more that are in press, and 9 articles that are with associated editors or in revision, plus 51 abstracts. He has served as chair/co-chair for 21 graduate students and has served on the committees of 24 others. His students have excelled in the student paper, poster and weed contests.

Dr. Wilcut has served on numerous committees, chaired sections, moderated sessions, organized symposia and judged papers and posters for the SWSS. He has also served on WSSA on committees, section chair, as reviewer, abstract editor, and was recently named Editor of Weed Technology. John was awarded the Outstanding Young Weed Scientist Award from WSSA in 1994 and SWSS in 1995. He is currently past president of the Weed Science Society of North Carolina.

2003 Outstanding Young Weed Scientist Award

Scott A. Senseman

Scott Senseman was born March 22, 1964 in Troy, OH. He graduated from Wilmington College of Ohio in 1986 with a B.S. in agricultural business. After a six-month internship with Monsanto, he attended the University of Arkansas where he completed his M.S. in agronomy-weed science in 1990 under the direction of Dr. Lawrence R. Oliver. He continued at the University of Arkansas toward his Ph.D. in agronomy-pesticide residue under the direction of Dr. Terry L. Lavy. During his doctoral program, he was awarded a doctoral fellowship and membership into both Gamma Sigma Delta and Sigma Xi. Upon graduations, he accepted a position with Texas A&M University in the Department of Soil & Crop Sciences as an Assistant Professor in October, 1994. In September of 2000 he was promoted to Associate Professor.

Dr. Senseman's research program has concentrated on several aspects of herbicide chemistry including the effectiveness of grass buffer strips on removal of herbicides from runoff water, herbicide dissipation and carryover, absorption and translocation of new herbicide combinations, effect of herbicides on soil microbial activity, and extraction method development for soil and water using solid-phases, supercritical fluid and accelerated solvent extraction techniques. He has authored or co-authored 35 peer-reviewed journal articles, 89 abstracts of poster and oral presentations, four technical reports and a magazine article.

Dr. Senseman has helped develop and teach an undergraduate course related to the evolution, role, and fate of agricultural chemicals in row crop production as well as a graduate course related to environmental fate of herbicides and their mode of action. He has served as advisor to the Texas A&M University Agronomy Club from 1997 to 2001 and is currently major advisor or co-advisor for 13 graduates students and has served on 40 other graduate student committees during his tenure at Texas A&M. In 2001, he received the Association of Former Students Distinguished Teaching Award from the college of Agricultural and Life Sciences at Texas A&M. Scott also received the Novartis Crop Protection Recognition Award from the American Society of Agronomy and was recently named the Outstanding Young Weed Scientist by the Weed Science Society of America.

2003 Outstanding Graduate Student Award (Ph.D.)

Shea W. Murdock

Shea W. Murdock was born and raised in Princeton, Kentucky. While growing up in the small community he worked for numerous local producers. He was employed by the University of Kentucky for two years (1991-1993) in the Horticulture Department, where he helped conduct research on various fruit and vegetable crops. Then he worked under Dr. James Martin, also at the University of Kentucky, in weed science from 1991 through 1994, assisting with research and extension work. Shea earned his private pilots license in 1993 at the age of 19. In 1995, he completed an internship with Monsanto in the Products Development Division at West Lafayette, Indiana. In 1996, he returned to the University of Kentucky where he worked in weed science under Dr. Bill Witt and Charlie Slack.

He received his B.S. in Agronomy (1996) at the University of Kentucky. Upon graduation, he started his M.S. Work under Dr. Bill Witt, where he evaluated the dissipation and carry-over of disclosulam in soybean cropping systems. While at Kentucky, Shea was a member of WSSA, SWSS, NCWSS, Gamma Sigma Delta, Graduate Student Organization, and participated in the SWSS and NCWSS weed and paper contests. Upon receiving his M.S. degree in 1999, Shea entered the Ph.D. program under Dr. Don Murray at Oklahoma State University. While at Oklahoma State University Shea continued to be a member of WSSA, SWSS (serving on the Placement Committee), Gamma Sigma Delta, Graduate Student Organization. He was co-author on two grants that were used to financially support his thesis project. He also has received the Robert Gleen Rapp Foundation Distinguished Graduate Fellowship and Presidential Fellowship, both from Oklahoma State University. Shea received his Ph.D. in 2002 and currently hired by Monsanto as a Technology Development Manager.

2003 Outstanding Graduate Student Award (M.S.)

Shawn C. Troxler

Shawn C. Troxler was born and raised in Brown Summit, North Carolina on September 14, 1978. As a son of a tobacco farmer, he worked diligently on a farm where he learned his hard-work ethic that carried him throughout his struggles and travels. Shawn graduated from Northeast Guilford High School in June 1996 as the salutatorian of his class. He received his B.S. in Agronomy: Turfgrass Management Concentration on May 20, 2000, where he graduated valedictorian of North Carolina State University. Shawn received his Masters in Crop Science in May of 2002.

Shawn has won the graduate student poster contest at the Southern Weed Science Society. He was a member of Weed Science Team at North Carolina State University, where he placed second in the individual competition in 2001, and was on second and first place graduate teams of 2000 and 2001. He also received the Fred Bond Scholarship, E. G. Moss Fellowship, and CORESTA study grant that have assisted in his research. Shawn has authored or co-authored 6 journal articles and 14 abstracts from scientific presentation. He has been principal investigator for field studies in corn, cotton, peanuts, soybean, tobacco, and rights-of-way. His thesis research was entitled: Evaluation of Preemergence and Postemergence Systems and Physiological Behavior of CGA-362622 on Purple and Yellow Nutsedge (Cyperus rotundus L. and C. esculentus L.). Shawn's studies comprised of nutsedge dynamics in corn and soybean, as well as a tobacco and soybean rotation. He also pioneered field studies using real-time site-specific technology for weed management. Shawn further researched nutsedge control using cotton postemergence herbicides, and the absorption, translocation, and metabolism of an experimental cotton herbicide in purple and yellow nutsedge.

Shawn is currently attending the University of North Carolina at Chapel Hill where he is pursuing a Juris Doctor in Law.

SOUTHERN WEED SCIENCE SOCIETY 2002-2003
OFFICERS AND EXECUTIVE BOARD

100. SOUTHERN WEED SCIENCE SOCIETY OFFICERS AND EXECUTIVE BOARD

100a. OFFICERS
President - J. W. Wells - 2004
President Elect - W. W. Witt - 2005
Vice President - J. S. Harden - 2006
Secretary-Treasurer - T. C. Mueller - 2005
Editor - P. A. Dotray - 2005
Immediate Past President - J. E. Street - 2003

100b. ADDITIONAL EXECUTIVE BOARD MEMBERS
Member-at-Large - C. T. Bryson - 2003
Member-at-Large - J. E. Driver - 2003
Member-at-Large - E. P. Webster - 2004
Member-at-Large - R. C. Scott - 2004
Representative to WSSA - T. R. Murphy - 2005
Representative to CAST - J. W. Barrentine - 2005

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

101. SWSS ENDOWMENT FOUNDATION

101a.. BOARD OF TRUSTEES - ELECTED
T. J. Monaco - President - 2004
J. C. Banks - Vice President - 2005
R. M. Hayes - Secretary - 2006
E. P. Prostko - 2006
H. R. Smith - Past President - 2003

101b. BOARD OF TRUSTEES - EX-OFFICE
T. C. Mueller (SWSS Secretary-Treasurer)
J. S. Harden (SWSS Finance Committee Chair)
R. A. Schmidt (SWSS Business Manager)
G. D. Wills (SWSS Constitution & Operating Proc. Committee Chair)
C. Gray (Student Representative)

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

J. E. Street*	2003	T. R. Murphy	2003
H. P. Wilson	2003	C. W. Swann	2003
A. Wiese	2004	R. H. Walker	2003

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

102a. Distinguished Service Award Subcommittee

T. R. Murphy*	2003	D. M. Simpson	2004	D. L. Jordan	2005
P. A. Dotray	2003	T. L. Smith	2004	K. L. Smith	2005

102b. Outstanding Young Weed Scientist Award Subcommittee

H. P. Wilson*	2003	D. Sanders	2004	T. R. Murphy	2005
H. D. Skipper	2003	A. R. Rhodes	2004	H. S. McLean	2005
T. C. Mueller	2003				

102c.Weed Scientist of the Year Award Subcommittee

S. W. Swann*	2003	D. R. Shaw	2004	E. Palmer	2005
T. Whitwell	2003	M. L. Wood	2004	A. C. York	2005

102d. Outstanding Educator Award Subcommittee

A. Wiese*	2004	T. Crumby	2004	M. Singh	2005
J. D. Burton	2003	M. Scharer	2003	L. L. Whatley	2005

102e. Outstaining Graduate Student Award Subcommittee

R. H. Walker*	2003	W. Wells	2004	C. Pearson	2005
E. S. Hagood	2003	S. Garris	2004	S. Senseman	2005

103. COMPUTER APPLICATION COMMITTEE (STANDING)

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

104. CONSTITUTION AND OPERATING PROCEDURES COMMITTEE (STANDING)

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

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

W. W. Witt	2003	J. S. Harden*	2004	J. C. Holloway	2004
T. C. Mueller	2005	R. L. Ratliff	2003	D. Poston	2004
P. Dotray (Ex-Off)	2005				

107. HISTORICAL COMMITTEE (STANDING)

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

108. LEGISLATIVE AND REGULATORY COMMITTEE (STANDING)

Rob Hedburg*		J. W. Everest	2004	J. Wilcut	2005
G. MacDonald	2003	M. Locke	2004	M. M. Kenty	2004
C. E. Snipes	2003				

109. LOCAL ARRANGEMENTS COMMITTEE - 2003 (STANDING)

Chairperson - G. Schwarzlose
Audio Visual - Russ Perkins
Registration - Ann Wiese
Meal Functions - Brad Minton
Room Setup - Arlen Klosterboer
Spouses Program - tba
Signs and Exhibits - Vernon Langston
Graduate Student & Room Reservations - Scott Senseman
Public Relations Liaison - Charlie Grymes
Placement Liaison - Paul Baumann
Information Booth & Message Coordinator - John Bremer
Equipment Storage & Security - James Grichar

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

L. L. Whatley*	2003	J. E. Street**	2004
R. L. Ratliff	2003	P. Dotray	2004
R. M. Hayes	2003	A. C. York	2004
J. D. Byrd, Jr.	2003	B. Watkins	2004

111. MEETING SIDE 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.*

V. Hawf	2003	H. R. Smith	2004	J. D. Byrd, Jr.	2005
R. L. Ratliff*	2006	A. Klosterboer	2007	M. E. Kurtz	2005
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.*

J. E. Street*	2003	L.L. Whatley	2004	S. K. Rick	2005
H. D. Skipper	2003	B. Watkins	2004	J. A. Kendig	2005
J. L. Griffin	2003	S. Hagood	2004	J. L. Yeiser	2005
G. Groninger	2003				

113. PLACEMENT COMMITTEE (STANDING)

S. Murdock*	2003	C. D. Youmans	2004	W. S. Garbett	2005
N. McClelland	2003	J. A. Kendig	2004	R. Jain	2005
L. Lyon (Student Representative)					

114. PROGRAM COMMITTEE - 2003 (STANDING) - *Shall consist of the President-Elect as Chairperson and the Program Sectional Chairpersons as the remaining members.*

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

115. PROGRAM COMMITTEE - 2004 (STANDING)

Chairperson . . . . J. S. Harden
1. Agronomic Crops . . . . E. P. Prostko
2. Turf, Pastures & Rangeland . . . . S. Askew
3. Horticultural Crops . . . . D. K. Robinson
4. Forest Vegetation Management . . . . H. Quicke
5. Utility, Railroad & Highway Rights-of-Way, Industrial Sites . . . . J. D. Byrd
6. Ecological, Physiological & Biological Aspects . . . . C. Tingle
7. Educational & Regulatory . . . . J. Ducar
8. Development from Industry . . . . G. Stapleton
9. Application of Herbicides . . . . T. Adcock
10. Soil & Environmental Aspects . . . . J. P. Massey
11. Research Posters . . . . J. Mitchell

116. PUBLIC RELATIONS COMMITTEE (STANDING)

N. R. Burgos*	2003	R. C. Scott	2004	G. L. Cloud	2005
J. C. Banks	2003	D. Poston	2004	B. W. Bean	2005

117. RESEARCH COMMITTEE (STANDING) - *Shall consist of the Vice President as Chairperson and the remaining members as Section Chairpersons for the following sections: (1) Chemical and Physical Properties of New Herbicides, (2) Extension Publications (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. S. Harden		2003
E. P Webster	Economic Losses Due to Weeds	2003
J. D. Byrd	State Extension Weed Control Publications	2003
T. M. Webster	Weed Survey - Southern State	2003
V. L. Ford	Chemical & Physical Properties of New Herbicides	2003

118. RESOLUTIONS AND NECROLOGY COMMITTEE (STANDING)

D. Gealy*	2003	M. E. Kurtz	2004	S. Askew	2005
L. Cargill	2003	G. L. Schwarzlose	2004	J. C. Holloway	2005

119. SALES COORDINATION COMMITTEE (STANDING)

M. DeFelice*	2003	D. L. Jordan	2004	D. R. Reynolds	2005
J. Driver	2003	B. Kline	2004	T. Barber	2005
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	W. 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	T. Koger
H. Cummings (student rep)			

121. STUDENT PROGRAM COMMITTEE (STANDING)

G. Stapleton*	2003	T. D. Scott	2004	R. Etheridge	2005
D. Simpson	2003	T. Heap	2004	J. P. Massey	2005
R. B. Lassiter	2003	S. M. Schraer	2004	R. B. Batts	2005
T. Baughman	2003	T. McKemie	2004	K. M. Jennings	2005
J. E. Street		C. Jones (Student Representative)			

122. SUSTAINING MEMBERSHIP COMMITTEE (STANDING)

R. L. Ratliff*	2003	T. Holt	2004	M. Nespeca	2005
C. E. Walls	2003	B. Minton	2004	D. L. Jordan	2005
		K. L. Smith	2004		

123. TERMINOLOGY COMMITTEE (STANDING)

Deletion pending

124. WEED IDENTIFICATION COMMITTEE (STANDING)

C. T. Bryson*	2005	M. L. Ketchersid	2003	J. D. Green	2004
M. DeFelice	2004	T. M. Webster	2004	T. Koger	2005

124a. Herbicide Resistant Weeds Subcommittee

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

125. CONTINUING EDUCATION UNITS COMMITTEE (SPECIAL)

D. E. Dippel	R. Rivera*	S. Snodgrass	A. C. York

126. MEMBERSHIP COMMITTEE (SPECIAL)

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

* Chair
** Vice-Chair

Minutes for SWSS Board Meeting
Adams Mark Hotel, Houston TX
June 1-2, 2002

President Jerry Wells called the meeting to order at 1:00 PM Central Standard time. Those in attendance were Jerry Wells, Gene Wills, Charles Bryson, Shep Zedaker, Tim Murphy, Peter Dotray, Gary Schwarlose (local arrangements Chairman for 2003 meeting at Adams Mark), Jackie Driver, Bob Scott, Eric Scherder (Grad student rep), John Harden, Bill Witt, Tom Mueller, Bob Schmidt, and Eric Webster

Brief introductions of all in attendance were made.

Bryson moved and Murphy seconded to approve minutes from previous meeting as amended. Jackie Driver was not included on attendance list from January 27 meeting, and she was present and participated at that meeting.

Business Manager's report (Bob Schmidt)
- membership in 2002 = 618
- discussion on most current publication, Forest Plants of Southeast United States, no board action needed at this time
- Witt asked about copyright matters related to all SWSS publications
    - SWSS Weed ID guide copyright resides with Arlyn Evans
    - Forest plants of SE US, images not copyrighted, book (text) is copyrighted
- Dotray asked "who owns (copyright) of SWSS abstracts?" He expressed concern about potential misuse of authors and affiliations. Wells asked if society should copyright abstracts. Discussion followed and recommendation was to let each author pursue misuse of abstracts (use for advertisement by selective editing of text to mis-represent original authors results, etc)

Witt moved, Scott seconded to approve business manager's report (see attachment #1). Motion passed

Treasurer's report (Bob Schmidt)
- industry support at annual meeting at Atlanta avoided loss at annual meeting
- Mueller wished to clarify role of local arrangements in raising money to pay for annual meeting (deferred to finance committee report)
- Witt moved, Driver seconded to accept treasurer's report. Motion passed

Site Selection Committee (Jerry Wells for Randy Ratliff)
- report requested from Helms Briscoe with deadline of July 1 (as opposed to the actual meeting date for the summer board meeting of June 1), so no report was given.
- Wells wishes to make decision in late summer prior to winter board , concensus was to provide information prior to a conference call and voice vote at that time to pick a location in the "Eastern region" of SWSS
- Wells said a CD will be mailed 2 weeks prior to the conference call

Editor's report - Peter Dotray
- good progress on 2002 proceedings (99% complete)
- Dotray asked for clarification of MOP procedures related to information inclusion
- committee reports delayed publication of 2002 proceedings
- CD versus hard-copy (printed) version of proceedings
    - only CD available for 2003 meeting (announce in Newsletter * Mueller)
    - production of 2002 proceedings handled by Bob Schmidt and Dan Reynolds, and this version will have both CD version and hard copy (as requested at time of 2002 registration)

Dotray moved, Mueller seconded that 2002, 2003 and all future years of proceedings will be on each CD until that CD is filled to capacity

- Witt (program Chair) was requested to assign tracking numbers to all speakers (including general session and symposium) to facilitate electronic submission via website of input to proceedings (abstracts, etc)

WSSA report - Tim Murphy

-WSSA attendance at 2002 meeting in Reno = 555 ($30,000 net income)
- use of LCD projectors was successful
- discussion of WSSA Weed ID guide proposal to WSSA from Richard Olds, members urged caution to support this project

Rob Hedberg report- Jerry Wells

- SWSS still supportive
- need to place contact information in SWSS newsletter (* Mueller)
- Witt commented that Hedberg was responsive to requests when they are made

Those in attendance toured facility in a group led by Gary Schwarlose.
Discussion on property:

- Witt asked if space was available on Thursday for workshop (discussed in program report).
- Mueller instructed to place cost of transport from airport to hotel in Newsletter
- concensus was that property is good, and will provide a good opportunity for a successful meeting

Graduate Student MOP - Eric Scherder

- distributed revised MOP (note - copy had been emailed prior to meeting)
- discussion yielded several suggestions to remove some language as being too rigid
- discussion on role of SWSS Grad Student Organization (GSO) in raising money for endowment (Witt and Mueller expressed concern based on previous incidents of money not handled properly).
- board concensus suggested adding language to GSO MOP about the supervisory nature of the SWSS board
- board requested clarification of Endowment Board plans (Wells will do)

Adjourned at 5:40 PM, Dinner at 7:00 PM at Old San Francisco Steak House, Houston

Wells called meeting to order at 7:42 AM (all same members in attendance)

Finance committee report (John Harden)

- SWSS lost money each of last 3 years on annual meeting on regular revenues (loss at Atlanta averted by local arrangements chair soliciting additional funds from industry)
- Harden shared projection analysis of meeting attendance, expenses, and income
- extensive discussion occurred.
-Murphy moved, Bryson seconded to have banquet tickets included in registration and reduction of registration (if not attending the banquet) is not an option. Motion passed.
- Murphy moved and Witt seconded that pre-registration be increased to $210 for non-student members. Discussion occurred. Motion passed
- Zedaker moved, Bryson seconded that student pre-registration be increased to $75. Discussion occurred, motion passed.
- Murphy and Driver (and others) encouraged Wells to address need for registration increases in Newsletter
- Bryson moved, Murphy seconded that one-day registration be increased to $75. motion passed

2003 meeting program report - Bill Witt

-Topical Theme = "Invasive Species"
- He plans to have a symposium on Invasive Species (more details discussed)
- He plans to have a symposium on "Graduate Student Education" (speakers below)
    - History of Paper contest at SWSS (Bill Witt)
    - Overview of Academic careers (Mike Barrett)
    - the Publication Process (John Wilcut)
    - Overview of Careers in Industry (speaker not decided)
    - Financial considerations in selecting jobs (tentative, speaker not decided)
- Board commended Witt for selection of timely topics and good speakers on them
- Witt also discussed having a session(s) devoted to Rice weed control that would focus on a local outreach mission to those persons interested in rice in S. Texas and surrounding areas. This effort will be led by Bob Scott and Eric Webster. Webster said he would take care of arranging CEU points

Other items in program report (Bill Witt)

- change MOP to say use of trade names of herbicides. Witt moved, Zedaker Seconded to allow use of trade names in MOP (Appendix 3, Section 4) motion passed
- Will asked Dotray to suggest changes MOP to reflect abstract collection as it is currently being done. Witt asked Gene Wills to update MOP on abstract collection. (This is an item for Peter Dotray and Dan Reynolds)
- Witt suggested Gene Wills update MOP to delete use of slides (given SWSS decision to use exclusively LCD projectors)
- Witt opened discussion on suggested guidelines for LCD presentation:
    - Powerpoint version to be Powerpoint 97
    - Presenters should send files to Witt prior to meeting (board consensus okayed)
    - Witt ="Who brings LCD projectors to meeting? A= local arrangements comm.
    - Witt = Who brings computers to meeting? A = local arrangements
- Bob Schmidt suggested getting an insurance policy to cover audiovisual equipment at meeting. Witt moved and Driver seconded to get one $10,000 policy for this purpose at annual meeting. motion passed (one person voted no)
- Witt- (after discussion), Invasive species workshop to be included in 1 day registration, unless there is a cost (such as handouts, etc) associated with the workshop.
- Instructions to authors and call for papers should be sent from Witt to Schmidt and Mueller (Newsletter Editor)
- Discussion on CD logistics at meeting. Consensus was that program chair should use good judgement to facilitate the meeting as he deems appropriate.

Weed ID committee report - Charles Bryson

-set #2 printing in progress
- set #8 photos are complete, writeups not complete
- Bryson asked to clarify future SWSS weed ID copyright status

New Business- Wells

Wells asked MOP to be updated on the following points:
- represent new structure in Long Range Planning committee
- reflect changes in legislative committee, (change chairman)
- reflect changes in airline travel (no longer used) and annual visit to Washington DC (no longer done)

Wells discussed ideas to reach out to new clientele, and commented on society membership
Wells suggested resolutions and necrology report to be placed on webste
Wells commented on Don Murray (chair Long Range Planning committee) plan to survey membership
Wells encouraged public relations committee to advertise CEU and CCA points as appropriate

Budget Report - Bob Schmidt

-Schmidt presented 2002-2003 budget (attachment 2) and discussion followed

-Bryson moved, Witt seconded to accept budget (motion passed)

Computer application committee

- Wells proposed that Dan Reynolds (Chair of computer applications committee) be added to the executive board since his role is of growing importance to SWSS. Murphy moved, Scott seconded to add Dan Reynolds as ex-officio member of SWSS executive board. Item tabled after discussion. Wells will discuss with Dan Reynolds and bring recommendation to SWSS board at next meeting

Driver asked for clarification about industry support of breaks and hospitality suites at upcoming annual meeting. Wells polled board and consensus of board indicated no objection to local arrangements soliciting for sponsorship of breaks.

Discussion of Student Paper/Poster Contest - Mueller

- Stapleton will draft Article for newsletter
- Mueller will send correct score sheet to Wills for inclusion in MOP
- Scherder commented on contest
- Wells commented that judges informed him they did not need to have a "non-contest" paper after each contest paper (this will allow to have more contest papers all within one section)
- Witt said he would try to schedule a contest group within a single time block, but he requested flexibility to realize the best use of available resources at the meeting. Witt stated his belief that the paper contest is important, but he would also like to have papers on similar topics scheduled to allow SWSS members to see a group of papers on the same or similar topics.
- Scott moved, Webster seconded to change MOP such that students are excluded from being judges in paper/poster contest.

SWSS board commended local arrangements chair Schwarslose for handling details of summer board meeting.

Meeting adjourned at 10:45 AM June 2, 2002

These minutes respectfully submitted,

Tom Mueller
SWSS Secretary/Treasurer

Minutes of SWSS Board Meeting
Adams Mark Hotel, Houston TX
January 26, 27, and 30, 2003

Meeting called to order by President Jerry Wells. Those in attendance include Jerry Wells (president), Gene Wills (MOP), Charles Bryson, (Board-academia), John Harden (Vice president), Jim Barrentine (CAST rep), Jackie Driver (Board-Industry), Eric Webster (Board-academia), Peter Dotray (Editor), Bob Schmidt (business manager), Tim Murphy (WSSA rep), Eric Scherder (Grad student rep), Scott Senseman (newly elected Board-academia), Bill Witt (President-elect and Program Chair), Tom Mueller (Secretary/Treasurer), Shep Zedaker (Forestry Rep), David Shaw (newly elected VP), Dan Reynolds (Computer applications).

Minutes from previous meeting were approved as edited.

Nilda Burgos made Herbicide resistance Committee report, which was approved by board. Burgos asked for direction concerning liaison activities with WSSA committee of similar function.

Burgos presented Public Relations committee report. Burgos asked to appoint members, and this request was referred to Witt (incoming president). Committee encouraged to get information and prepare press releases to announce winners of various contests. Mueller moved, Driver seconded to amend MOP to reflect this change in MOP.

Gary Schwarzlose made local arrangements report. 1148 rooms booked so far, banquet on track, good support from hotel staff. Attendance at GLP session still good, 9 LCD projectors available, with only 6 scheduled for use at one time. Report accepted.

Secretary/Treasurer report by Tom Mueller
Those selected in recent elections include David Shaw (Vice President), Scott Senseman (Board of Directors-Academia), Dunk Porterfield (1 yr term for board of directors-Industry), Fred Strachan (board of directors-industry), and Randy Ratliff (Endowment Foundation Trustee). Membership is flat to declining. Current economic status is sound, with ample funding in reserve.

Dotray made editor's report. Dotray thanked SWSS for secretarial support, and also thanked Dan Reynolds for good advice in transition period and also for instituting effective on-line procedures in abstract and committee report submissions. Wells and Witt commended Dan Reynolds for service to SWSS. Wells asked for recommendation from Computer Applications Committee (chaired by Reynolds) on tasks for SWSS board to consider.

Bob Schmidt was instructed to provide picture and biographical sketch to Peter Dotray (editor), as he has the past proceedings and information to do so.

Dotray moved, Mueller seconded to add webmaster as ex-officio member of SWSS board. Discussion followed about naming chair of computer applications committee to board, Reynolds clarified that those are two very distinct functions, although he has previously done both. Shaw encouraged SWSS to separate duties of webmaster and computer applications committee. Reynolds shared information about favorable terms of housing data on current site. Motion passed.

Bob Schmidt gave business manager report.

Mueller moved, Bryson seconded to change MOP to have program chair send list of graduate students to both the business manager and the student program chair. Mueller suggested deleting graduate student coordinator from local arrangements committee.

Wells presented awards committee report from Joe Street. Webster discussed graduate student awards, and how many times there are limited numbers of nominees. Mueller commented that the current application procedures are cumbersome, and the rankings suggested have the appearance of objectivity, but they may not accurately reflect the most deserving students. Scherder (grad student rep) commented on grad students awards package. Webster moved, Witt seconded to eliminate MS student award. Motion failed (4 for, 6 against). No further board action on this particular item. Awards committee may recommend changes in procedures.

Short break at 3:50 PM, reconvene at 4:00 PM

Wills reported on MOP. Mueller expressed desire to harmonize "official" MOP to make it the same as the MOP on the SWSS website.

Witt reported on 2003 program (96 posters, 219 oral papers - this includes symposia and general session speakers). Discussion held about LCD presentations, lead time for submission of slides deemed excessive by some board members, file format flexibility considered. Board recommended to add a time section (and equipment) in 2004 program to allow students and others to review slides prior to presentations. Board recommended (voice vote) to not allow use of slides in 2003 program (except for invited symposium speakers).

Barrentine reported on CAST activities, including changing terms of CAST compared to SWSS, since information was sent to previous CAST rep (Alan York). York and Barrentine coordinated SWSS-CAST duties well. Barrentine presented on CAST activities.

Murphy presented WSSA report, included short discussion on project to sell images of weeds.

Wittt moved, Barrentine seconded to disband External Funding Committee. Motion passed.

Bryson reported on Weed ID committee. Slide sets #2, and #7 are in progress. Mueller commented on potential vulnerability of SWSS if sales of slides decline (as indicated by Schmidt). This matter was referred to the finance committee.

Bryson displayed 2 prints for sale that the funds will be used for the Endowment fund. Meeting adjourned at about 5:45 PM. TCM

Board reconvened at 10:00 AM January 27, 2003

Finance committee report by Harden. Pre-registration for annual meeting was previously increased from 150 to $210 for members, from 60 to $75 for students.

Harden moved, Mueller seconded to support "Kids journey to understanding weeds" at a level of $500 to $1000, at the discretion of Harden.

Discussion of cost of Weed ID set #8, and number to produce. Board had previously allocated $60,000 to cover costs, but Mueller expressed concern this expense would not be re-couped due to greatly decreased sales. Board recommended Schmidt to inventory current # of each set of weed ID guides in inventory, and produce that number of sets of #8 or 1,500 sets, whichever is lower. Witt strongly recommended re-invigoration of sales committee.

Harden moved, Barrentine seconded the business manager to receive a $200 increase in pay per month (which is approximately a 9% increase), effective January 1, 2003. motion passed. Board consensus was also to conduct an annual review of business manager to justify when we provide a raise and an opportunity to provide him feedback on his performance as well as an opportunity fo him to provide feedback. Suggested that President and President-Elect conduct this evaluation with business manager after the meeting, and that it include a written evaluation.

Hedberg reported on his activities. He mentioned greater awareness of invasive plant pests on a national scale, and listed several accomplishments. He informed board of a joint WSSA + Ecological Society of America meeting to be held in Jacksonville, FL on November 3-7, 2003.

Discussion was held about interaction of SWSS and SE EPPC (Exotic Plant Pest Council). Don Shilling (Legislative and Regulatory Comm) spoke in strong support of Hedberg's activities. He asked for feedback on issues upon which to focus, asked for a contact list for Hedberg to utilize (experts on certain topics), and promoted the use of more conference calls to reduce expenses.

JC Banks gave Endowment foundation report. He stressed the importance of clear communication between the endowment and SWSS boards. He informed the board that Endowment still desires to have a raffle. Board consensus was for endowment to proceed, with appropriate due diligence encouraged to minimize problems.

Harden presented research report. Webster discussed the difficulty in obtaining survey data for research report (annual losses due to weeds, most important species, etc). Board consensus was to continue to collect the data.

Wells made site selection report. SWSS board selected Charlotte (Weston) for 2005 meeting. Vote was made after summer board meeting via email ballot.

Webster made SWSS weed contest report. Contest hosted by Monsanto in 2002 at farm near Greenville, MS. 37 students competed.

Scherder made grad student report. Cody Gray was mentioned as contact person for raffle. Grad students requested (in their meeting) to not have grad student luncheon in 2004 to reduce expenses to the endowment. Scherder shared several comments of students about early submission of slides, and willingness of several students to serve on computer applications committee. Wells commended Scherder for excellent service to SWSS. Meeting adjourned 12:36 PM.

Meeting reconvened, 7:00 AM CST January 30, 2003

New board members now in place. Those members in attendance: Witt, Wills, Harden, Greg Steele (grad student rep), Senseman, Barrentine, Dotrary, Schmidt, Wells, Strachan, Porterfield, Reynolds, Shaw, Murphy, and Mueller.

Placement committee (Witt reported on behalf of Shea Murdock) had 7 resumes desiring academic jobs, 12 resumes desiring industry; 4 academic position announcements and 1 industry job announcement. Additional information was also available on resume building, interviewing, etc.

Gealy made resolutions and necrology report. Presented draft resolutions complimenting hotel (wells moved, Strachan seconded, motion passed), and local arrangements chair and committee members (Barrentine moved, Senseman seconded, motion passed). Witt informed group he would send to all members of the local arrangements committee (desired to add each person's name to resolution). Additional resolution of the death of Jim Herron proposed (Porterfield moved, Harden seconded, motion passed). Additional resolution for April Fletcher thanking her for support (and of Fish and Wildlife service) of invasive species workshop (Shaw moved, Senseman seconded, motion passed). Mueller requested final copy of all four resolutions to be included in minutes.

Program 2004 Update (Harden) Harden discussed possibilities, including symposiums on rice (Bob Scott, Eric Webster), Organic Farming (David Jordan), and a workshop on regulatory affairs (Wells). Wills suggested adding a one-day registration list to followup with a letter soliciting membership (Witt will suggest to membership committee). Shaw suggested having soils section approved for CEU for CCA. end program report.

Business manager report on 2003 meeting:
299 full registrants, 101 students = 400 total attendance, banquet = 300 guarantee, with 225 in attendance at banquet. For students, 96 checks were prepared, 19 checks not picked up.

Shaw commented on banquet printing errors, Schmidt asked for biographical sketches to be sent electronically. Barrentine suggested a proof-reader on the banquet program (Mueller agreed to do this). Concensus to change MOP to add electronic version of biographical sketch to submission of awards packet.

Strachan commented on index of chemical names in back of meeting program, with some errors and omissions. Senseman moved, Shaw seconded to remove herbicide list from program for 1 year (motion carried)
Dan Poston = local arrangements chair for 2004 (Memphis)
Randy Ratliff = local arrangements chair for 2005 (Charlotte)

Witt asked for clarification of Forestry Representative.
GLP training update. Sessions were well-attended, and is a good revenue source for SWSS endowment. Question was raised as to the need for SWSS to reimburse members that have expenses related to the GLP training. Board consensus was to have SWSS endowment board cover costs (such as room nights at hotel) as it deems appropriate prior to deriving income.

Grad Student Organization (GSO) (Greg Steele)
expressed desire of GSO to add a representative to computer applications committee
Discussed meeting with Endowment board concerning raffle:
-consider "safe" types of prizes
-expressed concerns about ticket distribution, accountability
-initiated idea of selling raffle tickets on Ebay (Mueller said this was not proper, nor legal)
-consider credit card acceptance on the website
Wells proposed to have GSO send clear communication on fund-raising events to President and then to SWSS board. Witt requested to have this information prior to the summer board meeting.
Wells asked for clarification of procedures pertaining to conductance of the raffle.
Murphy commented on desire for publicity concerning SWSS Endowment fund activities.

Summer board meeting dates were discussed, with several members stating the desire to not meet on a weekend. Mueller expressed concern that people would originally plan on attending the meeting if held during the week, but would then cancel if the event was held during the week due to other commitments. Proposed dates were June 18-22, 2003 and second choice was June 23-27, 2003 for the meeting in Memphis, TN.

Site selection committee chair Klosterboer report requested to be ready on June 1, 2003.

Committee Assignments. Witt reminded board members that all (essentially) all committee assignments are made by the president when vacancies occur. The president accepts recommendations and suggestions, but the president fills the committees.

Shaw suggested we get program approved for CEU-CCA points. Witt asked for clarification on this procedure. Shaw suggested to change name of continuing education committee. Persons suggested to lead the task of getting program approved for CCA points were Bob Hayes and Cletus Youmans. Suggestion was made to add soils discussion to capture audience as available.

Witt suggested to add new committee of Herbicide Resistance Committee (to a 5 year term). Wells moved, Barrentine seconded, motion passed (elevate 124 A from sub-committee to a special committee). Shaw asked for clarification on terms of committee members. Witt solicited Murphy to suggest members currently involved in the weed control in turf area to add to this committee to broaden its scope.

Local Arrangements Report (Schwarzlose)
Conductance of meeting was good, and relations with local property were very good. Schwarzlose commented on substantial savings to SWSS with respect to breaks and other meal functions. He reported that spouses program went well. He suggested to add to MOP that sustaining members can

have an exhibit at no charge from SWSS, and to more fully advertise that information. He suggested deleting graduate student representative from local arrangements, since those functions can be done by program chair and graduate student program (contest) chair. He reminded future local arrangements chair of the wisdom of separating hospitality suites and sleeping rooms. Board commended Schwarzlose on an excellent job as local arrangements chair.

Long Range Planning report (file included from Don Murray, edited by Mueller)

A five question questionnaire was brought to the meeting and completed by the members and students while attending the 2003 meeting. The members returned 113 questionnaires (38%), and the students returned 42 questionnaires (42%). It would appear that conducting surveys during the meeting is as good a method as any other method to gather opinions and seek input from the members. The committee felt that conducting short (few questions) surveys during the meeting was a simple and cost effective method to obtain the opinions of the members and students. The following is a summary of the survey. The numbers in parentheses are (members/students) so that a breakout of the results can be easily reviewed. Questionnaire results are as follows: Would you like to see us meet at some time other than January, 35 Yes (28/7), 103 No (71/32), and 17 Undecided (14/3). The following months had the most votes, January with 126 (92/34), February with 55 (36/19), and March with 30 (21/9). The other months received the following total votes: April, 4; May, 3; June, 2; July, 5; August, 13; September, 15; October, 13, November, 15; and December, 21. By almost a two to one margin the Monday at 1:00 p.m. through Wednesday night banquet (current meeting schedule) was the preferred weekly schedule. This report will break out the member/student numbers for only the ten most popular proposed meeting sites. San Antonio, TX 107 (79/28), New Orleans, LA 101 (72/29), Memphis, TN 93 (70/23), Orlando, FL 89 (67/22), Nashville, TN 81 (63/18), Biloxi, MS 78 (57/21), Dallas, TX 71 (47/24), Atlanta, GA 67 (47/20), Charlotte, NC 61 (42/19), and Gulf Shores, AL 57 (39/18). The remaining 16 sites on the survey received the following total member/student votes: Jacksonville, FL 55, Charleston, SC 54, Little Rock, AR 43, Williamsburg, VA 42, Raleigh, NC 42, Houston, TX 40, Baton Rouge, LA 40, Ft Myers, FL 38, Oklahoma City, OK 35, Knoxville, TN 35, Chattanooga, TN 33, Louisville, KY 32, Lexington, KY 29, Richmond, VA 27, Jackson, MS 22, and Columbia, NC 20. There were a few write in sites, but there was no particular site suggested, no site received more than 3 votes. Only one suggested Tulsa!!!

The Committee would be willing to provide another questionnaire with a new focus. It would appear that the sites chosen for the meeting are potentially expensive sites. Is a questionnaire needed to determine what the members are willing to pay? Students were not mentioned for this question because the members (faculty members) are covering most of the costs. We realize that a decision will need to be made soon regarding our meeting site in 2006 and next year's questionnaire would not be helpful until 2007. This questionnaire could again be available at the meeting or it could be conducted via the Society e-mail list server. This short questionnaire may be needed annually if for no other reason, it allows the members a forum to express their thoughts and concerns. An annual survey could be done with fewer, more specific questions. A survey should not have open ended questions such as "other" or "specify". Information gained from this type of question may be valuable, but it is difficult to summarize.

<u>Objectives for Next Year</u>:
As stated in last year's report, the committee would like to get a new charge from the President each year regarding the wishes of the Board. This committee should be challenged annually to provide helpful suggestions to the Board to help make this a better society.

<u>Recommendations or Requests for Board Action</u>:
The committee suggests that the Board consider Program Section name or title changes. Some of these suggestions recommend a minor name change and other suggestions include additional Program Sections. If these name changes are approved, the Program Chairperson would still retain control over the development of the program and could combine or eliminate any of these sections

in a given year. The following Program Sections are proposed (order not important):
Agronomic Crops
Turf
Horticultural Crops
Forest Vegetation Management
Rights-of-Way and Industrial Sites
Physiology, Biology, and Ecology
Invasive Species
Developments from Industry (NOTE: This section to be deleted based on motion below)
Developing Technologies
Education and Extension
Soil and Environmental Aspects
Posters
Pasture and Rangeland
Regulatory

Shaw moved and Dotray seconded to accept the above list of section names, with the exception of deleting the "Developments from Industry" (these topics could be included in others sections). Motion passed.

The committee suggests that the Board consider adding the President of the Endowment Foundation to the SWSS Board of Directors as an Ex-Offico member. This appointment should help improve communications between the two organizations who are each trying to improve the Society and the Graduate Program in particular.

The Board is asked to consider ways to include groups interested in invasive species to join, attend, or interact with this Society. Groups such as EPPC should be contacted to inquire about their interest in holding joint meetings with us. Apparently Drs. Bryson and Byrd are familiar with these groups and may help the SWSS contact them.

The Board is asked to devise a mechanism (special committee, volunteer Board member, Newsletter Editor) to contact former Presidents of SWSS and ask them to write brief articles for the Newsletter. These can be issues of the past, current concerns, or simply what is happening in the life of the former President. These members are ageing, but I am sure the SWSS is in their thoughts from time to time.

The last recommendation from the Committee would be a proposal to the Board to amend the MOP's to include the current President to serve on the Long Range Planning Committee. Wells moved, Strachan seconded. motion passed.

New business:
Witt expressed concern about submission of abstracts via website (discussion point for summer meeting). Shaw suggested having webmaster (and program chair) provide written proposal to board 3 weeks prior to summer meeting, and computer applications committee to make recommendations on technical aspects of presentation technology. Andy Bennett mentioned as possible chair of this committeee.

Reynolds discussed aspects of conducting financial transactions via current website. Senseman moved, Murphy seconded to start procedure to establish process of accepting credict card payment for SWSS products on the internet upon presidential approval. Wells discussed concern about security of password availability (Schmidt, Reynolds only). Motion carried.

Barrentine moved, Shaw seconded to dedicate 2003 proceedings to Charles E. Moore (Barrentine to provide picture and bio to Dotray). Motion passed. Suggestion was made to contact parent awards committee (past president) concerning recommendations of proceeding dedications.

Witt expressed thanks for those in attendance.

Meeting adjourned 10:15 AM (January 30. 2003)

Respectfully submitted,

Tom Mueller
SWSS Secretary/Treasurer.

BUSINESS MANAGER'S REPORT - **Bob Schmidt** January 22, 2003

Southern Weed Science Society

Business Manager's Report

Membership as of December 31

	2002	2001	2000	1999	1998	1997	1996
Members and Sustaining Members	500	510	527	559	662	661	637
Students	118	126	131	136	136	120	139
Totals	618	636	658	695	798	781	776

Research Methods to date

Expense $38,003 Income $41,266

Weed Identification Guide to date

Expense $444,005 Income $761,662

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

Expenses $29,001 Income $154,648

Forest Plants of the Southeast and Their Wildlife Uses

Expenses $107,559 Income $146,533

Good Laboratory Practice for the Field

Registration	
Advance/Protol	30
Notebook	16
Quality Assurance	13

Preregistration

	2003	2002	2001	2000	1999	1998	1997	1996	1995
Members	220	226	248	249	261	285	292	282	331
Students	66	80	87	115	116	74	74	63	67
Total	266	306	335	364	377	359	365	345	398
Percentage of final	65%	68%	68%	76%	75%	59%	60%	60%	56%
Total Attendance	440 est	456	492	476	501	601	584	566	703

Investments

$15,000	CD 4.0% due 7/05
$70,000	CD 6.95% due 8/03
$25,000	CD 4.5% due 4/12
$25,000	CD 5.75% due 5/06
$30,550	CD 1.69% due 10/04
$25,000	CD 5.50% due 6/06
$59,812	MM

EDITOR'S REPORT - Peter A. Dotray

Summary of Progress:
The 2002 Proceedings contained 408 pages. This was a slight increase from the 396 pages in the 2001 Proceedings. The Proceedings contained all executive board minutes, committee reports, business manager's report, general session presentations, presidential address, award winners, research report, abstracts, and full papers. The abstracts and full papers are available via the web from the SWSS home page (www.swss.ws). Following is the distribution of number of presentations and number of pages.

Section	Number Presented	Number of Pages	Number of Papers
Minute of Executive Board, Committee Reports, etc.	---	70	---
General Session	2	14	1
Weed Management in Agronomic Crops	57	44	1
Weed Management in Turf, Pasture, and Rangeland	44	26	0
Weed Management in Horticultural Crops	6	4	0
Forest Vegetation Management	23	28	6
Utility, Railroad and Highway Right-of-Way and Industrial Sites.	5	6	1
Physiological and Biological Aspects of Weed Control	28	20	1
Education and Regulatory Aspects of Weed Management	7	6	0
Developments from Industry	15	10	0
Application Technology	5	4	0
Soil and Environmental Aspects of Weed Science	12	12	1
Research Posters	85	54	1
Symposiums	2	2	0
State Extension Publications, Weed Survey, Economic Losses, Index	---	48	---
Indexes, Registrants, etc	---	60	---
Total Presentations (General Session, Abstracts & Papers)	291	---	---
Grand Total	**291**	**408**	**10**

Objective(s) for Next Year:
Get the SWSS CD Proceedings in the hands of the membership by mid-summer.
Recommendation or Request for Board Action:
None.
Finances (in any) Requested:
None.
Respectively submitted;
Peter A. Dotray, Editor

SECRETARY-TREASURER'S REPORT-Tom Mueller

Ballots were mailed to Southern Weed Science Society membership to vote on election of officers, including Vice-President, Board-of-Directors for Academia, Board of Directors for Industry (two positions, one for three years and one to fill a vacancy), and Endowment Foundation Trustee. Ballots were mailed out in October and counted after the November 15, 2002 deadline. Elected officers for 2003 include David Shaw (Vice President), Scott Senseman (board of directors - Academia, 3 year term), Dunk Porterfield (board of directors - Industry, 1 year term), Fred Strachan (board of directors - Industry, 3 year term), and Randy Ratliff (Endowment Foundation Trustee). The number of ballots counted for the election ranged from 250 to 259, which was slightly higher than the previous year.

The net worth of the Southern Weed Science Society as of May 31, 2002 was $237,403. Year end report, audit and tax form preparations were done by Lafferty and Associates, Champaign.

Committee Number: 100b **Committee Name:** WSSA Report

Summary of Progress:

WSSA Report to SWSS Board Meeting
January 26, 2003
Houston, TX

The WSSA summer Board meeting was held July 20-21, 2003 in Jacksonville, Florida at Adams Mark Hotel.

Items discussed included:

2003 Annual Meeting: Meeting will be held at the Adams Mark Hotel in Jacksonville, Florida February 10-13, 2003. Four symposia and one workshop will be held:

* Impact of Current Events on Weed Biological Control in North America
* Invasive Weed Management: Resolving Regulatory and Jurisdictional Conflicts
* Implications of Global Environmental Changes on Future of Weed Science
* Role of Weeds in IPM Systems
* Weeds in Natural Areas Workshop

Presentations are LCD only and should be presented one week before the annual meeting to the section chair. Joan Dusky serving as Chair of Local Arrangements Committee.

Future Annual Meetings: 2004 - Kansas City, MO; 2005 - Honolulu, HI; 2006 - New York City, NY (currently in negotiation).

Graduate Students: Through the years students have requested to have feedback on their presentations and to have a formal graduate student organization. The WSSA Board has asked the Endowment Foundation to donate $1,000.00 for graduate students to prepare a proposal on these items for WSSA Board consideration. Tom Barker of Mississippi State, current student representative, and Ann Legere will be advised of this action.

Agricultural Research Institute (ARI) Contract: WSSA is considering accepting administrative duties for an on-going grant that would generate additional income for WSSA. This EPA grant is for analyzing and developing pilot pesticide safety programs and materials, and ARI is seeking an administrator.

WSSA Publications: Bob Blackshaw will become the new editor of Weed Science, replacing retiring editor Bob Zimdahl, after the annual meeting in February 2003. Only web-based submissions will be accepted by both WSSA journals effective January 2003. Reviews will also be submitted on the web as well. This system will be operated by Allen Press and Marketing. Cost for this system is: initial set-up fee of $3000 each for Weed Science and Weed Technology, $1250 yearly maintenance each, and $22.50 per reviewed paper. The initial contract would be for a 3-year period ending December 31, 2005. Page charges for Weed Science and Weed Technology will increase to $60 per page. The increased charge will go into effect when the electronic manuscript system is operational.

Executive Director Position: A Committee that was initially formed to determine the feasibility of a full-time Director of Education for WSSA has recommended that WSSA seriously consider hiring an professional Executive Director for its next paid position, rather than a Director of Education. Many similar professional societies have a paid professional Executive Director to handle day-to-day activities, provide continuity for the leadership, and provide mid- to long-term direction for the organization. Publications are a major source of revenue for the societies, so a professional Director of Publications is a common position, and many of the societies have a part- or full-time position similar to WSSA's Director of Science Policy. Most do not employ staff solely for educational activities. Given the need for a corporate memory, ongoing project coordination and the lack of available volunteer time, this Committee felt that an Executive Director is needed for WSSA. Funding for this position was discussed, but no action plan was formulated.

Strategic Plan: The WSSA strategic plan for 2002-2006 was accepted by the Board, and will be published in the newsletter and web site

Expert Weed Identification Systems Project (XID): Dr. Richard Old has presented a proposal for collaboration between WSSA and XID; the initial goal is to fine-tune a CD ROM containing an interactive key to 1,000 common weeds in North America. Phase II of the proposal would expand the project to include additional weed species to bring the total to 1,420 species. WSSA members would be asked to supply photos for Phase II. Selling cost would be $49.95. WSSA is in the process of negotiating a contract.

Allen Marketing and Management Contract: WSSA has entered into a new 3-year contract with Allen Marketing and Management The current annual fee for services is $56,800 annually. The new contract is for $72,000, $73,800, and $75,600 respectively, for 2002, 2003 and 2004

Award Committees: In order to prevent a perception of bias, sub-chairs of WSSA awards committees are now non-voting members, except in the case of a tie vote.

WSSA Facts:
Current membership - 1805 members (down from 2002 in 2001)

Objective(s) for Next Year:
Attend WSSA and SWSS Board meetings, Represent SWSS at WSSA Board Meetings.

Recommendation or Request for Board Action:
None.

Finances (if any) Requested:
None

Respectively submitted;

Tim R. Murphy, Representative to WSSA

Committee Number: 100b **Committee Name:** CAST

Report to SWSS Board, January 26, 2003
Alan York and Jim Barrentine

Council for Agricultural Science and Technology (CAST)

1. CAST plans to hold a workshop (symposium) on pest resistance management following, and in conjunction with, the 4th National IPM Symposium at Indianapolis in April 2003. The IPM Symposium ends at noon on April 10. The CAST workshop will begin in the afternoon of April 10 and go through April 11. The workshop will probably be titled "Management of Pest Resistance: Strategies using Crop Management, Biotechnology, and Pesticides". Barry Jacobsen, a plant pathologist from the University of Montana, will chair the workshop. A steering committee has been working on the details. The steering committee is made up of weed scientists, entomologists, pathologists, modelers, and experts on transgenics. Weed scientists on the committee include Harold Coble, Rod Lym, Carol Mallory-Smith, and Jamie Retzinger. A proposed agenda was presented to the Plant Protection Work Group at the fall, 2002 meeting. The agenda consisted of four parts. Part 1 will focus on issues in pest resistance management. Speakers representing grower groups, such as National Cotton Council, National Corn Growers, etc., and representing consultants will review the issues. Part II will focus on attributes of pests that contribute to resistance and attributes of strategies that lead to resistance. Part III will focus on the roles of stakeholders. Plans are to have consumers, growers, consultants, industry, government, academia, and food processors represented. Part IV will focus on a summary of the situation and recommendations concerning research, funding, and education. CAST will publish proceedings of the workshop. The Union of Concerned Scientists, which is very much opposed to biotechnology, was invited to participate in the workshop, but they declined.

2. The Plant Protection Work Group proposed a conference, to be followed by a proceedings published by CAST, on "Biotechnology-derived Perennial Turf: Risks and Benefits". Biotechnology-derived turf (Roundup Ready bentgrass is first product) represents the first biotechnology-derived product with the potential for widespread use in the environment by consumers. At issue are questions surrounding release of a perennial that can propagate vegetatively and questions on gene flow, allergies, toxicity, and adventitious presence. The proposal was for a 1 or 1.5-day meeting with presentations on environmental, animal, and human health issues to be followed by a panel discussion and then facilitated discussion. Coming from the presentations and discussion, there hopefully would be a description of the issues, identification of areas where more basic science and regulatory science are needed, and a list of recommendations. It is anticipated that USDA will be developing regulations in 2003, and recommendations coming from this conference could impact those regulations. The Board approved the conference, with the understanding it would be held adjacent to the WSSA meeting in Jacksonville, and contingent upon industry funding to cover publication costs. (Note: Since the fall Board meeting, the location and date of conference has been changed to Baltimore on January 9 and 10, 2003).

3. Reviews of non-CAST publications: There was discussion on giving member societies an opportunity to publish reviews of publications in NewsCAST. This would basically be a service to member societies, where they can promote their publications. Reviews should be 400 to 500 words, and can be a review already published in a society journal. This may be a way to promote SWSS publications. My notes are unclear, but I don't think the Board took any action on this.

4. China Food and Agricultural Biotechnology Effort: In January 2002, CAST entered into an agreement with the U.S. Trade and Development Agency (TDA) to coordinate an U.S.-China food and agricultural biotechnology training and dialogue. This is a public-private partnership primarily sponsored by TDA with contributions from U.S. industry and other U.S. governmental agencies. The program is still in development. To date, four CAST publications have been translated into Chinese.

5. Web-based dialogue on Food and Agricultural Biotechnology: There are a number of web sites dealing with this, but most are advocacy in nature and not science-based. The idea is for CAST to have on its web site video clips from scientific authorities speaking on identified topics. Additional web-based and written resources would be posted with each of the dialogues. CAST would form a steering committee to identify topics and to serve as a critical review. Outside monies are already in place to support this for a while. This is a pilot project, which will be evaluated at some point in the future, and a decision made to continue or abandon.

6. Future of Agricultural Biotechnology Forum: The proposal (approved by the Board) was for a media day to be held in late 2002 to focus on future applications of biotechnology for improved human/animal food nutrition and human health. Audience would be news media. The objective is to increase reporter and public awareness of what is in the pipeline and the regulatory infrastructure in place and in development to address future food and Ag biotech innovations. The focus will be on things that interest the general public, such as medicinal crops, improving food quality, and using plants as factories for pharmaceuticals.

7. Update on ARI: ARI was finally dissolved September 30, 2002. Assets were transferred to CAST. Dick Herrit will continue to manage the EPA contract on worker safety as a contract employee of CAST. There is a cooperative agreement with EPA to ultimately combine WPS and applicator certification into one program. CAST should bring in about $200,000 for managing the project. CAST hopes this will lead to opportunities to manage education projects in the future.

8. As part of the Benefits of Ag Research project, CAST wants short success stories (such as the witchweed eradication program). Member societies are encouraged to submit one-pagers.

9. Reports and Issue papers released in 2002:

   Comparative Environmental Impacts of Biotechnology-derived and Traditional Soybean, Corn, and Cotton Crops. Released June 2002. This consisted primarily of a comprehensive review of the scientific literature. Literature basically supported environmental benefits from the technology. Also supported idea that biotechnology-derived soybean, corn, and cotton pose no environmental concerns unique to or difference from those historically associated with conventionally developed varieties. This report has been posted to the CAST, USB, and Talk Soy web sites. The Executive summary has been translated into Chinese, French, Portuguese, and Spanish. The Department of State distributed the report to US embassies in 108 nations.

   Urban and Agricultural Communities: Opportunities for Common Ground. Released May 2002. This report considers the changing role of agriculture in urban settings. It deals with geographic, demographic, and economic changes in rural and metropolitan life. Policy issues such as land preservation, alternative market opportunities, sprawl, taxation, and food security are considered.

Animal Diet Modification to Decrease the Potential for Nitrogen and Phosphorus Pollution. Released July 2002. This issue paper outlines technologies and approaches poultry and livestock producers can use to decrease amounts of nitrogen and phosphorus entering the environment.

Invasive Pest Species: Impacts on Agricultural Production, Natural Resources, and the Environment. Released March 2002. This issue paper provides a guide to curtail the impact on non-native pests. There is also some discussion of bioterrorism.

Environmental Impacts of Livestock on U.S. Grazing Lands. Released November 2002. This issue paper examines environmental impacts of grazing systems and provides guidance on land management tools. Issues discussed include alteration of wildlife habitat and degradation of soil and water quality.

10. Reports and Issue papers in progress:

Agriculture's Response to the Climate Change Challenge
Benefits from Agricultural Research
Biosolids: Land Treatment or Disposal
Biotechnology in Animal Agriculture: An Overview
Ethics in Agriculture
Global Risks of Animal Disease
Implications of Total Maximum Daily Loads on Rural and Urban Land
Integrated Pest Management
Intervention Strategies for the Safety of Foods of Animal Origin
Management of Pest Resistance: Crop Management Strategies (symposium discussed earlier)
Microbial Risk Analysis in Food Safety
Mycotoxins: Risks in Plant, Animal, and Human Systems
Nutraceuticals for Health Promotions and Disease Prevention
Pros and Cons of Bioenergy: Pointing to the Future

11. Possible future issue paper or task force report: There was discussion on an issue paper or report on "measuring pesticide exposure through non-dietary exposure". CAST staff was asked to make some contacts in Washington to see if EPA wanted it and would use it and also to make contact with Spray Drift Task Force. This will be discussed further in the spring.

12. Essay contest: An essay contest, *Bountiful Science for Bountiful Agriculture*, for 6^{th}, 7^{th}, and 8^{th} grade students is in progress. It was funded primarily by USDA CSREES and NRCS, with lesser funding from a number of sources.

13. Financial situation: CAST, like many organizations, is suffering financially. Membership (company and individual) and membership income are down. Overall revenue was about $100,000 short of the 2002 budget. Externally funded projects have helped the overall financial situation. The Board approved a balanced budget for 2003. Projected expenses have been held to 2002 levels or reduced. Projected income was reduced from the 2002 budget.

14. Dale Maronek, head of the Department of Horticulture and Landscape Architecture at Oklahoma State, was elected as President-Elect.

Committee Number: 102 **Committee Name**: Awards Committee (standing)

Summary of Progress:
The annual call for nominations for awards was published in the summer newsletter. There were multiple nominees for the awards and determining a winner was difficult.

Distinguished Service Award, Industry – Susan K. Rick

Distinguished Service Award, Academia – James L. Griffin

Outstanding Young Weed Scientist Award – Scott Senseman

Weed Scientist of the Year Award – John Wilcut

Outstanding Educator Award – Dan Reynolds

Outstanding Graduate Student Award, M.S. – Shawn Troxler

Outstanding Graduate Student Award, Ph.D. – Shea Murdock

Objective for Next Year: With the exception of the Graduate Student awards, files of all unsuccessful nominees will be forwarded to the next subcommittee chair.

Recommendation or Request for Board Action: None

Finances (if any) Required: None

Respectively submitted:

Joe E. Street, Awards Committee Chair

Distinguished Service Award Subcommittee

T. P. Murphy, Chair	D.M. Simpson	D.L. Jordon
P.A. Dotray	T.L. Smith	K.L. Smith

Outstanding Young Weed Scientist Award Subcommittee

H.P. Wilson, Chair	D. Sanders	T.R. Murphy
H.D. Skipper	A.R. Rhodes	H.S. McLean
T.C. Mueller		

Weed Scientist of the Year Award Subcommittee

S.W. Swann. Chair	D.R. Shaw	E. Palmer
T. Whitwell	M.L. Wood	A.C. York

Outstanding Educator Award Subcommittee

A. Wiese, Chair	T. Crumby	M. Singh
J.D. Burton	M. Scharer	L.L. Whatley

Outstanding Graduate Student Award Subcommittee

R.H. Walker, Chair	W. Wells	C. Pearson
E.S. Hagood	S. Garris	S. Senseman

Committee Number: 102e

Committee Name: Outstanding Graduate Student Award Subcommittee

Summary of Progress:

M.S. Candidates	**University**	**Nominator**
Ian C. Burke	North Carolina State	Dr. John W. Wilcut
Cecilia Gerngross	Texas A&M	Dr. Scott Senseman
Franklin Kelly	Mississippi State	Dr. David R. Shaw
Brian V. Ottis	Texas A&M	Dr. J. M. Chandler
Kristie J. Pellerin	Louisiana State	Dr. Eric P. Webster
Shawn C. Troxler **(winner)**	North Carolina State	Dr. John W. Wilcut
Ph.D. Candidates	**University**	**Nominator**
Shea W. Murdock (**winner**)	Oklahoma State	Dr. Don S. Murray
Andrew J. Price	North Carolina State	Dr. John W. Wilcut
Jason C. Sanders	Mississippi State	Dr. Daniel B. Reynolds

Objective(s) for Next Year:
Evaluate nominations submitted to subcommittee. The 2003 format for nomination and submission will be used.

Recommendation or Request for Board Action:
None

Finances (in any) Requested:
None

Respectively submitted;

Scott Hagood, Virginia Tech
Wayne Wells, Mississippi State
Sam Garris, Bayer CropScience
Charles Peason, Syngenta Crop Protection
*Scott Senseman, Texas A&M
Robert H. Walker, Auburn, Chairperson

*David Teem served as an alternate judge for M.S. candidate nominations since Scott Senseman nominated a M.S. candidate.

Committee: 103 **Committee Name:** Computer Application

Summary of Progress:
Submission of paper and poster titles for the 2003 meeting were received only via the web. Abstracts and reports were also received primarily via the web. Prior to January 20, 22, and 24, 2003 the web submission system had received 19, 27, and 41% of the abstracts, respectively. By close of business on January 24, 2003 we had received 85% of the abstracts and by the time of the meeting 90% of the potential abstracts were accounted for. The actual percentage of submission was greater than 90% because many of the authors of the symposia presentations elected not to publish an abstract.

This year templates for abstracts and reports were made available via the web. These files contained all font and formatting commands such that authors only needed to type in the needed information thus it be in the correct format. This was done in an effort to simply the formatting of documents and to minimize the amount of reformatting necessary by the editor prior to sending to the publisher.

Objective(s) for Next Year:
1) To modify the web interface to facilitate ease of use.
2) To publicize and increase the capacity for report submission on the web.
3) To work with Gene Wills to ensure that forms and MOPs are the most current with no discrepancies between sources.
4) To generate an electronic form page where all forms utilized in the MOP can be downloaded electronically.
5) To investigate the use of PayPal as a method of purchasing publications over the web and for payment of registration dues.
6) To study and recommend a method by which to submit the PowerPoint presentations closer to the actual meeting date.

Recommendation or Request for Board Action:
The groups recommends that it be allowed to develop a proposal to investigate the submission of PowerPoint presentations via the web in a manner similar to abstracts or have kiosks at the meeting where individual authors can upload their respective presentations. It is also recommended that the Web Master not be the chairman of the Computer Application Committee but instead serve as an ex-officio member of that committee.

Finances (in any) Requested:
Continue same level of support for cost associated with the maintenance of the web page. (Up to $1,000)

Respectively submitted;

Shawn Askew, Andy Bennett, Ted Whitwell, Tom Mueller, Scott Senseman, Bill Vencill, and Daniel B. Reynolds, Chairperson

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

SUMMARY OF PROGRESS: At the annual meeting of the SWSS Executive Board in January and at the Summer Meeting in June 2002, suggestions for changes in the SWSS Operating Procedures were presented to the Executive Board. Following the Summer Board Meeting, all approved revisions and all directives for changes by the Executive Board were made in the SWSS Manual of Operating Procedures (MOP). During October 2002, the revised edition of the MOP was submitted for distribution on the SWSS Web Sitehttp://www.weedscience.msstate.edu/swss/. Changes of concern to the entire membership were adjustments in the registration fees for the annual meeting and the move to publish the Proceedings beginning in 2003 only on compact disc.

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

FINANCES REQUESTED: None

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

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

Summary of Progress:
The financial status of the Southern Weed Science Society continues to be sound. The society benefits primarily from the sales of its publications.

In an effort to make the annual meeting self-supporting, registration fees were reviewed. Since the year 2000, the annual meeting has not covered the meeting expenses. The Board approved to increase registration from $115 to $210 for members and $60 to $75 for graduate students.

During 2002 the Board approved $1000 for the support of "A Kids Journey to Understanding Weeds" from the Intermountain Agricultural Foundation.

Objective(s) for Next Year:

Recommendation or Request for Board Action:
Review the graduate student reimbursement for registration and rooming.

The Board should consider continuing to fund the program "A Kids Journey to Understanding Weeds" from the Intermountain Agricultural Foundation.

The Board should consider increased funding for Bob Schmidt's compensation.

Finances (in any) Requested:

Respectively submitted

Committee member W.W. Witt
Committee member R. L. Ratliff
Committee member J. C. Holloway
Committee member D. Poston
Committee member T. C. Mueller
Committee member, Chairperson J. S. Harden

Committee Number: 108 **Committee Name:** Legislative and Regulatory Committee

January 27, 2003
Houston, Texas

In attendance were:
Donn Shilling, UF
Martin Loche, USDA - Stoneville
Mike Kenty
Rob Hedberg, WSSA Director of Science Policy
Bob Nichols, Director of Cotton, Inc.
Greg MacDonald, UF
John Wilcut, NCSU

Meeting called to order, 8:00am

Business discussed -

Rob Hedberg, WSSA Director of Science Policy (DSP) was in attendance as the guest of SWSS. The committee discussed at some length how Rob can best serve the interests of our society. Rob provided the committee with a report that summarized his activities over the last several months. This report was not intended to be inclusive of all Rob's activities, but did provide some examples of what the DSP does to stimulate discussion. Rob did discuss some of his activities in detail. Rob has been devoting an increasing amount of his time to the invasive weed problem. The members felt this was appropriate at this time. Members felt this issue provides Weed Science and our society with a tremendous opportunity that must be pursued. Rob has hired an intern that is focusing his time on Invasive Weed Week. We also discussed communication between Rob and the committee. Most members felt the way we have been communicating, primarily through email, was working well. The Chairman agreed to continue obtaining member input through email.

Rob discussed the function and finances of his position as Director of Science Policy for WSSA with the committee. He explained how each regional society including SWSS contributed funding to WSSA to support Rob's position. The committee fully supported all aspects of his job.

The committee also discussed how Rob should address state issues. The committee has discussed this before. We agreed that this committee should continue to coordinate legislative and regulatory issues between SWSS and the WSSA Director of Science Policy. The committee also continued its discussion, started in 2002, dealing with coordinating communication. The committee recommended that we should develop a "master list" of organizations and contact people interested in weed related issues. This would provide the society with a data base that could be used to enhance communication, help the Director of Science Policy contact people that can help with various technical issues and help the society better coordinate its efforts. The chairman and the DSP presented the committee's recommendation to develop a "contact data base" to the SWSS Board of Directors. The board supported the recommendation.

The committee discussed the need to improve the focus of the Regulatory and Legislative section of the Annual SWSS meeting. Although the talks presented in this section are of great interest to society members, many talks seem to have little relevance to the intended section subject (based on the section title). Members suggested that contact between the section chair and the committee provide an opportunity to suggest more relevant speakers and topics.

The committee discussed the need to help the DSP develop a brochure and poster to better represent our society and profession. The chairman of the committee agreed to help the DSP develop these materials.

The committee recommended that the SWSS newsletter include updates on Legislative and Regulatory issues. The committee chair and the DSP will work together to provide the newsletter editor with this information.

The committee also discussed approaches to establishing an ARS Weed Science Program and a Federal Job classification for Weed Science. Several members of the committee agreed to help the DSP determine what other disciplines (eg., Plant Pathology and Entomology) had Federal Job classifications. Some members felt that there may not be sufficient precedence within the USDA to justify the time commitment to establish a classification specifically for Weed Science. The committee did support the DSP continued efforts to establish an ARS Weed Science Program.

The Chairman agreed to report the committee's recommendations to the SWSS Board.

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

Summary of Progress:
This committee report was delayed until the Thursday Board meeting so that the survey results could be included and a single report given. Several topics were discussed and the recommendations are presented below.

A five question questionnaire was brought to the meeting and completed by the members and students while attending the 2003 meeting. The members returned 113 questionnaires (38%), and the students returned 42 questionnaires (42%). It would appear that conducting surveys during the meeting is as good a method as any other method to gather opinions and seek input from the members. The committee felt that conducting short (few questions) surveys during the meeting was a simple and cost effective method to obtain the opinions of the members and students. The following is a summary of the survey. The numbers in parentheses are (members/students) so that a breakout of the results can be easily reviewed. Questionnaire results are as follows: Would you like to see us meet at some time other than January, 35 Yes (28/7), 103 No (71/32), and 17 Undecided (14/3). The following months had the most votes, January with 126 (92/34), February with 55 (36/19), and March with 30 (21/9). The other months received the following total votes: April, 4; May, 3; June, 2; July, 5; August, 13; September, 15; October, 13, November, 15; and December, 21. By almost a two to one margin the Monday at 1:00 p.m. through Wednesday night banquet (current meeting schedule) was the preferred weekly schedule. This report will break out the member/student numbers for only the ten most popular proposed meeting sites. San Antonio, TX 107 (79/28), New Orleans, LA 101 (72/29), Memphis, TN 93 (70/23), Orlando, FL 89 (67/22), Nashville, TN 81 (63/18), Biloxi, MS 78 (57/21), Dallas, TX 71 (47/24), Atlanta, GA 67 (47/20), Charlotte, NC 61 (42/19), and Gulf Shores, AL 57 (39/18). The remaining 16 sites on the survey received the following total member/student votes: Jacksonville, MS 55, Charleston, SC 54, Little Rock, AR 43, Williamsburg, VA 42, Raleigh, NC 42, Houston, TX 40, Baton Rouge, LA 40, Ft Myers, FL 38, Oklahoma City, OK 35, Knoxville, TN 35, Chattanooga, TN 33, Louisville, KY 32, Lexington, KY 29, Richmond, VA 27, Jackson, MS 22, and Columbia, NC 20. There were a few write in sites, but there was no particular site suggested, no site received more than 3 votes. Only one suggested Tulsa!!!

The Committee would be willing to provide another questionnaire with a new focus. It would appear that the sites chosen for the meeting are potentially expensive sites. Is a questionnaire needed to determine what the members are willing to pay? Students were not mentioned for this question because the members (faculty members) are covering most of the costs. We realize that a decision will need to be made soon regarding our meeting site in 2006 and next year's questionnaire would not be helpful until 2007. This questionnaire could again be available at the meeting or it could be conducted via the Society e-mail list server. This short questionnaire may be needed annually if for no other reason, it allows the members a forum to express their thoughts and concerns. An annual survey could be done with fewer, more specific questions. A survey should not have open ended questions such as "other" or "specify". Information gained from this type of question may be valuable, but it is difficult to summarize.

Objectives for Next Year:
As stated in last year's report, the committee would like to get a new charge from the President each year regarding the wishes of the Board. This committee should be challenged annually to provide helpful suggestions to the Board to help make this a better society.

Recommendations or Requests for Board Action:
The committee suggests that the Board consider Program Section name or title changes. Some of these suggestions recommend a minor name change and other suggestions include additional Program Sections. If these name changes are approved, the Program Chairperson would still retain control over the development of the program and could combine or eliminate any of these sections in a given year. The following Program Sections are proposed (order not important):
Agronomic Crops

Turf
Horticultural Crops
Forest Vegetation Management
Rights-of-Way and Industrial Sites
Physiology, Biology, and Ecology
Invasive Species
Developments from Industry
Developing Technologies
Education and Extension
Soil and Environmental Aspects
Posters
Pasture and Rangeland
Regulatory

The committee discussed the role of the Society. Are we a service or science Society? It was the consensus of the committee that this not be strictly stated and is probably an issue that should not be a major concern to the Board or the Society membership. In its present form and format this Society can and will be a service Society for some attendees and at the same time be a science Society for other attendees. At times, when special symposia are organized, the Society will take on a role of service, but this should not diminish the role as a science Society.

The committee suggests that the Board consider adding the President of the Endowment Foundation to the SWSS Board of Directors as an Ex-Offico member. This appointment should help improve communications between the two organizations who are each trying to improve the Society and the Graduate Program in particular.

The Board is asked to consider ways to include groups interested in invasive species to join, attend, or interact with this Society. Groups such as EPSY should be contacted to inquire about their interest in holding joint meetings with us. Apparently Drs. Bryson and Byrd are familiar with these groups and may help the SWSS contact them.

The Board is asked to devise a mechanism (special committee, volunteer Board member, Newsletter Editor) to contact former Presidents of SWSS and ask them to write brief articles for the Newsletter. These can be issues of the past, current concerns, or simply what is happening in the life of the former President. These members are ageing, but I am sure the SWSS is in their thoughts from time to time.

The last recommendation from this Committee would be a proposal to the Board to amend the SOP's to include the current President to serve on the Long Range Planning Committee. Presently, the five most current Past Presidents serve, but it is the Committee's opinion that better linkages will be formed between this Committee and the Board if the current President also serves on this committee. For example, Jerry Wells will be giving this report as Past President because he is still an active SWSS Board member. Normally, President Wells would not have attended the Long Range Planning Committee meeting because on Sunday afternoon he is still the President and not a Past President.

Budget:
None requested

Acknowledgments:
The Committee appreciates the attendance of President Wells, President Elect Witt, and Vice President Harden at our meeting. Their advice and input were very valuable. It is likely that these three officers by title will be invited to attend future Long Range Planning Committee meetings.

Respectively submitted:
R.L. Ratliff, J.E. Street, L.L. Whatley, R.M. Hayes, D.S. Murray, Chairperson

Committee Number: 112 **Committee Name:** Nomination Committee (standing)

Summary of Progress: Committee members solicited nominations from the membership for the office of Vice President, Board of Directors – Academia, Board of Directors – Industry (a three year term and a one year term to fill the unexpired term of Bob Scott), and Endowment Foundation Trustee. The nominees were ranked and the two highest ranking nominees were selected for placement on the ballot. The Secretary/Treasurer reported the results to the president who notified the successful and unsuccessful candidates. The following candidates were placed on the ballot. The winners are denoted by an asterisk.

Vice President:	David Shaw* Shep Zedaker
Board member for Academia:	Stanley Culpepper Scott Senseman*
Board member for Industry (Three-year term)	Harry Quicke Fred Strachan*
Board member for Industry (One-year term)	Dunk Porterfield* Tom McKemie
Endowment Foundation Trustee:	Phil Banks Randy Ratliff*

Objective for Next Year: Facilitate the nomination of candidates for election of officers and board members.

Recommendation or Request for Board Action: Approve the slate of officers/board members.

Finances (if any) Required: None

Respectfully Submitted:
L.L. Whatley, S.K. Rick, H.D. Skipper, B. Watkins J.A. Kendig, J.L. Griffin, S. Hagood, J.L. Yeiser, G. Groninger, Joe Street, chair

Committee Number: 113 **Committee Name**: Placement Committee

Positions Available:
There was one position posted in the industry notebook.
There were four positions posted in the academia notebook.

Position Desired:
There were twelve (resumes) posted in the industry notebook.
There were seven (resumes or placement forms) posted in the academia notebook.

All four notebooks have been sent Steve Fennimore (WSSA Placement Committee Chair) to be posted at the WSSA annual meeting.

There were 13 references available to help students with cover letters, resumes, and interview skills.

2 references to aide in writing cover letters.
7 references designed to aide in building and strengthening resumes.
4 references designed to build and improve interview skills and to prepare for an interview.

Committee Number: 114 **Committee Name:** Program (STANDING)

Summary of Progress:
The theme of the 2003 annual meeting of the Southern Weed Science Society was "Invasive Weeds: Real or Imagined Threat?" Dr. Steve Dewey of Utah State University presented the keynote address on the theme of the meeting. President Jerry Wells' address to the membership was "What's Left To Do?" The membership was welcomed to Houston by Susan Russell, Harris Co. Extension Director for Texas A&M.

There were 96 posters and 219 papers submitted. The following symposia were presented: Rice Weed Management and Production; Invasive Weeds; Graduate Student Issues, and Glyphosate Resistance/Tolerance in *Conyza canadensis*. The Invasive Weeds Symposium also included a workshop for 45 registrants. The Invasive Species Workshop and the Rice Weed Management and Production symposium were structured to attract new clientele that normally do not attend the SWSS annual meeting. The number of registrants at the meeting will determine the success of this effort. Non-SWSS members were charged the one-day registration fee of $100.00.

The 2003 annual meeting was the first using LCD presentations at all sessions. There were a few 'bumps' along the road to LCD presentations. The deadline for submitting the presentations to the Program Committee Chair was January 15 and about 60% of the presentations were submitted by the due date and about 80% were received by January 17. As of January 22, all but 5 presentations were received. I received 4 phone calls or emails about the "early" deadline and explained the reason of wanting the presentations in my possession to make a CD for each session. Overall, the process of obtaining the presentations was relatively painless although I had numerous comments about "let's do this downloading at the meeting site."

The next Program Chair and the Board should carefully consider the direction in which the Society moves in the future on this issue. The biggest challenge in downloading the presentations at the meeting site is the Monday afternoon sessions. Should we require only the Monday presentations be sent early? I opted not to do that because about one-fourth of those presenting would be treated differently than the others. Of the five presentations not received by January 22, two of them are on Monday afternoon. Not all those presenting papers on Monday arrive on Sunday night, so the issue of downloading Monday afternoon paper s on Monday morning could present problems.

Objective(s) for Next Year:

The Board should carefully consider all aspects of LCD presentations before the call for papers is issued for the 2004 annual meeting.

Recommendation or Request for Board Action:

Explain the process, including the pros and cons of downloading the presentations at the meeting site, to the membership at the Business Meeting.

Finances (in any) Requested:
None.

Respectively submitted;

William W. Witt, Chairperson
T. H. Koger, D. K. Robinson, A. S. Culpepper, S. A. Knowe, D. Montgomery, N. R. Burgos, A. Rankins, J. A. Mills, J. R. Martin, J. H. Massey, T. C. Mueller

Committee Number: 117 **Committee Name:** Research Committee (STANDING)

Summary of Progress:
Reports were prepared and submitted. There were no responses for "Chemical and Physical Properties of New Herbicides".

Objective(s) for Next Year:
Look for ways to improve the response for "Economic Losses Due to Weeds" and the "Weed Survey". The request for information was made, but the response was poor. These reports are used by industry and governmental agencies.

Recommendation or Request for Board Action:

Finances (in any) Requested:

Respectively submitted

Committee member E.P. Webster
Committee member T. M. Webster
Committee member J.D. Byrd
Committee member V. L. Ford
Committee member, Chairperson J.S. Harden

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

Summary of Progress:
The 23rd annual Southern Weed Contest was held August 6, 2002 at the Monsanto Company's Leland Agronomy Center in Leland, Mississippi. Dr. Chris Corkern and the entire staff of the Leland Agronomy 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 the identification of 20 pictures of various agricultural pests.

A total of 37 contestants from 7 universities competed this year. Universities represented were the University of Arkansas, Louisiana State University, University of Georgia, Mississippi State University, North Carolina State University, University of Tennessee, and Texas A&M 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.

Winning teams and individuals were as follows:

Team Awards:

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

Individual Awards:

1st	Brian Ottis, University of Arkansas ($400)	6th	Nathan Buehring, Mississippi State University
2nd	Chris Leon, Louisiana State University ($250)	7th	Erin Stiers, University of Arkansas
3rd	Eric Scherder, University of Arkansas ($100)	8th	Oscar Sparks, University of Arkansas
4th	Jason Bond, University of Arkansas ($75)	9th	Cody Gray, Mississippi State University
5th	Eric Walker, University of Arkansas ($50)	10th	Brooks Blanche, Louisiana State University

Objectives for Next Year: Dr. Tom Mueller and the University of Tennessee will host the 2003 Weed Contest. The Weed Contest Committee would like to encourage every university affiliated with the Southern Weed Science Society to attend the 2003 contest.

Finances (if any) Requested: (None). Sustaining members for 2002 ($2,000+) - BASF, DowAgro, FMC, and Syngenta; (1,000-1,999) - Bell Inc.; ($1-999) - Helena.

Committee Members:

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

E. P. Webster, Chairperson

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

Summary of Progress:
Mike DeFelice continues to work steadily on CD-ROM version 3.0 by reformatting weed photos at the rate of about one per night. The final release of CD-ROM version 3.0 is not expected prior to 2004. Data-base descriptions were completed for the weeds currently in the SWSS Weeds of the United States and Canada CD-ROM and those proposed for Weed ID Guide set # 8. These descriptions are being edited and formatted for the development of an interactive key for mature and immature weeds in CD-ROM version 3.0 of the Weed ID CD-ROM by Mike DeFelice. Weed write-ups and maps for SWSS Weed ID Guide set # 8 were completed and edited and photos are currently being selected for printing during 2003.

Objective(s) for Next Year:
Completed weed write-ups descriptions, distributions, and maps for SWSS Weed ID Guide set # 8 will be matched with photos from the Photo CDs of Arlyn Evans' slides. Work will continue on CD version 3.0 with a target release date of sometime in 2004.

Recommendation or Request for Board Action:
Monies were approved for reprinting set # 2 and printing set # 8 in 2000. Because set # 8 was delayed until the reprinting set # 2, the committee requests that the budgeted monies be rolled over into the 2003 budget.

Finances (in any) Requested:
See above.

Respectively submitted;

C. T. Bryson, Chairperson
M. DeFelice
J. D. Green
M. L. Ketchersid
C. H. Koger
T. M. Webster

Committee: 124b **Committee Name:** Herbicide Resistant Weeds Subcommittee (STANDING)

Summary of Progress:

- Membership Update. Sixteen new members were added to the committee to serve with 10 previously active members. The committee composition now has representatives from every state composing the southern Region and the major agrichemical companies.

- Committee chairmanship. It has been voted by the membership that the committee chair and secretary serve for two years instead of the traditional one year rotation to provide for some continuity in plans and projects.

- The committee's thrust. The committee has discussed taking a proactive stance on herbicide resistance management. The current consensus is to handle management of resistant weeds on a state-by-state basis. Tennessee has taken a step in producing a bulletin about resistance development and the principles of herbicide rotation to forestall the development of resistance.

- Bridging the activities of regional and national resistant plant committees: it has been agreed that the SWSS herbicide resistant plants committee be regularly represented at the national meeting. The committee chair, secretary or a designated representative is charged to attend the WSSA herbicide resistant plants committee meeting every year. Information and issues discussed at the WSSA Herbicide Resistant Plants committee meeting was disseminated by the committee chair to the members. Conversely, relevant issues discussed at the SWSS committee meeting were relayed to the national committee.

- Information dissemination. A paper on testing for herbicide resistance was presented at the 2002 meeting in an attempt to disseminate information on proper testing protocols for confirmation of resistance.

- Status of herbicide-resistant weeds.
  AR - new cases of diclofop-resistant ryegrass continue to appear
  - propanil-resistant barnyardgrass about 10 new cases
  FL - hydrilla resistant to Fluridone is being studied
  KY - smooth pigweed resistant to Pursuit + Exceed in corn production
  LA - the state highway department has developed ALS-resistant wild flowers for use in highway beautification projects.
  TN - horseweed resistant to glyphosate (6X rate) in four counties approximately affecting 10,000 A

- Gene flow management and other issues were discussed.

Objective(s) for Next Year:

Plans on producing educational tools for understanding and diagnosing herbicide-resistant weeds, labeling herbicides by mode of action, and resistance management will be discussed seriously at the 2003 meeting. The committee has invited Reid Smeda, chair of the WSSA herbicide-resistant plants committee to make a short presentation about the mode of action labeling issue and kick off discussion on this matter.

Recommendation or Request for Board Action:

- Yearly update of information on the website regarding chair, secretary, and membership of this committee.

- Include a specific statement in the by-laws as to the function and duties of this committee, rotation of chairmanship, and terms of membership.
- Set aside resource for development of educational materials re herbicide-resistant weeds and protocols for testing of resistance. Coordinate with WSSA on this project.

Finances (in any) Requested:
None. The committee will discuss the issue of producing educational materials during its meeting on January 27, 2003. Depending on the outcome of that discussion, a resolution may be passed to initiate legwork on production of educational materials upon approval by the board.

Respectively submitted;
F. Carey, Valent
J. M . Chandler, TX
J. Collins, Bayer
L. Glasgow, Syngenta
J.D. Green, Ky
J. L. Griffin, LA
R. M. Hayes, TN
D. Heering, Monsanto
J. A. Kendig, MO
T. Klingaman, BASF
J. J. LeClair
G. McDonald, FL
C. Medlin, OK
E. Murdock, SC
R. L. Nichols, Cotton Inc. - Secretary 2001 & 2002; incoming Chair, 2003
D. Reynolds, MS
D. Sanders, LA
R. E. Talbert, AR
A. York, NC
G. Wehtje, AL
J. Wilcut, NC
H. Wilson, VA
T. Wright, Dow Agro
N. Burgos, AR - Chairperson 2001 & and 2002, outgoing Chair, 2003

Committee Number: 125 **COMMITTEE NAME:** Special Continuing Education Units Special Committee

SUMMARY OF PROGRESS:
The Texas Department of Agriculture (TDA) approved the 2002 SWSS conference for continuing education units (CEUs) for licensed pesticide 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. SWSS Business Manager, Robert A. Schmidt set out the CEU materials at the beginning of the SWSS 2002 conference. The completed forms were collected and mailed to TDA.

Thirty five licensed pesticide applicators requested continuing education units (CEU's) from 7 state agencies during the 2002 SWSS conference.

OBJECTIVES FOR NEXT YEAR:

The department will have the CEU materials at the beginning of the SWSS 2003 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, 2003, letters will be sent to states agencies requesting their approval for the 2004 SWSS Conference.

The program for the 2004 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 at this time.

F**INANCES (IF ANY) REQUESTED:**
None at this time.

RESPECTIVELY SUBMITTED:
D. Dippel
J. Snodgrass
A. C. York
R. Rivera (Chairperson)

I WILL NOT BE AVAILABLE TO GIVE MY REPORT:
Regretfully we are not able to have a TDA staff at the directors meeting or on site this year.

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

Summary of Progress:
Membership Committee members were polled as to comments, recommendations, or suggestions that they may have concerning SWSS membership and how to address the decline in membership. The suggestions and comments by the Membership Committee this year mirrored last year's report. It is apparent that the same challenges and issues face us this year and are likely to continue. I have included some rather frank comments, suggestions, and questions in this year's report, in a somewhat distilled version:

1. Is it the goal of membership committee to increase attendance at annual meeting or to increase members? These lines may be blurred. Perhaps the activity, influence, and importance of the society aside from the annual meeting need to be emphasized more strongly.

2. SWSS has evolved primarily into an "applied weed control in southern row crops" conference, with many other areas of weed management playing very minor roles. Some of the areas suggested by members of the committee for enhanced emphasis include: exotic invasive weeds, non-agricultural situations, and weed management systems that are not centered on herbicide use or that minimize herbicide use. Can we cultivate stronger relationships with ecology, botany, environmental, biocontrol, and forestry groups?

3. Change the meeting format. Some suggestions to consider: Develop the meeting around special sessions that focus on hot topics and invite prominent speakers; Schedule the 15 minute papers for one day only, regardless of the length of that day; Shorten the meeting to two days; Schedule Board Meetings and committee meetings before or after the meeting itself, and encourage all committees to complete business before the meeting begins.

4. Schedule meetings at locations that attract people for other purposes. Location is critical.

5. Redo the Weed ID guide into a popular format paperback that might attract gardeners, homeowners, other "non-weed scientists". Enlist a national organization such as Amazon.com to market it.

Finances (if any) Requested:
None

Respectfully Submitted;

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

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

Summary of Progress:
There were no formal Committee meetings during 2002; however, numerous telephone contacts were made primarily outside the Committee. Competition for funding has been keen and we had no success in developing interest among philanthropic organizations.

Considerable time and resource was spent in establishing a graduate student / SWSS Endowment fundraiser centered on hunting and fishing events. Donors were secured for 10 events from Florida to Texas and tickets donated. Concerns over liability caused the SWSS Board of Directors to reconsider their support and the project was cancelled.

Once again with industry support, GLP training will be given in conjunction with the 2003 SWSS Annual Meeting as a fundraiser.

Objective(s) for Next Year:
None

Recommendation or Request for Board Action:
There are no other fund raising events planned at this time, but it is strongly recommended that the graduate student enthusiasm for the raffle project not be lost and be channeled to some other project.

Based on current funding opportunities, it is recommended that this Committee be disbanded and that fund raising be returned to the SWSS Endowment Foundation.

Finances (in any) Requested:
None

Respectively submitted;

J. L. Griffin
J. H. Miller
L. R. Oliver
T. F. Peeper
D. G. Shilling
W. W. Whit
A. D. Worsham
J. R. Bone, Chairperson

Committee Name: Student Representative Report

Summary of Progress:

1. The Graduate Student Organization (GSO) has implemented two new representative positions to our organization which are now recognized by the SWSS. The first position is an Endowment Foundation Representative and the Second is a Student Program Committee Representative position. These two positions will allow the GSO to better serve these two standing committees within the SWSS.

2. Through a combined effort of the GSO and the SWSS, a GSO weblink is now apart of the SWSS homepage.

3. Throughout the year the GSO executive board along with representatives from each University have reorganized and updated our MOP to better reflect the direction of our organization as well as the direction the SWSS is taking.

Objective(s) for Next Year:

The GSO is currently in the process of meeting with the Endowment Foundation to evaluate the possibility of using various organized events, such as raffles, to raise money for the Endowment Foundation. Raffle prizes may include but are not limited to the following: bed and breakfast getaway package, two-day hunting/fishing trips, or a two nights stay at various resorts. Graduate students from each university would be eligible to sell tickets for a particular event. The details for these events, as well as an organized plan will be submitted to the Endowment Foundation as well as the Executive board of the SWSS once details are available in 2003.

Recommendation or Request for Board Action:

The GSO would like to request that the SWSS MOP be updated to reflect the current changes the GSO has implemented into our MOP. These changes would entail that the SWSS past-President, SWSS President, and SWSS Vice-President will serve on the SWSS GSO Selection Committee to develop a slate of officers to be voted upon at our annual meeting each year.

Finances Requested:

The GSO expenses have traditionally been covered by the SWSS Endowment Foundation or the SWSS. Our current expenses should be similar from year to year. The only differences in expenses will be the costs of food/rooms/etc. charged by the hotel each year.

Respectively submitted:

Eric F. Scherder	GSO President
Greg L Steele	GSO Vice-President
Audie S Sciumbato	GSO Secretary

Abstracts & Papers Index

WHAT'S LEFT TO DO? J.W. Wells, Syngenta Crop Protection, Inc., Greensboro, NC.

ABSTRACT

It is a pleasure to be in my hometown of Houston to say a few words about this society. The SWSS has meant a lot to me over the past 20 or so years. It started in 1981 with a terrifying experience, presenting a paper in front of hundreds of people in a room about this size in the Grand Ballroom of the Dallas Hilton. I'm sure many of the people in this room can relate to that experience. Since then, I have met many dear friends here and it has been a real honor to serve as the society's president.

I plan to say a few words about the society's current state of affairs, address this provocative question of running out of things to do, and end with some thoughts on ways I think we can strengthen the society. But first, I intend to do something a little different. I want to tell you a story about the Mamelukes.

The Mamelukes were warriors. They may have been the most fierce and skilled fighters of their time, between the 13th and 16th centuries. Part of their success as warriors was due to their heritage and their training. The Mamelukes were slaves, typically sold into slavery as children or adolescents on the great steppe of Central Asia. This is where the riding horse originated. These young men were taken to Egypt where they were trained to be elite fighters for their caliphs. Their training taught them to be excellent riders. They were experts with the lance, composite bow, and curved saber. Groups of Mamelukes eventually defeated the kinsmen of Genghis Khan and some Mamelukes, under their sultans, ruled unchallenged for centuries. I'll come back to the story of the Mamelukes in a few minutes.

First, I want to acknowledge some of the people who have gone above and beyond to ensure that this society continues to fulfill its primary purpose. The society's purpose is, according to our MOP:

> "*to exchange ideas, experiences, opinions and information, and discuss a plan means of securing more adequate weed control through more and better correlated and coordinated effort on weed research and control by Federal, State, and local public or private agencies*."

That's quite a mouthful, but I think we do a pretty good job of fulfilling our mission. There are two people that deserve special recognition. The first person is Bill Witt, our President-Elect. Dr. Witt is responsible for putting together the program with the help of the section chairs and the Student Program Committee Chair. This is always a difficult job and he has had the added responsibility of coordinating the first meeting to use LCD projectors exclusively. There have been some bumps along the way but the first time is always the hardest. The second person that should be acknowledged is Gary Schwarzlose. He volunteered to take on the daunting task of chairing the Local Arrangements Committee. He and his hand picked committee make all the arrangements for the meeting rooms, meals, spouses program, and the endless list of details that must be worked out in advance of the meeting and occasionally as they arise.

I would also like to send a personal thank you to Joe Street, our immediate Past President for patiently mentoring me during the past three years and trying to keep me out of trouble. Thanks to all the committee chairs and committee members for their work on the various committees and to the SWSS Board who administer and guide the society. I have really enjoyed serving on the Board and would highly recommend the experience to anyone. The committee members and board members are all listed in the program. Thanks also to Bob Schmidt, our Business Manager. He may be the only paid member on this list but his devotion and professionalism are always appreciated. Finally, thanks to all the presenters and the graduate student contest judges for their efforts.

So, how is this society of ours faring? As Tom Mueller, our Treasurer has already stated, the society is on strong financial footing. This years program is also very strong and I'll address this in more detail. The annual meeting program is one of the most important benefits of society membership. It fulfills two very important purposes. It provides a forum for exchanging information and ideas and it gives students the additional opportunity to gain experience in presenting research results. I think many of the other services provided by the society are also as strong.

One of the most important functions of the society is the education opportunity and exposure it offers students. Not only here at the annual meeting, but also in the field at the annual weed contest. I had the opportunity to participate in the first two "weed meets" as they were called then. Both were held in Albany, Georgia and it is an experience I will never forget. Students also have the opportunity to serve in the Graduate Student Organization. Eric Scherder has done an excellent job representing the students this past year. The importance of student involvement and development is shared to the extent that the Endowment Foundation was developed to help provide funding to cover some graduate student expenses. You can contribute to the Endowment Foundation directly or by participating in the events that benefit this fund. This year they include the silent auction for two watercolor prints made possible by Charles Bryson's generous donation of his work and the GLP Workshop. Proceeds from the workshop continue to be an important contributor to the fund. Ray Smith, in particular, should be acknowledged for his efforts to coordinate and promote the workshop.

The society also makes several publications available to weed scientists and others interested in weeds and native plants. In particular, the *Weed Identification Guide* and the *Forestry Plants of the Southeast and Their Wildlife Uses*, both available in book and CD format are outstanding weed science resources. They have also generated working capital for the society that can be used on other projects. If you have not ordered either of these or insert Set 7 of the *Weed ID Guide,* doing so would benefit yourself and the society. Insert set 8 should be available later this year. The *Proceedings of the Southern Weed Science Society* is also an important resource. The change to CD format makes it possible to put multiple years on one CD and adds search capability.

The society also facilitates important interactions with other groups. Rob Hedburg's interface with legislative policy makers that affect weed science is an excellent example. The societies relationship with CAST and other groups also help us make sure our point of view is clearly presented. This society even offers us opportunity to work with groups we don't always see eye-to-eye with, what Doug Worsham called the "seemingly unholy" alliances. Any opportunity to exchange information and concerns with such organizations should be encouraged where possible. We should be proud when we look at the fruits of a lot of hard work to build and keep this society strong.

There is a troublesome trend, however. SWSS membership has had a declining trend for many years now. Over the past 10 years society membership has declined from around 900 to around 600 members. When I joined the SWSS in 1980 membership was near its peak. At that time the annual meeting was attended by between 800 and 1,000 members. Over the past 10 years meeting attendance has dropped from around 700 members to around 450 members. We are all aware of the decline in membership and meeting attendance. The situation has been addressed in the last several presidential addresses. One interesting aspect of the annual meeting statistics is that the number of presentations, papers and posters, not including symposia has remained almost constant during the same 10-year period. While attended by fewer people, the society has continued to provide a consistent program. I don't know how long we can keep this up if the annual meeting attendance continues to fall.

Let's go back to the Mamelukes. During the time that firearms were developed, the Mamelukes refused to adopt them. Their devotion to their traditional ways of fighting on horseback made them resistant to change. Kurtbay, a Mameluke chieftan, wrote the following:

> *"Hear my words and listen to them, so that you and others will know that amongst us are the horsemen of destiny and red death. A single one of us can defeat your whole army. If you do not believe it, you may try, only please order your army to stop shooting with firearms. You have here with you 200,000 soldiers of all races. Remain in your place and array your army in battle order. Only three of us will come out against you… you will see with your own eyes the feats performed by these three… You have patched up an army from all parts of the world: Christians, Greeks, and others, and you have brought with you this contrivance artfully devised… The contrivance is that musket which, even if a <so and so> were to fire it, would hold up such and such a number of men. And woe to thee! How darest thou shoot with firearms…"*

As John Keegan, the author of a book describing these events says, "The outcome was predictable." I won't go into the gory details of the Mamelukes demise, but, I worry that if we don't make adaptations now to change our declining membership trend we could end up longing for the good old days like the Mamelukes. I'll talk some about the kind of adaptations I think we can make to stabilize and grow our membership, but first I would like to examine what might be causing the decline.

The simple answer is that there are not as many jobs in some areas traditionally covered at this meeting as there used to be. Budgets are also tighter and former members may not have renewed their membership if they know they will not be able to attend the annual meeting. Why this has occurred is more difficult to determine. Not all sectors are affected equally, but we all recognize that the number of jobs has declined in both public and private institutions working in the areas of chemical weed control. Factors like a difficult economy, decreases in government support, free trade and globalization with other countries finding ways to get their produce to the US markets, and simple supply/demand economics all contribute. These relate somewhat to what I think Randy Ratliff was talking about when he said a couple of years ago that "The biggest threat to the future of the SWSS may be the general decline in American agriculture." These are issues better suited for an economist to wrestle with, not a weed scientist, at least not this weed scientist. It's real and it doesn't seem like it's going to get much better real soon. Finally, could it be that we are victims of our own success? Have we solved so many of the problems caused by weeds that we have to ask, "What's Left to Do?"

The title "What's left to Do" was intended to be provocative. It actually reflects on the successes that weed scientists have had in the last 60 some odd years in managing weeds. These advances allow us to produce the food and fiber we need and improve our quality of life. I thought about giving a short review of the breakthroughs in weed management but this group knows the story so I won't launch into it. Nor will I hold you in suspense any longer; there is plenty of work left to do as our program indicates. There is even work left to do relating to weed science that is not well represented at this meeting. This includes areas of new research resulting from advances in technology and not so new areas that for some reason have never been well represented in this society. Identifying these areas and offering the services of society membership and representation to those involved could ensure that we can continue to provide a consistent program and ensure we are changing with the world around us.

What's a little surprising is that the kind of research we do and report on at this meeting has not really changed as much as you might think.

To examine how what we do has changed over the last 10 years, I went back and looked at the program from the 1993 SWSS meeting which was held in Charlotte, NC. Most of the papers presented in both 1993 and 2003 deal with different aspects of chemical weed control on various use sites. They include work on weed efficacy, crop tolerance, herbicide compatibility in solution, and herbicide interactions with other pesticides. This type of research has been the backbone of the SWSS program for many years. The distribution of presentations by use site *has* changed. Papers on chemical weed control in soybean have dropped significantly. This is not surprising considering the widespread acceptance of glyphosate resistant soybean seed and dominance of glyphosate for weed control. The use of chemical weed control in cotton and related aspects were the most reported on topics in both years and the number of papers presented both years is similar. Chemical weed control in peanut, forestry, and corn is also well represented in both years' program. There is actually an increase in the number of papers on chemical weed control in turf, rice and pasture and rangeland. Other use sites like sugarcane, vegetables, and sorghum are reported on less frequently but the number of presentations is about the same for 1993 and 2003. So, again papers on the use of herbicides for weed control continue to dominate the meeting program with some shifts in the use sites. Most of the people who do this type of research in the Southern Region are current members of the society.

What about topics like weed interference with crops and non-chemical weed control (i.e. biological weed control, usually with fungi, allelopathy, or use of cover crops)? I counted about 10 papers on weed interference in 1993 and the same number this year. The same is true for papers on non-chemical weed control, about 10 each year. Believe it or not, there as many papers related to invasive plants in the 1993 proceedings as there are in this years program which has the topic as its theme. The number of plant physiology papers is also about the same with several of these relating to weed resistance.

There has been a recent significant increase in the number of presentations on weed biology and crop biology. These are presentations related to things like germination, morphology, and environmental effects. There has also been a significant increase in "evolving technology" based aspects of weed management, including remote sensing, GPS applications and weed mapping. I think that the people doing this type of research in our region are well represented in the society. As some of the new technologies develop and expand, there is some opportunity for increasing membership.

The real opportunity for reversing the trend of our declining membership however is to broaden our horizon. There are aspects of weed management that aren't well represented at this meeting. We might disagree on what areas are not represented well or what new areas should be considered. A few that I would suggest are: 1) Environmental Monitoring of Pesticides, we see an occasional paper here on environmental herbicide monitoring but there is obviously a lot more work being done. Federal and state agencies, public and private institutions, and private companies operating in our region might be served by incorporating their findings into our meetings. 2) Organic Weed Control, while we all have opinions on the subject, there is a demand for organically grown produce. Think about that one but remember the Mamelukes. 3) Regulatory Aspects, this is one I know a little more about. We have a few regulatory folks in the society and an occasional paper in the program. Enforcement of the Endangered Species Act, reassessing inert ingredients, and the evolving EPA priority system all have significant effects on weed management. The people who work in these areas have a place in our society. I list these as examples. You may be thinking of additional ideas.

The important thing is to bring ideas forward and act on them. John Harden will be our next program chair. I encourage you to talk to him about sponsoring a symposium or workshop, especially one that will broaden the societies horizon while staying within our mission. If you come to John with a *new* area for the society, he would likely also consult with the board and long range planning committee before deciding to include it in the next program. If approved, the sponsor (with any help he/she can muster) would need to contact potential speakers and promote the symposium to those interested. This will require some time, but getting SWSS members to serve has never been difficult in this society. My challenge to you today is to consider this message, promote SWSS to potential new members, and remember the Mamelukes.

Finally, I would like to thank Dr. Morris Merkle, Dr. Phil Banks, Dr. John Abernathy and Dr. Jack Gipson for training me to be a weed scientist and Mr. Tom Holt, Dr. Randy Ratliff, Dr. Mike Johnson and Dr. Greg Watson for allowing me to have a fulfilling career.

SECTION I. WEED MANAGEMENT IN AGRONOMIC CROPS

A BELTWIDE REGIONAL ECONOMIC ASSESSMENT OF WEED MANAGEMENT SYSTEMS IN NON-TRANSGENIC AND TRANSGENIC COTTON. J.W. Wilcut, R.M. Hayes, R.L. Nichols, S.B. Clewis, J. Summerlin, D.K. Miller, A. Kendig, J.M. Chandler, D.C. Bridges, B. Brecke, C.E. Snipes, and S.M. Brown; North Carolina State University, Raleigh, NC; University of Tennessee; Cotton Incorporated; Louisiana State University; University of Missouri; Texas A&M University; University of Georgia; University of Florida; and Mississippi State University.

ABSTRACT

Experiments were conducted in eight states at 23 locations from 1997 through 1999 to evaluate weed management, crop tolerance, cotton lint yield, fiber quality, and net returns to land and management in non-transgenic and transgenic herbicide-resistant cotton varieties. The transgenic cotton varieties included Buctril- and Roundup Ultra-resistant varieties. Weed management systems evaluated different combinations of Treflan preplant incorporated (PPI), Cotoran preemergence (PRE), Buctril postemergence (POST), Roundup Ultra POST, Staple POST, Bladex plus MSMA late-postemergence directed (LAYBY), and Cotoran plus MSMA early postemergence-directed (EPDS). Common cocklebur, common ragweed, entireleaf morningglory, ivyleaf morningglory, large crabgrass, pitted morningglory, smooth pigweed, and velvetleaf were controlled at least 90% with only minor differences among weed management systems. Sicklepod was controlled 91% or better with all Roundup Ultra systems while the Staple and Buctril system controlled less. Common lambsquarters, goosegrass, pitted morningglory and prickly sida were controlled greater than 90% with all weed management systems except the Roundup Ultra-only POST system. The Buctril system controlled less Texas panicum and johnsongrass than the other systems. The yields of transgenic and non-transgenic cotton varieties kept weed free were similar and there were only minor differences in yields from cotton in non-transgenic systems and Roundup Ultra systems. The Buctril system yielded similarly to three of four Roundup Ultra systems and with one of two non-transgenic systems. There were no differences in net economic returns among the non-transgenic and Roundup Ultra weed management systems. The Buctril system cotton yielded less than Roundup Ultra-resistant cotton treated with Treflan PPI and Roundup Ultra POST. These data show that there are a number of effective weed management systems for optimizing high yields and net returns.

TWO PASS WEED CONTROL IN MISSOURI COTTON PRODUCTION. R.M. Cobill, J.A. Kendig, B.A. Hinklin, and P.M. Ezell. University of Missouri - Delta Research and Extension Center, Portageville, MO.

ABSTRACT

Field studies were conducted to examine the potential of a two pass weed control program in Missouri cotton production. Studies showed that a three way tank mix of glyphosate+S-metolachlor+propazine applied at the cotyledon (COTYL) or over-the-top at the 3-5 leaf stage (OT3-5) combined with preemergence or post-directed herbicide applications provided season long weed control comparable to that from a three pass program.

Introduction

Weed control with conventional cotton varieties commonly requires multiple herbicide applications incorporating several different herbicides for broad spectrum control. Additional passes for cultivation may also be necessary for season long weed control. Roundup Ready cotton cultivars provide for the use of glyphosate in-season. The ability to use glyphosate as part of an in-season herbicide program reduces the number of herbicides necessary for broad spectrum control, however, multiple passes are still necessary to obtain season long weed control.

Incorporation of residual herbicides into a herbicide program with glyphosate may provide season long weed control in two passes. Previous research has indicated that a tank mix of glyphosate, S-metolachlor and propazine might provide broad spectrum, residual control of common cotton weed species. The objectives of this research are: 1) to determine the best herbicide tank mix combination(s) with glyphosate for a two pass program, specifically examining the use of S-metolachlor and propazine; 2) to determine the best application timings for adequate control, 3) to examine post-directed herbicide options for a two pass program.

Experimental Approach

Field studies were conducted in 2000, 2001 and 2002 at Portageville and Clarkton, MO on a Tiptonville fine sandy loam and Boskett sandy loam soils respectively. Control of large crabgrass (*Digitaria sanguinalis*) and goosegrass (*Eleusine indica*), collectively illustrated as annual grasses, Palmer amaranth (*Amaranthus palmerii*), common cocklebur (*Xanthium strumarium*) ivyleaf and entireleaf morningglory (*Ipomoea hederacea* and *hederacea* var. *integruiscula*), and puncturevine (*Tribulus terrestris*) were evaluated.

Preliminary field studies were conducted in 2000 and 2001 to examine the feasibility of a two pass weed control program in Roundup Ready cotton and to evaluate glyphosate tank mixtures with S-metolachlor and propazine. These studies examined two way combinations of preemergence(PRE), cotyledon(COTYL), over-the-top applications at the 3-5 leaf stage(OT 3-5) and post-directed layby(LAYBY) applications. The use of glyphosate with and without residual herbicides was also examined. Preemergence applications included 1.0 lb ai/A pendimethalin (Prowl) + 1.25 lb ai/A fluometuron (Cotoran). Treatments applied at the COTYL and OT 3-5 included 0.75 lb ai/A glyphosate alone, 0.75 lb ai/A glyphosate + 1.0 lb ai/A S-metolachlor (Dual II Magnum), 0.75 lb ai/A glyphosate + 1 lb ai/A propazine (Milo Pro), and 0.75 lb ai/A glyphosate + 1.0 lb ai/A S-metolachlor + 1 lb ai/A propazine. Post-directed applications consisted of 0.375 lb ai/A fomesafen (Reflex) + 2.0 lb ai/A MSMA at LAYBY. Standard three pass herbicide programs were included for comparison. Three pass treatments included 1.0 lb ai/A pendimethalin + 1.25 lb ai/A fluometuron PRE followed by (fb) 1.0 lb ai/A fluometuron + 2.0 lb ai/A MSMA DIR 3-5 fb 0.375 lb ai/A fomesafen + 2.0 lb ai/A MSMA LAYBY and 1.0 lb ai/A pendimethalin + 1.25 lb ai/A fluometuron PRE fb 0.0625 lb ai/A pyrithiobac (Staple) OT 3-5 fb 0.375 lb ai/A fomesafen + 2.0 lb ai/A MSMA LAYBY.

Research was continued in 2002 with treatments based on results of the preliminary studies. These studies continued to examine application timings but also evaluated post-directed options. The rates of fluometuron, pendimethalin, glyphosate, S-metolachlor, propazine and MSMA were the same as in initial studies. Post-directed treatments were 1.0 lb ai/A fluometuron + MSMA or 0.25 lb ai/A fomesafen + MSMA. Standard three pass herbicide programs were 0.75 lb ai/A glyphosate alone at COTYL and OT 3-5 fb fluometuron or fomesafen + MSMA DIR 8-10, 1.25 lb ai/A fluometuron + 1.0 lb ai/A pendimethalin PRE fb 0.75 lb ai/A glyphosate OT 3-5 fb 1.0 lb ai/A fluometuron or 0.25 lb ai/A fomesafen + 2.0 lb ai/A MSMA DIR 8-10, and 1.25 lb ai/A fluometuron + 1.0 lb ai/A pendimethalin PRE fb 0.75 lb ai/A glyphosate + 1.0 lb ai/A S-metolachlor OT 3-5 fb 0.25 lb ai/A fomesafen + 2.0 lb ai/A MSMA DIR 8-10. Standard weed science methodology was used. Herbicide applications were made with a compressed CO_2 backpack or a tractor mounted compressed CO_2 post-direct sprayer. Application volume was 20 GPA. Studies were arranged in a randomized complete block with four replications.

Results and Discussion

Preliminary studies showed that the best two pass treatments tended to be those incorporating a three way mix of glyphosate + S-metolachlor + propazine postemergence and these treatments were comparable to the standard three pass treatment (Table 1). Ttreatments incorporating postemergence glyphosate alone generally exhibited the poorest control. Annual grass control was similar across two pass treatments, ranging from 90 to 94%, and was similar to three pass treatments, 91 to 95%. Common cocklebur control ranged from 86 to 95% with two pass treatments and 89 to 95% with three pass treatments. Palmer amaranth control with the two pass treatments ranged from 85 to 92% and 89 to 92% with three pass treatments. Seed cotton yield ranged from 2230 to 2974 lbs/A with the two pass treatments and 2230 to 3450 with three pass treatments.

Summary

Overall weed control in 2002 with two pass treatments ranged from 85 to 95% across weed species (Table 2). The control exhibited by this system was comparable to control achieved by three pass comparisons, 86 to 95% across weed species. Results were similar with yield. Post-directed use of either fluometuron or fomesafen also provided similar control in post-directed treatments.

Acknowledgment

This research was funded, in part, by the Cotton Incorporated CORE program.

Table 1: Preliminary two pass vs. three pass weed control and yield from Portageville and Clarkton, MO.

Treatment			Weed Control					Yield
Herbicide	Rate	Timing[1]	Annual grasses	Palmer amaranth	Common cocklebur	Mornging glory	Puncture-vine	seed cotton lbs/A
	lb ai/A		----------% control----------					
pendimethalin fluometuron glyphosate	1 1.25 0.75	PRE PRE OT 3-5	76	61	33	30	98	924
pendimethalin fluometuron glyphosate propazine	1.0 1.25 0.75 1.0	PRE PRE OT 3-5 OT 3-5	96	97	81	90	96	1011
pendimethalin fluometuron glyphosate S-metolachlor	1.0 1.25 0.75 1.0	PRE PRE OT 3-5 OT 3-5	99	98	59	65	99	1176
pendimethalin fluometuron glyphosate S-metolachlor propazine	1.0 1.25 0.75 1.0 1.0	PRE PRE OT 3-5 OT 3-5 OT 3-5	99	98	83	89	98	1133
glyphosate fomesafen MSMA	0.75 0.375 2.0	COTLY LAYBY LAYBY	66	41	76	84	74	836
glyphosate propazine fomesafen MSMA	0.75 1.0 0.375 2.0	COTYL COTYL LAYBY LAYBY	74	97	85	88	100	758
glyphosate S-metolachlor fomesafen MSMA	0.75 1.0 0.375 2.0	COTYL COTYL LAYBY LAYBY	93	86	76	75	85	1133
glyphosate S-metolachlor propazine fomesafen MSMA	0.75 1.0 1.0 0.375 2.0	COTYL COTYL COTYL LAYBY LAYBY	98	99	63	71	100	1350
glyphosate fomesafen MSMA	0.75 0.375 2.0	OT 3-5 LAYBY LAYBY	79	77	83	88	99	1011
glyphosate propazine fomesafen MSMA	0.75 1.0 0.375 2.0	OT 3-5 OT 3-5 LAYBY LAYBY	85	95	86	91	100	1176
glyphosate S-metolachlor fomesafen MSMA	0.75 1.0 0.375 2.0	OT 3-5 OT 3-5 LAYBY LAYBY	92	66	89	91	100	1150
glyphosate S-metolachlor propazine fomesafen MSMA	0.75 1.0 1.0 0.375 2.0	OT 3-5 OT 3-5 OT 3-5 LAYBY LAYBY	96	100	93	100	100	1036

pendimethalin fluometuron fluometuron MSMA flomesafen MSMA	1.0 1.25 1.0 2.0 0.375 2.0	PRE PRE DIR 3-5 DIR 3-5 LAYBY LAYBY	98	94	95	96	100	871
pendimethalin fluometuron pyrithiobac fomesafen MSMA	1.0 1.25 0.0625 0.375 2.0	PRE PRE OT 3-5 LAYBY LAYBY	96	81	88	89	100	1175
glyphosate glyphosate	0.75 0.75	OT 3-5 LAYBY	93	93	95	95	100	1115
fluometuron glyphosate glyphosate	1.25 0.75 0.75	PRE OT 3-5 LAYBY	96	85	85	78	100	1377
glyphosate glyphosate glyphosate	0.75 0.75 0.75	COTYL OT 3-5 LAYBY	92	90	91	89	100	1228
LSD(.05)			16	33	27	21	18	551

1 - Application timings: PRE, preemergence, application following planting; COTYL, application made when cotton is at the cotyledon growth stage, OT 3-5, over-the-top at the 3-5 leaf stage; DIR 3-5, post-directed at the 3-5 leaf stage, LAYBY, post-directed when cotton is 8-12 inches tall.

Treatment			Weed Control			Yield
Herbicides	Rate	Application timing[1]	Annual grasses	Common cocklebur	Palmer amaranth	Seed cotton lbs/A
pendimethalin fluometuron glyphosate S-metolachlor propazine	1.0 1.0 0.75 0.96 1.0	PRE PRE COTYL COTYL COTYL	90	86	85	2387
pendimethalin fluometuron glyphosate S-metolachlor propazine	1.0 1.0 0.75 0.96 1.0	PRE PRE OT 3-5 OT3-5 OT3-5	93	90	88	2230
glyphosate S-metolachlor propazine fomesafen MSMA	0.75 0.96 1.0 0.25 2.0	COTYL COTYL COTYL DIR 8-10 DIR 8-10	92	91	91	2736
glyphosate S-metolachlor propazine fomesafen MSMA	0.75 0.96 1.0 0.25 2.0	OT 3-5 OT 3-5 OT 3-5 DIR 8-10 DIR 8-10	94	95	92	2770
glyphosate S-metolachlor propazine fluometuron MSMA	0.75 0.96 1.0 1.0 2.0	COTYL COTYL COTYL DIR 8-10 DIR 8-10	94	93	90	2974
glyphosate S-metolachlor propazine fluometuron MSMA	0.75 0.96 1.0 1.0 2.0	OT 3-5 OT 3-5 OT 3-5 DIR 8-10 DIR 8-10	94	94	93	2718
glyphosate glyphosate glyphosate	0.75 0.75 0.75	COTYL OT 3-5 DIR 8-10	93	95	91	2230
glyphosate glyphosate fomesafen MSMA	0.75 0.75 0.25 2.0	COTYL OT 3-5 DIR 8-10 DIR 8-10	91	95	89	2649
glyphosate glyphosate fluometuron MSMA	0.75 0.75 1.0 2.0	COTYL OT 3-5 DIR 8-10 DIR 8-10	91	94	86	3101
pendimethalin fluometuron glyphosate fomesafen MSMA	1.0 1.0 0.75 0.25 2.0	PRE PRE OT 3-5 DIR 8-10 DIR 8-10	94	95	89	2753
pendimethalin fluometuron glyphosate fluometuron MSMA	1.0 1.0 0.75 1.0 2.0	PRE PRE OT 3-5 DIR 8-10 DIR 8-10	92	95	92	3450

glyphosate glyphosate S-metolachlor fomesafen MSMA	0.75 0.75 0.96 0.25 2.0	COTYL OT 3-5 OT 3-5 DIR 8-10 DIR 8-10	95	95	92	2457
pendimethalin glyphosate diuron MSMA	1.0 0.75 1.0 2.0	PRE OT 3-5 DIR 8-10 DIR 8-10	93	95	92	2579
LSD(0.05)			4	3	12	1365

1 - Application timings: PRE, preemergence, application following planting; COTYL, application made when cotton is at the cotyledon growth stage, OT 3-5, over-the-top at the 3-5 leaf stage; DIR 3-5, post-directed at the 3-5 leaf stage, LAYBY, post-directed when cotton is 8-12 inches tall.

SOUTH CAROLINA RESULTS: WEED CONTROL IN GLUFOSINATE-TOLERANT COTTON. E.C. Murdock, M.A. Jones, J.E. Toler, and R.F. Graham.

ABSTRACT

Crop tolerance and weed control in glufosinate-tolerant cotton were evaluated in four field trials established at the Pee Dee Research and Education Center, Florence, SC, and at an on-farm site in Horry County, SC. No crop injury was observed with up to three applications of Liberty. In Horry County, one application of Liberty at 24- to 40-oz/ac applied postemergence (POST) to 4-leaf cotton and weeds that were 2- to 4-inches tall controlled entireleaf morningglory, sicklepod, Florida beggarweed, and common lambsquarters 90 to 100% nine weeks after planting (WAP). Two POST applications of Liberty with and without a preemergence herbicide (Prowl, Cotoran, Prowl & Cotoran) provided 99 to 100% control of the broadleaf weeds present. The use of a PRE herbicide was not necessary to attain complete weed control.

In Florence, Liberty was applied Post to 4-leaf cotton and to weeds that were 2- to 3-inches (southern crabgrass, sicklepod, entireleaf morningglory) and 4- to 6-inches (Palmer amaranth) tall. When evaluated 1 week after application, southern crabgrass control was 85 to 96% with a single application of Liberty at 24- to 40-oz/ac. However, most of the southern crabgrass exhibited rapid recovery and regrowth, and poor control (7 to 15%) was observed 16 WAP. Two POST applications of liberty at 32 oz/ac controlled southern crabgrass 99% 8 WAP, but control dropped to 72% 16 WAP. However, PRE application of Prowl (2.4 pt/ac), Cotoran (1.25 Qt/ac), or Prowl + Cotoran (2.4 pt + 1.25 qt/ac) followed by two POST applications of Liberty controlled southern crabgrass 100%.

Palmer amaranth control with a single POST application of Liberty at 24- to 40-oz/ac was generally inadequate and ranged from 47 to 77% 16 WAP. However, when Liberty was applied early-POST followed by mid-POST and a PRE herbicide was used. Palmer amaranth control was excellent (96 to 100%)

One POST application of Liberty controlled sicklepod and entireleaf morningglory 83 to 97% and 67 to 97%, respectively. Two POST applications of Liberty with and without a PRE herbicide controlled sicklepod 93 to 100% and entireleaf morningglory 97 to 100% 16 WAP.

NOTE: South Carolina was declared in an extreme-to-severe drought throughout most of the 2002 growing season. Subsequently, there was little or no weed emergence following the early-POST herbicide applications.

TOLERANCE AND WEED MANAGEMENT IN ROUNDUP READY FLEX COTTON.
J.W. Keeling, T.A. Baughman J.D. Everitt, L.L. Lyon, and P.A. Dotray; Texas Agricultural Experiment Station, Lubbock and Texas Cooperative Extension, Vernon.

ABSTRACT

The development of Roundup Ready Flex cotton varieties with a lengthened postemergence-topical (POST) application window would provide improved flexibility to treat past the 4-leaf growth stage when wet or windy conditions have prevented earlier treatments. In addition, more consistent control of tougher weeds including perennials, morningglory spp., and Russian thistle could be achieved with higher glyphosate rates.

Field experiments were conducted at Lubbock and Munday, Texas in 2002 to evaluate the effect of transgene insertion on cotton growth, fruit retention, and yield in populations of new Roundup Ready events. The effects of topical glyphosate applications at sequential timings and rates on cotton growth, fruit retention, and yield were determined. Weed control in Roundup Ready Flex cotton with different timings and rates of glyphosate was also compared. Plants were box mapped and boll number and weight by fruiting position was determined.

Three Roundup Ready Flex events were compared to the current Roundup Ready technology (1445) at both locations. Trifluralin was applied preplant incorporated, and plots were maintained weed-free using cultivation and hand-hoeing. Glyphosate was applied POST at four growth stages (3-leaf, 6-leaf, 10-leaf, and 14-leaf cotton) and at two rates (1.5 and 2.25 lb ae/A). These rates would be two and three times the currently used rate in Roundup Ready cotton. Stand counts and visual injury ratings made during the growing season showed no visible injury from any application rate or timing at Lubbock and slight leaf necrosis at Munday (most likely from carrier burn).

At Lubbock, bur cotton yields ranged from 1750 to 2000 lb/A, with similar yields produced by the three Roundup Ready Flex events and the current technology when no glyphosate was applied. Glyphosate applied POST reduced yields of the current Roundup Ready technology 50 to 75%. Yields of the Roundup Ready Flex events were not affected by either glyphosate rate. Mapping data showed reduced boll number and boll weights in the 1445 line, with no late season yield compensation. Similar fruiting patterns in the three Roundup Ready Flex events were observed in treated and untreated plots. At Munday, glyphosate POST reduced yields 15 to 25% when applied to the current Roundup Ready technology, but did not affect the yields of the three Roundup Ready Flex events. In the weed control test, use of higher glyphosate rates improved silverleaf nightshade (*Solanum elaeagnifolium*) control, but were not necessary for effective Palmer amaranth (*Amaranthus palmeri*) or devil's-claw (*Proboscidea louisianica*) control.

INFLUENCE OF LATE GLYPHOSATE APPLICATIONS IN NARROW ROW COTTON. S.P. Nichols and C.E. Snipes. Mississippi State University, Delta Research and Extension Center, Stoneville, MS.

ABSTRACT

Roundup (glyphosate) treatments to Roundup-Ready (RR) cotton (*Gossypium hirsutum* L.) have been associated with glyphosate accumulation in plant reproductive structures resulting in poor pollination and increased boll abortion. Previous studies have indicated that lint yield can be negatively affected when topical applications of Roundup are applied after the labeled timing. The Roundup Ready cotton label specifies a maximum glyphosate rate of 0.75 lb ae/A and that topical applications can be made through the 4 true-leaf growth stage. The ability to topically apply Roundup after the 4 true-leaf stage would enhance production flexibility in weed control.

Narrow row cotton, 15-in. rows or narrower, typically sets fewer bolls per plant and the first boll is set at a higher position when compared to conventional row spacings. Field studies were conducted at the Delta Research and Extension Center in Stoneville, MS in 2001 and 2002 to evaluate the use of glyphosate beyond label restrictions in narrow row cotton. Data collected included lint yield, gin turnout, plant mapping, and HVI fiber quality. Deltapine 436 RR and Stoneville 4892 BR were evaluated in 15-in. row spacing. Roundup Ultra was applied at 0.75 lb ae/A at four different stages of plant growth as treatments at the 3, 6, 9, and 12-node stage. Untreated plots for both varieties were also included in the study.

No differences in lint yield were determined for all treatments up to the 6-node stage for Stoneville 4892 BR and up to the 9-node stage for Deltapine 436 RR. Glyphosate applications had no effect on gin turnout for either variety. Plant mapping data at maturity showed differences in lowest node with a first position boll. The lowest first position boll was 7.6, 8.1, 10.0, 9.3, and 8.1 for untreated, 3, 6, 9, and 12-node applications, respectively. These data indicate Deltapine 436 RR and Stoneville 4892 BR possess significant tolerance to “off-label” timings of glyphosate applications in narrow row production. Yield reductions can result from such applications when late season environmental conditions are not favorable for boll production and retention, thus limiting fruit compensation to minimize early season losses. HVI fiber quality has not been evaluated.

GLYPHOSATE TANK-MIXES FOR LAYBY WEED CONTROL IN COTTON. W.K. Vencill; Department of Crop and Soil Sciences, University of Georgia, Athens, GA 30602-7272.

ABSTRACT

Field studies were conducted to examine several glyphosate tank mix combinations to broaden the weed control spectrum and provide better residual weed control. Studies were established in Athens and Plains, GA in 2002 using standard small-plot technique examine the following tank-mix combinations with glyphosate (840 g ai/ha) applied at layby application: diuron (600 & 840 g ai/ha); carfentrazone (4 g ai/ha); diclosulam (24 g ai/ha); cloransulam (18 g ai/ha); CGA 362622 (6-11 g ai/ha); halosulfuron (18 g ai/ha); flumioxazin (35 & 70 g ai/ha); flufenapyr (18 g ai/ha); amicarbazone (100 g ai/ha) and oxyfluorfen (140 g ai/ha). None of the tank-mixes caused more than 15% cotton injury 7 or 30 days after treatment. All treatments provided >95% Texas Panicum, Palmer amaranth, and sicklepod control 7 and 30 DAT. All treatments provided >95% tall morning-glory control 7 DAT, but by 30 DAT, flufenapyr and diuron were 85 and 88%, respectively. All treatments except diuron and glyphosate alone provided >90% yellow nutsedge control. Seed cotton yields did not significantly differ at either location.

GLYPHOSATE- AND TRIFLOXYSULFURON-BASED WEED CONTROL PROGRAMS IN ROUNDUP READY® COTTON. O.C. Sparks, J.L. Barrentine, and M.R. McClelland; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville.

ABSTRACT

Studies were conducted at the Cotton Branch Experiment Station, Marianna, AR, to evaluate the advantage of early POST combinations of glyphosate plus metolachlor followed by trifloxsulfuron for weed control in Roundup Ready cotton. The study design was a randomized complete block with four replications. Experimental units were 12.7- by 40-ft plots, overseeded with seed of Palmer amaranth, pitted morningglory, and large crabgrass. There were also natural populations of prickly sida and goosegrass. Following incorporation of weed seed, Paymaster cultivar 1218 BR was planted at a rate of 60,000 seed acre^{-1} accompanied by an in-furrow application of Temik® at 4 lb acre^{-1}. Herbicide treatments consisted of a postemergence (POST) application of glyphosate at 0.75 lb acid equivalent (ae) acre^{-1} to 1- to 2-leaf cotton followed by (fb) POST or postdirected (PDIR) glyphosate applications at 0.75 lb ae acre^{-1} to 4- or 7- to 8-leaf cotton; trifloxysulfuron applied POST at 0.0071 lb ai acre^{-1} to 5- to 6- or 7- to 8-leaf cotton, or trifloxysulfuron applied post-directed at 0.0094 lb ai acre^{-1} to 7- to 8-leaf cotton. Other herbicide treatments included applications of glyphosate at 0.75 lb ae acre^{-1} plus metolachlor at 0.95 lb ai acre^{-1} applied to 1- to 2-leaf cotton alone, or fb no follow-up program; trifloxysulfuron applied POST at 0.0071 lb ai acre $^{-1}$ to 5- to 6- or 7- to 8-leaf cotton or trifloxysulfuron applied post-directed at 0.0094 lb ai acre^{-1} to 7- to 8-leaf cotton. Data collected consisted of weed control, crop injury, and seed-cotton yield. All data except weed control from the untreated control were subjected to analysis of variance, and means were separated using Fisher's Protected LSD at the 0.05 level of significance.

In general, applications of glyphosate to 1- to 2- fb 4-leaf cotton did not provide adequate control of weed species evaluated due to late-season emergence of weeds. The later application of glyphosate controlled these later flushes and allowed for the crop canopy to retard any later weed emergence. Applications of glyphosate plus metolachlor increased the level of weed control obtained from later applications of trifloxysulfuron. Early application of glyphosate plus metolachlor also increased control of pitted morningglory from later applications of trifloxysulfuron as compared to glyphosate alone fb trifloxysulfuron late-season; however, single applications of glyphosate followed by higher PDIR applications of trifloxysulfuron provided equal control. It appears that trifloxysulfuron does not control prickly sida as well as the other species evaluated; although inadequate, the addition of metolachlor increased prickly sida to about 60 to 75%. The addition of metolachlor also increased early- and late-season control of large crabgrass and goosegrass. There was a trend for increased cotton yields with glyphosate plus metolachlor applied early POST fb trifloxysulfuron when compared to the same treatments without the addition of metolachlor.

EFFICACY AND CROP SAFETY OF GLYPHOSATE FORMULATIONS IN ROUNDUP READY ™ COTTON. N.W. Buehring, D.B. Reynolds, D.G. Wilson, J.C. Sanders, and L.T. Barber. Mississippi State University, Mississippi State, MS, 39762.

ABSTRACT

The recent patent expiration on glyphosate has resulted in the availability of numerous new glyphosate herbicides, some of which are labeled for use in Roundup Ready ™ cotton. This has lead to more options for cotton producers; however, it has also increased their concerns about Roundup Ready cotton tolerance to all glyphosate herbicides. The objective of this experiment was to compare various glyphosate herbicides for Roundup Ready cotton tolerance and efficacy on weedy species. This experiment was conducted at the North Mississippi Research and Extension Center in Verona, MS in 2002. The experimental design was a randomized complete block. Cotton, Stoneville 4892 BR, was planted into 6.33 by 50 ft plots. The glyphosate herbicides used in this experiment are as follows: Glyfos, Glyfos X-tra, Glyphomax, Glyphomax Plus, Glyphosate Original, Roundup UltraDry, Roundup Original, Roundup D-Pak, Roundup UltraMax, Touchdown 5, Touchdown IQ, ClearOut 41, and ClearOut 41 Plus. For comparison purposes, an untreated check was also included in the experiment. The glyphosate herbicides were applied at 0.75 lbs ae/A with a spray volume of 15 GPA. If an additional surfactant was required by the label, Latron AG-98 at 0.5% v/v was added to the spray solution. All of the glyphosate herbicides were applied topically at the 2-leaf stage and followed by another topical application at the 4-leaf stage. Data were collected for visual injury, weed control, and yield. Also, plant mapping data were collected from five plants within each plot. Plant mapping data were analyzed by two different methods: percent boll retention at each fruiting position (1, 2,and 3); and percent boll retention at each zone [zone 1 (all positions between nodes 6 through 10), zone 2 (all positions between node 11 through 15), and zone 3 (all positions greater than node 15)].

Visual injury was observed with Touchdown 5 at 10 days after the 2-leaf application (21%) and 7 days after the 4-leaf application (10%). All glyphosate herbicides controlled broadleaf signalgrass, large crabgrass, and pitted morningglory 85 to 93%. Roundup UltraMax resulted in lower percent boll retention (32.9%) at position 1 than the untreated (51.4%), but did not differ from any other glyphosate herbicide. All of the other glyphosate herbicides resulted in no differences at position 1 from the untreated. None of the treatments were different in percent boll retention from the untreated at position 2, position 3, zone 1 and zone 3. At zone 2, Glyfos and ClearOut 41 Plus resulted in lower percent boll retention (37.2 and 39.7%) than the untreated (47.7%). All of the treatments responded similarly in yield when compared to the untreated.

These preliminary crop tolerance data show some variability among herbicide sources, but generally were not significantly different from the untreated check. Efficacy on the species evaluated did not differ among the herbicides evaluated in this experiment. Further research is needed, under a variety of growing conditions, before broad statements can be made regarding differential tolerance of Roundup Ready cotton varieties to various glyphosate herbicides and their related efficacy on important weed species.

NON-GLYPHOSATE TOLERANT COTTON RESPONSE TO SIMULATED DRIFT RATES OF GLYPHOSATE. L.L. Lyon, J.W. Keeling, T.A. Baughman, T.S. Osborne, and P.A. Dotray; Texas Agricultural Experiment Station, Lubbock, Texas Cooperative Extension, Vernon, Oklahoma State University, Altus, Texas Tech University, Lubbock, and Texas Cooperative Extension, Lubbock.

ABSTRACT

In 2001, approximately 70% of the 15.5 million acres of upland cotton planted in the United States was glyphosate tolerant. The potential for herbicide drift or misapplication exists on non-glyphosate tolerant cotton cultivars that are often planted adjacent to glyphosate tolerant cotton. These include conventional, non-transgenic varieties, as well as other non-glyphosate tolerant transgenic varieties. Experiments were conducted at three locations in 2002, including Lubbock, TX; Munday, TX; and Altus, OK to determine the effects of low rates of glyphosate (similar to drift) on non-glyphosate tolerant cotton. At the Lubbock location, Paymaster HS26 was planted and at Munday and Altus, DPL 237B was planted. Glyphosate (Roundup UltraMax) was applied at 0.38 lb ae/A, 0.19 lb ae/A, 0.094 lb ae/A, 0.047 lb ae/A, and 0.023 lb ae/A (1/2X, 1/4X, 1/8X, 1/16X, and 1/32X of 0.75 lb ae/A, respectively) postemergence-topical to cotton at the cotyledon to 1-leaf (COT-1 lf), 4- to 5-leaf (4-5 lf), pinhead square (PHSQ), and first bloom (FBLM) growth stages. An additional treatment of glyphosate at 0.75 lb ae/A was applied at all growth stages at the Lubbock and Munday locations. Cotton visual injury ratings were taken at 14 days after treatment (DAT), 21 DAT, 28 DAT, and at the end of the season. Plants were mapped at the end of the season and cotton lint yields and quality were determined.

At Lubbock, 14 DAT, injury from 8 to 98% was observed from rates $\geq$ 0.023 lb ae/A when applied at COT-1 lf, 4-5 lf, and PHSQ. The lowest rates (0.023 and 0.047 lb ae/A) did not show any visual injury when applied at FBLM compared to higher rates, which injured cotton 60 to 95%. Injury decreased slightly from higher rates applied early season (COT-1 lf and 4-5 lf), with only rates $\geq$ 0.19 lb ae/A showing 10 to 82% injury by the end of the season. Later season (PHSQ and FBLM) applications however, showed an increase in injury from the 0.38 and 0.75 lb ae/A rates to at or near 100% visual injury. Glyphosate applications $\geq$ 0.094 lb ae/A applied at PHSQ caused visual injury, while rates $\geq$ 0.047 lb ae/A applied at FBLM injured cotton. Yield was only reduced by rates $\geq$ 0.19 lb ae/A applied at COT-1 lf, although all but the 0.023 lb ae/A application showed visual injury 14 DAT. Yield was reduced by all glyphosate rates except 0.023 lb ae/A on 4-5 lf cotton. All rates applied at PHSQ reduced cotton yield, even 0.023 lb ae/A, which showed no visual injury 14 DAT. Only glyphosate at 0.023 lb ae/A applied at FBLM did not reduce yields. No yield was produced when 0.75 lb ae/A of glyphosate was applied at PHSQ and FBLM or from the 0.38 lb ae/A rate applied at FBLM.

At Munday, 14 DAT, 20 to 82% injury was observed from all glyphosate rates applied at COT-1 lf, and rates $\geq$ 0.023 lb ae/A applied at 4-5 lf cotton caused visual injury (30 to 81%). Glyphosate rates $\geq$ 0.094 lb ae/A applied at PHSQ caused 40 to 70% visual injury, while 12 to 30% injury was observed from rates $\geq$ 0.19 lb ae/A applied at FBLM. The injury from FBLM applications was much less than injury at other growth stages. By the end of the season, injury was only seen from 0.75 lb ae/A applied at the COT-1 lf and 4-5 lf stages. Injury from glyphosate rates $\geq$ 0.094 lb ae/A applied at the PHSQ stage was still apparent by the end of the season, but was reduced. Glyphosate rates $\geq$ 0.094 lb ae/A applied at FBLM showed visual injury at the end of the season. Although visual injury decreased by the end of the season, yield reductions were observed with rates $\geq$ 0.094 lb ae/A applied at all but the FBLM growth stage. Even though all the glyphosate rates showed initial and end of season visual injury less than the injury observed at other stages, only 0.023 lb ae/A applied at FBLM did not decrease yield.

Glyphosate rates $\geq$ 0.023 lb ae/A applied at the COT-1 lf and 4-5 lf stages showed visual injury 14 DAT at Altus (10 to 92%). All rates applied at PHSQ injured cotton 10 to 40%. Only glyphosate at 0.19 lb ae/A applied at FBLM showed any visible injury at 14 DAT (10%). By the end of the season, the only visual injury observed was from 0.38 lb ae/A made at the COT- 1 lf

(20%) and 4-5 lf (28%) stages and from 0.19 lb ae/A applied at FBLM (10%). Yield was reduced at all growth stages from glyphosate applied at the 0.38 lb ae/A rate. Glyphosate applied at 0.19 lb ae/A at the COT-1 lf and FBLM growth stages reduced cotton yields, while rates ≥ 0.094 lb ae/A applied at 4-5 lf decreased yields.

Application timing and glyphosate rate affected cotton injury levels at all locations; however, visual injury did not always result in a yield reduction. Yield loss tended to be over estimated by visual injury, especially for early applications (COT-1 lf, 4-5 lf). Later applications (PHSQ, FBLM) affected yield more than early applications. Cotton injury varied by location and was dependent on the growing season and crop conditions.

POST-DIRECTED OPTIONS IN ROUNDUP-READY COTTON. L.T. Barber, D.G. Wilson, M.T. Kirkpatrick and D.B. Reynolds, Mississippi State University, Mississippi State, MS.

ABSTRACT

In the past, cotton (*Gosypium hirsutum*) weed control programs were dependant on the use of one or more preemergence residual herbicides followed by several post-directed applications and cultivation to maintain early season weed control. The development of Roundup Ready cotton technology has allowed use of non-selective weed control options such as topical applications of Roundup Ultramax (glyphosate). Roundup Ultramax can be applied topically until cotton reaches the fourth node stage. For this reason, early post-directed treatments have decreased due to the efficiency of earlier topical treatments. Bladex (cyanazine) plus MSMA (monosodium methanarsonic acid) was the standard layby treatment for late season weed control. However, Bladex was taken off of the market and a comparable replacement has yet to be found. The purpose of this study was to evaluate different compounds for post-directed and layby applications in Roundup Ready cotton to determine the best weed control program and to ascertain if Roundup offers equivalent control when applied alone.

Research was conducted in 2002 at the Blackbelt Research Station near Brooksville, MS on a silty clay loam. Stoneville 4892 BR was planted in plots that were 12.6 by 40 feet. Plots were arranged in a randomized complete block design and all treatments were applied at 15 gallons per acre (GPA). Weeds evaluated were broadleaf signalgrass (*Brachiaria platyphylla*), pitted morningglory (*Ipomoea lacunosa*), sicklepod (*Senna obtusifolia*) and common cocklebur (*Xanthium strumarium*). A blanket application of 0.75 lbs ae/A Roundup Ultramax was applied at 2- to 3- leaf cotton. Subsequent treatments included applications of Aim (carfentrazone), Valor (flumioxazin) Direx (diuron), and Caparol (prometryn) applied alone and in tank-mixtures with Roundup Ultramax at post-directed and layby timings. Visual ratings for weed control and cotton injury were taken 10 days after post-directed treatments, 14 days after layby treatments and 21 days after layby treatments. Cotton yield data were collected on the center two rows of each plot. Data were subjected to analysis of variance and means were separated by least significant difference at the 0.05 level of significance ($LSD_{0.05}$).

No cotton injury was observed with any treatment applied early post, post-directed or at layby timings. Three applications of Roundup Ultramax early post, post directed and layby produced season long control (95%) of broadleaf signalgrass, and was equivalent to control provided by any other treatment. The highest morningglory control was maintained with treatments of Valor or Aim applied post-direct alone (95%), or with Roundup (98%). Roundup applied at three timings provided only 80% morningglory control. Valor and Aim applied alone, post-direct, and combinations of post-direct and layby treatments with Roundup Ultramax provided the highest control of sicklepod (93 to 95%) and common cocklebur (93 to 97%). Roundup applied alone at each timing provided 88% control of sicklepod and 86% control of common cocklebur. Results from this study indicate the need for alternative herbicides such as Aim or Valor to increase control of problematic weeds such as morningglories, sicklepod and common cocklebur later in the season unless producers are willing to apply Roundup on an as needed basis as subsequent weed flushes occur.

TANKMIX COMBINATIONS OF TRIFLOXYSULFURON AND PROMETRYN FOR POST-DIRECTED WEED CONTROL IN COTTON. M.T. Kirkpatrick, L.T. Barber, N.W. Buehring, and D.B. Reynolds Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Trifloxysulfuron and prometryn are broad spectrum herbicides for postemergence weed control in cotton. Trifloxysulfuron is a new chemical that will be marketed as a premix in combination with prometryn under the trade name Suprend. This study was designed to address weed control efficacy of Suprend in a weed management program with Touchdown IQ in glyphosate tolerant cotton. Touchdown (0.75 lbs ae/A) or Touchdown (0.75 lbs ae/A) plus Dual (0.95 lbs ai/A) were applied early postemergence over the top when cotton was three inches tall, and followed by Suprend. Suprend was applied either post-directed on 6 to 10 inch cotton or layby following the topical application of Touchdown or Touchdown plus Dual. Suprend rates of 0.6, 0.8, 1.0, 1.2 lbs ai/A were used at each application timing. The test was designed as a randomized complete block design with four replications, and conducted at the Black Belt Research Station in Brooksville, MS. Weed control ratings (0 to 100% scale) and seed cotton yield (lbs./A) were determined for each plot.

Results of the study indicated that rates of Suprend did not affect weed control, and a high weed mortality was observed on pitted morningglory, palmleaf morningglory, smallflower morningglory, large crabgrass, and sicklepod. The use of Suprend, regardless of rate, controlled these weeds better than Touchdown applied alone. Furthermore, there were no differences in weed control between Touchdown alone followed by Suprend and Touchdown + Dual followed by Suprend when post-directed at 6- to 10-inch cotton. Both chemical combinations controlled all weeds 90 to 95%. Application timing of Suprend did not affect efficacy when applied following an early postemergence over the top application of Touchdown plus Dual . However, Touchdown alone followed by Suprend resulted in significantly less control when applied post-directed as compared to layby for smallflower morningglory and palmleaf morningglory. These data further indicate that Touchdown followed by a layby application of Suprend provided control equal to or greater than Touchdown plus Dual followed by 0.008lbs ai/A Aim or 0.06 lbs ai/A Valor. In conclusion, these preliminary data show that a low rate of Suprend (0.75 lbs/A) in combination with Touchdown applied layby, provided equivalent control to higher rates of Suprend and Touchdown plus Dual followed by layby applications of Aim or Valor. The effectiveness of Suprend applied as a layby application can also increase the window of application timing in weed management programs.

INTERFERENCE OF SHARPPOD MORNINGGLORY (*IPOMOEA TRICHOCARPA* VAR. *TRICHOCARPA* ELL.) WITH COTTON. G.L. Steele and J.M. Chandler, Texas Agricultural Experiment Station, Texas A&M University, College Station, TX 77843-2474.

ABSTRACT

Field research was conducted in 2002 to evaluate the interference of seedling sharppod morningglory with cotton. Sharppod morningglory is a perennial vining herb commonly found throughout central and eastern Texas. Sharppod morningglory flowers and produces viable seed during the first year of establishment, but may also persist through shoot regeneration from root segments. Previous research has shown that detopped seedling sharppod morningglory is capable of resprouting as early as 17 days after emergence. The effect of sharppod morningglory density on cotton yield has not been addressed in the literature.

Sharppod mornigglory was germinated from seed in a greenhouse and transplanted in the field at densities of 0, 2, 4, 6, and 8 plants/10m of 40-inch row. Two days after planting cotton, sharppod morningglory in the cotyledon growth stage were established on rows 2, 3, and 4 of each 4-row plot. Treatments were replicated 3 times. Plots were maintained free of other weeds by hand hoeing. Cotton and sharppod morningglory were allowed to compete until harvest. Data collection consisted of seed cotton yield, harvest efficiency, and gin turnout. HVI analysis was used to classify cotton samples from each plot.

Unadjusted seed cotton yield ranged from 2662 to 1842 lb/A, with no significant differences in yield among 2, 4, and 6 plants/10m. All treatments yielded 1137 to 829 lb/A cotton lint. There was no significant difference in lint yield among sharppod morningglory densities of 0 to 6 plants/10m. The highest density (8/10m) reduced cotton lint yield 27% from the untreated yield. Harvest efficiency was similar for all densities up to 6 plants/10m. There were no significant differences in any fiber quality parameter among all sharppod morningglory densities. However, sharppod morningglory at 4, 6, and 8 plants/10m resulted in below grade classification for color grade, compared to a strict good ordinary grading for the untreated and 2 plants/10m density. These results indicate that the annual form of sharppod morningglory can interfere with cotton by reducing lint production and decreasing harvest efficiency. However, densities below 8 plants/10m have little to no effect on cotton yield. Additional research is needed to evaluate the effect of perennial sharppod morningglory density on cotton yield and harvest efficiency.

REAL-TIME SITE-SPECIFIC WEED MANAGEMENT IN COTTON: ECONOMIC EVALUATION AND WEED SPATIAL DISTRIBUTION. I.C. Burke, W.E. Thomas, S.B. Clewis, J.W. Wilcut, F.H. Moody, and J.B. Wilkerson. Department of Crop Science North Carolina State University, Raleigh, NC, and University of Tennessee, Knoxville.

ABSTRACT

Cotton (*Gossypium hirsutum*) requires more herbicide inputs than many other U.S. crops. Although selective herbicide technology has improved over the last 50 years (lb ai/A to oz ai/A), little advance has been made in spray-application technology. Weed-sensing sprayers apply pesticide only where it is needed and avoid expensive and time consuming requirements for scouting, collecting, and interpreting numerous data. 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 and triggering a spray event. Plastic hoods must be used in row crops to exclude crop plants from the detection area. Rather than band herbicides on the drill between the plastic hoods, spray events under the hood trigger drill applications of herbicides. In theory, weeds grow in patchy patterns. By automatically triggering spray applications 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 this study 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 2002 at Kinston, NC. A randomized complete block design was replicated three times. Plots were 25-ft wide by 100-ft long and contained eight 38-in crop rows. Preemergence (PRE) herbicides included Prowl at 1.0 lb ai/A plus Cotoran at 1.0 lb ai/A. The last herbicide treatment (LAYBY) consisted of Caparol at 1.0 lb ai/A plus MSMA at 2.0 lb ai/A with 0.25% (v/v) nonionic surfactant. The study included the following six herbicide systems: 1) PRE herbicides followed by (fb) extension recommended herbicide (Roundup Ultramax at 1.0 lb ai/A) postemergence (POST) fb LAYBY; 2) System 1 with HADSS-recommended POST herbicides; 3) No PRE herbicides with HADSS- recommended POST herbicides fb LAYBY; 4) PRE herbicides fb HADSS deciding the herbicide to use with the weed-sensing sprayer; 5) the previous system except without PRE herbicides; 6) a non-treated check; and 7) a weed-free control.

All herbicide systems controlled carpetweed (*Mollugo verticillata*), ivyleaf morningglory (*Ipomoea hederacea*), large crabgrass (*Digitaria sangiunalis*), sicklepod (*Senna obtusifolia*), and slender amaranth (*Amaranthus gracilis*) at least 98% late in the season. Cotton injury in the form of stunting was observed in treatments that received PRE herbicides and is likely due to Cotoran application. Treatments that received herbicides had greater yields than the non-treated check. Lint yields averaged 1290 lb/A and were similar among herbicide treatments. Weed spatial distribution was recorded in the form of percent spray nozzle activation per second. Weed populations in treatments that received PRE herbicides were clustered in small dense patches which resulted in 85-95% POST herbicide spray reduction. Weeds populations in treatments that did not receive PRE herbicides were more uniformly distributed across the plots. The resultant herbicide spray reduction in these plots ranged from 5-46%, further illustrating the patchy nature of weed populations. Herbicide costs reflected reduction in spray associated with the weed-sensing sprayer. Herbicide costs were lowest when the weed sensing sprayer was used without PRE herbicides, at \$12.58/A. When used with PRE herbicides, cost of herbicides using the weed-sensing sprayer was \$18.26/A. Broadcast applications of all herbicides cost \$34.65/A. Net returns reflected trends in yield more than herbicide cost reductions. Weed sensing sprayers

offer cotton producers a valuable tool to reduce herbicide costs while maintaining net returns and weed control efficacy.

WEED MANAGEMENT IN CENTRAL AND SOUTH TEXAS LIBERTY LINK® COTTON SYSTEMS. M.E. Matocha, P.A. Baumann, R.G. Lemon, F.T. Moore, D.J. Pigg, and L.M. Etheredge, Jr. Texas Cooperative Extension College Station, TX 77843.

ABSTRACT

Weed management in today's farming industry continues to be an integral part of crop production. Herbicides that control annual and perennial grass and broadleaf weeds are valuable tools in cotton weed control. Liberty® (glufosinate-ammonium) is a non-selective herbicide that provides effective control against many annual grass and broadleaf weeds. Biotechnology has aided weed control through the development of genetically engineered crops such as cotton, corn, soybeans and rice which are tolerant to Liberty herbicide.

Test results from Liberty Link® cotton studies in Central and South Texas have shown that postemergence applications of Liberty provided effective control of grass and broadleaf weeds with little or no crop injury. Weeds evaluated included Johnsongrass (*Sorghum halepense)*, Texas panicum (*Panicum texanum*), Palmer amaranth (*Amaranthus palmeri*), hophornbeam copperleaf (*Acalypha ostryifolia*) and sharppod morningglory (*Ipomoea trichocarpa*).

At the Corpus Christi site in South Texas, mid-post treatments of Liberty at 32 to 40 oz. of product per acre provided control in excess of 92% and 96% for Palmer amaranth and Texas panicum, respectively. The Stiles Farm experiment located in Central Texas employed mid-post applications of Liberty at 32 oz. product per acre which provided 88% or greater control of both Johnsongrass and Palmer amaranth. However, subsequent weed flushes at both locales resulted in a significant reduction in control. At the IMPACT Center site in Burleson County, early-post treatments of Liberty at 32 oz. product per acre effectively controlled hophornbeam copperleaf at 100%, and provided sharppod morningglory control of 99%. With no subsequent weed flushes at this site, an additional treatment with Liberty was not required.

Weed control programs utilizing typical preemergence treatments in combination with postemergence treatments of Liberty were evaluated at the Corpus Christi and Stiles Farm locations. Study results at Corpus Christi show that either multiple applications of Liberty or Liberty + soil applied herbicides were required for season-long control of Palmer amaranth and Texas panicum. Similarly, the Stiles Farm site required either multiple applications of Liberty or Liberty + soil applied herbicides for excellent control of Johnsongrass and Palmer amaranth.

The use of a non-selective herbicide such as Liberty aids in the management of weeds that have developed resistance to currently used herbicides, and in prevention of herbicide resistance development. Liberty tolerant cotton will provide cotton producers with an effective method for controlling grass and broadleaf weeds.

WEED DETECTION AND CLASSIFICATION IN SOYBEAN USING HYPERSPECTRAL REMOTE SENSING. F.S. Kelley, D.R. Shaw, and J.W. Easley; Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Weed populations were monitored at two fields at the Black Belt Branch Experiment Station, Brooksville, MS in 2001 and 2002. The fields were 15 and 16 ha in size. Upon soybean emergence, a 50- x 50-m Universal Transmercator (UTM) grid system was imposed on both fields. Hyperspectral measurements were collected for four weed species and bare soil at the center of each grid using a hand-held spectroradiometer with an 8 degree field of view. Weed species present in both fields in both years were sicklepod [*Senna obtusifolia* (L.) Irwin and Barnaby], pitted morningglory (*Ipomoea lacunosa* L.), entireleaf morningglory (*Ipomoea hederacea* var. *integriuscula* Gray), and horsenettle (*Solanum carolinense* L.).

Data were analyzed using linear discriminant analysis (LDA) with indices as classification discriminants. Indices created included Ratio Vegetation Index (RVI), Normalized Difference Vegetation Index (NDVI), Difference Vegetation Index (DVI), Normalized Difference Vegetation Index green (NDVIg), and Infrared Percentage Vegetation Index (IPVI). Data were also analyzed using customized software, which performed a feature extraction technique that classified weed species and bare soil using spectral bands chosen as "best" for discriminating species. All spectral measurements were first pooled over years and locations, then by year and location to determine the robustness of the classification techniques.

Classification accuracies ranged from 29 to 99% for LDA on data pooled across years and locations. As expected, classification accuracies for entireleaf morningglory and pitted morningglory were low with LDA at 38 and 29%, respectively, since these are two closely-related species. Classification accuracies were slightly better using spectral bands, and ranged from 44 to 97%. Accuracies were generally better using spectral bands to classify species than LDA on data analyzed by year and location. Regardless of the analysis technique with respect to pooling versus by year and location, bands chosen for discriminating these four weed species were all in the near-infrared portion of the electromagnetic spectrum, ranging from 742 to 868 nm.

WEED MANAGEMENT IN GLUFOSINATE-TOLERANT COTTON ON THE TEXAS SOUTHERN HIGH PLAINS. B.C. Burns, P.A. Dotray, Texas Tech University and Texas Cooperative Extension, Lubbock, TX; J.W. Keeling, Texas Agricultural Experiment Station, Lubbock, TX; and W.R. Perkins, Bayer CropSciences, Idalou, TX

ABSTRACT

Field studies were conducted at the Texas Agricultural Experiment Station near Lubbock in 2001 and 2002 to evaluate the effects of glufosinate on glufosinate-tolerant stripper cotton lines when applied at selected growth stages, rates, and sequential timings. Additional studies were conducted to evaluate weed control in Liberty Link cotton using glufosinate in combination with residual herbicides. The varieties observed for the tolerance tests were lines derived from the genetic backgrounds of two commercially available varieties.

For the growth stage test, glufosinate was applied postemergence-topical (POST) at 0.54 lb ai/A to both lines at the cotyledon, 2- to 3-leaf, first square, first bloom, peak bloom, and cut-out growth stages. In a second test, glufosinate was applied to both lines at 0.36, 0.72, 1.44, and 2.88 lb ai/A. In the sequential test, glufosinate was applied at the cotyledon, 2- to 3-leaf, and 4- to 5-leaf stages POST, and at the same rate postemergence-directed (PDIR) late season. Visual injury was evaluated 7, 14, and 21 days after each glufosinate application. Plant heights were recorded 14 and 21 days after treatment (DAT). Cotton plants were mapped at harvest and yield and fiber quality characteristics determined. Both stripper cotton lines exhibited excellent tolerance to glufosinate applications throughout each growing season. Treatments had no adverse effects on visual injury, plant height, first position bolls, nodes per plant, or yield. Glufosinate applications also had no effect on fiber properties such as micronaire, length, and strength.

Additional field studies were conducted in 2001 and 2002 to evaluate Palmer amaranth (*Amaranthus palmeri*), devil's-claw (*Proboscidea louisianica*), and silverleaf nightshade (*Solanum elaeagnifolium*) control in Liberty Link cotton. Trifluralin at 0.75 lb ai/A was applied preplant incorporated to all plots. Treatments for this test included: 1) Prometryn at 1.2 lb ai/A preemergence (PRE) followed by (fb) glufosinate POST; 2) glufosinate POST; 3) prometryn PRE fb glufosinate POST fb glufosinate POST; 4) glufosinate POST fb glufosinate POST; 5) prometryn PRE fb glufosinate POST fb glufosinate POST fb glufosinate PDIR; 6) glufosinate POST fb glufosinate POST fb glufosinate PDIR. Glufosinate was applied at 0.36 lb ai/A for all treatments POST and PDIR. Palmer amaranth, devil's-claw, and silverleaf nightshade control was evaluated after each glufosinate application. For both Palmer amaranth and devil's-claw, there was no year by treatment interaction so years were pooled and control of these weeds was averaged over years. Season-long Palmer amaranth and devil's-claw control was achieved when two glufosinate applications were used following trifluralin PPI. In 2001, silverleaf nightshade control increased to 65% with three applications of glufosinate. In 2002, silverleaf nightshade control was improved after two (50%) and three (72%) glufosinate applications.

Two perennial weed control tests were conducted in 2002 to evaluate Texas blueweed (*Helianthus ciliaris*) and woollyleaf bursage (*Ambrosia grayi*) control before planting. Glufosinate was applied POST to these weeds on May 21 at the following rates: 1) 0.36 lb ai/A; 2) 0.42 lb ai/A; 3) and 0.52 lb ai/A. At 7 (DAT) glufosinate controlled Texas blueweed 85 to 95%. By 28 DAT, a rate response was observed and glufosinate at 0.36 lb ai/A provided 60% control, while the highest rate (0.52 lb ai/A) provided 90% control. By 42 DAT little Texas blueweed control was observed. Liberty controlled woollyleaf bursage 95 to 100% across all three rates at 7 DAT. At 28 DAT, control of this weed decreased to 80 to 90%, and little to no control was observed at 42 DAT.

Growers on the Texas Southern High Plains should have a new weed management option with the development of Liberty Link cotton. Liberty Link seed should be available on a limited

acreage basis for the 2003 growing season, and varieties should be available for commercial use by 2004. Studies will be continued to evaluate weed control in Liberty Link cotton on both annual and perennial weeds across the Texas Southern High Plains.

COTTON RESPONSE TO TANK-MIXES OF ENVOKE WITH FOLIAR INSECTICIDES. D.G. Wilson, D.B. Reynolds, J.C. Sanders, and N.W. Buehring. Department of Plant and Soil Sciences. Mississippi State University, Mississippi State, MS 39762

ABSTRACT

Envoke (CGA-362622) is a new ALS inhibiting sulfonylurea herbicide being developed by Syngenta Crop Protection. Previous research has shown that topical applications of Envoke have in some cases resulted in cotton injury. Numerous foliar insecticides are used in cotton production. In many cases, tank-mixing herbicides with insecticides have resulted in phytotoxic interactions to cotton when neither constituent applied alone resulted in injury. In many situations, producers desire to tank-mix herbicides with insecticides to achieve broad spectrum pest control with a single application. Therefore, greenhouse and field studies were conducted at the Plant Science Research Center, Starkville, MS, and the Black Belt Experiment Station, Brooksville, MS, to determine the effects of tank-mixing Envoke with currently used foliar insecticides. The insecticides evaluated were 1.0 lb ai/A acephate, 0.5 lb ai/A dicrotophos, 1.0 lb ai/A profenophos, 0.1 lb ai/A bifenthrin, 0.04 lb ai/A cyhalothrin, 0.047 lb ai/A indoxacarb, and 0.089 lb ai/A spinosad (all full labeled rates). All insecticides were applied alone, and tank-mixed with 0.1 oz product/A of Envoke. Treatments were applied to cotton at the 7-to 8-leaf growth stage in both the greenhouse and field experiments. In the greenhouse study, injury was evaluated on a 0 to 100 % scale at 7 and 14 days after treatment (DAT), with 0% being no injury and 100% is total death of the plant. Plant heights were taken 7 and 14 DAT, and fresh weights were collected 14 DAT. In the field study, injury ratings were taken on a 0 to 100% scale 7 and 14 DAT, and yield data were collected at maturity.

In the greenhouse study, tank-mixtures of Envoke plus either profenophos, or acephate, resulted in 28 and 14% more injury 7 DAT, respectively, than Envoke alone. Fourteen days after treatment, tank-mixes of Envoke plus either acephate, profenophos, bifenthrin, cyhalothrin, or indoxacarb resulted in 18, 46, 27, 8, and 12 % injury, respectively, over Envoke alone in the greenhouse. In the field study, no treatment combination resulted in more crop injury than Envoke applied alone 7 or 14 DAT. Plant heights taken in the greenhouse 7and 14 DAT, for all treatments, were not significantly different than Envoke alone. Seed cotton yield, for all treatments in the field experiment, were not significantly different than the untreated check. Injury symptoms were shown to be higher in the greenhouse than in the field experiment, for all rating dates. Of all the classes of insecticides used, the organophosphates resulted in more injury when applied in combination with Envoke. The application timings that Envoke will be utilized as a POT treatment coincides at the same time that most organophosphate insecticides will be used. These data indicate that Envoke may have interaction potential with organophosphate insecticides. Additional testing is needed under a variety of growing conditions to adequately determine the interaction potential when applied under field conditions.

INFLUENCE OF GROWTH STAGE ON SUGAR TRANSLOCATION AND CONTROL OF YELLOW NUTSEDGE. F.E. Groves, K.L. Smith, N.R. Burgos, and J.B. Murphy; University of Arkansas, Southeast Research and Extension Center, Monticello, AR 71656; University of Arkansas, Southeast Research and Extension Center, Monticello, AR 71656; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72704, Department of Horticulture, University of Arkansas, Fayetteville, AR 72704

ABSTRACT

Studies were conducted in the greenhouse and field during 2001 and 2002 to determine if a correlation exists between plant growth stage and basipetal translocation of carbohydrates. If such a relationship could be determined, an improved understanding of *C. esculentus* (yellow nutsedge) may be achieved. Greenhouse studies were conducted in Fayetteville, utilizing a completely randomized design. Three tubers were planted into a potting soil/sand mixture (50% v/v) contained in a 10-cm pot. Plants were collected from the 1- to 9-lf stage. In one study plants were dissected into various tissues for sugar analysis by high-performance liquid chromatography (HPLC). In a separate study plants were chemically treated for herbicide efficacy. Plants selected for HPLC analysis were separated anatomically into tubers, shoots, old leaves, new leaves (upper three leaves), and secondary tubers. The plant parts were frozen, freeze-dried, and ground. Fructose, glucose and sucrose was extracted by boiling ground tissues, and analyzed using a HPLC with a refractive index detector. Sugars were quantified and expressed as µg/g fresh dry weight (FDW). Sucrose content was greater than that of the hexoses among all plant parts. However, the three sugars followed the same general trends when sugar content (µg/g FDW) was evaluated relative to plant growth stage. The sucrose content of the primary tuber gradually increased until reaching a maximum (> 40 µg/g) at the fifth to sixth leaf stages. A sharp decrease to 10 µg/g FDW was observed at the seventh leaf stage and sucrose content remained low until the ninth leaf stage. The sucrose content of the new leaf was inversely related to sucrose content of the primary tuber. Sucrose content decreased sharply from 30 µg/g FDW to 22 µg/g FDW from the fifth to sixth leaf stages, respectively. Sucrose content of the new leaf increased gradually until reaching a maximum at the eighth leaf stage at > 35 µg/g FDW and declined thereafter. A decrease in sucrose content among all plant parts occurred at the eighth leaf stage resulting in similar content in all tissues at the ninth leaf stage.

In a spray chamber, plants were treated with glyphosate at 0.84 kg ae/ha or trifloxysulfuron at 0.019 kg ai/ha + 0.25% non-ionic surfactant (NIS). Plants were returned to the greenhouse and evaluated at 10 days after treatment (DAT) for visual injury using a scale from 0 to 100 with 0 representing no injury. Treatments were applied at 140 L/ha using compressed air as the propellant and water as the carrier. Glyphosate provided > 65% control at the two- to four-leaf stage. Control decreased to < 30% when glyphosate was applied at the five- to seven-leaf stages and increased to > 85% at the eight- and nine-leaf stages. Trifloxysulfuron provided > 70% control for leaf stages five through seven. Control improved to > 85% for the eighth- and ninth-leaf stages. In greenhouse studies, a correlation was observed between plant growth stage, sugar translocation, and herbicide efficacy. During the 5- to 6-leaf stage, sucrose content was the highest and glyphosate injury was lowest. At the 8- and 9-leaf stage, sucrose content was lowest while glyphosate and trifloxysulfuron injury was the greatest.

Field trials were conducted at Rohwer in 2001 on a Hebert silt loam. Cotton variety DP451 BRR was planted on 0.096 m-rows, using a conventional planting method. Plots were 3.86 x 9.14 m and utilized a complete randomized block design. Plots were furrow irrigated as required. Early-postemergence (EP), mid-postemergence (MP) directed, and late-postemergence (LP) directed applications were evaluated at 14 DAT. An EP application of Glyphosate at 0.84 kg ae/ha provided 80% control while trifloxysulfuron at 0.013 kg ai/ha offered 70% control. Directed MP and LP applications of glyphosate provided > 90% control and trifloxysulfuron

offered > 80% control. The greenhouse findings were not consistent with observations from the field trials.

The role of starch in this correlation remains unclear. Starch analysis is being conducted and ^{14}C CO_2 tests have been proposed to trace photosynthates and gain a better understanding of sugar translocation within the plant.

EFFECT OF CARRIER VOLUME ON WHEAT RESPONSE TO SIMULATED ROUNDUP DRIFT. C.A. Roider, J.L. Griffin, S.A. Harrison, and C.A. Jones. Louisiana State University Agricultural Center, Baton Rouge, LA

ABSTRACT

Field experiments were conducted over two years at the Ben Hur Research Farm near Baton Rouge, LA to evaluate wheat response to simulated drift of glyphosate using Roundup Ultra herbicide. The experimental design was a randomized complete block with a three-factor factorial treatment arrangement replicated four times. The first and second factors were wheat growth stage and herbicide drift rate. Drift rates represented 1/8 and 1/16 the use rate of 1.0 lb ai/A of Roundup Ultra (4 and 2 oz/A, respectively). The third factor was carrier volume. Simulated drift rates were applied in a constant carrier volume of 25 gallons per acre (GPA) and in variable carrier volumes of 3.1 GPA (1/8 rate) and 1.6 GPA (1/16 rate). Treatments were applied using a tractor equipped with compressed air sprayer and a constant spray pressure of 27 psi. Turbo Drop 005 nozzle bodies with a Turbo TeeJet 110015 nozzle were used to reduce droplet size. Tractor speed was adjusted to obtain the desired carrier volumes; 0.6 mph (25 GPA), 3.1 mph (5 GPA) and 10 mph (1.6 GPA). Treatments were applied to the wheat variety USG 3209 at F6 (first node detected) and F10 (heading) growth stages. Data were subjected to analysis of variance and means were separated using Fisher's Protected LSD.

Wheat injury 28 days after treatment with Roundup Ultra, averaged across years, carrier volumes, and growth stages was 42 and 57% for the 2 and 4 oz rates, respectively. Wheat injury averaged 37 and 61% for constant and proportional spray volumes. Averaged across Roundup Ultra rates and growth stages, height reductions ranged from 12% (constant carrier volume) to 30% (proportional carrier volume) in 2001 and 4% (constant carrier volume) to 11% (proportional carrier volume) in 2002. Greater height reductions were observed for the early compared with late applications.

In 2002, wheat yield was 10 bu/A less when Roundup Ultra was applied in a proportional spray volume when compared to a constant spray volume and 19 bu/A less when applied at 4 oz/A compared with 2 oz/A. In 2002, Roundup Ultra applied at 2 oz/A using a proportional spray volume rather than a constant spray volume reduced yield 38 bu/A when applied at first node and 13 bu/A when applied at heading. Reductions in seed weight per spike were closely correlated to yield reductions with both carrier volume and herbicide rate.

Results show that wheat injury with Roundup Ultra is greater when applied in a lower carrier volume (3.1 or 1.6 vs. 25 GPA). This response can be attributed to fewer spray droplets at the lower spray volume with higher concentration of herbicide and surfactant. Wheat is very sensitive to Roundup Ultra and caution should be taken when applications are made near wheat fields.

WEED CONTROL IN TEXAS GRAIN SORGHUM UTILIZING 2,4-D AND SULFONYL UREA COMBINATIONS. M.W. Rowland and B.W. Bean; Texas Agricultural Experiment Station, Bushland.

ABSTRACT

Studies were conducted in 2001 and 2002 to evaluate crop injury and control of Palmer amaranth with combinations of metsulfuron-methyl (Ally 60DF) and 2,4-D amine in grain sorghum. Treatments applied included Ally @ 0.05 & 0.10 oz/ac with and without 2,4-D amine @ 8 oz/ac, as well as a 2,4-D alone treatment. These treatments were all applied to grain sorghum at 6 inches and 12 inches of height. Visual injury ratings were recorded at 2 and 4 weeks after treatment (WAT) for all applications. Ratings were based on a scale of 0 to 100. Palmer amaranth control ratings were recorded at the same timings using the same scale. Grain sorghum yield was taken at maturity for all treatments and compared to a weed-free check for yield reduction as a result of injury.

Levels of crop injury, Palmer amaranth control, and yield reduction varied somewhat between years though the overall trends were similar. In both years crop stunting was higher when Ally applications were made alone at 0.10 oz/ac though the 0.05 oz/ac rate also caused significant injury. Injury was definitely higher when Ally was not tank-mixed with 2,4-D amine at 8 oz/ac. The treatment of Ally @ 0.05 plus 2,4-D amine on average had 10-15% less injury than the same treatment with 0.10 oz/ac of Ally. Levels of injury seemed to be dependent on the crop stage at application. Applications made to 6-inch grain sorghum caused less than half the stunting that occurred to 12-inch grain sorghum. Though significant crop injury and stunting did occur, crop yield was not always significantly reduced by Ally applied alone at either rate when compared to the tank-mix applications, especially with applications made at the 6-inch growth stage. Control of Palmer amaranth appeared to improve when Ally and 2,4-D were combined, especially over 2,4-D applied alone. Postemergence control for Ally @ 0.05 oz/ac plus 2,4-D amine was better than 80 % in 2001 and better than 90% in 2002. The combination of Ally and 2,4-D provided good residual control in 2002 as well. Early applications were made prior to weed emergence and control of new weed emergence later in the season exceeded 70%. No advantage for weed control was seen in either study by applying the 0.10 oz/ac rate of Ally over the 0.05 oz/ac rate. In conclusion, an application of Ally @ 0.05 oz/ac plus 2,4-D amine @ 8 oz/ac will provide an effective, cheap method of controlling Palmer amaranth while not providing significant crop injury or causing yield loss.

YIELD AND PHYSIOLOGICAL RESPONSE OF PEANUT (*ARACHIS HYPOGAEA*) TO GLYPHOSATE DRIFT. B.L. Robinson, W.E. Thomas, W.A. Pline, I.C. Burke, D.L. Jordan and J.W. Wilcut; Department of Crop Science, North Carolina State University, Raleigh.

ABSTRACT

Roundup Ready corn, soybean, and cotton are being produced on a greater amount of acreage in North Carolina, which has introduced several potential problems for conventional peanut growers. Peanuts are sensitive to Roundup UltraMax (glyphosate) drift, but unfortunately are often grown in areas situated near transgenic corn, soybean, and cotton fields. Shikimic acid accumulation is unique to glyphosate inhibition of EPSPS, and may be used to determine exposure to glyphosate drift. Objectives of this study were to determine yield, crop injury, and shikimic acid accumulation in peanuts exposed to various glyphosate rates. Four field trials were conducted in 2001 and 2002 at the Peanut Belt Research Station in Lewiston-Woodville, NC and the Upper Coastal Plain Research station in Rocky Mount, NC. Peanut variety NC 12C was planted in early May of both years, using conventional-tillage methods in plots that measured 12 x 20 feet. Plots were kept weed free, and only the center two rows of each four row plot were treated with glyphosate. Roundup UltraMax was applied EPOST at 0, 0.0078, 0.0156, 0.03125, 0.0625, 0.125, 0.25, 0.5, and 1.0 lb ai /ac to peanut plants 4-6 inches in diameter using a CO_2-pressurized backpack sprayer delivering 15 GPA at 30 PSI. Plots were arranged in a randomized complete block design with three replications of treatments. Crop injury, stunting, discoloration, and stand reduction were visually rated 7, 14, 21, 34, 41, and 47 days after the EPOST treatment. Samples for shikimic acid accumulation were taken 7, 14, 21, and 28 days after Roundup UltraMax treatments (DAT), and analyzed using a spectrophotmeter under guidelines developed by Singh and Shaner (1999)

Shikimic acid accumulation was found to be an effective diagnostic tool to determine peanut exposure to glyphosate at 7 DAT, but not 14, 21 or 28 DAT. Shikimic acid accumulation increased as Roundup UltraMax rates increased at all locations. Roundup UltraMax rates of 0.25, 0.5 and 1.0 lb ai/acre resulted in significant economic loss, crop injury, and reduced peanut yield. Shikimic acid concentration was not influenced by glyphosate at 14, 22, or 31 days after EPOST treatment. Crop injury, stunting, and plant discoloration also increased at Roundup UltraMax rates of 0.063 lb ai/ac or higher. As shikimic acid accumulation increased, peanut yield and quality decreased.

PEANUT WEED MANAGEMENT UNDER VARYING ROW PATTERNS AND TILLAGE REGIMES. D.C. Yoder, G.E. MacDonald, B.J. Brecke, D.L. Wright, T.D. Hewitt, and J.T. Ducar; Department of Agronomy, University of Florida, Gainesville, FL, 32611; West Florida Research and Education Center, Jay, FL, 32565; North Florida Research and Education Center, Quincy, FL 32351; North Florida Research and Education Center, Marianna, FL, 32448; Department of Animal & Horticultural Sciences, Berry College, Mt. Berry, GA, 30149.

ABSTRACT

Southeastern peanut producers face dynamic challenges in achieving profitability and sustainability. Continuous pressure to reduce input costs has played a role in re-evaluating standard production practices to determine the most cost effective herbicide programs for weed management. Recently, there has been tremendous interest in alternative row patterns, such as twin rows, for peanut production. Twin row spacing also leads to quicker canopy of row middles, but the impact on weed control efforts has not been determined. In addition, there is limited weed management research under conservation tillage regimes, especially in conjunction with twin row spacing.

To determine the impact of reduced tillage practices and twin row planting patterns on weed management in peanuts, experiments were conducted at Citra and Quincy, Florida in 2001 and 2002. A standard variety was utilized, Georgia Green, planted at 110 lbs/A for both single and twin row spacing. The single row spacing was standard 36 inches, with the twin row planting being on 36-inch centers and the two twin rows 8 inches apart. Tillage regimes included a typical conventional tillage system and a minimum tillage system. Within each pattern of row spacing and tillage method, five standard herbicide weed management packages were evaluated. Visual ratings of weed control and tomato spotted wilt virus (TSWV) were conducted throughout the season. Yield was taken at the end of each season at both locations in both years. Grades were determined for both locations in 2002. Data was subjected to analysis of variance ($P < 0.1$) to test for treatment effects and interactions.

There was a significant interaction between years and locations, therefore results are presented accordingly. There was no difference in either year or location between the performance of any of the herbicide systems evaluated as a function of row spacing or tillage regime. However, it was noted that significantly greater control of Florida beggarweed (*Desmodium tortuosum*) was observed with twin rows in Citra in 2002. There was also significantly lower TSWV incidence in Quincy in 2002 with the twin row pattern. Significant yield differences were seen at both locations in both years. At Quincy in 2001, yields under conservation tillage were higher than conventional tillage and twin rows had greater yields compared to single rows. At Citra in 2001, significantly lower yields were observed with single row spacing under conservation tillage compared to single rows under conventional planting, or compared to twin rows under either tillage regime. This effect was also observed at the Quincy location in 2002. At Citra in 2002, no yield differences were seen. There were no differences noted for peanut grades at either location.

This research suggests peanuts planted under twin row patterns yield equal to or better than single rows, especially under conservation tillage regimes. Twin row peanuts also provided quicker canopy closure, and this could be the reason for greater the Florida beggarweed control observed. In addition, twin row planting may help to reduce the severity of TSWV in southeastern peanut production.

INTERFERENCE OF VARIOUS WEED SPECIES IN PEANUTS. J.B. Willis and D.S. Murray. Department of Plant and Soil Sciences. Oklahoma State University, Stillwater, OK 74078.

ABSTRACT

Experiments were conducted at the Agronomy Research Station, Perkins, OK and Caddo Research Station, Fort Cobb, OK to measure the interference of eight selected weed species on peanut (*Arachis hypogaea*) yield. This interference data will be a means of testing the accuracy of a decision support system designed for use in Oklahoma peanuts. A randomized complete block design with four replications was used, with a plot size of 12 ft by 32.8 ft. Tamspan 90, a Spanish peanut cultivar, was planted at 80 lbs/A. Weeds were planted into the center two rows of the four-row plot on alternating sides of the row, at a density of eight weeds per 100 ft^2 (eight weeds/32.8 ft row) and remained the entire season for full-season interference. Weeds included in these experiments were selected based on being common and/or troublesome in Oklahoma peanuts and are as follows: common cocklebur (*Xanthium strumarium*), eclipta (*Eclipta alba*), johnsongrass (*Sorghum halepense*), prickly sida (*Sida spinosa*), ivyleaf morningglory (*Ipomoea hederacea*), Palmer amaranth (*Amaranthus palmeri*), crownbeard (*Verbesina encelioides*), and barnyardgrass (*Echinochloa crus-galli*). Undesired weeds were controlled by hand hoeing, hand pulling and herbicide application. Data collection included dry weed weights and in-shell peanut yield from the center two rows. Weeds were removed from plots at soil level before senescence or before peanut digging, dried and weighed. Peanuts were harvested in a traditional manner and plot yields recorded to determine the interference each weed species caused to the peanuts.

Peanut yields were converted from pounds/plot to pounds/acre. The LSD procedure was used to gain treatment mean and a least significant difference value at 5% for each location. A decision support system designed for use in Oklahoma peanuts was used to estimate predicted peanut yield values for each weed species at eight weeds/100 ft^2 and a yield goal equal to the check plot yield specific to each location. If the predicted yield value fell within the LSD value of the treatment (weed species) yield mean then it was determined that there was no significant difference in the predicted yield and the actual yield. Analysis of the experiment conducted at Caddo Research Station found that there was no significant difference between the actual yields and predicted yields with any of the eight weed species. The experiment conducted at the Agronomy Research Station found that there was significant difference in two weed species between the actual yields and predicted yields. Johnsongrass interference was overestimated by 430 pounds/acre of peanuts by the decision support system while common cocklebur interference was underestimated by 440 pounds/acre of peanuts.

WEED MANAGEMENT IN PEANUT PLANTED IN VARIOUS ROW PATTERNS. J.E. Lanier, D.L. Jordan, P.D. Johnson, J.F. Spears, and R. Wells. North Carolina State University, Raleigh, NC 27695-7620.

ABSTRACT

Effective weed management is critical in peanut (*Arachis hypogaea* L.) production due to the prostrate growth habit of peanut and the digging operation required during harvest. Rapid canopy closure in narrow row patterns often minimizes weed interference in crops like soybean [*Glycine max* (L.) Merr.] and can reduce reliance on herbicides. Seeding peanut in twin rows has become more prominent in the United States because it minimizes incidence of tomato spotted wilt tospovirus. Twin row planting patterns consist of planting two rows 7 to 9 inches apart with centers between the two twin rows spaced 36 to 40 inches apart. Canopy closure is more rapid in twin rows compared with single rows spaced 36 to 40 inches apart. Obtaining satisfactory weed control early in the season with herbicides and allowing the canopy to close more rapidly by seeding peanut in twin rows may improve weed control and minimize the need for late-season herbicides. Research was conducted to determine if seeding peanut in twin rows improved weed control using several different preemergence and postemergence herbicide programs.

The peanut cultivar NC-V 11 was seeded in single and twin row planting patterns in conventional tillage systems at the Cherry Unit located near Goldsboro, NC in 2001 and 2002. Herbicide programs consisted of preemergence applications of Outlook (dimethenamid at 1 lb ai/acre) or Outlook plus Strongarm (diclosulam at 0.024 lb ai/acre) applied alone or followed by postemergence applications of Cadre (imazapic at 0.063 lb ai/acre) or recommendations based on HADSS (Herbicide Application Decision Support System). In both years the HADSS recommendation was Cadre. All treatments received Gramoxone MAX (paraquat at 0.13 lb ai/acre) plus the commercial package mixture of Storm (acifluorfen at 0.25 lb ai/acre plus bentazon at 0.5 lb ai/acre) applied at peanut cracking stage. Herbicides applied at the cracking stage controlled weeds that escaped preemergence applications and allowed a more accurate depiction of the interaction of planting pattern and residual effectiveness of preemergnce herbicides. Visual estimates of percent sicklepod [*Senna obtusifolius* (L.) Irwin and Barneby] based on a scale of 0 (no control) to 100% (complete control were recorded in early August and mid September. Peanut was inverted in early October and harvested with conventional harvesting equipment. Sicklepod density in plots treated with Outlook alone was approximately 2 m^2 in 2001 and 40 m^2 in 2002. Sicklepod control was 9 and 11% higher in twin rows compared with single rows when evaluated in early August and mid September, respectively, when data were pooled over herbicide treatments. Although pod yield did not differ among row pattern treatments in 2001, pod yield was 970 kg/ha higher in twin rows compared with single rows in 2002 when data were pooled over herbicide treatments. Pod yield did not differ among herbicide treatments in 2001 even though herbicide programs that included Cadre controlled sicklepod more effectively. In contrast, pod yield was higher in 2002 when Cadre was applied compared with the other herbicide treatments. Outlook plus Strongarm suppressed sicklepod enough to provide yields higher than Outlook alone. Sicklepod density was much higher in 2002 than in 2001, which may have contributed to differences in yield noted between years. These data suggest that seeding peanut in twin rows improves weed control when compared with seeding in single rows. However, a postemergence application of Cadre was still needed to optimize sicklepod control and pod yield.

RESPONSE OF FIVE PEANUT VARIETIES TO DICLOSULAM AND FLUMIOXAZIN IN TEXAS PEANUT. T.A. Murphree, P.A. Dotray, J.W. Keeling, T.A. Baughman, and W.J. Grichar, Texas Tech University and Texas Agricultural Experiment Station, Lubbock; Texas Cooperative Extension Service, Vernon and Texas Agricultural Experiment Station, Yoakum, TX.

ABSTRACT

Diclosulam and flumioxazin are new peanut herbicides registered since 2000. They have good activity on broadleaf weeds and nutsedge. During the 2000 growing season, it was reported that diclosulam caused stunting, stand loss and chlorosis to the peanut canopy when applied preplant incorporated (PPI) and preemergence (PRE). Therefore a supplemental label was issued in 2001 for Texas, Oklahoma, and New Mexico, which restricted applications to soils with a pH of 7.2 or greater. Flumioxazin was registered in 2001. During its first year, injury was reported in Oklahoma, Georgia, North Carolina and West Texas. Therefore, a peanut variety trial was conducted in Gaines County in 2001 and 2002 to observe peanut varietal tolerance to diclosulam and flumioxazin. In addition, diclosulam application timing was also investigated. Four high oleic peanut varieties: Flavor Runner 458, Sunoleic 97R, Tamrun OL/01, Georgia Hi O/L and one conventional variety, Tamrun 96, were used in this study.

The design of this study was a split-plot design with three replications. Plot size was 7 by 30 ft. Diclosulam was applied PRE and postemergence (POST) at 0.016 and 0.024 lb ai/A. Flumioxazin was applied PRE at 0.063 and 0.094 lb ai/A. Peanuts were planted and PRE treatments were applied May 15, 2001 and April 30, 2002. POST treatments were applied June 12, 2001 and May 28, 2002. All treatments were applied using a CO_2 backpack sprayer calibrated to deliver 10 GPA. Evaluations were made early, mid, and late season both years. Peanut grades and yields were determined at the end of the season.

In 2001, diclosulam applied PRE at 0.024 lb ai/A injured peanut 15 to 40% in all varieties except Tamrun 96, 14 DAP. At 42 DAP, diclosulam PRE injured Flv Runner 458 and the Sunoleic 97R 20-25% while injury to Georgia Hi O/L at 0.024 lb ai/A was 35 to 45%. At 118 DAP, all injury decreased to < 5% and yield was not affected by diclosulam PRE. Less than 5% peanut injury was observed in all varieties from flumioxazin applied PRE at 14 DAP. No injury was observed at 42 and 118 DAP and yield was not affected by any flumioxazin treatment. At 14 DAP, diclosulam applied POST at both rates injured peanut < 5% in all varieties and no injury was observed 90 DAP. Yield was not affected by diclosulam POST.

In 2002, diclosulam applied PRE at 0.016 and 0.024 lb ai/A injured peanut less than 8% in all varieties early season. At 42 DAP, diclosulam PRE at 0.016 lb ai/A injured peanut 10 to 17% in all varieties except Tamrun 96. At 42 DAP, diclosulam PRE at 0.024 lb ai/A injured all varieties 13 to 25%. No late season injury was observed in any variety from any diclosulam treatment. No injury was reported throughout the season from any flumioxazin or diclosulam POST application. Yield was not affected by any treatment of diclosulam or flumioxazin.

These studies suggest that differential peanut tolerance exists for diclosulam soil applied, but no adverse affects on yield were observed.

WEED CONTROL WITH REDUCED RATES OF CADRE AND PURSUIT IN PEANUT.
T.A. Baughman, W.J. Grichar, P.A. Dotray, and J.C. Reed. Texas Cooperative Extension, Texas Agricultural Experiment Station, and Texas Tech University; Vernon, Yoakum, and Lubbock, TX.

ABSTRACT

Field studies were conducted in Northwest and South Texas during the 2002 growing season to evaluate weed control in peanut (*Arachis* hypogaea L.) with reduced rates of Cadre and Pursuit. Herbicides combinations and rates varied with experiment. However, in general included Cadre and Pursuit applied postemergence at 1/2X or 1X (0.72 or 1.44 oz pr/A) alone or in combination with postemergence applications of Strongarm 1/2X or 1X (0.225 oz pr/A or 0.45 oz pr/A), Dual Magnum 1/2X or 1X (10.6 fl oz pr/A or 21.2 fl oz pr/A), 2,4-DB (16 fl oz pr/A), Storm (24 fl oz pr/A), or Ultra Blazer (24 fl oz pr/A). Weed species evaluated included: ivyleaf morningglory (*Ipomoea hederacea* (L.) Jacq.), Palmer amaranth (*Amaranthus Palmeri* S. Wats.), pitted morningglory (*Ipomoea lacunose* L.), smellmelon (*Cucumis melo* L. var. dudaim Naud.), and yellow nutsedge (*Cyperus esculentus* L.).

In Northwest Texas at one location, yellow nutsedge control was at least 85% with Cadre and Pursuit alone at the 1X rate or applied at the 1/2X rate in combination with Strongarm or Dual Magnum at the 1/2X and 1X rates. At the second location, yellow nutsedge control was at least 70% with all Cadre combinations except Cadre 1/2X + Strongarm 1/2X. All Pursuit combinations controlled yellow nutsedge less than 60% at this location. Palmer amaranth control was greater than 75% when Cadre or 2,4-DB was applied alone at the 1X rate or with Cadre 1X + Storm in a third experiment. At this location when a 1X rate of Cadre was applied in combination with Ultra Blazer Palmer amaranth control was less than 15%. At the final Northwest Texas site, control of Palmer amaranth and ivyleaf morningglory was at least 80% with all combinations of Cadre, Pursuit, Strongarm, and 2,4-DB except when Pursuit was applied at the 1/2X rate alone.

In South Texas, Cadre applied alone at the 1/2X rate or used in combination with Strongarm at the 1/2X or 1X rate controlled Palmer amaranth, smellmelon, and yellow nutsedge at least 80%. Yellow nutsedge control was less than 60% with Pursuit applied alone or in combination with Dual Magnum or Strongarm at this location. In a second experiment in South Texas the only treatment that controlled Palmer amaranth and yellow nutsedge at least 80% was Cadre 1/2X + 2,4-DB. Smellmelon control was at least 80% when Ultra Blazer was used in combination with Pursuit or Cadre at both the 1/2X and 1X rates.

This preliminary research indicates that there is the potential to reduce rates or Cadre and Pursuit when used in combination with other herbicides. However, activity of these combinations will be dependent on weed species, weed size, and environmental conditions. Also, in some case there is the potential for antagonism with some combinations and weed species.

BROADLEAF SIGNALGRASS (*BRACHIARIA PLATYPHYLLA*) INTERFERENCE AND MANAGEMENT IN CORN (*ZEA MAYS L.*).

J.L. Alford, R.M. Hayes, T.C. Mueller, University of Tennessee, Knoxville, TN.

ABSTRACT

Grass species compete with corn for light, water, and nutrients. An increase in grass density can cause a shortage of the required resources available to corn, and result in a decrease in corn yield.

Broadleaf signalgrass (*Brachiaria platyphylla*) is a decumbent, spreading, branched, summer annual grass species that has become difficult too control in cornfields across the southern United States. Field tests were conducted to determine the effects of broadleaf signalgrass competition in corn and the effect it has on corn yields. A second objective of the field tests was to determine the optimum timing for applying glyphosate herbicide for broadleaf signalgrass control in corn.

Research was conducted in the summers of 2000-2002 at University of Tennessee experiment stations in Jackson and Knoxville, TN. Asgrow® 738RR corn was planted using a four-row no-till planter at a rate of 68,000 seeds/ha. Plots were 3 m wide x 7.6 m long and treatments were replicated four times. At Jackson, herbicides were applied using a tractor-mounted CO_2 boom sprayer. When the corn reached a height not accessible by tractor, a CO_2 backpack sprayer was utilized for application. Both were calibrated to apply 94 L/ha. Applications at Knoxville were made using a CO_2 backpack sprayer calibrated at 94 L/ha.

Roundup Ultra® (0.84 kg/ha a.e.) was applied at both locations in sequential treatments, 2 and 4 weeks after corn emergence (WAE); 2, 4, and 6 WAE; 2, 4, 6, and 8 WAE. Also single applications at 2, 3, 4, 5, 6, 7, and 8 WAE was made. The test also contained a weed-free check and one untreated check for yield comparisons. The number of broadleaf signalgrass plants per square meter was counted at 2 WAE. A measure of broadleaf signalgrass biomass was conducted before plant senescence. Corn injury evaluations were conducted 2 weeks after each treatment (WAT). Broadleaf signalgrass control was evaluated at 4, 6, 8, and 10 WAE. Corn was harvested at maturity and yields were adjusted to 15.5% moisture. Data was analyzed using the Proc mixed (SAS 1997), and means were separated by Fisher's least significant difference test (α=0.05).

All glyphosate treatments provided > 85% control of broadleaf signalgrass. However, in Jackson 2000-2002 and Knoxville 2002 lower overall control from the 2 WAE treatment was noted. Initial control evaluations of broadleaf signalgrass were > 90%. Broadleaf signalgrass in the 2 WAE treatment was not controlled throughout the season due to emergence following the application. Also, all sequential applications had >95% control of broadleaf signalgrass.

No corn injury related to glyphosate applications was observed in the treatments tested at Jackson or Knoxville for 2000-2002. Broadleaf signalgrass, being much smaller than corn, does not compete with corn for light, but appears to compete primarily for water and perhaps for some nutrients. Competition of broadleaf signalgrass with corn for more than 5 WAE reduced yields from 5-25%. Test data determined that the most important time to eliminate broadleaf signalgrass in corn with glyphosate applications is through applications made 4 to 5 WAE.

SUGARCANE SEED RESPONSE TO 2,4-D AND ALTERNATIVES FOR RED MORNINGGLORY CONTROL. J.D. Siebert, J.L. Griffin, C.A. Jones, and K.A. Gravois; Louisiana State University Agricultural Center, Baton Rouge, LA.

ABSTRACT

In Louisiana, sugarcane (*Saccharum* interspecific hybrid) is grown as a perennial with 3 to 5 annual harvests from a single planting. Sugarcane is planted by harvesting mature stalks in August, placing them in an open furrow, and covering with no more than 4 inches of soil. Lateral buds germinate and emerge in the fall before dying back during the winter period. In the spring sugarcane shoots reemerge and the crop is harvested in the fall as the first or "plant cane" crop. Sugarcane plants ratoon and are harvested annually thereafter.

Red morningglory (*Ipomoea coccinea* L.) emerging after the layby cultivation in May can reduce harvest efficiency and sugar yield. To manage this weed producers often utilize a late season aerial application of 2,4-D. This treatment poses no problem if sugarcane is harvested for sugar production, but if stalks are harvested for planting material bud germination and shoot emergence may be affected.

Field studies conducted over two growing seasons evaluated the effect of 2,4-D applied at 1.5 qt/A (3.8 lb ai/gal) to LCP 85-384 sugarcane 7, 5, 3, and 1 wk before planting. Sugarcane was planted in mid-September using both whole stalk and billet (18 inch) seed pieces. When 2,4-D was applied 5 wk or closer to planting, sugarcane shoot emergence and shoot population averaged across planting methods were reduced 5, 7, and 28 wk after planting (WAP) when compared to the nontreated, but stalk counts 52 WAP were not affected. Sugarcane height in one of two years was reduced when 2,4-D was applied 5 wk or closer to harvest for seed, regardless of planting method. The first year, sugarcane and sugar yield were reduced 12 to 15% when 2,4-D was applied 5 wk or closer to harvest for seed compared with the nontreated, but yields were not affected the second year. Since the potential for yield reduction exists, a 7 wk period should be allowed between 2,4-D application and harvest of LCP 85-384 for planting material as either whole stalks or billets.

Because of restrictions on use of 2,4-D in sugarcane production areas alternative herbicides for red morningglory control were evaluated over two years. Complete control of 12 and 24 inch red morningglory was obtained 21 days after treatment (DAT) with 2,4-D at 1 pt/A, Weedmaster at 1 pt/A, Aatrex at 2 qt/A, Valor at 3 oz/A, and Spartan at 6.7 oz/A. Red morningglory 6 feet tall was controlled 100% with 2,4-D at 1 qt/A 28 DAT the first year, but control was only 78% the second year. In the second year when herbicides were applied three weeks earlier than the previous year and when weed growth was more vigorous, red morningglory was controlled 87% with 2,4-D at 1.5 qt/A. Postemergence - directed applications to the lower 18 inches of 6 feet red morningglory plants with Aatrex at 4 qt/A and Spartan at 6.7 oz/A provided at least 96% control the first year, but control was 23 to 30 percentage points less the second year. Several viable options are available to control 24 inch red morningglory in areas where 2,4-D is restricted. When red morningglories begin to climb and wrap sugarcane stalks control with alternative herbicides is more variable and complete control is difficult to obtain. 2,4-D remains the treatment of choice for late season control of red morningglory in areas where its use is not restricted.

A COMPARISON OF WEED CONTROL WITH COMMERCIALLY AVAILABLE GLYPHOSATE. M.C. Smith, D.R. Shaw, and F.S. Kelley, Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Field studies were conducted in 2001 and 2002 at the MSU Plant Science Research Center near Starkville, MS, to compare weed control with commercially available glyphosate formulations under sub-optimum conditions (i.e. dry growing conditions and up to 25 cm weed height). The experimental design was a 3 x 13 split-plot, factorial arrangement of treatments with herbicide rate as the main-plot factor and glyphosate formulation as the sub-plot factor. Glyphosate rates included 0.42, 0.63, 0.84 kg ae/ha. Glyphosate formulations included Roundup UltraMax, Touchdown IQ with and without (+/-) nonionic surfactant (NIS), Glyphomax Plus, Glyphomax +/- NIS, Roundup Original +/- NIS, Glyphosate Original +/- NIS, Glyfos +/- NIS, and Glyfos Extra. Barnyardgrass, johnsongrass, prickly sida, sicklepod, hemp sesbania, pitted morningglory, velvetleaf were each planted in two separate 19-cm rows with an average density of 26 plants/m. Weed size was up to 25 cm at the time of glyphosate application. Additionally, weeds were not actively growing at the time of application as the result of drought. Visual control ratings were collected 2 and 4 weeks after glyphosate application. Weed control data were analyzed using SAS mixed model method. Experimental run was considered a random factor, and glyphosate rate, glyphosate formulation, and rating date were considered fixed factors. Means separation was accomplished using Fisher's protected LSD at P = 0.05. Data were pooled over run and rating date.

Weed control differentiation based on glyphosate formulation (salts and surfactant) was minimal. When averaged over glyphosate rates, all formulations controlled barnyardgrass and johnsongrass more than 90%. Prickly sida and sicklepod were controlled 76 to 81%. Hemp sesbania was controlled 64 to 69%. Pitted morningglory was controlled 57 to 63%. Velvetleaf was controlled 61 to 70%. Preliminary weed control results in 2002 were similar with Roundup WeatherMAX. Since product differentiation based on weed control appears to be minimal, glyphosate differentiation will probably be based on cost, service, and support program.

DIFFERENTIAL RESPONSE OF RICE VARIETIES TO COMMAND®. W. Zhang, E.P. Webster, C.T. Leon, and C.R. Mudge. Department of Agronomy, Louisiana State University AgCenter, Baton Rouge.

ABSTRACT

Nine rice varieties or experimental cultivars were evaluated for tolerance to Command 3ME (clomazone) in a drill-seeded system from 2000 to 2002. The experimental design was a randomized complete block with a two-factor factorial arrangement of treatments and four replications. Factor A was rice varieties, consisting of five long-grains, 'Cocodrie', 'Cypress', 'Drew', 'CL-141', and 'Wells', and four medium-grains, 'Bengal', 'Earl', 'LL-401', and 'LL-601'. The seeding rate for each variety was 100 lb/A. Command 3ME was applied preemergence (PRE) at 2.7 or 0 pt/A. Rice bleaching was visually evaluated at 14 and 42 days after treatment (DAT). Rice height, population, and grain yield were also evaluated.

Rice bleaching was 27 to 51% at 14 DAT with long-grain Drew having less injury compared with all medium-grain varieties. At 42 DAT, rice bleaching was 5 to 30% with medium-grain Earl. LL-401 was injured the most compared with all other varieties. In general, the medium-grains were bleached more than the long-grains with a few exceptions.

Plant height was reduced by Command with all varieties except long-grain Drew at 34 DAT. At 34 DAT, Command also caused stand loss to Earl, LL-401, and Wells, but other varieties' stands were not affected. Rice grain yield reduction was only observed with LL-401 when compared with the nontreated LL-401.

These results indicate that differential tolerance to Command exists among rice varieties; therefore, choosing more tolerant varieties may be a strategy to reduce risks associated with Command application.

VARIETAL TOLERANCE TO COMMAND IN WATER SEEDED RICE. C.R. Mudge, W. Zhang, E.P. Webster, and C.T. Leon. Department of Agronomy, Louisiana State University AgCenter, Baton Rouge.

ABSTRACT

A field study was conducted in 2002 at the Rice Research Station near Crowley, Louisiana to evaluate tolerance of rice varieties to Command 3ME (clomazone) in a water seeded system. The experimental design was a randomized complete block with a two-factor factorial arrangement of treatments and four replications. Factor A was rice varieties, consisting of six long-grains: 'Cocodrie', 'Francis', 'Ahrent', 'Cypress', 'Wells', 'Cheniere', one medium-grain: 'Bengal', and one short-grain: 'Pirogue'. Factor B consisted of Command at 2.1 pt/A impregnated on 150 lb/A urea fertilizer or 150 lb/A urea without Command applied at one leaf stage of rice, often referred to as the pegging stage. Percent bleaching of foliage, plant height, and rice population were evaluated at 14, 21, and 54 days after treatment (DAT). Rice was harvested with a small plot combine and adjusted to 12% moisture. Data were analyzed using PROC Mixed.

Bleaching of rice foliage increased on Pirogue when treated with Command compared to all other varieties at 14, 21, and 54 DAT with 30%, 40%, and 11%, respectively. Bleaching of treated Bengal was 4 to 23% across all rating dates. Cocodrie was bleached 23 and 31% at 14 and 21 DAPEG, respectively. Cheniere resulted in the least bleaching with 16, 21, and 1% at 14, 21, and 54 DAPEG, respectively, when treated with 2.1 pt/A Command.

Plant height, rice population, and yield between the treated and nontreated were compared within varieties. Plant height (cm) for treated varieties was shorter compared with the same nontreated varieties at 28 DAPEG. The treated varieties of Cocodrie, Ahrent, and Cypress at harvest were taller than the same nontreated varieties. All nontreated rice varieties produced more tillers (plants/m^2) than the treated varieties at 28 DAPEG. The nontreated Pirogue yielded higher than treated Pirogue, while the treated of Cypress and Bengal yielded more than the respective nontreated.

These results indicate that producers should consider not using Command on the short-grain Pirogue. Command has been an economical treatment in drill seeded rice for control of grasses. These data indicate that it can be used with medium and long grain rice varieties in water seeded rice.

ALTERNATIVE HERBICIDES FOR THE CONTROL OF QUINCLORAC-AND PROPANIL-RESISTANT BARNYARDGRASS. M.S. Malik, R.E. Talbert, E.F. Scherder, M.L. Lovelace, and B.V. Ottis Department of Crop, Soil and Environmental Sciences, University of Arkansas, Fayetteville, AR 72701

ABSTRACT

An experiment was conducted at the Rice Research and Extension Center Stuttgart, AR, to evaluate alternative control measures for quinclorac-resistant and propanil-resistant barnyardgrass *(Echinochloa crus-galli)*. Broadleaf signalgrass *(Brachiaria platyphylla)*, quinclorac-resistant and propanil-resistant and susceptible barnyardgrass were planted perpendicular to rows of rice. The rice cultivar 'Wells' was planted in plots where conventional herbicides were to be used. 'Clearfield' rice (CL-161) was planted where imazethapyr was to be used. Preemergence herbicide treatments included quinclorac at 0.375 lb ai/A and clomazone at 0.4 lb ai /A applied preemergence (PRE), pendimethalin at 1lb ai/A, and thiobencarb at 4 lb ai/A applied delayed preemergence (DPRE). Postemergence (POST) programs included propanil at 4 lb ai/A, cyhalofop-butyl at 0.25 lb ai/A, fenoxaprop at 0.8 lb ai/A, and bispyribac-sodium at 0.02 lb ai/A applied postemergence at 2-to3-leaf (EPOST), 4-to 5- leaf (MPOST) or at preflood (PREFLD) stages of rice growth. Herbicide treatments in 'Clearfield' rice included imazethapyr applied PRE at 0.063 lb ai/A followed by a second application of imazethapyr at 0.063 lb/A EPOST, MPOST or PREFLD.

Propanil-resistant barnyardgrass was controlled > 90% for all herbicide treatments, except with propanil, at 19 DAE and was further increased to 93% and greater by 54 DAE. Control of quinclorac-resistant barnyardgrass, except with quinclorac, from other herbicide treatments was >95% at 19 DAE. Control of quinclorac-resistant biotype was >93% 54 DAE. All PRE and DPRE herbicide treatments including clomazone, pendimethalin, quinclorac and thiobencarb gave >90% control of susceptible barnyardgrass, with a decrease in control observed with broadleaf signalgrass (63%) 19 DAE. Later in the season (54 DAE) there was >93% control of susceptible barnyardgrass as well as broadleaf signalgrass. Clomazone applied PRE caused 20% rice chlorosis 19 DAE; however, this chlorosis was short-lived with minimal bleaching signs by 40 DAE. Imazethapyr in Clearfield rice provided excellent control (100%) of all the grasses.

Rice yields reflected weed control in most of the cases. The yields (< 117 bu/A) were reduced in some cases due to the weed infestations remaining in the plots. Low rice yields were attributed to lodging in Wells and CL-161, which was due to winds from hurricane 'Lili'. In the plots treated with clomazone, quinclorac, bispyribac-sodium, cyhalofop butyl, the rice yields were superior because of good weed control. Yields from CL-161 were lower , 60 to 70 bu/A.

WEED CONTROL PROGRAMS WITH NEWER RICE HERBICIDES. J.A. Kendig, R. M. Cobill, B.A. Hinklin and P. M. Ezell, University of Missouri Delta Center, Portageville

ABSTRACT

Over the last two years bispyribac (Regiment), cyhalofop, (Clincher) and a safened version of fenoxaprop (Ricestar) have been registered for rice. These herbicides have several attributes: Cyhalofop and fenoxaprop offer drift safety to broadleaf crops, bispyribac can control larger barnyardgrass (*Echinochloa crus-galli*) (Cyhalofop also can control large barnyardgrass in a flooded environment), and bispyribac controls many common rice weeds. However, these herbicides also have limitations. Most notably they do not provide a broad enough spectrum of weed control: Cyhalofop and safened fenoxaprop only control relatively small, actively growing grasses in the early-POST, unflooded environment, and bispyribac provides poor control of sprangletop species (*Leptochloa* spp.) fall panicum (*Panicum dichotomifolium*), broadleaf signalgrass (*Brachiaria platyphylla*) and crabgrass species (*digitaria* spp.).

Because of the limitations, these herbicides must be integrated into weed control programs. These herbicides might be useful in early-post tank mixtures with residual herbicides where they control emerged weeds, and the residual mix partner prevents further weed emergence until the time of permanent flood. Similar programs with propanil (Stam)-based herbicides have been effective. Bispyribac may be useful for preflood clean up of grass and broadleaf weeds that escaped earlier preemergence, delayed preemergence or early-POST treatments. Salvage or rescue treatments are still common; consequently, bispyribac and post-flood cyhalofop may be useful.

Three studies were conducted. In the first study, fenoxaprop (0.07 lb/A), cyhalofop (0.19 and 0.25 lb/A) and propanil (3 lb/A) and bispyribac (0.02 lb/A) were tank mixed in a factorial arrangement with clomazone (Command) (0.5 lb/A), pendimethalin (Prowl) (1 lb/A), quinclorac (Facet) (0.25 lb/A), and thiobencarb (Bolero) (3 lb/A) and a no-residual control. In the second study, bispyribac (0.02 lb/A) was applied either in an early-post tank mixture with the residual herbicides clomazone, pendimethalin, thiobencarb and quinclorac (0.25 lb/A) or was applied preflood following normal applications (PRE, delayed PRE, and early POST as appropriate) of clomazone, pendimethalin, thiobencarb, propanil, cyhalofop, fenoxaprop (applied as 17 fl oz of Ricestar + 4 fl oz Whip 360). In the third study, propanil was applied early postemergence to generate a typical, moderate post-flood barnyardgrass infestation, then bispyribac, cyhalofop (0.28 lb/A), fenoxaprop (applied as 17 fl oz of Ricestar + 4 fl oz Whip 360), fenoxaprop (0.06 lb ai/A applied as Whip 360), and propanil + quinclorac (4 + 0.375 lb/A) were applied either one, two or three weeks postflood.

Barnyardgrass was in the 2 to 4 leaf stage and the soil was dry when the early-post, residual tank mixtures were applied, and grass control was inadequate. Bispyribac provided the best (58 to 83%) control as compared to 73 to 27% control from the other postemergence herbicides. Clomazone and pendimethalin provided slightly better residual control at the later ratings as compared to control from thiobencarb and quinclorac.

In the bispyribac (second) study, early-POST tank mixtures with pendimethalin and thiobencarb gave the best late season weed control of the residual mixes. Preflood bispyribac following an earlier treatment of the other herbicides resulted in 90 to 96% weed control, even though weed control from early treatments ranged from 35 to 86%.

In the postflood salvage (third) study, bispyribac, cyhalofop and propanil + quinclorac generally provided 70% or better barnyardgrass control as compared to 70% or less weed control from fenoxaprop treatments. There was some grass regrowth from many treatments, and rice was significantly injured by competition in two and three week postflood treatments.

Bispyribac appears to have greater barnyardgrass efficacy in early POST, unflooded environments as compared to safened fenoxaprop and cyhalofop. Bispyribac was effective in preflood applications, especially when earlier treatments provided poor weed control. In postflood salvage situations bispyribac and cyhalofop provide barnyardgrass control equivalent to that from propanil + quinclorac, which has recently been a standard for salvage. Given that bispyribac and cyhalofop are currently less expensive than propanil + quinclorac, they may be popular for that use. Because of the weed control spectrum and tank-mix limitations, bispyribac, cyhalofop and safened fenoxaprop may be limited to niche, and unplanned salvage uses.

RICE YIELD AND QUALITY AS AFFECTED BY VARIETY AND SEEDING RATE AND RED RICE DENSITY. K.L. Smith, R.C. Scott and N.R. Burgos; University of Arkansas.

ABSTRACT

Previous research reports that the red rice competes with the field rice therefore reducing yield and also causing the farmer to suffer dockage at the dryer. As of 1979, Diarra et al. listed red rice as a severe problem in rice resulting in an almost fifty million dollar loss each year. The strawhull variety of red rice has a larger leaf area index and grows faster than the blackhull red rice and matures later than "Lemont" or "Newbonnet" white rice varieties. Kwon, et.al. (1992) reported grain yield of Lemont and Newbonnet was reduced 86% and 52%, respectively, by red rice competition that lasted for 120 days after emergence. A study by Diarra et al. in 1985 showed Mars to be 24% to 33% more competitive with red rice than Lemont. These past studies show the effects on and competition of red rice with older white rice varieties. There are many new varieties of rice on the market each with different growth characteristics and yield potential. Many seed companies are also suggesting lower seeding rates for these new varieties. There is little information concerning the competition of red rice with modern white rice varieties.

In 2002, field studies were performed at Lonoke, Arkansas to evaluate the competitiveness of modern rice varieties with the red rice at varying red rice densities and commercial rice seeding rates. In the first study, Lemont, Lagrue, Cocodrie, CL-161, and XL-8 rice varieties were drill seeded at a rate of 101 kg/ha in a silt loam soil. Red rice seeding rates were 0, 0.36, 0.54, 1.0, 2.2, 3.3, 5.4, and 10.8 seeds/m^2. The experimental design was a complete randomized block design with four replications per treatment. The plot size was 1.4 X 6.1 meters. Number of red rice plants, number of red rice heads, total grain yield and percent red rice was measured.

In the second study, Cocodrie, Lagrue, and XL-8 rice varieties were planted at 33.6, 67.2, and 100.8 kg/ha. Red rice seeding rates were 0, 1.0 and 3.3 seeds/m^2. Again, the experimental design was a complete randomized block design with four replications per treatment and plot size was 1.4 X 6.1 meters. Number of red rice plants, number of red rice heads, total grain yield and percent red rice was measured. All data collected was evaluated by analysis of variance (ANOVA) and means separated by LSD=0.05.

There was a linear relationship between the planting density of red rice and the red rice percentage in each variety, but no relationship between yield and red rice seeding rates within varieties. This is contrary to reports from earlier research. As density increased red rice percentage increased. At the highest red rice seeding rate, XL-8 had fewer red rice plants/m^2 than Lemont, Lagrue, Cocodrie or CL-161 varieties. At each red rice seeding rate, XL-8 contained the lowest percentage of red rice, while Lemont had the highest. This is due to a reduced number of red rice plants and higher yield with XL-8 which dilutes the red rice amount. Dockage rates as determined by local grain elevator dockage scale were lower in the XL-8 variety than in all other varieties and higher in Lemont than all other varieties.

In the second study, the number of red rice plants/m^2 increased with increased red rice planting rate, but white rice seeding rates did not influence red rice density. There were no differences in density of red rice between white rice varieties except at the 3.3 red rice/m^2 seeding density and 100.1 kg/ha seeding rate, the Lagrue variety contained fewer red rice plants than the Cocodrie or XL-9. Percent of red rice in total yield was smaller with XL-8 than Lagrue or Cocodrie.

SPRANGLETOP AND RED RICE CONTROL IN CLEARFIELD RICE. M.E. Kurtz. Delta Research and Extension Center, Stoneville, MS 38776.

ABSTRACT

A field experiment was initiated on May 24, 2002 at Stoneville, MS to evaluate sprangletop [*Leptochloa panacoides* (Presl.) Hitch.] and red rice (*Oryza sativa* L.) control in Clearfield 161 rice. Clearfield 161 rice is a second generation, non-transgenic rice variety that is tolerant to Newpath 2AS (imazethapyr) herbicide. Sprangletop was naturally infested and red rice was over-seeded in this study. Herbicides were applied with a hand-held boom calibrated to deliver 20 gal/A. Prowl 3.3 EC (pendimethalin) 1 lb ai/A and Newpath (imazethapyr) 4 fl oz/A were applied alone or tank-mixed as a delayed preemergence (D-PRE) treatment. Prowl + Newpath tank-mixtures were followed by (fb) 1 application of Newpath 4 oz/A at 1-to 2-leaf (1-2 L) red rice, 3-to 4-leaf (3-4 L) red rice, or 1-to 2-tillered (1-2 T) red rice. The Prowl, D-PRE treatments were fb 2 applications of Newpath 4 oz/A at 1-2 L and 3-4 L, or 1-2 L and 1-2 T red rice. The Newpath 4 oz/A D-PRE treatment was fb Newpath 4 oz/A at 1-2 L red rice and Raptor 1 S (imazamox) 6 fl oz/A postflood (PSTFLD). A non-ionic surfactant 0.025% v/v was added to all postemergence treatments (POST).

Data were subjected to ANOVA and means were separated using Waller Duncan's K ratio t-test P=0.05. Season-long sprangletop control ranged from 48% with the Newpath D-PRE treatment fb Newpath at 1-2 L red rice and Raptor PSTFLD, which was different from all other treatments that resulted in 99% control. Season-long red rice control was 95% for the two Prowl D-PRE treatments fb 2 applications of Newpath POST, but were not different from all other treatments which resulted in 99% control of red rice.

RED RICE GROWTH SUPPRESSION IN CLEARFIELD AND LIBERTY LINK RICE.
R.T. Dunand, E.P. Webster, R.R. Dilly, C.T. Leon, and W. Zhang; Louisiana State University Agricultural Center, Crowley and Baton Rouge, LA.

ABSTRACT

Herbicide tolerant rice (Clearfield and Liberty Link) permits the application of Newpath AS and Liberty for control of red rice in rice. Control can be as high as 98%, and in heavily infested areas, there will be a noticeable number of escapes. Pollen exchange between herbicide tolerant rice and red rice will allow movement of herbicide resistance into the weed. Techniques to minimize cross pollination are necessary for an effective weed resistance management program. Mid- and late season applications of Newpath AS and Liberty were evaluated to determine the effect on reproductive development of red rice and crop production in general.

An early season Clearfield rice line, CL121, and a Liberty Link line, LL001, were drill-seeded on 7-inch rows at 90 lb/A on April 29, 2002 in an area naturally infested with red rice at the Rice Research Station in Crowley. Plot size was 9 x 20 ft. Soil type was Crowley silt loam. Agricultural chemicals were applied as recommended for general pest control. Experimental design was a randomized complete block with four replications. There was a factorial arrangement of variety and herbicide treatments. CL121 received either no early season herbicide or Newpath AS (BASF Corp., Research Triangle Park, NC) preemergence followed by postemergence. LL001 received either no early season herbicide or Liberty (Bayer CropScience, Kansas City, MO) postemergence. These early season treatments were generally classified as pretiller applications (PrTl). The PrTl applications were followed by no herbicide, herbicide at the panicle differentiation (PD) stage of the crop, or herbicide at heading (HD) of red rice. Newpath AS was applied at 4 fl oz/A and Liberty was applied at 28 fl oz/A per each application. All treatments were applied with a CO_2 driven backpack sprayer using a delivery rate of 15 gal/A.

The impact of early, mid-, and late season herbicide applications on red rice was evaluated. At 30 days after planting and just prior to flooding, PrTl applications of Liberty and Newpath AS had produced on average a decrease in stand density from 13 to 2 plants/10 yd^2. At maturity, the resultant change in panicle density was a decrease from 180 to 9 panicles/10 yd^2. Due to the significant impact of the PrTl treatments, the influence of the mid- and late season applications was most clearly noted in the plots without the PrTl treatments. In these plots, panicle density was decreased by the PD application of Newpath AS from 185 to 4 panicles/10 yd^2. Liberty applied at PD and the HD applications of both herbicides had no effect. Abnormal or malformed and unproductive panicles (little or no seed set) were observed with the mid- and late season applications. The appearance of abnormal panicles in the control was less than 5 panicles/10 yd^2 compared with 170, 181, and 120 panicles/10 yd^2 with Liberty applied at PD and HD and Newpath AS applied at HD, respectively. The few panicles produced following the PD application of Newpath AS were all abnormal.

Evaluations at harvest maturity showed PrTl and mid- and late season applications of Liberty and Newpath AS had minimal effects on crop stature and maturity, and production was mainly influenced by the PrTl applications. Mature plant height averaged 96 and 113 cm for LL001 and CL121, respectively, regardless of herbicide treatment. Similarly, grain moisture averaged 22.5 and 23.9% for LL001 and CL121, respectively. Early season control of red rice by PrTl applications of Liberty and Newpath AS increased grain yield. With no PrTl treatments, grain yield averaged 5700 lb/A compared with 6505 lb/A with PrTl treatments. Grain yield with the PrTl treatments increased continuous when followed by the mid- and late season applications. Grain yields averaged 6190, 6508, and 6820 lb/A, respectively. Grain yield of the PrTl treatment followed by the heading treatment (6820 lb/A) was significantly higher than the PrTl treatment alone (6190 lb/A).

Liberty and Newpath AS have the ability to reduce red rice populations and, in addition, minimize seed production through mid- and late season applications in the small percentage of red rice plants that survive early season control. With both population control and interruption of panicle development, an effective means of managing pollen transfer between rice and red rice to prevent outcrossing and provide a weed resistance management strategy can be accomplished. Crop production in herbicide tolerant rice is not negatively impacted by mid- and late season applications.

THE EFFECT OF FLOODING TIME ON RED RICE CONTROL WITH NEWPATH™ APPLIED AT DIFFERENT RICE STAGES. L.A. Avila, CAPES/Brazil and Texas Agricultural Experiment Station, College Station, TX; G.N. McCauley, Texas Agr. Exp. Stn., Eagle Lake, TX; S.A. Senseman, J.M. Chandler and J.H. O'Barr. Texas Agr. Exp. Stn., College Station, TX.

ABSTRACT

Newpath™ (active ingredient imazethapyr) is a new tool to control red rice in commercial rice production. It can provide good control of red rice, but evaluation of flooding time on red rice control is needed to more effectively use this herbicide. Field studies were conduct-161'. Data collected included initial rice plant stand, visual rice plant injury, and visual red rice control at 14, 21 and 28 days after treatment (DAT) as well as rice grain yield at the end of the season. The results showed that Newpath™ at 4 oz/A (PRE) followed by 4 oz/A (POST) did not significantly injure the 'CL-161' rice variety. There was no interaction between Newpath™ application timing and flooding time for rice grain yield. Rice grain yield was reduced when flooding was delayed 21 DAT. The application of Newpath™ increased rice grain yield regardless of application timing. There was no interaction between application timing and flooding time with respect to red rice control evaluated at 14 and 21 DAT. Red rice control was reduced when flooding was delayed until 21 DAT. Red rice control was also reduced when Newpath™ was applied at the 5- to 6-leaf stage compared with the 3- to 4-leaf stage. A significant interaction between Newpath™ application timing and time of flooding was apparent for red rice control evaluated 28 DAT. When Newpath™ was applied at the 3- to 4-leaf stage, flooding could be delayed until 14 DAT without adversely affecting red rice control. However, the best control was achieved when the rice flood was done within 7 DAT when the herbicide was applied at the 5- to 6-leaf stage.

CLINCHER™ SF COMMERCIAL EXPERIENCE IN SOUTHERN RICE. J.L. Breen[1], K.J. Pellerin[2] and R.B. Lassiter[1]; [1]Dow AgroSciences LLC, Indianapolis, IN 46268; and [2]Department of Agronomy, Louisiana State University AgCenter, Baton Rouge, LA 70803.

ABSTRACT

Dow AgroSciences' new rice herbicide, Clincher™ SF herbicide (cyhalofop-butyl, 2.38 lbs. / gallon EC), was registered by the EPA in May 2002, after Section 18 emergency exemptions were granted in California (2001-02) and Louisiana (2002). Clincher SF was applied on approximately 140,000 acres of drill-seeded and water-seeded rice in the Southern U.S. in 2002 for postemergent grass control of barnyardgrass (including propanil- and quinclorac-resistant biotypes), sprangletop, broadleaf signalgrass, fall panicum, seedling johnsongrass, knotgrass and other annual grasses. Due to the timing of registration, few pre-flood applications in drill-seeded rice were made. In both drill-seeded and water-seeded rice, Clincher SF was primarily used to clean up grass weeds emerging after failure of soil-applied herbicides. Pre-flood, good soil moisture was essential, while post-flood, best results were obtained when the flood was maintained at application and thereafter. Weed foliage at least 50% exposed at application was sufficient for optimum control. Tank mixing with postemergent broadleaf herbicides was not recommended with Clincher SF due to potential reduced grass control by Clincher SF. Overall, the performance of Clincher SF was excellent and no issues were reported with off-target drift, worker safety or rice crop safety. In 2003, Clincher SF will be recommended for both pre-flood (in tank mixture with soil-applied grass herbicides) and post-flood applications. ™Trademark of Dow AgroSciences, LLC.

EVALUATION OF POTENTIAL TANK-MIX PARTNERS FOR CLINCHER IN DRILL-SEEDED RICE. B.J. Williams, A.B. Burns, and D.B. Copes; Northeast Research Station, St. Joseph, La., Louisiana State University Agricultural Center, Baton Rouge, La. 70803.

ABSTRACT

Clincher (cyhalofop) tank-mixes with Command (clomazone), Pendimax (pendimethalin) and Facet (quinclorac) were evaluated in 2001 and 2002 at the Northeast Research Station near St. Joseph, La. on a Sharkey clay soil. In a study conducted in 2002, Clincher at 10 and 13.5 oz/A tank-mixes with Command (1.33 pt/A), Pendimax (2.4 pt/A) and Facet (0.38 lb/A) were evaluated. In studies conducted in 2001 and 2002, Clincher at 10, 12, 13.5 and 15 oz/A tank-mixes with 0.88, 1.0 and 1.33 pt/A Command were evaluated. All herbicides were also applied alone. In all three studies, rice 'Cocodrie' at 120 lb/A was drill seeded in rows 7.5 inches apart. Permanent floods were established 4 to 5 weeks after planting. Nitrogen, in the form of prilled Urea, was applied at 126 kg/ha just before permanent flood. At panicle initiation an additional 42 kg/ha of nitrogen was applied. Herbicide treatments were applied, in water using a CO_2 pressurized backpack sprayer calibrated to deliver 15 GPA to plots measuring 7 by 15 feet. The experimental designs for all three studies were randomized complete blocks with factorial treatment arrangements. Weed control ratings, rice injury ratings, and rice yield data were subjected to analysis of variance. Means were separated using Fisher's Protected LSD at the 5% level. In 2002, Clincher applied alone at the 2-3 leaf stage controlled barnyardgrass 80 to 90% 2 weeks after treatment (WAT), but control had dropped to less than 60% 8 WAT. Likewise, Command, Pendimax and Facet applied PRE controlled barnyardgrass 80 to 90% 4 WAT, but control had dropped to less than 70% for all three herbicides 8 WAT. Clincher rate did not impact barnyardgrass control 2 WAT when tank-mixed with Command, Pendimax or Facet and applied at the 2-3 leaf stage. At 8 WAT, 10 and 13.5 oz/A Clincher plus Command resulted in 90 and 95% barnyardgrass control, respectively. The higher rate (13.5 oz/A) of Clincher was needed when tank-mixed with Pendimax. Clincher plus Facet tank-mixes resulted in less than 70% control 8 WAT. Results from the Clincher plus Command rate studies were similar in 2001 and 2002. Generally, neither Clincher nor Command rate impacted barnyardgrass control when applications were made at the 2-3 leaf stage. These results from these studies indicate that excellent barnyardgrass control can be expected from Clincher tank-mixes with Command and Pendimax. However, the higher Clincher rate (13.5 oz/A) was needed when tank-mixed with Pendimax.

COMPARISON OF STALE AND CONVENTIONAL SEEDBED SYSTEMS USING NEWPATH IN CLEARFIELD RICE. R.E. Talbert, B.V. Ottis, M.S. Malik, M.L. Lovelace, and E.F. Scherder. University of Arkansas, Fayetteville 72704.

ABSTRACT

An experiment was conducted during the summer of 2002 at the Rice Research and Extension Center, Stuttgart, AR to evaluate the use of imazethapyr (Newpath) in conventional and stale-seedbed rice culture systems. The experiment was designed as a randomized complete block design with four replications, except conventional seedbed plots were alternated with the stale seedbed plots (each a 6-ft wide by 16 ft long plot, with eight 7-inch rows/plot) throughout the test area. Burndown treatments of glyphosate alone or in combination with imazethapyr were applied April 30, 2002 to 10-lf (leaf) little barley, 7- to 10-lf stinkgrass, 2- to 3-lf broadleaf signalgrass, and 3-lf barnyardgrass. The rice cultivar, CL-161, was planted on May 22, 2002 using a conventional drill and no-till drill. The stale seedbed and conventional seedbed areas were free of vegetation at the time of planting. Factors studied in the experiment included: 1)stale seedbed planting system using glyphosate at 1 lb/A at 21 days prior to planting versus conventional fresh seedbed planting system of drill-seeded rice, 2) initial treatment timings of imazethapyr of 21 days prior to planting , PPI, PRE, and POST on 2-lf rice, and 3) second or POST applied imazethapyr on 2-lf rice (13 DAE, days after emergence), 4-lf rice (15 DAE), 5- to 6-lf rice (27 DAE), and 7-lf rice (29 DAE, immediately preflood). All imazethapyr applications were made with 0.063 lb/A (4 oz Newpath/A) as sequential treatments, either 21 days prior to planting fb (followed by) POST (stale seedbed only), PPI fb POST (conventional seedbed only), PRE fb POST (both planting systems), or sequential POST(both planting systems). PPI treatments were applied two days prior to planting and PRE treatments one day after planting. Barnyardgrass (*Echinochloa crus-galli* L.), propanil-resistant and propanil-susceptible biotypes (both seeded in rows) plus a natural population, and broadleaf signalgrass (*Brachiaria platyphylla* (Griseb.) Nash) control were evaluated. Crop response observations were also recorded.

Weed control did not differ between tillage systems, except at 14 DAE, when barnyardgrass control was only about 65 % from the early preplant application compared to 75 % from PPI or PRE treatments. With the very moist conditions early in the growing season, control of all weeds by 40 DAE was outstanding with all the imazethapyr sequential treatments in both cultural systems (100 %). There was no crop injury observed with any treatment. Rice yields were good, 153 to 178 bu/A. The stale seedbed system of planting yielded 15 % more rice than the conventional seedbed system. Imazethapyr timing did not affect rice yield.

PRE VS. POST FLOOD APPLICATIONS OF REGIMENT IN RICE. J.H. O'Barr, J.M. Chandler and G.N. McCauley. Texas Agricultural Experiment Station, College Station.

ABSTRACT

Field studies were conducted in 2002 to evaluate early postemergence (EPOST) followed by (fb) pre or post-flood treatments of Regiment (bispyribac-sodium) for weed control and rice (*Oryza sativa* L.) tolerance. Experiments were conducted at the Texas Agricultural Experiment Station near Beaumont, Texas. Regiment was applied EPOST at 4.5 and 9 g ai/acre, fb either a pre-flood (PREFL) or post-flood (POSTFL) application of 9 g ai/acre. EPOST treatments were applied to rice at the 3-leaf stage. PREFL treatments were applied at the 2-3 tiller stage just prior to permanent flood establishment (PFE). POSTFL applications were made 10 days after PFE at the late tiller stage. An untreated check and a conventional treatment consisting of Stam, Bolero, and Facet applied at 4.5, 3.4, and 0.34 kg ai/acre respectively was applied EPOST. Hemp sesbania (*Sesbania exaltata*) weed control and crop injury in the form of root pruning were evaluated. All Regiment and conventional treatments provided greater than 92% hemp sesbania control with no significant differences among treatments. Hemp sesbania control of 98% was achieved with treatments of 4.5 and 9 g/acre applied EPOST fb 9 g/acre Regiment applied PREFL. Root pruning of 70% was noted with all PREFL treatments regardless of EPOST rate. By 35 days after POSTFL treatment, roots had regenerated and root pruning was less than 5%. No crop injury was observed from POSTFL treatments. Mid season root pruning did not result in any significant differences in yield.

EARLY POSTEMERGENCE TANK-MIX PROGRAMS WITH CYHALOFOP FOR RESIDUAL GRASS CONTROL IN RICE. B.V. Ottis[1], R.E. Talbert[1], E.F. Scherder[1], M.L. Lovelace[1], M.S. Malik[1], R.B. Lassiter[2], and D.R. Gardisser[3], [1]Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, [2]Dow AgroSciences, Little Rock, [3]University of Arkansas Cooperative Extension, Little Rock.

ABSTRACT

A study was conducted in 2002 evaluating tank mixtures of Clincher (cyhalofop-butyl) with Pendimax (pendimethalin) at 1.0 lb ai/A, Command (clomazone) at 0.4 lb/A, or Facet (quinclorac) at 0.28 lb/A for residual grass control in rice. Propanil (3 lb/A) and tank mixtures with these same herbicides were also included as standard treatments. All herbicide applications were made early postemergence (2- to 3-leaf rice). Propanil-susceptible barnyardgrass, propanil-resistant barnyardgrass and broadleaf signalgrass control were evaluated.

At three weeks after treatment (WAT), propanil-susceptible barnyardgrass control was at least 92% with 0.19 and 0.25 lb ai/A of Clincher or propanil (3 lb/A) alone or tank-mixed with Pendimax, Command, or Facet. By seven WAT, propanil-susceptible barnyardgrass control with propanil alone was 35%, while Clincher alone maintained 87% control. Clincher + Pendimax or Command did not improve control compared to Clincher (0.25 lb/A) alone. However, Clincher (0.25 lb/A) + Facet resulted in 98% control. Propanil + Command or Pendimax provided less than 85% control of propanil-resistant barnyardgrass. However, propanil + Facet controlled propanil-resistant barnyardgrass 99%. No significant differences were observed among Clincher tank mixtures, with control of propanil-resistant barnyardgrass being at least 92%, regardless of Clincher rate. Broadleaf signalgrass control seven WAT was at least 98% with all Clincher treatments. Rice yields among tank mixture treatments were similar, with yields being at least 6600 lb/A.

Also in summer 2002, a study was conducted in which several tank mixtures were applied by air in an effort to determine droplet size distributions and unreasonable drift potential of Clincher, Command, and other herbicides. Volume mean diameter (VMD), $V_{d.1}$ (droplet size of which 10% of the total spray volume is smaller), and $V_{d.9}$ (droplet size of which 90% of the total amount is smaller) were determined for these tank mixtures. All tank mixtures evaluated in this study had $V_{d.1}$ levels of > 200 microns. No significant differences were observed in droplet sizes among tank mixtures. The FMC Corporation has submitted a request for a 24C label, which will include aerial application of Clincher + Command tank mixtures for 2003.

AIM PROGRAMS FOR DRILL-SEEDED RICE (*ORYZA SATIVA*). C.T. Leon, E.P. Webster, W. Zhang, and C.R. Mudge. Louisiana State University AgCenter, Baton Rouge, LA 70803.

ABSTRACT

Research was conducted at the Rice Research Station near Crowley, LA, to evaluate Aim tank-mix combinations. Rice (*Oryza sativa* L.) was drill-seeded on April 3, 2002, using conventional rice production practices. Command at 1.0 pt/A was broadcast preemergence (PRE) then followed by (fb) 1 oz/A Aim alone or tank-mixed with 1.5 pt/A Basagran, 0.5 pt/A Blazer, 0.5 pt/A Storm, 1.1 oz/A Grandstand, 0.75 oz/A Permit, 0.4 oz/A Regiment, 0.8 oz/A Londax, or 3 qt/A Stam postemergence (POST) on 4-leaf to 1-tiller rice. Silicon surfactant, crop oil concentrate, or nonionic surfactants were included according to label recommendations of the tank-mix herbicides. Weed control was evaluated at 21, 33, and 47 days after (DA) POST. Weeds evaluated included barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.], Amazon sprangletop [*Leptochloa* panicoides (Presl) Hitchc.], broadleaf signalgrass [*Brachiaria platyphylla* (Griseb.) Nash], rice flatsedge (*Cyperus iria* L.), yellow nutsedge (*Cyperus esculentus* L.), and hemp sesbania [*Sesbania exaltata* (Raf.) Rydb. ex A.W. Hill]. Rice height at harvest and yield were also measured.

Barnyardgrass and Amazon sprangletop control was 90 to 91% with Command PRE 21 and 33 DAPOST. Barnyardgrass and Amazon sprangletop control was more than 85% at the 21 and 33 DAPOST rating intervals with the exception of Command fb Aim + Basagran, which controlled barnyardgrass 81% 33 DAPOST. At the 21 and 33 DAPOST rating dates, Command was providing the majority of the grass control. At 47 DAPOST, Command alone PRE controlled barnyardgrass and Amazon sprangletop 89 and 94%, respectively. Aim plus Blazer, Stam, or Regiment controlled barnyardgrass 90 to 97% and Amazon sprangletop 89 to 94%. All treatments controlled broadleaf signalgrass at least 88% at each rating interval.

Command alone or fb Aim provided no control of rice flatsedge and yellow nutsedge. Command fb Aim plus Londax or Permit controlled rice flatsedge and yellow nutsedge 86 to 97% at 21 and 33 DAPOST. Control increased to 95 to 98% 47 DAPOST. Command fb Aim + Basagran controlled yellow nutsedge 96% 47 DAPOST. All POST treatments controlled hemp sesbania more than 94%.

Rice heights were 82 to 87 cm and did not differ with treatment. Treatments consisting of Command fb Aim plus Basagran, Permit, Regiment, and Storm which provided grass and sedge activity resulted in rice yields approaching 150 bu/A, which was better than Command alone or Command fb Aim alone.

BEEF GAINS IN NO TILL VS CONVENTIONAL TILLAGE PRACTICE SYSTEMS.
D.L. Bushong and T.F. Peeper; Department of Plant and Soil Sciences, Oklahoma State University, Stillwater 74078.

ABSTRACT

In Northern Oklahoma, hard winter wheat (*Triticum aestivum* L.) is primarily grown as a dual-purpose crop (forage plus grain). Little research as been conducted to compare the no-till with conventional tillage for dual-purpose wheat. The objective of this study is to agronomically and economically compare no-till and conventional tillage production systems in continuous wheat grown for forage only, forage plus grain, and grain only. Experiments were established May 2002 in Northern Oklahoma at three on-farm locations. Planting dates varied with the intended use of the crop. An early September planting date was used for forage only, forage plus grain, and forage only plus a summer forage crop (foxtail millet (*Setaria italica* (L.) *Beauv*)) treatments. A late September planting date was used for forage and grain treatments and an October planting for a grain only treatment.

In May 2002, forage was removed from forage only plots. Foxtail millet was planted in appropriate forage-only plots in late May and the remaining wheat was harvested for grain in June. Glyphosate was broadcast at 0.84 kg a.i./ha on the no-till treatments that didn't contain foxtail millet. Conventional tillage plots were plowed and later disked to control weeds during the fallow period. In August, the millet was harvested and yields were determined on a dry weight basis. Prior to wheat planting the treatments were either sprayed with glyphosate at 0.56 kg a.i./ha or disked. Wheat was planted in early September, late September, and October. In November the September-planted wheat was clipped and dried to obtain forage yield.

Averaged across locations, the foxtail millet yield was 4770 kg/ha in the conventional treatments and 5450 kg/ha in the no-till treatments. Wheat forage yields in the forage only treatments (without foxtail millet double cropped) averaged 1860 kg/ha in conventional tillage plots and 2700 kg/ha in no-till plots. In the forage plus foxtail millet, the conventional wheat forage averaged 1500 kg/ha versus 1590 kg/ha in the no-till treatments. The early-planted treatments used for forage plus grain had an average wheat forage yield of 2630 kg/ha in conventional treatments and 3250 kg/ha in no till treatments. In the late-planted wheat used for forage plus grain the conventional treatments averaged 1180 kg/ha in conventional and 1110 kg/ha in the no-till treatments.

At all three locations, pigweeds (*Amaranthus* spp.) and carpetweed (*Mollugo verticillata*) were the primary weeds growing in the plots. At one of the locations kochia (*Kochia scorparia*) was also present and at another there were few summer annual weeds growing. The glyphosate applications controlled the weeds present in the experiments.

ON-FARM PERFORMANCE OF CLEARFIELD WHEAT. B.W. Collier, C.R. Medlin, T.F. Peeper, and J.P. Kelley; Department of Plant and Soil Sciences, Oklahoma State University, Stillwater, OK 74078

ABSTRACT

Six on-farm experiments were conducted in Oklahoma during the 2001-2002 winter wheat crop year to introduce Clearfield wheat technology to the hard red winter wheat industry. Two of the replicated on-farm experiments were infested with cheat, feral rye, and jointed goatgrass. Variables included herbicides and application timing. An experimental line of imidazolinone-tolerant hard red winter wheat provided by Dr. B. Carver of Oklahoma State University was planted at 83 lb/A, in 8-inch rows at each site in either September or October. The experiment design at each location was a randomized complete block with 12 by 30 ft plots and four replicates. Treatments included Finesse (chlorsulfuron + metsulfuron 5:1) applied (PRE) at 0.38 oz ai/acre, Maverick (MON 37500) applied (POST) at 0.5oz ai/acre, Everest (MKH 6562) applied (POST) at 0.43 oz ai/acre, Beyond (imazamox) applied (POST) at 0.5 and 0.63 oz ai/acre, and an untreated. Post treatments were applied with appropriate additives. Weed control was visually estimated in the spring and grain yield, grain moisture and dockage due to weed seed were determined by harvesting at maturity. All treatments except Finesse (Pre) controlled cheat above 95% at both locations. Finesse is labeled for cheat suppression and it suppressed cheat 28 and 40% at the two sites. Maverick and Everest controlled cheat 95% or more at both sites and were ineffective on feral rye, and jointed goatgrass. Imazamox at 0.63 oz ai/acre controlled cheat, feral rye, and jointed goatgrass 98% or more except that feral rye was controlled approximately 92% when the herbicide was applied in February.

ITALIAN RYEGRASS CONTROL IN WINTER WHEAT WITH AE F130060 00 PLUS AE F115008 00. H.L. Crooks and A.C. York; Department of Crop Science, North Carolina State University, Raleigh, NC 27695-7620; A.S. Culpepper; Department of Crop and Soil Sciences, University of Georgia, Tifton, GA 31793.

ABSTRACT

AE F130060 00 (proposed name mesosulfuron-methyl) is a new sulfonylurea herbicide being developed by Bayer CropScience for postemergence control of *Lolium* and *Avena* species in wheat. AE F115008 00 (proposed name iodosulfuron-methyl-sodium) is another sulfonylurea herbicide that may ultimately be mixed with AE F130060 00 for control of broadleaf weeds. AE F130060 00 plus AE F115008 00 control both diclofop-susceptible and -resistant Italian ryegrass (*Lolium multiflorum*).

Experiments were conducted in North Carolina to determine wheat varietal response to AE F130060 00 plus AE F115008 00 under weed-free conditions. Experiments also were conducted to determine response of weed-free wheat and control of Italian ryegrass in infested wheat with AE F130060 00 plus AE F115008 00 applied in UAN (urea ammonium nitrate) compared with application in water. A third series of experiments focused on tolerance of weed-free wheat and control of Italian ryegrass in infested wheat with mixtures of AE F130060 00 plus AE F115008 00 and thifensulfuron plus tribenuron, dicamba, or 2,4-D. Each experiment was conducted at two locations in the 1999-2000 (year 1) and 2001-2002 (year 2) growing seasons. In all experiments, the safener AE F107892 (proposed name mefenpyr-diethyl) was included with AE F130060 00 and AE F115008 00 at a 1:1 herbicide:safener ratio in year 1 and a 1:2 herbicide:safener ratio in year 2.

Tolerance of six soft red winter wheat varieties to AE F130060 00 plus AE F115008 00 applied at 12.5 plus 2.5 (anticipated 1X use rate) and 25 plus 5 g ai/ha, respectively, at the 2- to 3-tiller stage was examined under weed-free conditions. Wheat varieties included ‘Coker 9663', ‘Coker 9704', ‘Jackson’, ‘FFR 555', ‘Pioneer 2580', and ‘Pioneer 2684'. Visible injury averaged 5 and 15% 3 wk after treatment (WAT) in years 1 and 2, respectively. Injury in both years was 2% or less 10 WAT. No differences among varieties were noted for visible injury, and AE F130060 00 plus AE F115008 00 at 25 plus 5 g/ha did not reduce grain yield in year 1. In year 2, yield of ‘FFR 555', ‘Pioneer 2684', and ‘Jackson’ was reduced 6 to 10% by the herbicides at 12.5 plus 2.5 g/ha, and yield of all varieties was reduced 7 to 22% by the herbicides at 25 plus 5 g/ha. Yield reduction was attributed to reduced numbers of kernels per spike. Based upon grain yields in year 2, the varieties ‘Coker 9663', ‘Coker 9704', and ‘Pioneer 2580' were most tolerant, ‘FFR 555' and ‘Pioneer 2684' were intermediate in tolerance, and ‘Jackson’ was least tolerant.

Wheat tolerance and Italian ryegrass control by AE F130060 00 plus AE F115008 00 applied in water or UAN were evaluated in separate experiments. In the tolerance experiment, wheat responded similarly to AE F130060 00 plus AE F115008 00 at 12.5 plus 2.5 and 25 plus 5 g/ha, respectively, applied in water. The herbicides plus nonionic surfactant (NIS) at 0.6% (v/v) applied in water injured weed-free, 5- to 7-tiller wheat 3% or less and did not affect yield. Greater injury occurred with application in UAN, and yield was reduced 11% due to fewer kernels per spike. NIS added to the herbicides in UAN increased weed-free wheat injury but had no effect on yield. Greater Italian ryegrass control was obtained with application in UAN, and NIS increased control. Yield of Italian ryegrass-infested wheat treated with herbicides plus NIS in UAN was similar to or greater than yield when herbicides plus NIS were applied in water.
Wheat tolerance and Italian ryegrass control with AE F130060 00 plus AE F115008 00 applied alone and mixed with the broadleaf herbicides 2,4-D, dicamba, or thifensulfuron plus tribenuron were examined in separate field experiments. Wheat injury from AE F130060 00 plus AE F115008 00 mixed with the broadleaf herbicides was additive and generally minor. AE F130060 00 plus AE F115008 00 at 12.5 plus 2.5 g/ha applied in December or February did not affect weed-free wheat yield. Yields were similar with AE F130060 00 plus AE F115008 00 applied

alone and mixed with the broadleaf herbicides. AE F130060 00 plus AE F115008 00 applied in December controlled Italian ryegrass 86 to 99% late in the season and increased wheat yield 142 to 254%. At two of four locations, greater control was obtained with December application compared with February application. Dicamba or 2,4-D mixed with AE F130060 00 plus AE F115008 00 reduced late-season Italian ryegrass control approximately 10% in half of the trials but did not affect wheat yield compared to AE F130060 00 plus AE F115008 00 applied alone. Thifensulfuron plus tribenuron mixed with AE F130060 00 plus AE F115008 00 did not affect Italian ryegrass control or wheat yield. Under greenhouse conditions, 2,4-D increased the I_{80} (rate needed for 80% inhibition) of AE F130060 00 plus AE F115008 00 for Italian ryegrass visible control and shoot fresh weight reduction 60 to 68% while dicamba increased the I_{80} 132 to 139%.

EVALUATION OF MESOSULFURON IN SOFT RED WINTER WHEAT. L.R. Oliver, J.W. Barnes, and J.A. Bond. Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville.

ABSTRACT

Winter weed problems have become a major limitation to wheat production. Diclofop-resistant Italian ryegrass (*Lolium multiflorum*) has become the worst weed problem in Arkansas. A resistant-ryegrass control program was established in 1996 and since 1998 mesosulfuron-methyl (Falcon) was evaluated at Fayetteville, and Willow Beach on silt loam and silty clay, respectively. Mesosulfuron was applied to 2- to 4-leaf ryegrass and 2- to 3-tiller Pio 2684 wheat at 20 GPA. Adjuvants varied from Destiny (0.75 qt/A), 28% N (1 qt/A), and AG-98 (0.25%). The formulation for mesosulfuron (AEF130060) varied between 60.8 and 75 WG. Iodosulfuron (AEF115008) at 0.002 lb ai/A was included in treatments the first 2 years. After the first year, mefenpyr-diethyl (AEF107892) at 0.027 lb ai/A was included as a safener. Resistant-ryegrass control was excellent (96%+) in all years of the study. Initial wheat injury was 50% the first year of testing because mefenpyr was not in the mixture, but wheat yield was not influenced. The remaining years mefenpyr was included, and wheat tolerance was excellent. Resistant- and susceptible-ryegrass control was equivalent at either stage and rate of application (0.0111 or 0.0134 lb ai/A of mesosulfuron + 0.0268 lb ai/A of mefenpyr). A trend was noted for the 2- to 3-tiller applications of mesosulfuron to reduce wheat yield due to ryegrass interference. The adjuvants did not improve control. Annual bluegrass (*Poa annua*), bulbous buttercup (*Ranunculus bulbosus*), henbit (*Lamium amplexicaule*), and mouseear chickweed (*Cerastium vulgatum*) were also controlled with mesosulfuron. Mesosulfuron was the most effective treatment for resistant Italian ryegrass control at either growth stage, especially at the 2- to 3-tiller stage of wheat.

CHEAT AND ITALIAN RYEGRASS CONTROL WITH AE F130060 IN WINTER WHEAT. J.P. Kelley and T.F. Peeper, Department of Plant and Soil Sciences, Oklahoma State University, Stillwater, OK 74078.

ABSTRACT

Five field experiments were conducted in north central Oklahoma during the 2000-2001 and 2001-2002 wheat growing seasons to evaluate cheat (*Bromus secalinus*) and Italian ryegrass (*Lolium multiflorum*) control with AE F130060 compared to standard herbicides for each weed species. Herbicide standards for cheat included Maverick (proposed common name of sulfosulfuron) at 0.031 lb ai/acre + 0.5% v/v nonionic surfactant and Olympus (MKH 6561, proposed common name procarbazone-sodium) at 0.04 lb ai/acre + 0.25% v/v NIS. AE F130060 was applied with the crop safener AE F107892 at a 1:2 ratio. The standard herbicide for Italian ryegrass was Hoelon applied at 0.75 lb ai/acre. In all experiments hard red winter wheat '2174' was seeded in late September or October at 65 to 70 lbs/acre. Herbicide treatments were applied in early December using a CO_2 backpack sprayer delivering 20 GPA of water carrier. Cheat growth stage at application was two leaf to three tillers, Italian ryegrass growth stage was one leaf to four tillers, and wheat growth stage was three leaf to six tillers. In 2001-2002, the experiments were designated as cheat control experiments, but contained considerable amounts of Italian ryegrass. Pooled over two sites, AE F130060 at 0.0134 and 0.016 lb ai/acre controlled Italian ryegrass 97 and 99%, while controlling cheat 43 and 50%. Maverick and Olympus controlled Italian ryegrass 54 and 42%, but both controlled cheat 99%. All treatments increased yield compared to the untreated check, but AE F130060 increased wheat yields greater than Maverick or Olympus due to increased Italian ryegrass control. In 2001-2002, in two experiments where Italian ryegrass was the sole grassy weed, AE F130060 at 0.0067, 0.0112, and 0.0134 controlled Italian ryegrass 99 to 100% compared 97 and 100% control by Hoelon. Wheat yields of AE F130060 and Hoelon were similar. In the one cheat experiment conducted in 2001-2002, AE F130060 at 0.0067, 0.0112, and 0.0134 lb ai/acre controlled cheat 55, 64, and 71%, respectively, while Maverick and Olympus controlled cheat 99%. All AE F130060 treatments increased wheat yield, but not as great as Maverick or Olympus. No wheat injury was seen in the 2000-2001 experiments. In 2001-2002 AE F130060 injured wheat 10 to 15% regardless of rate 14 DAT, compared to 4 and 6% for Maverick and Olympus, while Hoelon caused no visible wheat injury.

A field experiment was conducted in north central Oklahoma during the 2000-2001 wheat growing season and repeated in the 2001-2002 season. The objective was to compare cheat control from AE F130060, Maverick and Olympus when applied in early March after the wheat had been grazed by cattle from November until early March. Treatments were applied 4 to 14 days after the cattle were removed in either water or 28% UAN carrier at 20 GPA. Water treatments were applied with 0.5% v/v NIS and 28% UAN treatments were applied with 0.25% NIS. In both experiments little wheat injury was seen when treatments were applied with water, but when applied with 28% UAN, Maverick, Olympus, and AE F130060 caused 14, 18, and 43% foliar leaf burn, respectively in 2000-2001 and 10, 13, and 20% foliar leaf burn, respectively, in 2001-2002. In both experiments carrier had little effect on cheat control and all treatments controlled cheat 93 to 99%. Wheat yields were increased compared to the untreated check in both years, but no difference was found between treatments.

WEED MANAGEMENT IN NORTH CAROLINA PEANUTS WITH DUAL MAGNUM, VALOR, STRONGARM, & CADRE. B.L. Robinson, I.C. Burke, J.W. Wilcut and S.B Clewis; Department of Crop Science, North Carolina State University, Raleigh.

ABSTRACT

The lengthy peanut growing season and delayed closure of row middles makes season-long weed control difficult in North Carolina. The preemergence (PRE) herbicides Valor and Strongarm are two relatively new herbicides that have been registered for use in peanut. The objectives of this study were to evaluate weed control with PRE applications of Dual Magnum + Valor (two rates) and Dual Magnum + Strongarm (two rates) when used alone or in a systems approach with Cadre postemergence (POST) at one of two rates. Four experiments were conducted in 2001 and 2002 at the Peanut Belt Research Station at Lewiston -Woodville, NC and the Upper Coastal Plain Research Station at Rocky Mount, NC. PRE treatments evaluated included Dual Magnum at 1.5 lb ai/ac, Dual Magnum + Valor at 0.063 or 0.094 lb ai/ac, and Dual Magnum + Strongarm at 0.012 or 0.024 lb ai/ac. POST treatments evaluated included Cadre at 0.032 (1/2 X rate) and 0.063 (1X rate) lb ai/ac. Weed densities ranged from 2-40 plants/m^2 for each species. Broadleaf weeds were cotyledon-8 leaf and yellow nutsedge ranged from 4-10 inches in height at time of POST applications. Herbicide treatments were applied when peanuts were 6-8 inches in diameter. All herbicides were applied using a CO_2-pressurized backpack sprayer equipped with 11002VS flat-fan nozzles delivering 15 GPA at 20 PSI. An NIS at 0.25% (v/v) was included in all POST treatments. Plots were arranged in a randomized complete block design with three replications of treatments. The experiment contained a factorial arrangement of PRE (5) x POST (3) herbicide options.

With the exception of Dual Magnum alone, all PRE treatments when averaged over POST options, controlled prickly sida (*Sida spinosa*), common ragweed (*Ambrosia artemisiifolia*), pitted morningglory (*Ipomoea lacunosa*), entireleaf morningglory (*Ipomoea hederacea* var. *integriuscula*), Palmer amaranth (*Amaranthus palmerii*), and smooth pigweed (*Amaranthus hybridus*) at least 80%. Cadre applied POST at the 1X rate was more effective than the ½ X rate at controlling Palmer amaranth, entireleaf morningglory, and prickly sida when averaged over all PRE treatments. Cadre POST at either rate increased control of yellow nutsedge for all PRE treatments. Yields were highest when a systems approach of PRE and POST herbicides was utilized. Early-season crop injury was less than 11% for all treatments, but was higher for both PRE treatments of Valor, with the higher rate being more injurious.

PEANUT PRODUCTION UTILIZING REDUCED RATES OF STRONGARM, VALOR, AND CADRE HERBICIDES. S.D. Willingham, B.J. Brecke, J.T. Ducar, G.E. MacDonald, and C.S. Bray; Department of Agronomy, University of Florida, Gainesville, Fl 32611, West Florida Research and Education Center, Jay, Fl 32565, and Department of Animal and Horticultural Sciences, Berry College, Mt. Berry, GA 30149

ABSTRACT

Field studies were conducted in 2002 at Jay and Citra, Florida to evaluate weed control, peanut tolerance and peanut yield using reduced rates of Strongarm, Valor and Cadre and to determine if herbicides at reduced rates could be used in combination to achieve broad spectrum weed control. Herbicide was applied with a CO2 backpack sprayer operated at 32 psi and calibrated to deliver 15 GPA. Treatments evaluated were Strongarm at 0.006 (1/4x) and 0.024 (1x) lb. ai/A, Valor at 0.024 (1/4x) and 0.094 (1x) lb. ai/A PRE; Strongarm at 0.006 (1/4x) plus Valor at 0.024 (1/4x) PRE tank mix; Strongarm (1/4x) plus Valor (1/4x) PRE fb Cadre POST at three rates 0.032 (1/2x), 0.042 (2/3x), and 0.064 (1x); Strongarm 0.024 (1x) and Valor 0.094 (1x) lb. ai/A PRE fb Cadre 0.064 (1x) lb. ai/A. A standard of Gramoxone Max 0.125 lb a.i/A plus Basagran 16 oz/A at cracking fb and Cadre 1.44 oz/A POST and an untreated check were also included.

Strongarm or Valor alone PRE at 1/4x rate gave control equal to the 1x rate for Florida beggarweed (Desmodium tortuosum) and amaranth (Amaranthus sp.) (85 and 95%). Strongarm or Valor PRE at the 1x rate controlled sicklepod (Senna obtusifolia) and yellow nutsedge (Cyperus esculentus) better than 1/4x rate of either herbicide. Strongarm plus Valor tank mix at 1/4x rate gave greater control (>75%) of yellow nutsedge than Strongarm or Valor alone at 1x rate (70 and 15%, respectively). Strongarm plus Valor at 1/2x and 1/4x rate gave 85% and 78% control of Florida beggarweed respectively and >95% control of amaranth. Strongarm plus Valor at all rate combinations controlled sicklepod and nutsedge between 65 and 75%. Strongarm plus Valor at 1/4x rate fb Cadre at 1/2x rate controlled amaranth and yellow nutsedge 88 and 95% and sicklepod and Florida beggarweed 75 and 76% respectively. When Cadre was applied POST at 2/3x with the same PRE combination, control of weeds increased to 99% for amaranth, 98% for yellow nutsedge, 83% for sicklepod, and 96% for Florida beggarweed. Strongarm plus Valor at 1/4x rate PRE fb Cadre at 2/3x rate POST gave control equal to that observed with the standard treatment. All herbicide management systems evaluated produced similar yields.

This research indicates that growers can use PRE herbicides in combinations at reduce rates followed by POST at reduce rates and achieve weed control and peanut yields comparable to the standard.

CADRE/FUNGICIDE TANK-MIXES IN PEANUT. E.P. Prostko, R.C. Kemerait, and T.L. Grey, University of Georgia, Tifton, GA 31793.

ABSTRACT

In an effort to reduce production inputs, a common management practice of many growers is to apply combinations or tank-mixtures of pesticides. However, the registration labels of many of these compounds do not adequately address the potential problems of pesticide combinations such as antagonism, increased crop injury, or physical mixing incompatibilities. Cadre (imazapic) is one of the most popular peanut herbicides used because of its low cost/A and broad spectrum control. However, the current Cadre label discourages the use of certain tank-mixtures. The objective of this research was to evaluate the influence of fungicides, applied in combination with Cadre, on crop and weed response in peanut.

Replicated field trials were conducted in 2001and 2002 in Georgia using traditional small plot research techniques. 'Georgia Green' peanuts were planted in late April or early May. Cadre 70DG (1.44 ozs/A) was applied 30 days after planting alone and in combination with the following fungicides at current labeled rates: Bravo Weather Stik (chlorothalonil), Tilt (propiconazole) + Bravo Weather Stik, Headline (pyraclostrobin), Abound (azoxystrobin), Folicur (tebuconazole), and Moncut (flutolanil). All treatments included a non-ionic surfactant at 0.25% v/v. All data were subjected to ANOVA and means separated using Fisher's Protected LSD Test (P = 0.05).

No physical mixing or compatibility problems were observed with any Cadre/fungicide combination. Peanut injury was not increased when fungicides were tank-mixed with Cadre. The control of various weed species, including Texas panicum (*Panicum texanum*), nutsedge (*Cyperus* spp.), smallflower morningglory *(Jacquemontia tamnifolia*), and sicklepod (*Cassia obtusifolia*) was not affected when fungicides were applied in combination with Cadre.

PEANUT AND WEED RESPONSE TO POSTEMERGENCE APPLICATIONS OF STRONGARM. D.L. Jordan, S.R. Hans, J.E. Lanier, B.R. Robinson, and J.W. Wilcut. North Carolina State University, Raleigh, NC 27695-7620.

ABSTRACT

Research was conducted from 1999 through 2002 to determine weed and peanut (*Arachis hypogaea*) response to postemergence applications of Strongarm (diclosulam). In one experiment conducted from 1999 through 2001, Strongarm was applied at 0.012 lb ai/acre alone or with acifluorfen plus bentazon 5 wk after peanut emergence. In a second set of experiments, Strongarm was applied at rates ranging from 0.008 to 0.046 lb/acre 3 wk after peanut emergence. These studies were conducted under weed-free conditions. In a third set of experiments, Strongarm at rates of 0.008 to 0.024 lb/acre was applied to emerged common cocklebur (*Xanthium strumarium*), common lambsquarters (*Chenopodium album*), common ragweed (*Ambrosia artemisifolia*), eclipta (*Eclipta prostrata*), entireleaf morningglory (*Ipomoea hederacea* vr. *integriuscula*), jimsonweed (*Datura stramonium*), and smooth pigweed (*Amaranthus hybridus*). In other experiments, peanut response and yellow nutsedge (*Cyperus esculentus*) control by Strongarm applied alone and with various other herbicides were evaluated. In a final set of experiments, interactions of Strongarm (0.012 and 0.024 lb/acre) applied with Poast Plus (sethoxydim) and Select (clethodim) were evaluated. Visual estimates of percent weed control and peanut injury were recorded one to four wk after application. Peanut yield was determined in the weed-free experiments.

Peanut injury from postemergence applications of Strongarm was no more than 5%, and Strongarm did not affect pod yield regardless of rate, application timing, or cultivar. Strongarm applied postemergence controlled common cocklebur, common ragweed, and jimsonweed completely. Entireleaf morningglory was controlled completely in one experiment by Strongarm but only 54 to 80% in a separate experiment. Common lambsquarters and smooth pigweed were controlled no more than 10% by Strongarm regardless of rate, while eclipta and yellow nutsedge were controlled 20 to 53%. In one experiment, Gramoxone MAX (paraquat) and Butyrac 200 (2,4-DB) reduced yellow nutsedge control by Strongarm when these herbicides were applied in mixture. Broadleaf signalgrass (*Brachiaria platyphylla*) control by Poast Plus and Select were not affected by Strongarm. However, large crabgrass (*Digitaria sanguinalis*) control by Poast Plus in two experiments was reduced when Poast Plus was applied with Strongarm at 0.012 and 0.024 lb/acre. Large crabgrass control by Select was affected by Strongarm applied at the highest rate at only one location.

WEED CONTROL SYSTEMS IN PEANUT WITH DICLOSULAM POSTEMERGENCE.
P.A. Dotray, T.A. Murphree, G.G. Light, W.J. Grichar, J.W. Keeling, T.A. Baughman, and V.B. Langston. Texas Tech University, Lubbock; Texas Agricultural Experiment Station, Lubbock and Yoakum; and Texas Cooperative Extension, Vernon; and Dow AgroSciences, The Woodlands, TX.

ABSTRACT

Peanuts continue to be an important crop for producers in Texas, although the acres harvested in 2002 (280,000) declined compared to acres harvested in 2001 (310,000). Average peanut yields, which increased from 2890 lb/A to 3100 lb/A, were in part the result of improved weed control. Since 2000, new soil-applied herbicides have been used to improve annual broadleaf weed control in peanuts. During its 2000 launch year, diclosulam slowed peanut emergence, caused stunting, discoloration, and stand loss on the Texas High Plains. Since the 2000 growing season, label restrictions prohibit the use of diclosulam on soils with a pH of 7.2 or greater, which is essentially all soils in the Texas High Plains peanut region. Experiments on soil type, watering frequency, and peanut variety have been conducted to better understand the cause of this injury. The objective of this experiment was to examine the efficacy and peanut tolerance following diclosulam applied postemergence. Twenty large plot field experiments were established on the Texas Southern High Plains in 2001. Additional experiments in 2001 and 2002 were conducted at Flomot and Lelia Lake (Rolling Plains), Lamesa (Southern High Plains), and Yoakum (South Central Texas). In the large plot studies, diclosulam was applied at 0.008 lb ai/A, , 0.016 lb ai/A, 0.016 lb ai/A + 2,4-DB (0.25 lb ai/A), and 0.024 lb ai/A and comparisons were made to the grower standard. In the additional small plot experiments, diclosulam was applied alone (0.004, 0.008, 0.012, 0.016, 0.024, 0.031, and 0.048 lb ai/A) and in combination with 2,4-DB (0.025 lb ai/A) plus crop oil or bentazon (1.0 lb ai/A) plus crop oil. Peanut injury from diclosulam applied postemergence was observed at 2 of 20 locations (up to 10%). A transient yellow chlorosis was observed that lasted approximately 8 days. Typical 2,4-DB injury was observed at several of these locations. Five of the 20 locations were harvested, and no adverse affects on yield were observed. Diclosulam postemergence had activity on many common weeds in Texas peanut. Diclosulam at 0.016 lb ai/A control devil's-claw 99% (averaged over 10 locations), common cocklebur 95% (1 location), golden crownbeard 99% (6 locations), Palmer amaranth 78% (5 locations), Russian thistle 78% (7 locations, yellow nutsedge 87% (3 locations), purple nutsedge 90% (1 location), and annual morningglories 77% (3 locations). In the small plot studies, no visual injury was observed throughout the growing season following diclosulam applied postemergence; however, diclosulam applied preemergence injury peanut nearly 50% and at-crack injured peanut nearly 10% early season . Diclosulam at 0.016 lb ai/A controlled purple nutsedge and ivyleaf morningglory at least 80% at Lamesa. At Flomot, diclosulam at 0.016 lb ai/A plus crop oil controlled ivyleaf morningglory and Palmer amaranth at least 80% on August 7, but yellow nutsedge control from this treatment at Lelia Lake was unsuccessful (less than 30%). These studies suggest that diclosulam postemergence has good activity on several weeds in Texas peanut, but the future of this application timing remains uncertain.

WEED MANAGEMENT IN NORTH CAROLINA PEANUTS WITH SPARTAN, STRONGARM, VALOR, CADRE, AND STORM. S.B. Clewis, J.W. Wilcut, and D.L. Jordan; Department of Crop Science, North Carolina State University; Raleigh, NC 27695.

ABSTRACT

Experiments were conducted in two separate fields at the Peanut Belt Research Station near Lewiston-Woodville, NC and in two separate fields at the Upper Coastal Plain Research Station near Rocky Mount, NC in 2002 to evaluate weed management, peanut tolerance, and peanut yields treated with soil-applied herbicide treatments alone or in a systems approach with postemergence (POST) herbicide treatments. Peanut varieties evaluated included VA-98R at Rocky Mount and NCV-11 at Lewiston-Woodville and were planted conventionally in raised beds with Temik in-furrow at 7 lb product/A for early season insect control. The experimental design was a randomized complete block design with a factorial treatment arrangement of four preemergence (PRE) and three POST treatment options replicated three times. The PRE options included Spartan at 1.25 lb ai/A + Dual Magnum at 1.25 lb ai/A, Strongarm at 0.024 lb ai/A + Dual Magnum, Valor at 0.063 lb ai/A + Dual Magnum, and Dual Magnum alone. The POST options included Storm at 0.75 lb ai/A + Butyrac 200 at 0.25 lb ai/A, Cadre at 0.063 lb ai/A + Butyrac 200, and NO POST option. All options with POST treatments received an early postemergence (EPOST) of Gramoxone MAX at 0.125 lb ai/A + Basagran at 0.25 lb ai/A. All EPOST and POST treatments included Induce at 0.25% (v/v). All data were subjected to analysis of variance (ANOVA) and means were separated using Fisher's Protected LSD at a P=0.05. ANOVA indicated that there was a PRE by POST interaction that was significant, but the year by treatment interaction was not significant. Therefore all data were pooled over locations.

Early season peanut injury was minimal (<10%) with all soil-applied herbicide treatments. The 2002 growing season was extremely dry in May and June, therefore may have reduced injury potential. Previous research has shown that Spartan and Valor have more potential for injury than Strongarm in the Virginia-Carolina (VC) peanut production region. Spartan, Strongarm, & Valor are of limited value for annual grass control. Cadre POST activity on small annual grasses is a benefit in the VC region. Spartan was the best PRE option for yellow nutsedge control with Valor being least effective. However, Cadre remains the POST standard for yellow nutsedge control. Strongarm is the best PRE option for common ragweed control while Spartan was the least effective. Common ragweed infests 75% of the peanut acreage in the VC region. Dual Magnum + Valor or Spartan are the best PRE options for common lambsquarters control. All PRE options except Dual Magnum provided similar levels of entireleaf, ivyleaf, pitted, and tall morningglory control. Valor is the best PRE option for control of Palmer amaranth while Cadre was the best POST option. Peanut yields were similar for PRE herbicide treatments with high yields requiring a systems approach of PRE, EPOST, and POST herbicide treatments. Rotation restrictions need to be considered when using Cadre, Spartan, and Strongarm [i.e. rotation restrictions are significant for Spartan on cotton (18 months), 10 months on corn, but not on tobacco (0 months)]. Strongarm has an 18 month restriction on corn and tobacco and 10 months on cotton. Cadre has an 18 month restriction on cotton for Arizona, Arkansas, New Mexico, Oklahoma, and Texas only and 9 months everywhere on corn and tobacco.

MESOTRIONE EFFECTIVENESS IN TEXAS PANHANDLE CORN. B.W. Bean and M.W. Rowland. Texas Cooperative Extension and Texas Agricultural Experiment Station, Amarillo.

ABSTRACT

Studies were conducted in 1999, 2001, and 2002 to determine weed control effectiveness and crop safety of mesotrione in corn near Amarillo, TX. Both preemergence and postemergence trials were conducted. Crop safety was excellent with all treatments tested.

Preemergence rates were 0.19 and 0.22 lb a.i./acre applied alone and in tank mixes with acetachlor, metolachlor, and metolachlor + atrazine. Control of palmer amaranth was near 100% when mesotrione was applied alone or in combination with other herbicides. Barnyardgrass control was inconsistent while velvetleaf control ranged from 45 to 100% depending on the year and rate applied.

Postemergence rates of mesotrione ranged from 0.062 to 0.125 lb a.i./acre and was applied with 1 qt COC and 2 qt UAN per acre. Excellent control of palmer amaranth and velvetleaf was achieved with the 0.094 lb a.i./acre rate. Red morningglory control with the 0.094 lb treatment 54 days after treatment was 62%, but control increased to 87% when tank mixed with 0.25 lb a.i./acre atrazine.

WEED CONTROL IN SOUTHERN FIELD CORN WITH OPTION. C.L. Main, T.C. Mueller, R.M. Hayes, G.N. Rhodes, Jr., and G.K. Breeden. University of Tennessee.

ABSTRACT

Option herbicide (foramsulfuron) received registration in 2002 for control of annual and perennial grasses and some broadleaf weeds in field corn. Studies were conducted at five locations across Tennessee to compare Option™ and AE F130360 02, an experimental herbicide containing foramsulfuron + iodosulfuron + isoxadefin, to industry standards for weed control in southern field corn.

Treatments at all five locations included: Option at 1.5 oz/A, early postemergence (EPOST); Option at 1.05 oz ai/A + atrazine at 0.75 lb ai/A, EPOST; Option at 1.05 oz ai/A + atrazine at 0.75 lb ai/A + Define at 3.6 oz ai/A, EPOST; AE F130360 02 at 1.07 oz ai/A, EPOST; AE F130360 02 at 1.07 oz ai/A + atrazine at 0.75 lb ai/A, EPOST; AE F130360 02 at 1.07 oz ai/A + atrazine at 0.75 lb ai/A + Define at 3.6 oz ai/A, EPOST; Basis Gold at 12.05 oz ai/A, EPOST; Steadfast at 0.546 oz ai/A, EPOST, Bicep II Magnum at 2.1 qt/A, preemergence (PRE); Bicep II Magnum at 2.1 qt/A, PRE followed by (fb) Option at 1.5 oz/A, mid-postemergence (MPOST); Bicep II Magnum at 2.1 qt/A, PRE fb AE F130360 02 at 1.07 oz ai/A, MPOST; Bicep II Magnum at 2.1 qt/A, PRE fb Exceed at 0.57 oz ai/A, EPOST; and an untreated control. All postemergence (POST) treatments included 28% liquid nitrogen at 2 qt/A. Treatments containing Option or AE F130360 02 were applied with Methylated Seed Oil at 1.5 pt/A. All other POST treatments contained Crop Oil Concentrate at 2 pt/A.

No injury occurred with any application of Option or AE F130360 02. Option and AE F130360 02 provided rhizome johnsongrass (>90%) and broadleaf signalgrass (80%) control comparable to regional standards. The addition of atrazine increased control of Pennsylvania smartweed and morningglory species. Little additional weed control benefit was observed from the addition of Define. Corn Yields were comparable for all treatments at all locations except for the untreated checks at all locations.

TANK MIXTURES FOR POTENTIAL IMPROVEMENT OF ROUNDUP READY SOYBEAN WEED CONTROL. J.W. Easley, D.R. Shaw, and C.J. Gray; Department of Plant and Soil Science, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

With the advent of Roundup Ready technology, producers have often focused on using glyphosate alone (rather than in tank mixtures or following soil-applied herbicides). Typically these applications have controlled most problem weeds causing significant problems. However, various researchers have found that glyphosate alone may be inconsistent in controlling some species. The objective of this research was to compare glyphosate alone and with various tank mixtures of other herbicides, as well as to the standard sequential applications of glyphosate at the labelled rates.

This research was conducted on the Plant Science Research Center, Starkville, MS in 2001 and 2002. Weed species initiated for this research included barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.], pitted morningglory (*Ipomoea lacunosa* L.), prickly sida (*Sida spinosa* L.), sicklepod [*Senna obtusifolia* (L.) Irwin and Barnaby], hemp sesbania (*Sesbania exaltata* (Raf.) Rydb. ex. A.W. Hill), and velvetleaf (*Abutilon theophrasti* Medik.). Glyphosate at 627 g ae/ha was tank-mixed with cloransulam (9 g/ha), cloransulam (18 g/ha), cloransulam plus flumetsulam (9 g/ha and 3.4 g/ha respectively), cloransulam plus fomesafen (18 g/ha and 6.7 g/ha respectively), fomesafen (140 g/ha), chlorimuron (4.5 g/ha), cloransulam plus fomesafen (9 g/ha and 71 g/ha respectively), diclosulam (9 g/ha), diclosulam (13 g/ha), diclosulam plus fomesafen (9 g/ha and 71 g/ha). In addition, glyphosate alone was included at three rates (420, 627, and 840 g/ha), and glyphosate followed by glyphosate (627 and 420 g/ha, respectively). ANOVA and a mixed model analysis were used to analyze these data.

The addition of some herbicides in tank mixtures with glyphosate improved control of several species four weeks after the initial treatment. Control with glyphosate tank-mixes was generally better than the full rate of glyphosate applied alone. Pitted morningglory and hemp sesbania control were both increased with the addition of diclosulam and fomesafen to glyphosate. The best overall control of prickly sida was given when glyphosate was tank-mixed with a high rate of diclosulam. In addition, this tank-mix gave the best overall control of velvetleaf. Effective barnyardgrass control was achieved with all treatments; however, slight antagonism appeared to occur when glyphosate was tank-mixed with fomesafen in 2001. The sequential glyphosate standard treatment controlled all weeds as well as or better than the tank mixtures, with the exception of pitted morningglory control, which was slightly improved by adding several of the herbicides in tank mixtures.

MIX-SEEDED SOYBEAN: AN INTEGRATED WEED MANAGEMENT STRATEGY.
J.K. Norsworthy; Department of Crop & Soil Environmental Science; Clemson University; Clemson, SC 29634.

ABSTRACT

Research was conducted to assess the feasibility of utilizing a drill-seeded conventional/glyphosate-resistant soybean seed mix for improved weed suppression and to determined the critical time for removal of the conventional cultivar from glyphosate-resistant soybean. 'Northrup King' S73-Z5, a MG VII glyphosate-resistant soybean, was drill-seeded at 200,000 seed/acre in combination with 'Motte', a MG VIII conventional soybean, at 0; 100,000; 200,000; 400,000; 600,000; and 800,000 seed/acre under overhead irrigation in May 2001 and 2002 at Blackville, SC. Glyphosate at 0.84 lb ae/acre was applied 2, 3, 4, 5, or 6 weeks after soybean emergence to control emerged weeds and the conventional soybean, which served solely for early-season weed suppression. Florida pusley (*Richardia scabra*) and Palmer amaranth (*Amaranthus palmeri*) infested the test area both years. Soybean populations were similar between years, ranging from 168,000 to 470,000 plants/acre. Percentage emergence likewise declined with increasing seeding rate, ranging from 47 to 84%. Weed suppression and soybean groundcover increased exponentially with soybean density and was greatest 6 weeks after soybean emergence. Weed suppression was maximized at 70 and 80% for Palmer amaranth and Florida pusley, respectively, at 100% soybean groundcover. Weed control was attributed to reduced weed emergence as a result of canopy shading of the soil surface along with greater competitiveness of soybean with emerged weeds beneath the soybean canopy. Although weed suppression increased with conventional soybean seeding rate and delays in application timing, several weeks after application were needed to obtain complete control of conventional soybean when glyphosate was applied at 5 or 6 weeks after soybean emergence. Furthermore, weeds were difficult to control at 5 and 6 weeks after soybean emergence, likely because of the larger weed sizes and inability to achieve adequate spray coverage of weeds beneath the soybean canopy. Glyphosate timing and conventional soybean seeding rate also interacted to affect soybean yield. However, yields were similar for conventional seeding rates of 0; 100,000; and 200,000 seed/acre regardless of application timing. This research suggests management strategies that promote rapid canopy closure will lead to improved weed suppression through diminished emergence and growth of certain weed species.

EFFICACY AND ECONOMICS OF BURNDOWN PROGRAMS FOR EARLY-PLANTED SOYBEAN IN THE MISSISSIPPI DELTA. D.H. Poston, M.A. Blaine, and R.M. Griffin. Delta Research and Extension Center, Stoneville, MS 38776; Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Studies were conducted in 2002 near Stoneville, MS to evaluate the efficacy and economics of various burndown programs applied at various dates prior to planting. Plots were 3 x 12 m arranged in a randomized complete block design with a split plot (burndown program x application timing) treatment arrangement. Twelve herbicide treatments, all including glyphosate, were evaluated. Treatments were: 1) 0.84 kg/ha glyphosate, 2) 1.12 kg ai/ha glyphosate, 3) 0.84 kg/ha glyphosate + 0.84 kg ai/ha 2,4-D, 4) 0.75 kg/ha glyphosate + 0.087 kg ai/ha flumioxazin, 5) 0.84 kg/ha glyphosate + 0.018 kg ai/ha thifensulfuron-methyl + 0.009 kg ai/ha tribenuron-methyl, 6) 0.84 kg/ha glyphosate + 0.128 kg ai/ha sulfentrazone + 0.026 kg ai/ha chlorimuron-ethyl, 7) 0.84 kg/ha glyphosate + 0.009 kg ai/ha carfentrazone-ethyl, 8) 0.84 kg/ha glyphosate + 0.015 kg/ha carfentrazone-ethyl, 9) 0.84 kg/ha glyphosate + 0.112 kg ai/ha oxyfluorfen, 10) 0.84 kg/ha glyphosate + 0.28 kg/ha oxyfluorfen, 11) 0.84 kg/ha glyphosate + 0.56 kg/ha oxyfluorfen, and 12) 0.84 kg/ha glyphosate + 0.112 kg/ha oxyfluorfen + 0.84 kg/ha 2,4-D. An untreated control was also included for comparison purposes. Herbicides were applied February 8, February 25, and March 25, 2002. Weed control and percent groundcover were visually rated at soybean planting. DK4868RR was planted in 38 cm rows April 14, 2002. Soil type was Dubbs very fine sandy loam with pH 6.6 and 0.8% organic matter. No herbicides were applied at soybean planting. Glyphosate was applied approximately 4 wk after planting (WAP) at rates ranging from 0.56 to 1.68 kg/ha. Glyphosate rates were determined individually for each treatment based on weeds present in plots at the time of application. Soybeans were harvested August 20, 2002.

Burndown ratings taken at planting exceeded 90% with all herbicides applied February 8, 2002. Control generally decreased with later herbicide application dates. Glyphosate + 2,4-D, glyphosate + flumioxazin, glyphosate + sulfentrazone + chlorimuron, and glyphosate + oxyfluorfen + 2,4-D were the only treatments that provided 90% pre-plant weed control regardless of application timing. In addition, groundcover was reduced more than 90% compared to the untreated control in plots treated with glyphosate + flumioxazin or glyphosate + sulfentrazone + chlorimuron regardless of application date. Cutleaf eveningprimrose (*Oenothera laciniata* Hill) control averaged across application dates was 95% or greater in plots where 2,4-D, flumioxazin, or sulfentrazone + chlorimuron were added to glyphosate. Control with all other treatments was less than 70%. Averaged across treatments, cutleaf eveningprimrose control decreased from 79% when application were made Feb 8 to 66% with applications made March 25. Greater than 90% horseweed (*Conyza canadensis* L.) control was documented with 8 of 12 treatments applied February 8. In contrast, only 3 of 12 treatments evaluated provided that level of control when applied at the later timings. Glyphosate + 2,4-D, glyphosate + sulfentrazone + chlorimuron, or glyphosate + 0.112 kg/ha oxyfluorfen + 2,4-D were the most efficacious treatments across application timings. Average soybean yields were 4260, 4040, and 4010 kg/ha when burndown herbicide applications were made February 8, February 25, and March 25, respectively. Yields in plots receiving no pre-plant burndown treatment were 3270 kg/ha. Net returns above weed management costs were 6% lower when pre-plant burndown applications were made March 25 rather than February 8. Averaged across application timings, maximum soybean yields and net returns above weed management costs were obtained with glyphosate + flumioxazin, glyphosate + thifensulfuron + tribenuron, glyphosate + sulfentrazone + chlorimuron, glyphosate + 0.56 kg/ha oxyfluorfen, and glyphosate + 0.112 kg/ha oxyfluorfen + 2,4-D. Yields equal to the best treatments were not achieved with glyphosate + 2,4-D, but net returns with this treatment were equal to the most profitable treatments. Based on these results, adding residual herbicides or 2,4-D to glyphosate pre-plant burndown programs can be profitable

when using the ESPS. In addition, early pre-plant burndown appears to be a critical component to maximizing yields with this system.

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

BERMUDAGRASS TOLERANCE TO IMAZAPIC AND 2,4-D AS INFLUENCED BY APPLICATION PARAMETERS. P.A. Baumann, L.M. Etheredge, Jr., F.T. Moore, M.E. Matocha and T.J. Butler; Texas Cooperative Extension, College Station, TX 77843-2474.

ABSTRACT

There are approximately 15 million acres of improved pastureland in Texas where broad-spectrum weed control is an important component of bermudagrass (*Cynodon dactylon*) hay production. Although many broadleaf herbicides are available, annual and perennial grass control has been a recurring problem.

In 2002, BASF Corp. developed Oasis herbicide which contains the active ingredients imazapic and 2-4,D. It provides broadleaf weed and annual grass control, however, bermudagrass injury from Oasis has been a problem that requires remediation. Research was conducted during 2001 and 2002 to evaluate the effects of Oasis on three popular Texas bermudagrass varieties at two locations. These included Coastal, Jiggs, and Tifton 85 bermudagrasses. Plot size was 8 ft. x 20 ft. and treatments were replicated four times and arranged in a RCB design. Treatments were applied with a CO_2 backpack sprayer calibrated to deliver 20 GPA. Two herbicide application timings were evaluated at crop heights of 2-3 in. (stubble) and 6-8 in. (regrowth) within both varieties. Water or urea ammonium nitrate (UAN 32-0-0) were evaluated as herbicide carriers, and Oasis was applied at 2, 4, 6, and 8 oz./A. Dry Nitrogen fertilizer (70 lbs./A) was applied in the water carrier treatments to compensate for the 32% UAN applications in the other treatments. Three harvests were collected during the season, however, harvest intervals varied in the two years of the study due to variable weather conditions.

All rates of Oasis consistently decreased crop yields in the first harvest, regardless of application timing, carrier or variety. Seasonal yields of Coastal bermudagrass were reduced from all rates examined. Similar results were shown with Tifton 85 and Jiggs bermudagrass. When Oasis was applied using water as the carrier, significant yield increases were shown, though numerically small. Carrier had no consistent effect in the Jiggs and Tifton 85 studies. Herbicide application timing was not a factor in any variety when Oasis was applied to crop stubble or 6-8 in. regrowth.

EFFECT OF VARIOUS HERBICIDES ON NEWLY ESTABLISHED BERMUDAGRASS.
T.J. Butler and J. Tredaway Ducar. Texas A&M Research and Extension Center, Stephenville, TX 76401 and Berry College, Mt. Berry, GA 30149.

ABSTRACT

The effect of pasture herbicides on newly established bermudagrass [*Cynadon dactylon* (L.) Pers.] is not well documented. Field trials were conducted near Stephenville, TX and Marianna, FL in 2002 to determine the effect of various herbicides on newly established bermudagrass. A randomized complete block design with a split, split-plot treatment arrangement was utilized with three replications. The main plots consisted of 'Coastal' and 'Tifton 85'bermudagrass. The sub-plot treatment consisted of four application timings (1,14, 28, and 42 days after planting (DAP). Herbicide treatments were applied using a CO_2 backpack sprayer delivering 15 gallons per acre. Herbicide treatments evaluated included Pasturegard (2 pt), LAF-004 (2 pt), Redeem R+P (2 and 3 pt), Envoke (0.5 oz), Cimarron Max (0.5 oz + 2 pt), Fuego (0.56 oz + 12.5 fl oz), Plateau (1,2, and 3 fl.oz.), 2,4-D amine (4 pt), 2,4-D LV ester (3 pt), and Weedmaster (3 pt). Percent visual injury, stolon length, percent crabgrass (*Digitaria* sp) control was recorded 30 DAT, and percent ground cover was estimated 90 DAP.

There was no visual injury to bermudagrass sprigs at the four timing applications with any of the above herbicide treatments, except Plateau. The rates of 1, 2, and 3 oz/A Plateau injured Tifton 85 by 12, 23, and 32%, respectively. The timing applications of 0, 14, 28, and 42 DAP averaged 19, 33, 17, and 19% Tifton 85 injury, respectively. The rates of 1, 2, and 3 oz/A Plateau injured Coastal by 6, 15, and 28%, respectively. The timing applications of 0, 14, 28, and 42 DAP averaged 16, 20, 16, and 13% Coastal injury, respectively. Stolon length was not different regardless of variety or timing; however, there were differences in percent ground cover, due to weed efficacy of the various herbicides. The best timing application for all the plant growth regulating (PGR) herbicides was 1 DAP. This pre-emergent application to crabgrass provided >70% control, which gave an average of 25% groundcover with Tifton 85 and 30% groundcover with Coastal compared to 5% groundcover in the untreated control. However there was no suppression of crabgrass with the PGR herbicides post-emergence and the percent groundcover did not differ from the control. The best timing for 1,2, and 3 oz/A Plateau was 14 DAP, which gave 37, 38, and 52% groundcover for Tifton 85, respectively, and 22, 30, and 35% groundcover for Coastal compared to 5% groundcover in the untreated control. The timing applications (0, 14, 28, and 42 DAP) averaged 32, 42, 28, and 11 % cover for Tifton 85, respectively, and 24, 29, 25, 17% groundcover for Coastal.

In summary, the herbicides in this study were relatively safe on newly established bermudagrass, and should be considered for labeling.

EFFECT OF VARIOUS HERBICIDES ON YIELD OF ESTABLISHED 'COASTAL' BERMUDAGRASS. T.J. Butler. Texas A&M Research and Extension Center, Stephenville, TX 76401.

ABSTRACT

There are several new herbicides that have been labeled for pasture weed control, however their effect on dry matter (DM) yield is not well documented. A randomized complete block design RCBD experiment with three replications was established during the 2001 and 2002 growing seasons in Stephenville, TX to determine the effect of new herbicide chemistries and mixtures of fluroxypyr (Starane), triclopyr (Remedy), 'triclopyr + fluroxypyr' (Pasturegard), picloram (Tordon 22K), 'picloram + fluroxypyr' (LAF004), 'triclopyr + clopyralid' (Redeem R&P), trifloxysulfuron (Envoke), and imazapic (Plateau) on DM yield of 'Coastal' bermudagrass [*Cynadon dactylon* (L.) Pers] and compare them to traditional pasture herbicides (2,4-D amine, 2,4-D ester, 'dicamba + 2,4-D amine' (Weedmaster), 'metsulfuron methyl + 2,4-D amine + dicamba' (Cimarron Max), 'triasulfuron + dicamba' (Fuego), and 'clopyralid' (Reclaim). In 2001, dormant applications were made 15 Mar and actively growing applications were made 19 April; in 2002, dormant applications were made 15 Feb and actively growing applications were made 19 April. All herbicides were applied using a CO_2 backpack sprayer delivering 15 GPA. Yields were estimated by harvesting 3.5 by 20 ft from each plot three times throughout the growing season on approximately monthly intervals.

In both 2001 and 2002, 3 pt/A 2,4-D amine, 3 pt/A 2,4-D ester, 3 pt/A Weedmaster, 0.5 oz + 2 pt Cimarron Max II, 0.56 oz + 12.5 fl oz Fuego, and 2 pt/A Reclaim did not effect the DM yield of Coastal bermudagrass in any harvest or total yield.

In 2001 (dry year), DM yield of Coastal in first harvest was reduced 54% by 0.5 oz/A Envoke and 31% by 3 pt/A Grazon P+D; however, in 2002 (wet year) DM was not reduced in the first harvest or total yield in either year. In both 2001 and 2002, DM yield of Coastal in first harvest was reduced 38% by 3 pt/A Remedy, 47% by 3 pt/A Redeem R&P, 38% by 3 pt/A Pasturegard, and 49% by 2 pt/A LAF004, however total DM yield was not reduced in either year.

In 2001 and 2002, the DM yield in first harvest was reduced 63% by 2 pt/A Tordon 22K and 37% by 2 pt/A Starane, and the total DM yields were reduced 21% by Tordon 22K and 23% by Starane, averaged across years.

Actively growing applications of 6, 9, 12 oz/A Plateau reduced yield in all three harvests and total yield by 46, 52, and 62%, respectively, averaged across years. Dormant applications of 9 oz/A Plateau reduced DM yield in all three harvests in 2001 and the first two harvests of 2002, which caused total DM yield to be reduced by 47%, averaged across years.

In summary, the herbicides in this study were relatively safe on Coastal bermudagrass, except for Tordon 22K, Starane, and Plateau, which caused reduction in total yield.

EFFECT OF TIMING APPLICATION OF PLATEAU ON 10 NEWLY SEEDED GRASSES. T.J. Butler. Texas A&M Research and Extension Center, Stephenville, TX 76401.

ABSTRACT

Annual weeds compete with newly established perennial grasses, because annuals complete their life cycle in year and perennials are typically slow to develop and establish. The objective was to determine the tolerance of five native perennial grasses: 'Big Earl' big bluestem (*Andropogon gerardii* var. *gerardii* Vitman.), 'Lometa' indiangras [*Sorghastrum nutans* (L.) Nash], 'Woodward'sand bluestem (*Andropogon gerardii* var. *hallii*. Hack), 'Haskell' sideoats grama [*Bouteloua curtipendula* (Michx.) Torr.], and 'Alamo' switchgrass (*Panicum virgatum* L.); and five introduced perennial grasses: 'Giant' bermudagrass [*Cynadon dactylon* (L.) Pers.], 'Selection 75' kleingrass (*Panicum coloratum* L.), 'Palar' Wilman lovegrass (*Eragrostis superba* Peyr.), 'WW Spar' yellow bluestem [*Bothriochloa ischaemum* (L.) Keng. var. *ischaemum* Hack], and 'WW-B. Dahl' Old World bluestem [*Bothriochloa baldhi* (Retz) S.T. Blake] to timing applications of imazapic (Plateau) either preplant (PRE) or postemergence (POST).

The strip-plot design experiment with three replications was established on 15 April 2002 on a Windthorst fine sandy loam in Stephenville, TX. The 10 grasses were seeded on 16 April 2002. Plateau (2 fl. oz/A) was applied 1 day before planting (PRE) and when seedlings reached the 2-3-leaf stage (POST) (15 May 2002) using a CO_2 backpack delivering 15 GPA. Plant injury was evaluated 30 DAT and plant heights were recorded 60 DAP.

Plateau was selective on the native grasses as well as the timing. When Plateau was applied PRE, indiangrass, big bluestem, sand bluestem were tolerant only with 0, 15, 15% visual injury, respectively, while sideoats grama and switchgrass were injured, 90, and 95%, respectively. Plant heights of indiangrass, big bluestem, sand bluestem, sideoats grama, and switchgrass were 5, 8, 8, 1, 0 in, respectively, for the pre-plant Plateau plots vs. 5, 10, 11, 4, 13 in, respectively, for the non-treated plots.

When Plateau was applied POST, Indiangrass, big bluestem, sand bluestem, sideoats grama, and switchgrass were injured 10, 10, 10, 5, and 80%, respectively. Plant heights of indiangrass, big bluestem, sand bluestem, sideoats grama, and switchgrass were 5, 10, 10, 4, 2 in, respectively, for the Plateau applied POST vs. 5, 10, 11, 4, 13 in, respectively, for the non-treated plots.

Plateau non-selectively killed the five introduced grasses. Plateau injured bermudagrass, kleingrass, yellow bluestem, Old World bluestem, and Wilman lovegrass by 99, 99, 99, 99, 95%, respectively, when applied PRE, and 99, 99, 99, 99, 50%, respectively, when applied POST.

In summary, Plateau was safe to use on 'Lometa' indiangrass, 'Big Earl' big bluestem, 'Woodward' sand bluestem either PRE or POST. Plateau was safe on 'Haskell' sideoats grama when applied in the POST, but not PRE. Plateau was not safe on 'Alamo' switchgrass, 'Giant' bermudagrass, 'Selection 75' kleingrass, 'WW Spar' yellow bluestem, 'WW B-Dahl' Old World bluestem, or 'Palar' Wilman lovegrass applied either PRE or POST.

TRUMPETCREEPER AND HORSENETTLE CONTROL IN BERMUDAGRASS AND FESCUE HAY. L.S. Warren, Jr., T.W. Gannon and F.H. Yelverton; Department of Crop Science, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

In North Carolina hay fields, postemergence (POST) broadleaf herbicides were evaluated in 2001 and 2002 for trumpetcreeper and horsenettle control. Recently registered herbicides such as picloram + 2,4-D amine (Grazon P+D) in 2001, triclopyr + clopyralid (Redeem R&P) and triclopyr ester (Remedy) in 2000 were compared against industry standards such as metsulfuron (Ally), 2,4-D amine (Weedar 64) and 2,4-D amine + dicamba (Weedmaster). Research objectives were to determine weed control efficacy and longevity as well as to further document bermudagrass and fescue tolerances. Ally was applied at 0.5 ounce of product per acre (oz/A). The remaining treatments were applied at 2 pints per acre (pt/A). All treatments received a nonionic surfactant at 0.25% v/v. Each trial also contained a nontreated check

The trumpetcreeper trial was located in the edge of a bermudagrass pasture. Treatments were applied on May 23, 2002 to plants ranging in size from 3 inches to 15-inch vines. Visual percent control and crop tolerance ratings were recorded at 2, 6, 8 and 13 weeks after treatment (WAT). Horsenettle locations 1 and 2 were also in bermudagrass pastures. Treatments at location 1 were applied on June 7, 2002 to young plants 2 to 6 inches tall with 4 to 6 leaves. Ratings were recorded at 5 and 11 WAT. Location 2 treatments were applied on June 28, 2002 to plants in the early bloom stage up to 15 inches tall. Ally was not included at location 2. Ratings were recorded at 4 and 11 WAT. Horsenettle location 3 was in a tall fescue pasture that was slightly drought stressed. Treatments were applied on June 12, 2001 to plants ranging from 4 inches to early bloom. Ally and Remedy were not included at this location. Ratings were recorded at 4 and 8 WAT.

Grazon P+D, Weedar 64 and Weedmaster provided good to excellent season-long trumpetcreeper control (78, 94 and 94%, respectively). Remedy provided fair control at 70%, while Redeem R&P and Ally (18 and 0%, respectively), resulted in poor control. At horsenettle location 1, all treatments except Ally provided excellent (88 to 100%) control 5 WAT. By 11 WAT, all treatments resulted in excellent control. Grazon P+D and Remedy at location 2 controlled horsenettle at 4 WAT better than Weedar 64 and Weedmaster. By 11 WAT, all treatments provided excellent (95 to 100%) control. At horsenettle location 3, Grazon P+D provided the highest level of control (78%) at 4 WAT. By 8 WAT, Grazon P+D and Redeem R&P resulted in excellent control (100% and 89%, respectively) while Weedar 64 resulted in poor to fair control (54%).

These data suggest that trumpetcreeper control in pastures is best attempted with Grazon P+D, Weedar 64 and Weedmaster. These treatments, along with Ally, Redeem R&P and Remedy, provide good to excellent horsenettle control when applied to juvenile or early bloom plants that are actively growing with adequate soil moisture. Grazon P+D and Redeem R&P effectively control slightly drought stressed horsenettle.

EVALUATION OF GRAZON P+D AND REDEEM R&P FOR WEED CONTROL IN COOL SEASON GRASSES. G.K. Breeden, R.L. Sliger and G.N. Rhodes, Jr., University of Tennessee.

ABSTRACT

Weed control is important to pasture and hay production. However, application of 2,4-D and similar herbicides create concerns for drift to sensitive crops. Cotton, tobacco and tomatoes are important crops in many Tennessee counties. All of these are sensitive to many pasture herbicides. These crops also are not in field production in the fall to winter months. This can offer an opportunity for control of many troublesome weeds with fall to early winter applications.

Field research was initiated in fall 2001, at Sweetwater, TN on natural infestations of buckhorn plantain (*Plantago lanceolata*), Carolina geranium (*Geranium carolinianum*) and corn gromwell (*Lithospermum arvense*) in an established tall fescue (*Festuca arundinacea*) and orchardgrass (*Dactylis glomerata*) mixture. Treatments included in the research were Redeem R&P (1, 1.5 and 2 pt/A); 2,4-D ester (2 and 4 pt/A); Banvel (1 and 2 pt/A); Weedmaster (2 pt/A); and Grazon P+D (1.5, 2 and 3 pt/A). Experimental units were 10 ft. wide by 30 ft. long. Treatments were replicated 4 times in a randomized complete block design. Herbicides were applied in a water carrier volume of 15 GPA with a CO_2 pressurized sprayer mounted on a 4-wheeler. Weed control and crop injury were evaluated visually utilizing a 0 to 99% scale.

At 7, 12 and 20 weeks after treatment (WAT) no injury to either tall fescue or orchardgrass was observed. All treatments provided good (86% or greater) control of Carolina geranium at 7 WAT with the exception of Redeem R&P (1.5 pt/A). Redeem R&P (2 pt/A), 2,4-D ester (2 and 4 pt/A), Weedmaster (2 pt/A) and Grazon P+D (1.5, 2 and 3 pt/A) provided excellent (88% or greater) control at both 12 and 20 WAT of Carolina geranium. All treatments provided good (86% or greater) control of corn gromwell at 7 WAT. Redeem R&P (1 and 2 pt/A), 2,4-D ester (2 and 4 pt/A), Banvel (1 pt/A), Weedmaster (2 pt/A) and Grazon P+D (1.5, 2 and 3 pt/A) provided good (85% or greater) control at both 12 and 20 WAT of corn gromwell. All treatments provided excellent (89% or greater) control of buckhorn plantain at 7 WAT with the exception of Redeem R&P (1 pt/A), 2,4-D ester (2 pt/A) and Banvel (1 and 2 pt/A). Banvel (1 and 2 pt/A) were the only two treatments that did not provide excellent (89% or greater) control of buckhorn plantain at 12 WAT. At 20 WAT all treatments provided excellent (92% or greater) control of buckhorn plantain with the exception of 2,4-D ester (2 pt/A) and Banvel (1 and 2 pt/A).

Grazon P+D provided excellent control of all weed species at all application rates. A 2 pt/A rate of Redeem R&P is required for adequate control of Carolina geranium and corn gromwell. Redeem R&P provided excellent control of buckhorn plantain at 1.5 or 2 pt/A. Grazon P+D and Redeem R&P are good options for weed control in cool season grasses. Fall applications are useful in Tennessee for weed control in pastures and hay fields. During some years however, weather can be a factor in proper application timing.

TROPICAL SODA APPLE: EVALUATION OF NEW FORMULATIONS FOR BURNDOWN AND RESIDUAL CONTROL. J. Tredaway Ducar, J.J. Mullahey, W.N. Kline, and M.J. Zielinski; Berry College, Mt. Berry, GA; University of Florida, Jay, FL; and Dow AgroSciences, LLC, Indianapolis, IN.

ABSTRACT

Field trials were conducted at a South Port, Florida site in 2002 to evaluate new herbicide formulations for their burndown potential and residual control of tropical soda apple. Treatments evaluated included LAF-4 (0.67 lbs picloram + 0.67 lbs fluoxypyr - total of 1.34 lbs/gal) at 1, 2, and 3 pt/A, Grazon P+D (0.54 lbs picloram + 2.0 lbs 2,4-D - total of 2.54 lb/gal) at 3 pt/A, Remedy (triclopyr ester, 4 lbs/gal) at 2 pt/A and Tordon 22K (potassium salt of picloram, 2 lbs/gal) at 1 pt/A. Activator 90 was added to all treatments at 0.25% v/v. Treatments were arranged in a randomized complete block design with four replications with plots measuring 10 feet by 20 feet. Herbicides were applied using a CO_2 pressurized backpack sprayer calibrated to deliver 15 gallons per acre. Postemergence (POST) tropical soda apple control was evaluated 12 to 26 days after herbicide application and preemergence (PRE) control was evaluated 83 days after application.

At the first site, all herbicide treatments except LAF-4 controlled tropical soda apple 60% 12 days after application (DAA); LAF-4 provided 85% control when applied at 3 pt/A. At 26 DAA, all herbicide treatments provided 95 to 100% control. All herbicides and rates controlled tropical soda apple 100% PRE (83DAA) except Remedy (80%).

At the second site, Pasturegard (2 pt) controlled tropical soda apple 85% followed by Tordon 22K providing 78% control at 14 DAA. LAF-4 (2 and 3 pt) and Remedy (2 pt) controlled tropical soda apple 65% 14 DAA. At 26 DAA, all herbicide treatments provided 95 to 100% control. PRE control (71 DAA) of tropical soda apple with Tordon 22K and LAF-4 (3 pt) was100%; other herbicide treatments evaluated controlled tropical soda apple >85%.

COMPARISON OF NEW POTENTIAL HERBICIDES FOR WEED CONTROL IN PASTURES AND RANGELAND. J. Tredaway Ducar, W.M. Price, W.N. Kline, and M.J. Zielinski, Berry College, Mt. Berry, GA; Lake County Cooperative Extension Service, Tavares, FL; and Dow AgroSciences LLC, Indianapolis, IN.

ABSTRACT

A field study was conducted in Lake County, Florida site in 2002 to evaluate new herbicide formulations for weed control of problem species in pasture and rangeland. Treatments evaluated included Pasturegard (1.5 lbs triclopyr + 0.5 lbs fluoxypyr - total of 2.0 lbs/gal) at 1, 2, and 2.5 pt/A, Redeem R+P (2.25 lbs triclopyr + 0.75 lbs clopyralid - total of 3.0 lbs/gal) at 3 pt/A, Remedy (triclopyr ester, 4 lbs/gal) at 2 pt/A, Cimarron Max at 0.50 oz/2 pt/A (60% metsulfuron methyl/[2.87 lb/gal 2,4-D + 1 lb/gal dicamba – total of 3.87 lbs/gal]) and Plateau (imazapic, 2 lbs/gal) at 8 fl.oz./A. Activator 90 was added to all treatments at 0.25% v/v. Weeds evaluated included *Baccharis* sp., cutleaf eveningprimrose (*Oenothera laciniata*), *Lantana* sp., mexicantea (*Chenopodium ambrosioides*), maypop passionflower (*Passiflora incarnata*), camphorweed (*Heterotheca subaxillaris*), and horseweed (*Conyza canadensis*) Treatments were arranged in a randomized complete block design with four replications with plots measuring 10 feet by 20 feet. Herbicides were applied using a CO_2 pressurized backpack sprayer calibrated to deliver 15 gallons per acre. Postemergence weed control was evaluated 31 and 62 days after herbicide application (DAA).

At 31 DAA, Pasturegard (2 pt) and Redeem R+P (2 pt) controlled *Baccharis* 70 and 75%, respectively; all other treatments provided < 60% control. Cutleaf eveningprimrose was controlled >80% by all herbicide treatments except by Redeem R+P (1 pt) and Cimarron Max. However, lantana control was best (78%) with Cimarron Max. Redeem R+P (1 pt), Pasturegard (2 and 2.5 pt), and Plateau provided 60-70% lantana control. Mexicantea was controlled >80% with Remedy (1 pt), Redeem R+P (2 pt), and Pasturegard (2 pt).

At 62 DAA, only Pasturegard (2 pt) provided any (45%) control of maypop passionflower. Pasturegard (2 pt) also provided the greatest control of camphorweed (85%). Mexicantea was controlled 90% by Remedy (1 pt), Pasturegard (1 and 2 pt), and Cimarron Max (0.5/2 pt). Lantana was controlled 90% by Pasturegard (2 pt) and 70% by Cimarron Max. All other herbicide treatments provided <65% control. All herbicides and rates evaluated controlled horseweed 90% or greater.

WEEDY GRASS CONTROL IN FORAGE BERMUDAGRASS. J.W. Boyd, B.S. Griffin and S. Milliken. University of Arkansas Cooperative Extension. Fayetteville, AR

ABSTRACT

We conducted three field trials in the Arkansas River Valley near Dardanelle, AR to evaluate the effectiveness of imazapic and glyphosate for control of field sandbur (*Cenchrus incertus*). Two trials were on sandbur with seed heads present and the other was applied to stubble (1-wk after mowing). Imazapic rates were 0.031, 0.046, 0.063 and 0.094 lb ai/a. Glyphosate was applied at 0.25 lb ae/a. Nonionic surfactant was added to all treatments at 0.5% v/v. In all trials, the 0.094 lb ai/a rate of imazapic provided between 98 and 100% control of sandbur at 30 DAT (days after treatment). The 0.031 to 0.063 lb ai/a rates provided 80 to 90% control. Regrowth of sandbur, was readily apparent in the 0.031, 0.046 and 0.063 lb ai/a treatments. Glyphosate at 0.25 lb ae/a was ineffective providing between 13 and 57% sandbur control. Large crabgrass (*Digitaria sanguinalis*) control was also evaluated with all herbicides and rates providing between 90 and 100% control with the exception of imazapic at 0.031 lb ai/a which gave approximately 85% control. Bermudagrass stunting ranged from 30 to 50% at 30 DAT.

Imazapic was applied at 0.031, 0.063, 0.094, and 0.125 lb ai/a to a native stand of johnsongrass (*Sorghum halepense*) and large crabgrass in common forage bermudagrass on the University of Arkansas Research Farm in Fayetteville, AR. Additional treatments included glyphosate at 0.25 lb ae/a and nicosulfuron at 0.047 lb ai/a. Johnsongrass control for all treatments except glyphosate (18%) ranged from 95 to 100% control at 75 DAT. Imazapic at 0.031, 0.094, and 0.125 lb ai/a provided >98% control of large crabgrass at 75 DAT. Nicosulfuron and imazapic at 0.063 lb ai/a were providing 100% control of crabgrass at 40 DAT but declined to 63 and 78% control, respectively, at 75 DAT. At 48 DAT, bermudagrass height in the glyphosate and untreated plots averaged 11-inches compared to 8 inches for nicosulfuron and 6, 4, 3 and 2 inches for increasing rates of imazapic.

In a weed only study located on University of Arkansas Research Farm in Fayetteville, AR, imazapic was applied at 0.031, 0.063 and 0.094 lb ai/a to large crabgrass, barnyardgrass (*Echinochloa crus-galli*), broadleaf signalgrass (*Urochloa platyphylla*), yellow foxtail (*Setaria lutescens*) and green foxtail (*Setaria viridis*). These grasses were established from seed in rows on vegetation free, irrigated site that had been fumigated in the fall of 2001. Crabgrass, barnyardgrass and green foxtail emerged quickly and were 6 to 7-inches tall at the time of application. Yellow foxtail and broadleaf signalgrass were slower to emerge and were 4 to 5-inches tall at application. All species were treated at 18 days after planting. Percent control at 27 DAT ranged from 90 to 100% for all species and rates of imazapic. Glyphosate at 0.25 lb ae/a provided 73% control of barnyardgrass, 88% control of crabgrass and broadleaf signalgrass and 100% control of green and yellow foxtail. The higher than would be expected control levels in this study are probably due to irrigation, relatively uniform plant size and absence of other species to interfere with spray coverage.

POSTEMERGENCE CONTROL OF VIRGINIA BUTTONWEED (*DIODIA VIRGINIANA*) IN BERMUDAGRASS (*CYNODON DACTYLON*). B.J. Tucker*, L.B. McCarty, and A.E. Estes. Clemson University, Department of Horticulture, Clemson, SC. 29634-0375.

ABSTRACT

Virginia Buttonweed is a perennial weed with an aggressive prostrate growth habit, commonly found throughout the southern United States. Virginia Buttonweed can tolerate low mowing heights, and reproduces via seed, roots, and stem parts. Herbicidal control of this weed has been very inconsistent. The objective of this research is to evaluate the short-term postemergence control of Virginia Buttonweed using various herbicides, combinations of herbicides, and sequential applications.

Two studies were performed during the summer of 2002. Each study was performed on a common bermudagrass rough on a golf course in Pendleton, SC. The initial application of study one was made on June 19, 2002, and the sequential application was made on August 19, 2002. In study two, the initial application was made on July 19, 2002, and the sequential application was made September 19, 2002. Treatments applied to study one included: Speed Zone 2.2 L (carfentrazone-ethyl + 2,4 D + MCPP + dicamba) at 0.83 lbs ai/A and 1.38 lbs ai/A, Speed Zone-St. Augustine formula 0.81 L (carfentrazone-ethyl + 2,4 D + MCPP + dicamba) at 0.41 lbs ai/A and 0.61 lbs ai/A, Power Zone 2.91 L (Carfentrazone-ethyl + MCPA + MCPP + dicamba) at 1.27 lbs ai/A, Trimec Classic 3.32 L (2,4 D + MCPP + dicamba) at 1.66 lbs ai/A, Trimec Southern 4.58 L (2,4 D + MCPP + dicamba) at 1.15 lbs ai/A, Trimec Bentgrass Formula 2.1 L (2,4 D + MCPP + dicamba) at 1.05 lbs ai/A, and Trimec Plus 2.64 L (2,4 D + MCPP + dicamba + MSMA) at 2.64 lbs ai/A. Treatments made to study two included: Corsair 75 DF (chlorsulfuron) at 0.14 lbs ai/A + 2,4 D 3.74 L at 0.5lbs ai/A, Millennium Ultra 3.75 L (2,4 D + clopyralid + dicamba) at 1.17 lbs ai/A, and Confront 3 L (triclopyr + clopyralid) at 1.13 lbs ai/A.

Virginia Buttonweed control was rated weekly. Control was rated visually on a 0-100% scale with 0% = worst and 100% = best. Control <75% was considered unacceptable. Three replicates on 1.5m x 1.0m plots were used. Data was analyzed using ANOVA and LSD, $\propto$ = 0.05.

In the first study, at 30 days after initial treatment (DAIT) Speed Zone at both rates provided >75% control. At 70 DAIT and 10 days after sequential treatment (DAST) Speed Zone at both rates, Speed Zone St. Augustine formula at both rates, and Power Zone all provided >90% control. Differences between the two rates for Speed Zone, and the two rates for Speed Zone St. Augustine formula were not significant.

At 30 DAIT Trimec Classic and Trimec Plus provided >80% control. At 70 DAIT and 10 DAST Trimec Classic, Trimec Southern, and Trimec Plus provided >90% control. Trimec Bentgrass formula provided <75% control at each rating.

In the second study, at 30 DAIT Corsair + 2,4 D, Millennium Ultra, and Confront all provided >90% control.

In conclusion, Virginia Buttonweed control >90% was achieved by several of the herbicide treatments in both studies. However, it is necessary to monitor the long-term effectiveness of these treatments (e.g. >1 year), and continue to evaluate Virginia Buttonweed control by adjusting herbicide combinations, timings, and rates.

RESPONSE OF JOHNSONGRASS, SOUTHERN CRABGRASS AND FORAGE BERMUDAGRASS TO IMAZAPIC. T.R. Murphy, The University of Georgia. Griffin, GA 30223.

ABSTRACT

Johnsongrass [*Sorghum halepense* (L.) Pers.] and southern crabgrass [*Digitaria ciliaris* (Retz.) Koel.] are problem weeds in forage bermudagrass (*Cynodon* spp.) hay fields. Imazapic (Plateau) was labeled in 2002 for the control of these weeds in forage bermudagrass; however, additional research was needed to determine the impact of bermudagrass hay harvest on the efficacy of imazapic for the control of johnsongrass and southern crabgrass. Experiments were conducted at the Central Georgia Research and Education Center near Eatonton, Georgia to determine: a) the effect of hay harvest interval after imazapic application on johnsongrass control, and b) the effect of imazapic application interval after hay harvest on southern crabgrass control.

Two separate experiments were conducted. In each experiment, a factorial treatment arrangement in a randomized complete block design with three replications was utilized. In the johnsongrass experiment, imazapic at 4.0, 6.0 and 8.0 fl. ozs. product/acre + 0.25% v/v nonionic surfactant was applied in mid-June to johnsongrass 30 in. tall in the boot to seedhead growth stage. Hay was harvested at either 7, 14 and 21 days after treatment (DAT) and again at 30 and 60 days after the initial hay harvest (DAIH). In the southern crabgrass experiment, imazapic at 4.0, 6.0 and 8.0 fl. ozs. product/acre + 0.25% v/v nonionic surfactant was applied either 7,14 or 21 DAIH. Weed control and bermudagrass injury was recorded at various DAT, and aboveground biomass was harvested at selected DAIH. Bermudagrass and johnsongrass or southern crabgrass plants were dried, physically separated and weighed to determine the effect of imazapic on bermudagrass hay yield and weed aboveground biomass.

<u>Johnsongrass.</u> There was no imazapic rate by hay harvest interval interaction on bermudagrass injury and hay yield or on johnsongrass control and biomass production. Imazapic rate effects on johnsongrass control and biomass reduction were significant. At 68 DAT, 6.0 and 8.0 fl. ozs./acre provided better johnsongrass control than 4.0 fl. ozs./acre. All rates of imazapic reduced johnsongrass biomass at 30 DAT, but only 8.0 fl. ozs./acre reduced biomass at 60 DAT. Total (sum of three hay harvests) bermudagrass hay yields with all rates of imazapic were higher than the untreated check.

<u>Southern crabgrass.</u> There was no imazapic rate by application timing after hay harvest interactions on bermudagrass injury and hay yield or on southern crabgrass control and biomass production. Only the main effects of imazapic rate and application timing significantly impacted bermudagrass injury and hay yields. At 12 and 21 DAT, imazapic applied 21 DAIH injured bermudagrass less than when applied at 7 and 14 DAIH. Across the rates used in this study, imazapic reduced total bermudagrass hay yield (sum of two hay harvests) 26 to 34%. Imazapic at rates of 4.0, 6.0 and 8.0 fl. ozs./acre were equally effective in reducing southern crabgrass biomass. Timing of imazapic application after bermudagrass hay harvest did not affect the level of southern crabgrass control or biomass reduction.

INFLUENCE OF APPLICATION TIMING ON THE PERFORMANCE OF FUEGO™ AND PLATEAU®. F.T. Moore, P.A. Baumann, L.M. Etheredge, Jr., and M.E. Matocha; Texas Cooperative Extension, College Station, TX 77843.

ABSTRACT

Treatment timings were assessed in the control of three problematic weeds in Texas pasturelands. Fuego herbicide, developed by Syngenta Incorporated, contains triasulfuron and dicamba. Fuego was evaluated in a 2002 field trial on marshelder (*Iva annua*). Treatments were applied at three progressive plant height intervals: 6-8", 8-10", and 10-12". Plot size was 10 ft. x 30 ft. and treatments were replicated three times and arranged in a RCB design. Treatments were applied with a CO_2 backpack sprayer calibrated to deliver 20 GPA. The rates of Fuego evaluated contained Amber at 0.48 oz./ac + Clarity at 10 oz./ac, Amber at 0.4 oz./ac + Clarity at 8.3 oz./ac, and Amber at 0.4 oz./ac + Clarity at 8.3 oz./ac + Weedone LV4 at 16.8 oz./ac. Application timing was not a factor in Fuego performance. Fuego was shown to be highly effective in controlling marshelder up to 12" tall where greater than 90% control was achieved.

Plateau herbicide (imazapic) was developed by BASF Corporation and was evaluated in two field trials during 2002 to assess control of johnsongrass (*Sorghum halepense*) and field sandbur (*Cenchrus incertus*), respectively. Plateau rates evaluated were 4.0, 6.0, and 8.0 oz./A and were applied to johnsongrass at 20-30" tall. Following treatment applications, three shredding timings were implemented, 7, 14, and 21 DAT, to simulate delayed hay harvests. These delays were performed to determine if they had an influence on johnsongrass control. Plot size was 10 ft. x 20 ft. and treatments were replicated three times and arranged in a RCB design. Treatments were applied with a CO_2 backpack sprayer calibrated to deliver 20 GPA. Early season evaluations showed that all treatments provided in excess of 75% johnsongrass control, however, no differences were observed in control when shredding was delayed 7, 14, & 21 DAT. However, when evaluated late season, the 14 & 21 day shredding delays at 6 & 8 oz. rates provided in excess of 70% control, which was significantly greater than the 7 day shredding delay. The decrease in johnsongrass control was attributed to regrowth by perennial plants.

In another study, Plateau was evaluated at the same rates for field sandbur control. The entire study area was shredded to simulate a hay harvest and treatment applications were made 7, 14, and 21 days after shredding to determine if the delays in application had an influence on field sandbur control. Plot size was 10 ft. x 20 ft. and treatments were replicated three times and arranged in a RCB design. Treatments were applied with a CO_2 backpack sprayer calibrated to deliver 20 GPA. No differences in field sandbur control were observed when treatment was delayed following shredding, except at the 6 oz. rate where control increased as treatment delay increased (73, 87, and 96%, respectively).

NEW HERBICIDE OPTIONS FOR SEEDING COOL-SEASON TURFGRASS IN SPRING. S.D. Askew, J.B. Beam, and W.L. Barker; Department of Plant Pathology, Physiology, and Weed Science, Virginia Polytechnic Institute & State University, Blacksburg, VA 24061.

ABSTRACT

Weed control is the limiting factor for successfully establishing turfgrass in spring or early summer. Siduron has been the only marketed herbicide for weed control at planting of cool-season grasses such as tall fescue (*Festuca arundinacea* Schreb). Unfortunately, siduron does not control summer annual broadleaves and many grasses other than crabgrass (*Digitaria* spp.) and foxtails (*Setaria* spp.). Instructions on herbicide labels require that turfgrass producers wait until the second mowing before treating with most postemergence broadleaf herbicides. More herbicide options are needed for preemergence weed control to avoid weed competition during turfgrass seedling establishment.

A field study was conducted between April and September 2002 at Blacksburg, VA to evaluate new and potential herbicide options for preemergence (PRE) and early postemergence (EPOST) weed control in spring-seeded tall fescue. The study was conducted as a randomized complete block with 9 treatments and four replications. Preemergence herbicides were applied on April 17, 2002 and Crossfire II turf-type tall fescue was seeded at 300 kg/ha on April 29, 2002. Early postemergence treatments were applied four weeks after planting (WAP) and late postemergence (LPOST) treatments were applied 10 WAP. A nontreated control was included for comparison. Treatments included mesotrione at 0.56 kg ai/ha PRE, mesotrione at 0.28 kg/ha PRE followed by (fb) mesotrione at 0.14 kg/ha EPOST, isoxaflutole at 0.56 kg ai/ha PRE, isoxaflutole at 0.28 kg/ha PRE fb isoxaflutole at 0.14 kg/ha EPOST, quinclorac at 0.84 kg ai/ha PRE, quinclorac at 0.84 kg/ha PRE fb quinclorac at 0.42 kg/ha EPOST, siduron at 6.72 kg ai/ha PRE, siduron at 3.36 kg/ha PRE fb siduron at 3.36 kg/ha EPOST, and siduron at 6.72 kg/ha PRE fb 2,4-D + dicamba + MCPP 61:6:33 (% by weight) at 1.70 kg ai/ha LPOST. Treatments were applied in 280 L/ha spray solution and nonionic surfactant at 0.25% (v/v) was included in postemergence treatments of mesotrione and isoxaflutole while crop oil concentrate at 1% (v/v) was included with postemergence treatments of quinclorac.

At 4 WAP, all treatments controlled smooth crabgrass [*Diqitaria ischaemum* (Schreb. ex Schweig.) Schreb] at least 98% except siduron at 3.36 kg/ha PRE (85%) and mesotrione at 0.28 kg/ha PRE (70%). Mesotrione and isoxaflutole treatments completely controlled common lambsquarters (*Chenopodium album* L.), henbit (*Lamium amplexicaule* L.), broadleaf plantain (*Plantago major* L.), and yellow woodsorrel (*Oxalis stricta* L.). Quinclorac controlled common lambsquarters at least 90%, henbit at least 75%, and seedling broadleaf plantain at least 70%. Quinclorac did not control yellow woodsorrel. Siduron did not control broadleaf weeds.

At 22 WAP, sequential treatments of mesotrione or isoxaflutole and either treatment of quinclorac controlled smooth crabgrass at least 90%. Siduron and single treatments of mesotrione or isoxaflutole controlled smooth crabgrass 60 to 70%. Mesotrione and isoxaflutole controlled all broadleaf weeds and quinclorac controlled only common lambsquarters. Siduron did not control broadleaf weeds unless fb 2,4-D + dicamba + MCPP. Midseason turfgrass coverage was highest when treated with mesotrione and isoxaflutole (>90%). Turfgrass coverage following quinclorac or siduron treatment was 55 to 75% and equivalent. Based on estimates from one supplier, chemical cost of siduron systems were twice that of quinclorac systems.

These data indicate that quinclorac is comparable or better than siduron for PRE smooth crabgrass and broadleaf weed control in spring-seeded fescue. Both mesotrione and isoxaflutole control weeds and improve turfgrass cover better than either quinclorac or siduron when used at

seeding. Mesotrione, isoxaflutole, and quinclorac perform better when applied as sequential treatments. However, siduron should be applied at a full rate rather than in split treatments.

SELECTIVE ROUGHSTALK BLUEGRASS CONTROL IN COOL-SEASON TURFGRASS. S.D. Askew, W.L. Barker, and J.B. Beam; Department of Plant Pathology, Physiology, and Weed Science, Virginia Polytechnic Institute & State University, Blacksburg, VA 24061.

ABSTRACT

In recent years, roughstalk bluegrass (*Poa trivialis* L.) has become a major weed problem on Virginia golf courses and small grain crops. Roughstalk bluegrass is a perennial in Virginia yet plants are difficult to manage in hot summer months when large portions of established populations either die or go dormant during hot and dry conditions. Plants grow in unsightly patches predominately on golf course fairways and roughs. Roughstalk bluegrass is a troublesome weed in creeping bentgrass (*Agrostis stolonifera* L.) fairways. There aren't any selective chemicals registered to control roughstalk bluegrass in creeping bentgrass. Field studies were conducted at three Virginia golf courses to evaluate bispyrobac sodium and ethofumesate applied in summer or fall for selective roughstalk bluegrass control on creeping bentgrass fairways.

Studies were conducted at Kinloch Golf Course (KGC) near Manikin-Sabot, VA; Stoney Creek Golf Course (SCGC) near Wintergreen, VA; and Robert Trent Jones Golf Course (RTJGC) near Manassas, VA. All three sites were creeping bentgrass fairways and predominate cultivars were 'L93', 'Penncross', and 'Penncross', at KGC, SCGC, and RTJGC, respectively. Summer treatments at all three locations were first applied between August 8 and August 13, 2002. Up to three applications were made depending on treatment and were spaced two weeks apart. Fall treatments were first applied September 30, 2002 at RTJGC and October 7 at SCGC. Fall treatments were not applied at KGC. The studies were conducted as randomized complete block designs with treatments in a factorial arrangement at RTJGC and SCGC and replicated four times. Factors were timing (Summer or Fall) and herbicide (five levels). The five herbicide systems included bispyrobac at 37 g ai/ha applied once, bispyrobac at 37 g/ha applied three times, bispyrobac at 74 g/ha applied once, bispyrobac at 74 g/ha applied three times, and ethofumesate at 840 g ai/ha applied twice. Herbicides were delivered in 280 L/ha spray solution and adjuvant was not included.

At KGC, roughstalk bluegrass populations were insufficient for control assessments and herbicides were applied only in summer. Bispyrobac and ethofumesate did not injure creeping bentgrass at KGC when applied in summer. At both SCGC and RTJGC the effects of herbicide and location were significant at 2, 5, and 8 WAIT so data were averaged over application timings. At 13 weeks after initial treatment (WAIT), the effect of application timing by herbicide by location was significant. At SCGC two and five WAIT and averaged over summer of fall timings, only bispyrobac at 74 g/ha applied three times significantly injured creeping bentgrass. However, this injury was never greater than 12% and of no biological significance. At the same location eight WAIT, bispyrobac applied three times at either rate injured creeping bentgrass between 7 and 13%. At RTJGC two WAIT and averaged over summer and fall timings, bispyrobac at 74 g/ha injured creeping bentgrass at least 22%. At the same location five WAIT, bispyrobac applied three times at 37 and 74 g/ha injured creeping bentgrass 24 and 43%, respectively. By eight WAIT at this location, bispyrobac applied three times at 37 and 74 g/ha injured creeping bentgrass 26 and 46%, respectively. At 13 WAIT, bispyrobac applied three times at either rate injured creeping bentgrass only in the fall at SCGC but in both summer and fall at RTJGC. Creeping bentgrass tended to recuperate from summer injury during the fall growing season, however creeping bentgrass could not recuperate from late fall injury following the onset of cold weather. Since injury was more severe at RTJGC, even creeping bentgrass injured during summer treatments did not fully recover by 13 WAIT.

Effects of timing after treatment and herbicide were significant for roughstalk bluegrass control at SCGC and RTJGC. Data were averaged over location and summer/fall timings and

polynomial regressions were used to describe the effects of herbicide treatments on roughstalk bluegrass control over time. Ethofumesate did not control roughstalk bluegrass. Bispyrobac at either rate applied once controlled roughstalk bluegrass less than 50% initially and control decreased over time. Bispyrobac at 74 g/ha applied three times controlled roughstalk bluegrass 70% by 8 WAIT and control decreased to 60% by 13 WAIT. Bispyrobac at 36 g/ha applied three times exhibited a similar quadratic response with maximum roughstalk bluegrass control of 50% 8 WAIT and decreasing to 36% 13 WAIT.

Reasons for unacceptable creeping bentgrass injury occurring at one of three locations are unclear and can't be explained by growth regulator use or creeping bentgrass cultivar. Selective roughstalk bluegrass control by bispyrobac seems promising. However, bispyrobac effects on creeping bentgrass must be further evaluated.

SELECTIVE BENTGRASS CONTROL IN COOL-SEASON ROUGHS. J.B. Beam, W.L. Barker, and S.D. Askew; Department of Plant Pathology, Physiology, and Weed Science, Virginia Polytechnic Institute & State University, Blacksburg, VA 24061.

ABSTRACT

Creeping bentgrass (*Agrostis stolonifera* L.) is grown on golf course tees, greens, and some fairways in Virginia. Golf course tees, greens, and fairways are commonly overseeded when grass stands become thin. Personnel overseeding an area with creeping bentgrass spread seed to roughs via wind, water, shoes, and/or equipment. Once established creeping bentgrass decreases aesthetic value of rough areas and competes with desirable turf for water, light, and nutrients. Previous research indicated isoxaflutole controls creeping bentgrass in cool-season grasses. Field trials were started in late spring 2002 at Kinloch Golf Course (KGC) near Manakin-Sabot, VA and in Fall 2002 at Stoney Creek Golf Course (SCGC) near Wintergreen, VA to determine rates and timings of isoxaflutole, mesotrione and imazaquin for control of creeping bentgrass in Kentucky bluegrass (*Poa pratensis* L.) roughs. Treatments included isoxaflutole and mesotrione each at 0.25 fb 0.25, 0.15 fb 0.15 fb 0.15, 0.05 fb 0.05 fb 0.05 lb ai/A and imazaquin at 0.5 and 0.35 fb 0.35 lb ai/A. A nonionic surfactant was included with each treatment at 0.25% (v/v). Sequential applications were made at two-week intervals. Bentgrass control and turf injury were visually assessed 2, 4, 6, 9, 14, and 18 week after treatment (WAIT).

A significant interaction of location by treatment was noted for each rating period. When separated by locations, isoxaflutole at all rates tested and mesotrione at 0.25 lb ai/A applied twice and 0.15 lb ai/A applied three times controlled bentgrass at least 67% 18 WAIT at KGC. Mesotrione at 0.05 lb ai/A applied three times and all rates of imazaquin did not control bentgrass at KGC. Isoxaflutole injured Kentucky bluegrass 30% 4 WAIT at KGC, injury dissipated by 6 WAIT. All rates of isoxaflutole and mesotrione and imazaquin at 0.35 lb ai/A applied twice controlled bentgrass at least 97% 14 WAIT at SCGC. Imazaquin at 0.35 lb ai/A applied twice injured turf 63% 9 WAIT at SCGC.

Results indicate isoxaflutole, mesotrione, and imazaquin control creeping bentgrass more when applied in fall than when applied in late spring. Mesotrione and isoxaflutole selectively control creeping bentgrass in Kentucky bluegrass when applied at 0.25 lb ai/A twice or 0.15 lb ai/A three times. Imazaquin controlled creeping bentgrass and injured Kentucky bluegrass inconsistently.

ANNUAL RYEGRASS CONTROL IN NEWLY-SEEDED FESCUE AND KENTUCKY BLUEGRASS. J.B. Beam, W.L. Barker, and S.D. Askew; Department of Plant Pathology, Physiology, and Weed Science, Virginia Polytechnic Institute & State University, Blacksburg, VA 24061.

ABSTRACT

Sod growers typically plant cool-season grasses in the fall and harvest the next spring or summer. Fall planted grasses generally have lower weed pressure. Certified seed in Virginia have an allotment for other crop seed. Annual ryegrass (*Lolium multiflorum* LAM) seed are similar to tall fescue (*Festuca arundinacea* Schreb) in size and shape and separating them is difficult. Since seed are hard to separate and certified seed have an allotment for other crop seed, sod growers often plant annual ryegrass seed along with desired seeds. Annual ryegrass control in cool-season sod has not been reported. Tests were conducted beginning in March 2002 at a sod farm near Aylett, VA to determine herbicide control options for annual ryegrass in cool-season sod. Sod was a tall fescue (85%)/Kentucky bluegrass (15%) mix. Herbicides tested included: primisulfuron and nicosulfuron each at 0.01 fb 0.01, 0.02 fb 0.02, 0.03, and 0.05 lbs ai/A, diclofop at 0.40 fb 0.40, 0.56, 0.75 lbs ai/A, metsulfuron at 0.02 and 0.01 lbs ai/A, chlorsulfuron at 0.05 lbs ai/A, and fluazifop + fenoxaprop at 0.125 lbs ai/A. In a separate study, flazasulfuron was applied at 0.008, 0.016, 0.023, 0.035, and 0.046 lbs ai/A. A nonionic surfactant was included with each treatment at 0.25% (v/v). Sequential applications were made two wk after initial.

Nicosulfuron at all rates tested controlled annual ryegrass at least 80% 10 weeks after initial treatment (WAIT). Primisulfuron, diclofop, metsulfuron, chlorsulfuron, and fluazifop + fenoxaprop controlled annual ryegrass less than 35% 10 WAIT and injured sod less than 30% at all rating periods. All rates of nicosulfuron injured sod. Highest injury occurred with nicosulfuron at 0.02 lbs ai/A applied twice (50% 7 WAIT). Flazasulfuron at rates of 0.035 and 0.046 lbs ai/A controlled annual ryegrass and injured sod at least 90% 8 WAIT. Results indicate nicosulfuron at 0.03 lbs ai/A could be used in cool-season sod to control annual ryegrass. However, this nicosulfuron treatment may injure desirable turfgrass severely.

EVALUATING HERBICIDAL INJURY TO SOD FORMING TURFGRASSES IN SOD PRODUCTION. R.D. Havlak, W.G. Menn, W.J. Grichar, B.M. Batchelor, B.A. Besler, M. Hall, R.L. Jahn, A.J. Jaks, J.D. Nerada, and D. Robinson; Texas Cooperative Extension, College Station, Bay City, and Wharton; Texas Agricultural Experiment Station, Yoakum.

ABSTRACT

Field studies were conducted at three locations in central Texas and along the upper Texas Gulf Coast to evaluate various turf herbicides for phytotoxicity, coverage over time, and harvestability on 'Raleigh' St. Augustinegrass (*Stenotaphrum secundatum),* 'Tifway 419' hybrid bermudagrass(*Cynodon spp.)*, and 'Palisades' Zoysiagrass(*Zoysia japonica)*. St. Augustinegrass was present at all three locations while bermudagrass and Zoysiagrass was present at one location. Herbicides selected were based on mode of action which included growth regulators (Trimec Southern, Confront, Lontrel, and Drive), photosynthesis inhibitors (Atrex, Basagran, Buctril, and Princep), amino acid synthesis inhibitors (Image, Manage, Manor, and Plateau), lipid synthesis inhibitors (Acclaim Extra), organic arsenicals (MSMA), and seedling growth inhibitors (Asulam, Balan, Barricade, Betasan, Dimension, Gallery, Pennant, Pendulum, Prograss, Ronstar, and Surflan). Herbicides were applied with a hand-held, six foot boom calibrated to deliver 20 to 40 GPA approximately 14 days after turf harvest in mid to late May at two locations and late July at another location. Plot design was a randomized complete block with 3 replications per location. Plot size was 6 ft wide by 10 ft long for each treatment. Percent ground cover was evaluated periodically throughout the growing season using a visual scale (0=no growth, 100=complete growth) and also using Sigma Scan Technology. Phytotoxicity was also evaluated (0=none, 5=complete death). At approximately 170 days after treatment, plots were rated for harvestability (0=not harvestable, 5=completely harvestable).

Phytotoxicity on St. Augustinegrass was significant higher from the untreated check with Acclaim Extra, Drive, and MSMA at all three locations. Plateau resulted in significant toxicity at two locations, while Confront, Image, and Simazine caused significant phytotoxicity at only one location. With hybrid bermudagrass, Acclaim Extra, Plateau, and Prograss caused phytotoxicity while on zoysiagrass Manor, Plateau, and Prograss resulted in significant phytotoxicity.

Ribbon recovery on St. Augustinegrass was significantly reduced when compared with the untreated check by Acclaim Extra, Drive, Image, Manor, and Plateau at all three locations; Manage and Surflan at two locations; and Barricade, Confront, Gallery, MSMA, and Pendulum at only one location. With hybrid bermudagrass, Gallery, Image, Manor, Plateau, Prograss, and Surflan reduced recovery while with zoysiagrass, Betasan, Manor, Plateau, Prograss, and Surflan reduced ribbon recovery.

Plateau reduced St. Augustinegrass harvesability at two locations while Betasan, Drive, Image, Manage, Manor, and Surflan reduced harvestability at one location. Hybrid bermudagrass harvestablity was reduced by Image, Plateau, and Prograss.

POSTEMERGENCE DALLISGRASS (*Paspalum dilatatum*) CONTROL. A.G. Estes and L.B. McCarty. Clemson University, Department of Horticulture, Clemson, SC 29634-0375

ABSTRACT

Dallisgrass (*Paspalum dilatatum*) is a perennial grass weed common in most turf situations. Dallisgrass is a clumping perennial that produces unsightly seedheads in the summer and disrupts the uniformity of the turf. The purpose of this research was to investigate the efficacy of various postemergence herbicides for dallisgrass control.

In the summer of 2002 two studies were conducted at Clemson University investigating postemergence dallisgrass control. Plot size for each treatment measured 2.0 m by 2.0 m, replicated three times. Treatments were applied with a CO_2 backpack sprayer calibrated at 20 GPA, at 30 p.s.i., using 8003 flat fan spray tips. Treatments for study one included: Flazasulfuron (25 DG) at 0.05 lb ai/A (0 fb 21 DAI); Flazasulfuron + MSMA (6.6 SC) at 0.05 lb ai/A + 2.0 lb ai/A (0 fb 21 DAI); MSMA at 2.0 lb ai/A (0 fb 7 fb 21 DAI); MSMA + Sencor (75 DF) at 2.0 lb ai/A + 0.25 lb ai/A (0 fb 7 fb 21 DAI); Revolver (35 WG) (AEF 130360) at 0.03 lb ai/A (0 fb 21 DAI); Revolver + MSMA at 0.03 lb ai/A + 2.0 lb ai/A (0 fb 21 DAI). Initial applications for study one were made on July 5, 2002. Treatments for study two included: MSMA at 2.0 lb ai/A (0 fb 7 DAI); MSMA + Sencor at 2.0 lb ai/A + 0.25 lb ai/A (0 fb 7 DAI); Turflon Ester (4.0 EC) at 1.0 lb ai/A (0 fb 14 DAI); Turflon Ester + MSMA at 1.0 lb ai/A + 2.0 lb ai/A (0 fb 14 DAI); Tuflon Ester + MSMA + Sencor at 1.0 lb ai/A + 2.0 lb ai/A + 0.25 lb ai/A (0 fb 14 DAI). Initial applications for study two were made on August 21, 2002. All treatments received a non-ionic surfactant (Lesco) at 0.25 % V/V.

Visual dallisgrass ratings for study one were taken 4 DAT, 26 DAT, and 56 DAT. Visual ratings for study two were taken 7 DAT, 14 DAT, 22 DAT, and 55 DAT. Ratings for control were based on a scale of 0-100% with 0% representing no control and 100% representing complete control. Ratings for bermudagrass injury were based on a scale of 0-100% with 0% representing no damage and 100% representing dead turf.

On the final visual rating date of study one, 56 DAT, excellent (>90%) dallisgrass control resulted from all treatments containing MSMA at 2.0 lbs ai/A. Bermudagrass injury was not acceptable with any treatment containing MSMA 26 DAT, but had recovered by 56 DAT. Flazasulfuron and Revolver did not provide acceptable dallisgrass control. In study two, excellent dallisgrass control, 55 DAT, resulted from all treatments containing MSMA, except for MSMA + Sencor, which provided 85% control. Turflon Ester alone provided 75% dallisgrass control 55 DAT.

CENTIPEDEGRASS TOLERANCE TO HERBICIDES APPLIED DURING ESTABLISHMENT. T.W. Gannon and F.H. Yelverton; Department of Crop Science, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

Centipedegrass (*Eremochloa ophiuroides*) is a warm-season turfgrass species which was introduced from China in 1916. Furthermore, centipedegrass has attributes that make it appealing for use along roadsides in North Carolina. Attributes include reduced foliar height compared to tall fescue (*Festuca arundinacea*) and inconspicuous seedheads. When centipedegrass is established along roadsides, these properties allow reduced maintenance costs due to reduced mowing cycles and reduced plant growth regulator requirements, as compared to tall fescue and bahiagrass (*Paspalum notatum*). Although centipedegrass is well-suited for use along roadsides in North Carolina, establishment of centipedegrass is much slower than most warm-season turfgrass species. Furthermore, weed control in centipedegrass poses a unique situation. In many cases, once centipedegrass is established, no weed control practices are needed due to minimal weed infestations; however, registered herbicides option are available for grass and broadleaf weed control in established centipedegrass. However, no registered herbicide options are available during the establishment of seeded centipedegrass. Further, if no weed control program is implemented, weeds are able to outcompete centipedegrass delaying grow-in and reducing winter survival.

Trials were initiated to investigate the effect of atrazine applied at centipedegrass seeding in the presence of large crabgrass (*Digitaria sanguinalis*) and centipedegrass tolerance to herbicides and plant growth regulators applied at seeding.

When atrazine (1100 g ai/ha) was applied at seeding, large crabgrass emergence was reduced (48%) compared to the control (89%). Further, centipedegrass tiller production and ground cover were reduced linearly with increasing amounts of large crabgrass; however, tiller production and ground cover were reduced less when atrazine was applied at seeding confirming atrazine applied at seeding can hasten centipedegrass grow-in.

When applied at seeding of centipedegrass, imazapic (18 or 35 g ai/ha), atrazine (1100 or 2200 g ai/ha), or simazine (1100 or 2200 g ai/ha) did not reduce centipedegrass ground cover compared to the nontreated at any observation date. However, sulfometuron (53 g ai/ha) or metsulfuron (21 or 42 g ai/ha) reduced centipedegrass ground cover compared to the nontreated at each observation date.

CONTROL OF TROPICAL SIGNALGRASS (*Urochloa subquadripara*) IN ST. AUGUSTINEGRASS SOD PRODUCTION. T.C. Teuton, B.J. Brecke, J.B. Unruh, G.E. MacDonald, G.L. Miller, J.T. Ducar and T.C. Mueller; Department of Agronomy, University of Florida, Gainesville, FL 32611; West Florida Research and Education Center, Jay, FL 32565; Department of Animal and Horticultural Sciences, Berry College, Mt. Berry, GA 30149; and University of Tennessee, Knoxville, TN 37996.

ABSTRACT

Tropical signalgrass is native to tropical Asia, and it infests the tropical and subtropical regions of the world. It is common throughout Florida and infests ditch banks, sod fields, golf courses, and home lawns. St. Augustinegrass sod growers have struggled with controlling tropical signalgrass because it tolerates many preemergence herbicides and most postemergence herbicides currently registered for use on St. Augustinegrass. Current methods of control for tropical signalgrass in St. Augustinegrass are similar to common bermudagrass (*Cynodon dactylon* [L.] Pers.) control, which requires multiple spot-treatment applications of glyphosate at 0.4 kg ai ha^{-1}.

The objectives of our research were to: 1) evaluate preemergence herbicides for control of tropical signalgrass, 2) evaluate postemergence herbicides for control of seedling tropical signalgrass, 3) evaluate postemergence herbicides for control of mature tropical signalgrass, and 4) evaluate sod regrowth following preemergence herbicide applications.

Preemergence trials were conducted in the spring of 2001 at H&H Sod Farm in St. Cloud, FL and at Duda Sod Farm in Ft. Lonesome, FL and 2002 at Agroturf Sod and Duda Sod in Ft. Lonesome, FL. Good control (>75%) at 8 WAA was achieved with benefin + oryzalin, benefin + trifluralin, diclofop, dithiopyr, imazapic, imazapic + 2,4-D, imazapyr, isoxaflutole, and oryzalin. By 11 WAA only benefin + oryzalin, benefin + trifluralin, imazapic, and imazapic + 2,4-D provided >75% tropical signalgrass control. However, use of imazapic, imazapic + 2,4-D, and imazapyr may cause excessive damage to St. Augustinegrass. Early postemergence trials were conducted in a greenhouse at the University of Florida in Gainesville, FL. Excellent control (≥ 89%) was achieved with asulam and trifloxysulfuron at the 2, 4, 6, and 8-leaf stage. Good control (≥ 60%) was achieved with ethofumesate, imazaquin, and metsulfuron when sprayed prior to the 8-leaf stage. Postemergence field studies were conducted in 2000 and 2001at the University of Florida West Florida Research and Education Center in Jay, FL. None of the 20 postemergence herbicide treatments provided adequate control of tropical signalgrass in either trial. A study to evaluate St. Augustinegrass sod regrowth was conducted at H&H sod farm in 2001 and 2002. Preemergence herbicide treatments of atrazine, atrazine + metolachlor, benefin, benefin + oryzalin, benefin + trifluralin, DCPA, dithiopyr, metolachlor, metolachlor + simazine, oryzalin, oxadiazon, pendimethalin, prodiamine, simazine, and trifluralin were applied to St. Augustinegrass strips one week after harvest. During the study there were no visual signs of injury, discoloration, stunting, or reductions in St. Augustinegrass quality. At the conclusion of the study the sod was harvested and there were no reduction in slab weight compared to the untreated check and no differences in root, shoot, or stolon weights or root diameters.

KYLLINGA (*Kyllinga odorata*) CONTROL IN TIFWAY BERMUDAGRASS. P.J. Brown, L.B. McCarty, and A.G. Estes. Clemson University, Clemson, SC 29634

ABSTRACT

'Tifway' bermudagrass is a fine textured warm-season turfgrass widely used on lawns, sports fields, fairways and tees in the Southern United States. Fragrant kyllinga (*Kyllinga odorata*) is a bunch type warm season annual that thrives in moist low mowed areas such as these. Kyllinga is a weed that competes with the 'Tifway' bermudagrass during the warm season. The object of this study was to evaluate the efficiency of various commercial and experimental herbicides for Fragrant kyllinga control in 'Tifway' bermudagrass.

Two studies were conducted at Clemson University. The treatments for study one were applied in June and the treatments for study two were applied in August. Study one investigated Manage (halosulfuron) at various levels, Image (imazaquin) and an experimental formulation of sulfosulfuron designated as MON-44951. Study two investigated the efficiency of Manage, Basagran (bentazone), Manor (metsulfuron), TranXit (rimsulfuron) and the sulfonylureas trifloxysulfuron (Monument), flazasulfuron, foramsulfuron and sulfosulfuron. The studies subjectively determined the control of kyllinga on a percentage scale with 100% designated as complete control and 90% being considered acceptable control.

Both of the studies were designed as randomized complete block arrangements with each individual plot measuring 2.0 m x 1.5 m. The blocks were each replicated a total of three times and were maintained at a mowing height of 1.27 cm. The treatments were applied using a CO_2 backpack spray boom calibrated at 187 l/ha (20 gal/A). Treatments for study one were applied on June 26 2002 with sequential applications on August 7, 2002. Treatments for study two were applied on August 12, 2002.

In study one, sulfosulfuron between 0.05 lb ai/A and 0.14 lb ai/A provided greater than 90% control of kyllinga 14 weeks after the treatment, the 0.07 lb ai/A rate provided unacceptable control. Sulfosulfuron at 0.05 lb ai/A and sulfosulfuron at 0.07 lb ai/A followed by a sequential application of 0.05 lb ai/A provided 100% control of the kyllinga. Acceptable control (>90%) was provided by Manage at 0.06 lb ai/A; 0.03 lb ai/A followed by a sequential application at 0.03 lb ai/A; and 0.06 lb ai/A followed by a sequential application at 0.06 lb ai/A but not at 0.03 lb ai/A.

In study two, trifloxysulfuron applied at 0.3 lb ai/A provided 100% control of kyllinga at the end of the study. Acceptable control of kyllinga was provided by MSMA, MSMA and Image and flazasulfuron seven weeks after the treatment. All other treatment provided less than 75% control of the kyllinga.

Best kyllinga control was provided by sulfosulfuron at 0.05 lb ai/A followed by a sequential application at 0.05 lb ai/A and sulfosulfuron at 0.07 lb ai/A followed by a sequential application at 0.05 lb ai/A. Multiple Manage and MSMA treatments also provided good control.

Future research in this area may include adjusting the rates, timing, and tank mixes of the herbicides. Further work could be put into observing these herbicides control of other problematic weeds. It would also be of benefit to investigate further into the use of sulfonylureas for kyllinga and sedge control.

PROSTRATE KNOTWEED CONTROL IN BERMUDAGRASS ROUGHS. W.L. Barker, J.B. Beam, and S.D. Askew; Department of Plant Pathology, Physiology, and Weed Science, Virginia Polytechnic Institute & State University, Blacksburg, VA 24061.

ABSTRACT

Prostrate knotweed (*Polygonum aviculare* L.) is a mat-forming, summer annual that overruns compacted areas. On golf courses, areas adjacent to cart paths can sometimes become compacted allowing for infestation by prostrate knotweed. Control options for prostrate knotweed in warm-season turf have not been reported. Two experiments were conducted in May 2002 at Hanover Country Club, in Hanover, VA to determine control options for prostrate knotweed in bermudagrass (*Cynodon dactylon* (L.) Pers.). The first study consisted of acetolactate synthase (ALS) inhibiting herbicides which included metsulfuron at 0.04 lb ai/A, chlorsulfuron at 0.13 lb ai/A, rimsulfuron at 0.05 lb ai/A, imazaquin at 0.44 lb ai/A, foramsulfuron at 0.04 lb ai/A, flazasulfuron at 0.05 lb ai/A, trifloxysulfuron at 0.02 lb ai/A, and sulfosulfuron at 0.02 lb ai/A and included a non-ionic surfactant (NIS) at 0.25% (v/v). The other study evaluated bromoxynil at 0.50 lb ai/A + NIS, bromoxynil + dicamba at 0.50 + 0.25 lb ai/A + NIS, dicamba at 0.25 lb ai/A, triclopyr at 0.56 lb ai/A, triclopyr +clopyralid at 0.75 lb ai/A, 2,4-D + triclopyr at 1.69 lb ai/A, 2,4-D + dicamba at 0.97 lb ai/A, 2,4-D + dicamba + MCPP at 1.66 lb ai/A, quinclorac at 1.50 lb ai/A+ COC at 1% (v/v), and metribuzin at 0.50 lb ai/A. Both experiments were conducted as randomized complete block designs with three replications, in bermudagrass roughs with natural infestations of prostrate knotweed. Bermudagrass injury and prostrate knotweed control were rated 2, 4, and 7 week after treatment (WAT).

In the ALS-inhibiting herbicide experiment, metsulfuron and chlorsulfuron controlled prostrate knotweed at least 90% 7 WAT. Flazasulfuron controlled prostrate knotweed 65% 7 WAT. Imazaquin, rimsulfuron, trifloxysulfuron, foramsulfuron, and sulfosulfuron controlled prostrate knotweed less than 35% 7 WAT. Imazaquin injured bermudagrass 30% 2 WAT, injury lessened with time. In the other experiment, 2,4-D + triclopyr, 2,4-D + dicamba, 2,4-D + dicamba + MCPP, and dicamba controlled prostrated knotweed at least 90% 7 WAT. Bromoxynil + dicamba, triclopyr, and triclopyr + clopyralid controlled prostate knotweed 70, 58, and 50%, respectively 7 WAT. Bromoxynil, quinclorac, and metribuzin controlled prostrate knotweed less than 25% 7 WAT. Quinclorac injured bermudagrass 27% 2 WAT, injury lessened with time. Results indicate metsulfuron, chlorsulfuron, 2,4-D + triclopyr, 2,4-D + dicamba, and 2,4-D + dicamba + MCPP control prostrate knotweed in bermudagrass roughs.

FLAZASULFURON TOLERANCE IN VARIOUS TURFGRASS SPECIES. N.B. Pool, B.J. Brecke, J.B. Unruh, G.E. MacDonald; West Florida Research and Education Center, Jay, FL 32565

ABSTRACT

Research was conducted at the University of Florida West Florida Research and Education Center during 2001 and 2002 to evaluate flazasulfuron, a sulfonylurea herbicide, for tolerance in turfgrass. Eight turfgrass species common in the Southern U.S. were selected for study (Sea Isle 1 and Sea Isle 2000 Seashore Paspalum; Tifeagle, Tifdwarf, and Floradwarf bermudagrass; Common centipedegrass; Raleigh St. Augustinegrass; and Emerald Zoysiagrass). Four rates of herbicide (0.023 lbs a.i./A, 0.035 lbs a.i./A, 0.047 lbs a.i./A, 0.093 lbs a.i./A) were applied to the various species of turfgrass. All applications included a non-ionic surfactant at 0.25% v/v. Sea Isle 1 seashore paspalum showed significant injury early, but recovered quickly indicating moderate tolerance to flazasulfuron. Sea Isle 2000 seashore paspalum showed no injury at the .023 lbs a.i./A level, and showed little injury at other rates suggesting good tolerance. Tifeagle and Tifdwarf bermudagrass had significant damage early, but recovered well over time. Both varieties had moderate to good tolerance. The Floradwarf bermudagrass showed little injury early, but had significant damage over time indicating moderate to low tolerance. Common centipedegrass showed significant injury early with little recovery over time. Raleigh St. Augustinegrass showed little injury early, but had severe damage over time and appears to not tolerate flazasulfuron. Emerald zoysiagrass showed little injury throughout the study and had good tolerance to this herbicide.

FLAZASULFURON FOR WEED MANAGEMENT IN WARM-SEASON TURFGRASS.

B.J. Brecke and J.B. Unruh; West Florida Research and Education Center, University of Florida, Milton, FL 32583.

ABSTRACT

Studies were conducted at the University of Florida, West Florida Research and Education Center near Jay, FL during 2001 and 2002 to evaluate flazasulfuron for control of both annual and perennial weed species in bermudagrass. At 4 wk after treatment (WAT), flazasulfuron (0.022 lb a.i./A) controlled southern crabgrass [*Digitaria ciliaris* (Retz.) Koel.] equal to MSMA (85 to 90%). By 14 WAT the rate needed to maintain 85% control increased to 0.0032 lb/A. Flazasulfuron applied three times at 0.70 lb/A, with treatments spaced 3 wk apart, provided better torpedograss (*Panicum repens* L.) control (80%) than a single treatment at the same rate (60%) when evaluated 8 wk after initial treatment (WAIT). Torpedograss control with the sequential program was comparable to that observed with the standard quinclorac 21 WAIT. Bahiagrass (*Paspalum notatum* Fluegge) control was less than 50% with a single application of flazasulfuron. A single application was also ineffective for control of Virginia buttonweed (*Diodia virginiana* L.). However, two sequential applications improved Virginia buttonweed control to 70% while three application provided 90% control 11 WAIT. Flazasulfuron provided more consistent control of purple nutsedge (*Cyperus rotundus* L.) and cocks-comb kyllinga (*Kyllinga squamulata* Thonn. ex Vahl) when applied twice compared with a single treatment. The sequential treatment controlled these species similar to the standard halosulfuron. Flazasulfuron was also effective for removing ryegrass overseeding and provided 90% control 3 WAT.

ROOT VERSUS FOLIAR SENSITIVITY OF GOOSEGRASS TO AEF130360. G.R. Wehtje, W.A. Williams, and R.H. Walker; Alabama Agric. Exp. Stn., Auburn University, AL 36849-5412.

ABSTRACT

Greenhouse experiments were conducted to determine the relative importance of foliar versus root absorption with respect to the postemergence activity of AEF130360 for controlling goosegrass [*Eleusine indica* (ELEIN)]. In addition, rimsulfuron and CGA362622 were also included since these herbicides may have similar potential in warm-season turf. And annual bluegrass [*Poa annua* (POANN)] was included as a second target species. Experiment consisted of a factorial arrangement of the three previously-mentioned herbicides, three herbicide rates, two growth media, and three application types. Herbicides rates were 0.016, 0.032 and 0.064 lb ai/A. Growth media was either a field soil (Kalmia sandy loam; pH = 5.7) or a sand/peat mixture (90/10 v/v). Application types included soil+foliar, soil-only and foliar-only. ‘Soil+foliar’ was a typical application where the spray fall indiscriminately on either foliage or soil surface. ‘Foliar-only’ was identical however soil surface was temporarily covered with charcoal to prevent soil entry. These two application were applied with an enclosed-booth greenhouse sprayer at 30 GPA. ‘Soil-only’ was achieved by applying the appropriate volume of spray solution directly to the soil surface. A methylated seed oil adjuvant was included at 1% v/v. Treatments were applied when seed heads on both species were first evident. POANN control was visually rated at 3 WAT. ELEIN was clipped near soil surface at 3 WAT and subsequent regrowth rated at 7 WAT. Experiment was repeated over time, and the pooled data subjected to an ANOVA that reflected factorial treatment arrangement.

Herbicide rate was either insignificant (POANN), or significant but not consistently increased with higher rates (ELEIN). With rimsulfuron, least activity against both species was obtained with foliar-only indicating that its activity was predominately, but not exclusively, root-absorption based. With CGA362622, soil-only and foliar-only were equivalent, but less effective than soil+foliar. This was more apparent in POANN than in ELEIN. This indicates that CGA362622 activity was probably the result of nearly equal root-based and foliar-based absorption. With AEF130360, soil-only was the least effective for both species. For all herbicide-weed combinations except rimsulfuron-POANN and AEF130360-ELEIN , greater control was obtained in soil than in sand/peat. In summary, in contrast to the other two sulfonylurea herbicides, AEF130360 was predominately foliar active.

EARLY POSTEMERGENCE CRABGRASS CONTROL WITH PENDIMETHALIN AND DITHIOPYR. J.W. Boyd, University of Arkansas Cooperative Extension, Fayetteville, AR 72704.

ABSTRACT

In 2002, we conducted three field trials and one greenhouse trial in Fayetteville, Arkansas to compare the effectiveness of pendimethalin at 1.5 lb ai/a and dithiopyr at 0.25 lb ai/a for postemergence control of seedling crabgrass. Field trials were conducted with large crabgrass *(Digitaria sanguinalis*). The greenhouse trial included large crabgrass and smooth crabgrass (*Digitaria ischaemum*). Herbicides (1.29% pendimethalin and 0.17% dithiopyr) were on a 30-3-4 fertilizer. The field trials were planted on an irrigated, vegetation free site that had been fumigated with methyl bromide in the fall of 2001. The greenhouse trial was planted in plastic growth trays using 85:15 sand: peat mix. Percent crabgrass cover was determined using overhead digital photographs of each plot and analyzing them using SigmaScan® software. SigmaScan® counts the number of green pixels (crabgrass) in the digital photo and divides it by the number of total pixels to calculate a percent crabgrass cover in the plot.

Pendimethalin at 1.5 lb ai/a and dithiopyr at 0.25 lb ai/a provided effective early postemergence large crabgrass control when applied at the one to two-leaf stage of growth but were ineffective when applied at the three-leaf stage or later. This was due in part to the absence of turfgrass competition. However, the absence of other species allowed quantitative measurement of herbicide performance compared to the more subjective visual evaluation process used when turfgrass is present. At 10 DAT (days after treatment) in field trials I, II and III, percent large crabgrass cover in plots treated with dithiopyr at the one to two-leaf stage of crabgrass growth was 7, 18 and 1%, respectively. Percent cover for pendimethalin was 11, 4 and 0%, respectively. If treatment was delayed until the one to three-leaf stage of crabgrass growth, percent cover for dithiopyr and pendimethalin at 10 to 16 DAT ranged from 40 to 80% across all field trials. In field trial I, 0.25 lb ai/a of an emulsifiable concentrate (1EC) and wettable powder (40WSP) formulations of dithiopyr applied as a spray at 30 GPA did not provide better control than dithiopyr applied on fertilizer granules.

In a separate field trial, three formulations of pendimethalin (3.3EC, 60DF and 2G) were applied to one to three-leaf large crabgrass at 1.5 lb ai/a. At 20 DAT, these treatments had 7, 31 and 88% cover, respectively. The EC and DF formulations were applied at 30 GPA.

Pendimethalin, applied at the one-leaf stage, in the greenhouse, provided significantly better control of smooth crabgrass than dithiopyr (97% vs. 50% at 10 DAT). Control of one-leaf large crabgrass was not statistically different (87% vs. 73% at 10 DAT). Greenhouse control ratings were visual where 0 = no weed control and 100 = complete weed control.

WEED CONTROL AND TURFGRASS TOLERANCE TO FLAZASULFURON. F.H. Yelverton, T.W. Gannon, J.D. Hinton, and L.S. Warren; Department of Crop Science, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

Sulfonylurea herbicides have proven effective in controlling many annual and perennial weeds in turfgrass systems. Currently, there are several experimental sulfonylurea herbicides being evaluated for various applications in turfgrass systems. Research trials were initiated to investigate weed control and turfgrass tolerance to flazasulfuron, an experimental sulfonylurea herbicide under investigation by ISK Biosciences. Turfgrass tolerance trials were conducted on 'Confederate' tall fescue (*Festuca arundinacea*), 'Sahara' bermudagrass (*Cynodon dactylon*), 'Tifsport' bermudagrass, 'Tifway 419' bermudagrass, and 'El Toro' zoysiagrass (*Zoysia japonica*). Tolerance trials included flazasulfuron 25DF applied at 1.4 - 5.7 oz product per acre and included a non-ionic surfactant. Flazasulfuron was also evaluated for control of purple nutsedge (*Cyperus rotundus*), a tough to control perennial sedge species. Trials were arranged in randomized complete block designs, included four replicates, and means were separated according to Fisher's Protected LSD (P=0.05).

Flazasulfuron caused slight phytotoxicity ($\leq$ 20%) applied after full greenup to 'Sahara' bermudagrass, 'Tifway 419' bermudagrass, 'Tifsport' bermudagrass, and 'El Toro' zoysiagrass. Applied to bermudagrass during transition (50% greenup), minimal turfgrass quality reductions were observed at four weeks after treatment. However, flazasulfuron applied to 'Confederate' tall fescue was detrimental. Flazasulfuron provided > 85% control of purple nutsedge 4 weeks after initial treatment (WAIT) while control ranged from 75 - 86% control 12 WAIT. Further, sequential applications of flazasulfuron did not enhance purple nutsedge control compared to single applications.

EFFICACY OF FLUROXYPYR IN WARM-SEASON TURFGRASSES. F.C. Waltz, Jr., T.R. Murphy, University of Georgia, Griffin, GA 30223, B.J. Brecke, University of Florida, Milton 32583, and D.W. Lickfeldt Dow AgroSciences, Indianapolis, IN 46268

ABSTRACT

To control a wide spectrum of broadleaf weeds in warm-season turfgrasses a herbicide mixture is typically used. A formulated mixture often includes a herbicide from the phenoxy family. Turfgrass tolerance to this class of herbicides varies between species, with some grasses like bermudagrass (*Cynodon* sp.) being relatively tolerant at labeled rates, while sever injury can occur to St. Augustinegrass (*Stenotaphrum secundatum*). Replacement of the phenoxy herbicide in these mixtures with a material that is efficacious at lower amounts and non-injurious to a broad spectrum of turfgrasses is desirable. Fluroxypyr is a broadleaf auxin-type herbicide in the pyridinyloxyacetic acid family with little soil activity. The objectives of these studies were to determine the efficacy of fluroxypyr on broadleaf weeds and determine the turf tolerance of warm-season turfgrasses to various tank mix combinations.

This work is a summary of twelve trials conducted in Florida and Georgia over the 2001 and 2002 growing seasons. These studies included seven turfgrass cultivars, common bermudagrass, 'Tifway' and 'TifSport' bermudagrasses (*C. dactylon* X *C. transvaalensis*), 'Raleigh' and 'Palmetto' St. Augustinegrasses, 'Meyer' zoysiagrass (*Zoysia japonica*), and centipedegrass (*Eremochloa ophiuroides*). Plots were in a randomized complete block design with three replications. Using a CO_2 backpack sprayer set to deliver 20 gpa, postemergence applications were applied as a single application during the growing season. Treatments included fluroxypyr (0.28 kg ai ha^{-1}), clopyralid (0.28 kg ai ha^{-1}), fluroxypyr + clopyralid (0.07 + 0.07, 0.13 + 0.13, and 0.28 + 0.28 kg ai ha^{-1}), MCPP + fluroxypyr (3.5 l ha^{-1}), MCPP + clopyralid (3.2 l ha^{-1}), and 2,4-D + MCPP + dicamba (2.3 l ha^{-1}). An untreated control was included in all studies.

The broadleaf weeds evaluated in these studies were white clover (*Trifolium repens*), buckhorn plantain (*Plantago lanceolata*), Virginia buttonweed (*Diodia virginiana*), and Dollarweed (*Hydrocotyle* sp.). Visual control ratings were made on a 0% to 100% scale, 0%= no control, and 100%= complete control, 70% control was considered minimally acceptable. Also, turfgrass 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.

For plots treated with clopyralid, fluroxypyr + clopyralid (0.25 + 0.25 kg ai ha^{-1}), MCPP + fluroxypyr, and MCPP + clopyralid, acceptable control (> 70%) of white clover was observed 2 weeks after application (WAA). All treatments had greater than 90% control of white clover and buckhorn plantain at 3 WAA. Acceptable control of Virginia buttonweed was noted 3 WAA for plots treated with fluroxypyr + clopyralid (0.13 + 0.13 and 0.28 + 0.28 kg ai ha^{-1}), and 2,4-D + MCPP + dicamba. Additionally, greater than 90% control was observed with these treatments 9 WAA. Dollarweed control was greater than 90% at 1 and 14 WAA when the phenoxy herbicide MCPP was added to fluroxypyr and clopyralid.

In all evaluations, no injury was observed in treatments containing fluroxypyr for common bermudagrass and 'Meyer' zoysiagrass. Centipedegrass injury did not exceed 10% and fully recovered by 4 WAA. In one of the studies, turfgrass injury was observed on 'Tifway' bermudagrass while no injury was observed on a separate study evaluating this cultivar. Observable injury never exceeded 30% and the turfgrass recovered by 3 WAA. 'TifSport' bermudagrass had similar results, but minimal injury (< 10%) was noted at 6 WAA. In one study on St. Augustinegrass, unacceptable (> 30%) injury was observed at 2 and 4 WAA for treatments containing 2,4-D or MCPP. Treatments including fluroxypyr, clopyralid, and fluroxypyr + clopyralid, did injure St. Augustinegrass, although injury did not exceed 30% and was less than 10% by 6 WAA.

A spectrum of broadleaf weeds ranging from easily controlled white clover and buckhorn plantain to more difficult species like Virginia buttonweed was controlled with fluroxypyr. However, inconsistent tolerance of hybrid bermudagrasses and St. Augustinegrass merits further study. Multiple applications at lower rates may be as effective at controlling these weed species and minimize turfgrass injury.

PURPLE NUTSEDGE CONTROL IN BERMUDAGRASS WITH SULFONYLUREA HERBICIDES. J.D. Hinton and F.H. Yelverton. Department of Crop Science. North Carolina State University, Raleigh, N.C.

ABSTRACT

Purple nutsedge (*Cyperus rotundus*) has long been a difficult weed to control in a turfgrass system. Halosulfuron (Manage) has been the commercial standard for purple nutsedge control for several years. Several new sulfonylurea herbicides are now being studied in turf and purple nutsedge control needs to be determined for these herbicides.

Trials to determine the efficacy of these sulfonylurea herbicides on purple nutsedge were conducted in 2001 and 2002 in Plymouth, N.C. and in 2002 in Maysville, N.C. The sulfonylurea herbicides studied in these trials included halosulfuron, sulfosulfuron (Outrider), rimsulfuron (TranXit), trifloxysulfuron (Monument), foramsulfuron (Revolver), and flazasulfuron. All treatments had an adjuvant added.

In Maysville, sulfosulfuron at 2.56 oz/a and trifloxysulfuron at 0.59 oz/a provided better than 90% control at 12 weeks after application.

In Plymouth, greater than 90% control at 11 weeks after initial treatment was achieved with halosulfuron (initial and 6 weeks after) at 1.33 oz/a. At 14 weeks after initial treatment, trifloxysulfuron (initial and 6 weeks after) at 0.59 oz/a, sulfosulfuron (initial) at 3 oz/a and sulfosulfuron (initial and 6 weeks after) at 1.5 and 1 oz/a provided better than 90% control.

Bermudagrass has not shown any significant reduction in quality from any of these sulfonylurea herbicides.

THE EFFECTS OF POSTEMERGENCE HERBICIDES ON CENTIPEDEGRASS SEED PRODUCTION. J.A. Ferrell, T.R. Murphy, W.K. Vencill, University of Georgia, Athens, GA 30602; and Griffin, GA 30223

ABSTRACT

Field studies were initiated in 2001, and repeated in 2002, to determine the effect of clethodim, sethoxydim, and halosulfuron application timing on centipedegrass seedhead suppression, seed yield, and seed germination. Clethodim, sethoxydim, and halosulfuron were applied at 0.25, 0.28, 0.06 lb. ai/A, respectively. Herbicide applications were made at -4, -2, 0, 2, and 4 weeks post seedhead emergence (WPS) in each year. Seedhead suppression varied in severity each year; however, suppression was greatest when clethodim or sethoxydim was applied 0 or 2WPS. Halosulfuron had no affect on seedhead emergence in either year. Likewise, halosulfuron did not reduce seed yield at any treatment timing. Clethodim reduced seed yield between 22 and 44% at all treatment timings. The pattern of yield reduction from sethoxydim was similar to that of clethodim, however, yield reduction for sethoxydim ranged between 7 and 48% for all application timings. The greatest reduction in seed yield occurred when clethodim or sethoxydim were applied 2WPS. Seed germination was not affected by halosulfuron and sethoxydim at any application timing. Clethodim, when applied at 2 or 4 WPS, decreased seed germination by 17 and 20%, respectively.

POSTEMERGENCE CONTROL OF GOOSEGRASS IN BERMUDAGRASS TURF WITH FORAMSULFURON. J.L. Belcher, R. H. Walker, and G.R. Wehtje; Department of Agronomy and Soils, Auburn University, AL 36849

ABSTRACT

Goosegrass [*Eleusine indica* (L.) Gaertn.] is one of the most common turf weeds in the southeastern United States. It is often found on high traffic areas such as athletic fields and golf courses and can tolerate mowing at putting green heights. Herbicides used for postemergence control of goosegrass on bermudagrass putting greens include MSMA, DSMA, and Illoxan (diclofop-methyl). However, where the organic arsenicals are used, bermudagrass injury can be a problem. Also, Illoxan is a restricted use herbicide, which may limit its use.

Foramsulfuron (AEF 130360) is a sulfonylurea herbicide currently used in field corn and is under development for use in warm-season turf by Bayer Cropscience. It has very low toxicity on non-target species while susceptible species are affected through inhibition of actolactate synthase.

Two studies were conducted in the summer/early fall of 2002 to evaluate the efficacy of foramsulfuron on goosegrass. Both studies were conducted on a Tifdwarf bermudagrass putting green at Grand National Golf Course in Opelika, Alabama. The first study was initiated July 31, 2002 and the second study started September 10, 2002. All treatments were repeated 2 weeks after the initial treatment (WAIT). Herbicides and rates were: foramsulfuron at 0.027, 0.04, and 0.054 lb ai/A; MSMA at 2.0 lb ai/A; and Illoxan at 0.75 lb ai/A. A non-ionic surfactant was added to all treatments at 0.25% v/v. Treatments were applied at 30 GPA. A randomized complete block design was utilized. Visual ratings of both goosegrass control and Tifdwarf injury were taken 4 and 6 WAIT with 0% equal to no injury and 100% representing total death.

By 4 WAIT, all foramsulfuron rates as well as Illoxan were providing >87% in both studies. 6 WAIT data showed all foramsulfuron rates and Illoxan providing 83-89% control in the first study and 96-100% in the second. Higher ratings in the second study may be attributed to cooler temperatures at that time, thus inhibiting goosegrass regrowth. MSMA failed to provided >25% control in either study at any rating date. At no point did Tifdwarf injury exceed 20% for any treatment. This injury consisted of some chlorosis but was not apparent 14d after treatment.

SECTION III. WEED MANAGEMENT IN HORTICULTURAL CROPS

TOMATO AND WEED RESPONSE TO TRIFLOXYSULFURON-SODIUM APPLIED AT-PLANT OR POSTEMERGENCE. A.S. Culpepper, Department of Crop and Soil Sciences, University of Georgia, Tifton, GA 31793 and W.M. Stall, Department of Horticultural Science, University of Florida, Gainesville, FL 32611.

ABSTRACT

Methyl bromide is currently the fumigant of choice for production of staked tomatoes on plastic mulch for control of weeds, nematodes, and soilborne diseases. Methyl bromide has been targeted as a culprit in the depletion of the atmosphere ozone layer. As a result, the use of methyl bromide is being phased out. Several alternative soil fumigants are available for the management of nematodes and soilborne diseases. However, control of weeds by methyl bromide fumigant alternatives has been inconsistent and often inadequate. The need for herbicides in methyl bromide alternative systems likely will be required for adequate weed management. One such herbicide in tomato may be trifloxysulfuron-sodium. A series of weed free field experiments were conducted in Georgia and Florida to evaluate tomato tolerance to trifloxysulfuron applied preplant incorporated (PPI), preemergence (PRE), and postemergence over-the-top (POT) in 2002. Sunpride or FL 47 tomato were planted into plastic mulch in Florida while HMX 0800 was transplanted into plastic mulch in Georgia. The entire trial was fumigated with Telone C-35 to manage soil-borne diseases and nematodes. Trifloxysulfuron was applied at 20 GPA in Florida and 14.8 GPA in Georgia. Also, trials evaluating the response of several weed species to trifloxysulfuron were conducted at three Georgia locations.

Trifloxysulfuron was applied PPI at 0.009 and 0.018 lb ai/A at Gainesville and Live Oak, Florida. Compared to the no herbicide control, these treatments stunted tomato 7 to 20% at Gainesville and 37 to 43% at Live Oak 30 to 40 days after treatment. Additionally at Live Oak, these treatments reduced the weight of extra-large fruit in the second harvest and weight of the total extra-large fruit harvested by 53 to 70%. The weight of total large fruit harvested also was reduced 34 to 37% at Live Oak.

Trifloxysulfuron was applied PRE at 0.00705 and 0.0141 lb/A at TyTy, Georgia and Gainesville, Florida. Trifloxysulfuron applied PRE at 0.0047 lb/A was also included at Gainesville. Tomato was stunted 11 to 17% and 5 to 6% at 30 and 40 days after treatment, respectively, in Georgia. Trends were similar in Florida and no affect on yield was noted at either location.

Trifloxysulfuron was applied POT at 0.00705 and 0.0141 lb/A at TyTy, Georgia and Gainesville, Florida. Trifloxysulfuron applied POT at 0.0047 lb/A was also included at Gainesville. Treatments were applied 19 to 26 days after transplanting tomato into plastic mulch and a nonionic surfactant was included. Tomato was stunted 4 to 12% at 14 to 44 days after treatment in Georgia with similar trends noted in Florida. No yield affect was noted in Florida. Trifloxysulfuron at 0.00705 did not affect yield in Georgia; however, trioflxoysulfuron at 0.014 lb/A reduced the weight and number of extra-large, large, and total tomato yield by 30 to 42% compared to the non-treated control.

The trifloxysulfuron weed response experiment was conducted at three Georgia locations applying trifloxysulfuron (0.0047 lb ai/A) 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 trifloxysufuron.

Two- and 5-inch weeds responded similarly; thus, weed control from the 5-inch stage is reported. Trifloxysulfuron controlled yellow nutsedge, 80%; pitted morningglory, 94%; smallflower morningglory, 30%; tropic croton, 73%; wild poinsettia, 88%; and Florida pusley, 0%. Control of 10-inch weeds followed similar trends to those noted at the 5-inch stage with yellow nutsedge, 75%; pitted morningglory, 87%; smallflower morningglory, 20%; tropic croton, 55%; wild poinsettia, 64%; and Florida pusley, 0%.

YELLOW NUTSEDGE CONTROL WITH METHAM-SODIUM IN TRANSPLANTED CANTALOUPE. W.C. Johnson, III; USDA-ARS, Coastal Plain Experiment Station, Tifton, GA 31793.

ABSTRACT

Vegetable growers are losing the broad-spectrum soil fumigant methyl bromide. The regulatory circumstances surrounding the impending cancellation of methyl bromide are well documented. Efforts are on-going to extend the deadline for using methyl bromide until suitable alternatives are developed. Preliminary research showed that perennial nutsedges in these crops could be controlled with metham-sodium fumigation. However, specific questions have not been fully answered regarding rates, application timing, and plastic mulching when using metham-sodium for weed control.

Trials were conducted in 2001 and 2002 at the Coastal Plain Experiment Station Ponder Farm on transplanted cantaloupe grown on narrow plastic covered beds to answer the questions regarding metham-sodium fumigation for weed control. The trial evaluated all possible combinations of three metham-sodium rates (nontreated, ½x rate, and 1x rate), preplant fumigation intervals (1-wk, 2-wk, or 3-wk before transplanting), and plastic mulching (bareground or plastic covered beds). Metham-sodium was applied with the specialized power tiller designed and modified by Mr. Dan Evarts, USDA-ARS. Sites where these trials were conducted had heavy natural infestations of yellow nutsedge (>100 plants/m^2).

Results indicated that preplant metham-sodium fumigation 2-wk before transplanting provided the best combination of yellow nutsedge control and protection from fumigant phytotoxicity of the preplant intervals evaluated. Fumigation with metham-sodium 1-wk before transplanting provided the most effective yellow nutsedge control, but the fumigant applied just prior to transplanting stunted cantaloupe and slightly delayed maturity. In contrast, metham-sodium fumigation 3-wk before transplanting was not as effective in controlling yellow nutsedge as fumigation closer to transplanting and yields were correspondingly lower due to nutsedge interference. Plastic mulch improved yellow nutsedge control and increased yields in all possible combinations of fumigant rates and times of preplant fumigation. In fact, nonfumigated seedbeds covered with plastic mulch had surprisingly effective yellow nutsedge control compared to nonfumigated bareground plots which were heavily infested with yellow nutsedge. Plots fumigated with the full-rate of metham-sodium had the most effective yellow nutsedge control and greatest yields compared to either nonfumigated or treated with metham-sodium at the ½x rate. The yield response is due to superior yellow nutsedge control provided by the full-rate compared to either the ½x rate or nonfumigated control.

These results are based on two years data and several trends are readily apparent at this stage of the project. First, if metham-sodium is to be used for perennial nutsedge control, the full rate should be applied using a power tiller similar to the one in this trial. The ½x rate will not effectively control yellow nutsedge. Second, a plastic mulch is needed for adequate perennial nutsedge control, regardless of fumigation. There are less perennial nutsedge escapes in plastic covered beds than in bareground, even when fumigated with the full rate of metham-sodium. Interestingly, it appears that plastic mulch itself provides useful suppression of perennial nutsedges, particularly if plastic mulch is laid just prior to transplanting. Rapidly growing transplants are effective shaders of perennial nutsedges when given a chance. It is plausible that laying plastic just prior to transplanting does not give perennial nutsedges opportunity to penetrate the plastic mulch before the transplants begin rapid growth. Since perennial nutsedges are highly susceptible to shading from other plants, this cultural weed control practice may be a cost-effective component of an integrated system to manage perennial nutsedges in transplanted cucurbit crops.

NUTSEDGE CONTROL AND BELL PEPPER PRODUCTION WITH REDUCED RATES OF METHYL BROMIDE APPLIED UNDER VIRTUALLY IMPERMEABLE FILM. T.N. Motis[1], J.P. Gilreath[1], and J.W. Noling[2]; [1]University of Florida, Bradenton, FL 34203, [2]University of Florida, Lake Alfred, FL 33850.

ABSTRACT

Nutsedge is commonly present in Florida vegetable fields and is controlled with the soil fumigant, methyl bromide/chloropicrin. With the ongoing phase-out of methyl bromide, it may be necessary to reduce the standard use rate of 392 $kg{\cdot}ha^{-1}$. Research was conducted to determine the efficacy of reduced rates of methyl bromide under virtually impermeable film (VIF) vs. standard low density polyethylene (LDPE) film. Methyl bromide was applied in fall 1998, spring 1999, fall 1999, and fall 2000 at 0, 98 (1/4X rate), 196 (1/2X rate), and 392 (full rate) $kg{\cdot}ha^{-1}$ under LDPE and/or VIF in fields where bell pepper (*Capsicum annuum*) seedlings were then planted. Nutsedge (mixture of *Cyperus esculentus* and *C. rotundus species*) data shown were shoot populations on bed-tops at or later than 8 weeks after methyl bromide application. Up to 107 nutsedge $shoots{\cdot}m^{-2}$ were observed with no methyl bromide. In fall 1998 and spring 1999, nutsedge control with the 1/4X rate of methyl bromide under VIF was comparable to that with the full rate of methyl bromide under LDPE. In fall 1999, the number of nutsedge shoots on the bed surface (not including those in pepper planting holes) declined linearly with both films from 23 to 10 $shoots{\cdot}m^{-2}$ with an increase in the rate of methyl bromide from 98 to 392 $kg{\cdot}ha^{-1}$; however, the average nutsedge population with methyl bromide (98 to 392 $kg{\cdot}ha^{-1}$) was 10 times lower with VIF than LDPE. In fall 1999 and 2000, with 98 to 392 $kg{\cdot}ha^{-1}$ methyl bromide under VIF, nutsedge populations in the pepper planting holes were reduced by 86% to 100% compared to those with no methyl bromide under LDPE. Pepper crop yields were as high with the 1/4X rate of methyl bromide under VIF as with the full rate of methyl bromide under LDPE. Results suggested that it is possible with VIF to reduce the rate of methyl bromide from 392 to 98 $kg{\cdot}ha^{-1}$ without a loss in pepper fruit production, but the 1/4X rate of methyl bromide under VIF should be used with caution in controlling nutsedge.

SUPPRESSION OF PURPLE NUTSEDGE IN BELL PEPPER WITH THE POTENTIAL BIOHERBICIDE *DACTYLARIA HIGGINSII.* J.P. Morales-Payan[1,2], R. Charudattan[2], W.M. Stall[1], and J.T. DeValerio[2]. [1]Horticultural Sciences Department and [2]Department of Plant Pathology. University of Florida, Gainesville. 32611-0690.

ABSTRACT

A bell pepper crop (*Capsicum annuum* ‘Camelot’) infested with 60 purple nutsedge plants/m^2 was sprayed with the potential mycoherbicide *Dactylaria higginsii* (1 x 10^6 conidia/ml) in single applications at 0, 7, 14, 21, or 28 days after nutsedge emergence (DAE) or repeated applications (8, 8+18 DAE, or 8+18+25 DAE), in order to determine the effect of the treatments on bell pepper yield and grade. Unchecked nutsedge interference resulted in about 70% yield loss, as compared to weed-free pepper. Purple nutsedge interference affected Fancy (extra-large) fruit yield more than US1 (large) and US2 (medium) fruit yield. Bell pepper yield loss was about 50% when *D. higginsii* was applied once at 7 DAE, and higher than 60% when *D. higginssii* was sprayed once later than 7 DAE. Application of *D. higginsii* two times (8+18 DAE) and three times (8+18+25 DAE) reduced yield loss to 31% and 24%, respectively, as compared to weed-free pepper.

SWEET POTATO TOLERANCE AND WEED CONTROL WITH FLUMIOXAZIN. S.T. Kelly[1], H.L. Carroll[2], J.M. Cannon[2] and M.W. Shankle[3]; LSU AgCenter, Winnsboro[1], LA 71295, Sweet Potato Research Station, Chase[2], LA 71324, and Mississippi State University, Pontotoc, MS, 38863.

ABSTRACT

Experiments were conducted in 2002 to evaluate tolerance of sweet potato to Valor (flumioxazin). Treatments included Valor (1, 2 or 3 oz/A) applied Pre-transplant, Post-transplant or Post-transplant in combination with non-ionic surfactant (0.25% v/v). Command (1.6 pt/A) applied Post-transplant was utilized a standard treatment. All treatments were applied in 20 gpa using a CO_2 backpack sprayer. Experimental design for each was a randomized complete block with four replicates. Soil type in each experiment was a silt loam. Plot size was two rows spaced 40 inches apart.

Experiment one was initiated near Forest, LA on a producer field on May 27. Sweet potato (*Ipomoea batatas* 'Beauregard') was planted 9 inches apart using a mechanical transplanter. Plant material was cuttings from field-grown plants, and planted 5 to 6 inches deep. All treatments were applied on May 27, 2002. Smellmellon (*Cucumis mello*) control was evaluated at 8 days after application (DAA). Valor controlled smellmellon 78 to 88% with any rate at 8 DAA. Smellmelon control was 90% following cultivation at 23 DAA and 37 DAA. Sweet potato injury was 5% or less with any rate Pre-transplant or 1 oz/A Post-transplant at 8 DAA but was not observed by 23 DAA. Valor applied at 2 oz/A and greater Post-transplant, or Post-transplant with surfactant caused 13 to 30% injury at 8 DAA 8% or less at 23 DAA,and was not observed at 37 DAA. Canner, #ones & twos, and total yield, was not reduced by Valor regardless of application timing when compared to Command. Only Valor at 3 oz/A plus surfactant reduced yield of #ones & twos. These data suggest that even though some injury was observed, sweet potato appeared to overcome this injury and produce yields comparable to the Command-treated plots.

Experiment two was conducted at the Sweet Potato Research Station near Chase, LA and was initiated on July 1, 2002. Sweet potato cuttings from greenhouse-grown plants were planted by hand 12 inches apart. Pre-transplant treatments were applied on July 1 and Post-transplant treatments on July 2. Weeds present included carpetweed (*Mollugo verticillata*) and smooth pigweed (*Amaranthus hybridus*). Sweet potato injury was 8% or less with any rate of Valor Pre-transplant at 9 or 18 DAA. When applied Post-transplant, injury was 35 to 45% without surfactant, but 75 to 83% with surfactant and lasted through 18 DAA. Although injury in these plots was not observed at 34 or 44 DAA, stand reduction was observed. Valor provided 85 to 90% carpetweed control at any evaluation date. Smooth pigweed control ranged from 85 to 90% from 34 to 50 DAA. Sweet potato yield mirrored early injury ratings. Valor applied Pre-transplant produced the highest yields of #ones & twos, canners and total yield. Yields with Valor applied Post-transplant were severely reduced in some cases due to reduced stand.

Experiment three and four was conducted since injury observed in the two field experiments was not consistent. Treatments and application methods in this experiment mirrored those in the two previously mentioned experiments, except that Command was not applied, but an untreated was utilized. Plant material was cuttings from field-grown plants, harvested the same day as treatment application. Plots were 1 gallon hanging pots with 4 hand planted sweet potato cuttings per pot. Experiment three was conduced at the Sweet Potato Research Station near Chase, LA and Experiment four at the Pontotoc Ridge-Flatwoods Experiment station near Pontotoc, MS. Experiment three was initiated on August 30, 2002 and Experiment four on August 26, 2002. Injury was evaluated at 4, 7, 14 and 21 DAA. A treatment by location interaction was observed, therefore, results from each location are discussed separately. In Experiment three, Valor applied Pre-transplant caused less than 5% injury at any evaluation date. Valor at 2 oz/A or less applied Post-transplant without surfactant caused 10% or less. Injury from Valor applied with surfactant ranged from 15 to 33% at 14 DAA. At the Pontotoc location,

greatest injury observed from a Pre-transplant application was 17% at 21 DAA. Post-transplant applications caused 53 to 84% injury at 14 DAA and 48 to 77% injury at 21 DAT.

POTENTIAL HERBICIDES FOR USE IN OKRA (ABELMOSCHUS ESCULENTUS (L.) MOENCH). R.B. Batts and A.S. Culpepper, North Carolina State University, Raleigh, and University of Georgia, Tifton

ABSTRACT

Field trials were conducted at TyTy, Georgia and Clinton, North Carolina to identify potential new herbicides for use in okra. Currently, only preplant applications of glyphosate and preplant incorporated applications of trifluralin are registered for use in this vegetable crop. Okra is taxonomically similar to cotton, a crop with many herbicide options. This experiment focused on several herbicides registered for use in cotton as well as some other recently developed herbicides.

The entire test area received Treflan (trifluralin) preplant incorporated (PPI) for weed control. Sites were maintained weed-free throughout the season in order to compare only treatment influence on the crop. Treatments included preemergence (PRE) applications of Sandea (halosulfuron) at 0.75 oz/a, Cotton-Pro (prometryn) at 1.5 pt/a, Meturon (fluometuron) at 2 pt/a, and Staple (pyrithiobac) at 0.8 oz/a. Staple at 1.2 oz/a applied postemergence over-the-top (POT) to six inch okra was included as were postemergence directed (P-DIR.) applications of Sandea, Cotton-Pro and Valor (flumioxazin) at 0.75 oz, 1.5 pt, and 1.5 oz/a, respectively. P-DIR treatments were applied to 12-inch okra. All postemergence treatments included nonionic surfactant at 0.25% v/v.

Injury

Injury was evaluated 2 weeks after each application timing. Injury from Cotton-Pro PRE was not different from that of Treflan alone at any evaluation at either location. Meturon applied PRE severely reduced okra emergence and stunted the surviving plants at both sites. Sandea PRE caused significant stunting in North Carolina, but was not different from Treflan alone in Georgia. Staple PRE produced significant early-season injury at both locations and lasted season-long at North Carolina. At 2 WAT, injury from Staple POT was less than 10% at both sites. Cotton-Pro and Sandea applied P-DIR caused little injury at both locations. Valor P-DIR caused speckling of stems and fruit in North Carolina and large lesions and plant loss in Georgia. It is suspected that the severe injury at the Georgia site with Valor was due to nozzle selection. Floodjet tips were used at this location while flat fan tips were used in North Carolina.

Yield

No significant earliness or delays were seen from any treatment, indicating that yield differences were not due to temporary insult but actual reduction in potential from the treatments. Yields from Cotton-Pro PRE were highest of all treatments in Georgia and not different from the highest yields in North Carolina. Staple POT yield was not different from the highest yield in Georgia and only slightly different from the highest yield in North Carolina. Yields from Cotton-Pro and Sandea P-DIR were similar to highest yield at both locations. Highest yields in North Carolina were from Valor P-DIR, but were lowest in Georgia from this treatment due to injury and subsequent plant loss at that site.

BIOCHEMICAL RESPONSE OF SOUTHERNPEA TO BENTAZON, ACIFLUORFEN, AND FOMESAFEN. E.N. Stiers, N.R. Burgos, S. N. Rajguru, and V.K. Shivrain; Department of Crop, Soil and Environmental Sciences, Fayetteville, AR; T.E. Morelock; Department of Horticulture, University of Arkansas, Fayetteville, AR.

ABSTRACT

Southernpea (*Vigna unguiculata* L.) is an important horticultural crop grown throughout the world. Unfortunately, as with many horticultural crops, options for chemical weed control are limited and several troublesome weed species are often left unchecked. The goal of this research is to broaden the types of herbicides labeled for southernpea. The objectives are to develop herbicide-tolerant southernpea cultivars through whole plant selection and to elucidate the mechanism of tolerance. A preliminary screen using advanced breeding lines was performed in 2001 at the Vegetable Substation in Kibler, AR to select tolerant lines that would be used in succeeding replicated yield trials (2002). The rates of bentazon, acifluorfen, and fomesafen used in these trials were approximately 2 times the rate used in soybean to select lines with high level of tolerance. Injury ratings in conjunction with yield data were used to select the best lines from the replicated trial to begin advanced testing at multiple rates and locations. Selected lines had less injury and yield reduction as compared to the commercial standard, Early Scarlet. Because the investigated herbicides cause the formation of free radicals in susceptible plants, antioxidant activity was investigated as the primary mechanism of tolerance. Preliminary studies on the tolerance mechanism focused on superoxide dismutase (SOD) because it is reported to play a role in detoxifying paraquat in several species. Advanced breeding lines were planted in Fayetteville, AR, and treated with the herbicides. Samples for SOD assay were taken at 3,6,12, and 24 hours after treatment to determine the optimum sampling time. Samples were processed using the procedure described by Forman and Fridovich (1973). SOD activity was highly variable among lines and times, and did not show any correlation with injury or yield reduction. Enhanced SOD activity may not be the primary mechanism of tolerance.

CONCLUSIONS

Based on this data, the herbicide options for okra could be expanded. This would give growers more flexibility in their herbicide program, save labor costs, and lead to more of an integrated pest management approach. Of the products evaluated, Cotton-Pro appears to have potential as a PRE treatment while Sandea and Cotton-Pro have potential as P-DIR treatments. With further investigation, there may exist the potential for Staple POT, as well.

FALL VEGETABLE RESPONSE TO HALOSULFURON, METOLACHLOR, AND SULFENTRAZONE SPRING APPLIED UNDER PLASTIC. T.L. Grey, A.S. Culpepper, and T.M. Webster. Crop and Soil Sciences, The University of Georgia and USDA/ARS, Tifton, GA.

ABSTRACT

Vegetable production is a $418,000,000 annual industry to Georgia farmers. The use of polyethylene mulch has become more common for many different spring and fall vegetables, including seeded or transplanted pepper (*Capsicum annuum* L.), tomato (*Lycopersicon esculentum* L.), squash (*Cucurbita pepo* L.), watermelon (*Citrullus lanatis* L.), and cucumber (*Cucumis sativus* L.). Following the spring crop, fall planting of eggplant (*Solanum melongena* L.), squash, cabbage (*Brassica oleracea* L. variety *capitata*), cucumber, and tomato are made directly into the existing polyethylene-covered beds. Currently, spring prepared plasticulture beds depend on methyl-bromide (MBr) application for season long weed and pest control. Generally there are no rotation issues with MBr for fall vegetables. However, the use of MBr is scheduled to end in 2005 and cost for this product continue to increase in the interim. Season long suppression and control of plant pathogens, nematodes, and weeds must be considered when alternatives for MBr are researched. Current fumigant alternatives include cloropicrin (trichloronitromethane), telone (1,3-dichloropropene), and vapam (sodium methyldithiocarb). However, these products provide variable nutsedge species (*Cyperus* spp.) suppression. Current research in spring crops is focusing on potential MBr alternatives that include combinations of fumigants and herbicides (e.g. metolachlor, halosulfuron, and sulfentrazone). When applied as part of a weed management program for spring formed beds, herbicide injury to fall planted vegetables becomes a rotational issue. Among these concerns are: fall crop injury and yield loss, season-long weed control, herbicide rates, and potential negative interactions between these herbicides and fumigants. Therefore, a study was initiated to determine fall vegetable response following a spring application of halosulfuron, metolachlor, and sulfentrazone applied under polyethylene mulch.

Spring applied fumigants included the following 10 treatments: 420 kg/ha MBr , 316 kg/ha cloropicrin, 113 kg/ha Telone II plus 168 kg/ha cloropicrin , 268 kg/ha vapam, 358 kg/ha vapam, 226 kg/ha Telone C-35, 452 kg/ha Telone C-35, 226 kg/ha Telone C-35 plus 179 kg/ha vapam, 226 kg/ha Telone C-35 plus 268 kg/ha vapamat 179 or 268 kg/ha, and a nontreated control. Randomized within these 10 fumigant treatments were 5 herbicide applications that included a nontreated control, 1.12 kg/ha metolachlor, 0.027 kg/ha halosulfuron, 0.28 kg/ha sulfentrazone, and 1.12 kg/ha metolachlor plus 0.027 kg/ha halosulfuron. A replicated spring pepper tolerance trial was terminated in August, plant debris removed, plastic painted white, and planted with transplanted eggplant, transplanted and seeded squash, seeded cucumber, and transplanted cabbage. Due to size limitations, only one fumigant treatment per vegetable species could be investigated. Crop injury and population density were evaluated for all crops. Crop height was evaluated for eggplant and cabbage, while plant diameters were measured for squash and cucumber. Crop plant biomass was measured with squash, cucumber, and cabbage (3 dates). Multiple eggplant fruit harvests (fruit number and biomass per ha) were made.

The fumigant X herbicide interaction was used as the error term for SAS analysis due to only one replication of fumigant per variable. There were no trends for variables for fumigant treatments, therefore data is presented for herbicide treatment only for all variables. Injury to eggplant, cucumber, transplanted- and seeded-squash ranged from 8 to 16% for halosulfuron, sulfentrazone, and metolachlor plus halosulfuron. Cabbage injury was less than 4% for any herbicide treatment. Greatest cabbage biomass for the three-harvest total was recorded with halosulfron, followed by metolachlor plus halosulfuron, sulfentrazone, metolachlor, and the nontreated check. Vine length for cucumber and transplanted squash was significantly reduced by sulfentrazone relative to the nontreated control. Eggplant yield in terms of fruit number and kg/plant was significantly reduced by sulfentrazone relative to the nontreated control for the first and total season harvest. In terms of tolerance, cabbage, eggplant, squash, and cucumber were

tolerant to halosulfuron; cabbage and eggplant were tolerant to metolachlor; squash and cucumber were not tolerant to metolachlor nor sulfentrazone; and cabbage and eggplant exhibited responses to sulfentrazone that would warrant further investigation.

WILD CHRYSANTHEMUM (*Artemisia vulgaris* L.) MANAGEMENT IN FALLOW LAND PRIOR TO ORNAMENTAL PLANT PRODUCTION. D.K. Robinson[1], D. Fare[2] and M. Halcomb[3]. [1] Plant Sciences and Landscape Systems, The University of Tennessee, Knoxville; [2] USDA-ARS, McMinnville, TN; [3] U.T. Agricultural Extension Service, McMinnville, TN.

ABSTRACT

For ornamental plant production, herbicide options for established perennial broadleaf weeds are limited. In tree seedling production, control of emerged perennial or annual broadleaf weeds is limited to physical removal (as directed application of a non-selective herbicide is not an option). Wild chrysanthemum (*Artemisia vulgaris* L.) is a clump forming rhizomatous perennial capable of forming solid stands with extensive underground root entanglement. This investigation was focused towards management strategies that would suppress or ideally eradicate wild chrysanthemum in fallow land prior to ornamental plant production. In 2001, two studies were conducted. In the first study, post-emergence herbicides available for use in ornamental plant production were evaluated for activity on wild chrysanthemum. Herbicides evaluated were BASAGRAN 4EC (at 3.0 pts./acre plus 1 qt./acre crop oil concentrate), GOAL 2 EC [at 7.5 pts./acre plus non-ionic surfactant (NIS) at 1.0 pt./acre], MANAGE 75WG (at 1.0 oz./acre plus NIS at 1.0 pt./acre), LONTREL 1.5EC (at 7.5 fl. oz./are plus NIS at 1.0 pt./acre), REWARD 2L (at 1.2 qts./acre plus NIS at 1.0 pt./acre) and ROUNDUP PRO 4L at 2.0 qt./acre). In addition, the pasture herbicide ALLY 60WG (at 2.0 oz. /acre plus NIS at 1.0 pt./acre) was evaluated as it provides activity towards certain broadleaf weeds in a non-phenoxy herbicide option. Treatments were applied mid-season. BASAGRAN, GOAL, MANAGE and REWARD provided little to no control activity towards wild chrysanthemum 3 months after treatment (MAT). ROUNDUP or LONTREL provided 50% control 3 MAT. ALLY provided 70% control 3 MAT. Based on results of study one, ROUNDUP, LONTREL and ALLY were applied late-season alone and in combinations. The next spring, the following treatments provided the following levels of control: ROUNDUP 55%; LONTREL 42%; ROUNDUP plus LONTREL 75%; ALLY 65%; ALLY plus ROUNDUP 92% and; ALLY plus ROUNDUP plus LONTREL 89%. By the fall, residual control was approximately 50% in all treatments. Results of this investigation, indicate that complete control or eradication of wild chrysanthemum can not be achieved with a single application of either herbicide alone or in combination. In 2002 for evaluation in 2003, three studies were initiated to evaluate application timing, multiple applications within a single growing season and, fall followed by spring applications of ALLY, LONTREL and ROUNDUP alone and in various combinations. Results from 2001 and 2002 indicate that ALLY, LONTREL and ROUNDUP provide control activity towards wild chrysanthemum. However, complete control and ideally eradication will likely require multiple, well timed applications.

SECTION IV. FOREST VEGETATION MANAGEMENT

A COMPARISON OF TREATMENT TIMING AND HERBICIDES FOR CONTROL OF CHINESE PARASOL TREE, AN INVASIVE ORNAMENTAL.

B.R. Chandler; Louisiana State University AgCenter, Clinton, LA; R.J. Lencse and R.E. Strahan; Louisiana State University AgCenter, Baton Rouge, LA.

ABSTRACT

Chinese parasol tree (*Firmiana simplex*), a fast growing, shade tolerant tree, is widely planted as an ornamental in the South. It has escaped cultivation and is an invasive pest in hardwood timber in the loess hills east of the Mississippi River making it difficult to regenerate desirable hardwood timber. It is a serious problem around St. Francisville, LA and Natchez, MS. In this study, eight herbicides were tested at selected intervals during the year to identify the most effective herbicide for hack and squirt treatments. Herbicides were applied during February, May, June and November 2001. Herbicides tested were Garlon 3A, Weedmaster, Grazon P+D, 2,4-D Amine, Roundup Ultra, Crossbow, Arsenal AC diluted to 1 lb. ai and Pathway. Five-tree plots were used for each herbicide treatment. Trees received one hack per two inches of diameter and 1 ml of herbicide per hack. The study area was a hardwood timber stand near St. Francisville where the dominant species was Chinese parasol tree. Trees were rated for percent defoliation in September 2002. Defoliation rates were Garlon 3A, 85%; Weedmaster , 90%; Grazon P & D, 85%; 2,4-D Amine, 78%; Roundup Ultra, 100%; Crossbow, 81%; 11b Arsenal, 94%, and Pathway, 74%. Results of this study indicate that Roundup Ultra was the most effective herbicide tested for controlling Chinese parasol tree.

HERBACEOUS WEED CONTROL STRATEGIES FOLLOWING SITE PREPARATION WITH CHOPPER HERBICIDE ON LOWER COASTAL PLAIN SITES. H.E. Quicke* and D.K. Lauer; BASF Corporation, Auburn, AL and Silvics Analytic, Richmond, VA.

ABSTRACT

Five study locations were established on lower coastal plain sites to examine post-plant herbaceous weed control strategies following two timings (August vs. November) and three rates (32, 48, and 64 oz/A) of Chopper herbicide for site preparation. All sites were bedded early in the year to allow a minimum of six weeks between bedding and the first application of Chopper site preparation. Chopper site prep treatments were applied to large plots, eight beds in width. Pines were planted in winter following site prep. Post-plant herbaceous weed control (HWC) treatments were assigned at random to the six inner beds in each site prep treatment plot. HWC treatments included no herbaceous control, March of the first year of pine growth, June of the first year of pine growth, March of the second year of pine growth, and June of the first year combined with March of the second year of pine growth.

Chopper site prep treatments included Garlon 4 at 1 pt/A if arborescent hardwood were present, 2 pt/A otherwise. On four sites, 5 qt/A MSO was included in a total spray volume of 10 gpa. On one site Chopper was applied without the addition of MSO at a spray volume of 30 gpa. HWC treatments were 4 oz Arsenal + 2 oz Oust on the four loblolly sites and 6 oz straight Arsenal on the one slash pine site. An additional early season HWC treatment of 3 oz straight Oust was included on all sites.

Vegetation cover was assessed in June, August and October of the first year of pine growth on two 50 ft competition measurement plots within each herbaceous treatment plot. These experiments were organized as split-plot designs with herbaceous weed control treatments applied as sub-plots within site preparation main plots. Each location included 3 replications. Analysis of variance was used to determine if vegetation control differed by timing or rate of Chopper site prep and if there was an interaction between timing and rate of Chopper. Chopper rate and date effects were significant and there were no significant total cover interactions between timing and rate of Chopper.

Vegetation cover differed between the two sites on spodosols (sandy surface with clay horizon – CRIFF C group near Mt Pleasant, GA and without clay horizon – CRIFF D group near Tennille, FL) and the three sites on non-spodosols (a poorly drained clay – CRIFF A group near Kings Ferry, FL; a poorly drained sandy-loam soil in the Green Swamp, NC and a poorly drained silt-loam in Oakdale, LA). Common species on the spodosols included gallberry, titi, sumac, grape vine, tall panic grass, low panic grass and brackenfern. Common species on the non-spodosols included sweetgum, blackgum, waxmyrtle, sumac, fetterbush, staggerbush, tall panic grass, low panic grass, sedges and dogfennel.

Chopper application date effects were small in magnitude. Non-spodosols had less total cover following August Chopper application but the difference was < 4%. Spodosols had less grass cover following November treatments but again the difference was < 4%.

On non-spodosols, total cover at the end of season assessment decreased from 64% to 51% as Chopper site prep rate increased from 32 to 64 oz. HWC treatments decreased cover to below 36%. Treatments providing < 20% cover were 48 or 64 oz Chopper followed by mid-season HWC with Arsenal + Oust. In June, at the time of the mid-season treatment, cover ranged from 23-12%, with cover decreasing with Chopper site prep rate.

On spodosols, total cover at the end of season assessment was < 20% for 32 oz Chopper with no HWC. All Chopper rates followed by HWC resulted in < 10% total cover. Chopper at 64 oz with no HWC resulted in < 10% total cover and < 5% grass cover throughout the year.

Future work includes application of the second-year herbaceous weed control treatments, assessment of pine response and additional vegetation control assessments. Site preparation treatments have traditionally been selected to maximize long-term control of woody vegetation with a reliance on post-plant treatments to reduce herbaceous competition. Early results from this study indicate that first year herbaceous weed control treatments may not be required on spodosols when adequate Chopper rates are used for site preparation. On non-spodosols, mid-season Arsenal + Oust treatments were the most successful in reducing competition. Chopper application date had little effect on vegetation cover.

INCLUSION OF SULFOMETURON METHYL IN PINE RELEASE TREATMENTS PROVIDES HERBACEOUS WEED CONTROL THE FOLLOWING GROWING SEASON. A.W. Ezell, J.L. Yeiser, and L.R. Nelson; Mississippi State University, Starkville, MS; Stephen F. Austin State University, Nacogdoches, TX; and Clemson University, Clemson, SC.

ABSTRACT

When chemical site preparation is not used in pine plantation establishment, release from woody competition is often required at a later date. Since adding Oust XP® to site preparation treatments provides excellent residual herbaceous weed control, this study was designed to evaluate the efficacy of adding Oust XP® to fall release treatments in second-year loblolly pine plantations. Study sites were located in South Carolina, Mississippi, and Texas. Six treatments were common to all sites, and two additional treatments were applied in Mississippi (Table 1). All treatments were applied during the first two weeks of September 2001. Plots were evaluated in April, May, June, July, August and September of 2002 to determine the residual control of herbaceous species.

In Mississippi and South Carolina, the additions of Oust XP® provided excellent (>90%) control of grasses and broadleaves throughout the 2002 growing season. The only notable exception to this was Andropogon in Mississippi plots, but sulfometuron methyl was not expected to control those plants. Overall, the South Carolina plots remained very clear throughout the evaluation period. In Texas, control of herbaceous species was not as good as in Mississippi and South Carolina. By June/July the treatments with Oust XP® were no longer significantly different from those without the addition. Herbaceous control was still good, and the pines flourished in all study sites, but the response in Texas was not as striking as in Mississippi and South Carolina. In Mississippi, Rubus was a principal species on the site, and treatments without Escort XP® were colonized by the Rubus. Sulfometuron is not expected to control these species, but the need for metsulfuron methyl in appropriate sites was strongly evident.

Overall, the addition of Oust XP® to the release treatments appears to be successful in providing residual herbaceous weed control. Operational applications should provide results which range from "good" to "excellent" depending on the weed complex of the site.

Table 1.

Trt No.	Herbicide and Rate/Ac.
1	Untreated
2	Arsenal AC (16 oz) +COC* (3.2oz)
3	Arsenal AC (12 oz) +COC (3.2oz)
4	Arsenal AC (12 oz) + Escort XP (1 oz) + COC (3.2 oz)
5	Arsenal AC (12 oz) + Escort XP (1 oz) + Oust XP (2 oz) + COC (3.2 oz)
6	Arsenal AC (12 oz) + Eagre (12.8 oz) + Oust XP (2 oz) + Escort XP (1 oz) + Entry II (10 oz)
7**	Eagre (25.6 oz) + Escort XP (2 oz) + Oust XP (2 oz) + Entry II (10 oz)
8**	Eagre (25.6 oz) + Escort XP (4 oz) + Oust XP (2 oz) + Entry II (10 oz)

* COC=Timbersurf 90
** MS Only

PREEMERGENT vs. POSTEMERGENT HERBACEOUS WEED CONTROL APPLICATIONS IN SLASH PINE PLANTATIONS: SECOND YEAR RESULTS. A.W. Ezell and J.L. Yeiser; Mississippi State University, Starkville, MS and Stephen F. Austin State University, Nacogdoches, TX.

ABSTRACT

A total of fourteen (14) treatments (Table 1) were replicated four times at locations in Alabama and Louisiana in an effort to evaluate different herbicides, application timing and growth response in newly established slash pine plantations. First-year evaluations included both competition control efficacy and pine growth (height and groundline diameter). First year results indicated that early (preemergent) treatments resulted in better herbaceous weed control than late (postemergent) application of the same herbicide(s). Also, total tree height and groundline diameter were greater in plots receiving early treatments. Oustar® applied at 13 oz. per acre was the best overall treatment.

After the second growing season, height growth followed the same trend as first-year measurements. Average total height was more than six feet in eight of the 13 Alabama herbicide treatments, and heights were generally greater in "early" treatment plots. Total height was generally less in the Louisiana plots, but the trend of response to "early" vs. "late" was the same as in the Alabama plots. Second-year evaluation of groundline diameter again indicated better growth in early treatment plots. This trend was evident in both Alabama and Louisiana plots. Survival was essentially unchanged from first-year evaluations.

While a number of treatments provided very good to excellent results in this study, the overall best competition control, pine survival, and growth resulted from early applications of 13 oz. Oustar® per acre.

Table 1. List of Treatments in 2001 DuPont Slash Pine Study

Treatment No.	Herbicide and Rate/Acre
Early (March)	
1	Untreated
2	13 oz. Oustar
3	32 oz. Velpar L
4	4 oz. Arsenal AC
5	4 oz. Arsenal AC + 1 oz. Escort
6	32 oz. Velpar L + 4 oz. Arsenal AC
7	2 oz. Oust XP
Late (May)	
8	13 oz. Oustar
9	32 oz. Velpar L
10	4 oz. Arsenal AC
11	4 oz. Arsenal AC + 1 oz. Escort
12	32 oz. Velpar L + 4 oz. Arsenal AC
13	2 oz. Oust XP
14	12 oz. Oust XP + 0.5 oz. Escort + 12 oz. Eagre

HERBACEOUS WEED CONTROL WITH THE NEW OUST FORMULATION. A.W. Ezell and J.L. Yeiser; Mississippi State University, Starkville, MS and Stephen F. Austin State University, Nacogdoches, TX.

ABSTRACT

A new formulation of sulfometuron methyl was produced by DuPont to facilitate application and thereby enhance product performance. The new formulation, referred to as "Improved Oust XP" was compared to Oust XP at different rates and in tank mixtures in field trials. A total of twelve (12) treatments were replicated four times at study sites in Mississippi and Texas. Plots were evaluated at 30, 60, 90, 120, 150 and 180 days after treatment for an assessment of vegetation control and any possible phytotoxicity symptoms. Results indicate that there is no difference between Oust XP and improved Oust XP in terms of competition control efficacy or loblolly pine tolerance. Both products did an excellent job of controlling herbaceous species and neither product caused any damage to the first-year loblolly pine seedlings.

INTRODUCTION

Herbaceous weed control in newly established loblolly pine plantations continues to be an important issue in the South. The benefits of controlling this competition during the first growing season have long been recognized and the use of second generation genetically improved loblolly pine seedlings generates even greater response to herbaceous release. Therefore, any improvement in herbicide formulation which would facilitate application or efficacy would be most beneficial. The formulation of sulfometuron methyl was modified by DuPont earlier in an effort to improve mixing and application. The new product was Oust XP. Dupont has again altered the formulation to produce "Oust XP-Improved Formulation DPX-T5648-098" (hereafter referred to as Improved Oust XP) in order to further improve mixing and application.

OBJECTIVE

The objective of this study was to compare alternative formulations of sulfometuron methyl and tank mixtures involving these formulations in operational field settings. In essence, the study was designed to compare Oust XP to Improved Oust XP.

MATERIALS AND METHODS

Study Site

A total of three study sites were utilized in this project, two in Mississippi and one in Texas. The first study site in Mississippi was located on land owned by Plum Creek Timber Company near Longview, Mississippi in Oktibbeha County. Soil on the area was a Falkner silt loam with pH=4.8. Previous stand of mixed pine-hardwood was harvested in 2001, and the site was treated with a "combination" plow in October 2001. The second study site in Mississippi was located on private non-industrial land in Hinds County. Soil on the area was a Memphis silt loam with pH=5.1. The previous stand of mixed pine-hardwood was harvested in 2001, and the site was burned in October 2001. In Texas, the study was installed on land owned by Temple-Inland forests near Wedon, Texas in Nacogdoches County. The soil was a sandy loam with pH=5.3. Repeated wildfires had cleared this area. All study sites were planted with 1-0, bareroot loblolly pine seedlings in January 2002.

Treatments

A complete list of treatments is found in Table 1. Of particular interest is the direct comparisons between Treatments 2 and 3, 4 and 5, 6 and 7, and 8 and 9.

Application

All treatments were applied on March 11, 2002 using a CO_2-powered backpack sprayer equipped with twin 110-02. nozzles. Total spray volume was 10 gpa. Each replication was a five-foot wide band of 100 linear feet with the planted pines serving as the center of the spray swath. Four replications of each treatment were installed in a randomized complete block design.

Evaluation

Pine seedling height and groundline diameter (GLD) were measured prior to treatment. Percent vegetative cover was estimated ocularly at 30, 60, 90, 120, 150 and 180 DAT (days afer treatment). Pine seedlings were also evaluated at the same timings for any phytotoxic symptomology. Pine seedling height and GLD were remeasured in December 2002. All data were analyzed using ANOVA and Duncan's New Multiple Range Test for means separations.

RESULTS AND DISCUSSION

Phytotoxicity

No symptoms of phytotoxicity were observed on any seedlings at any study sites during the study. Loblolly pine is tolerant of sulfometuron methyl, and thus, this lack of any negative impact was not surprising.

Competition Control

The percent clear ground observations are found in Tables 2 and 3. In Mississippi, no significant differences were noted among herbicide treatments at any observation time. The untreated check (Treatment 1) had significantly less clear ground at all observation times (Table 2). In the specific comparison of formulations (Treatments 2 vs. 3, 4 vs. 5, etc.) no significant difference was found in any of the pairings. Generally, all the treatments provided very good to excellent control of the herbaceous complex on these sites.

In Texas, more variation was observed in competition control, and significant differences did exist among treatments (Table 3). However, no significant difference was noted in the specific comparisons of the different formulations. All treatments generally provided season-long competition control with average percent clear ground ranging from 68% (Treatment 3) to 95% (Treatment 11).

Summary

There were no differences noted in the performance of Oust XP vs. Improved Oust XP. The new formulation exhibits the same spectrum of herbaceous weed control and neither formulation caused any damage to the pine seedlings. Operational applications of the improved formulation should provide excellent results in appropriate situations.

Table 1. List of Treatments in 2002 DuPont Oust Formulation Study-MS.

Treatment No.	Herbicide and Rate/Ac.
1	Untreated
2	Oust XP (2 oz.)
3	Improved Oust XP (2 oz.)
4	Oust XP (8 oz.)
5	Improved Oust XP (8 oz.)
6	Oust XP (2 oz.) + Velpar DF (10.67 oz.)
7	Improved Oust XP (2 oz.) + Velpar DF (10.67 oz.)
8	Oust XP (2 oz.) + Arsenal AC (4 oz.)
9	Improved Oust XP (2 oz.) + Arsenal AC (4 oz.)
10	Improved Oust XP (2 oz.) + Escort XP (1 oz.)
11	Improved Oust XP + Velpar DF (16 oz.)
12	Improved Oust XP + Velpar DF (8 oz.)

Table 2. Average percent clear-ground (based on herbaceous only) by treatment and time of observation in DuPont Oust formulation study-MS.

Trt No.	Days After Treatment					
	30	60	90	120	150	180
	--------------------------------------percent---------------------------------					
1	66b[1]	57b	42b	7b	5b	2b
2	98a	98a	98a	90a	86a	84a
3	99a	97a	97a	90a	88a	85a
4	99a	99a	96a	92a	90a	86a
5	98a	98a	93a	92a	88a	83a
6	98a	98a	93a	88a	88a	81a
7	99a	97a	92a	90a	88a	85a
8	98a	97a	93a	85a	85a	84a
9	98a	96a	94a	84a	83a	83a
10	97a	93a	91a	86a	74a	76a
11	98a	98a	95a	92a	88a	88a
12	98a	96a	95a	90a	80a	80a

[1] values in a column followed by the same letter do not differ at ∝=0.05.

Table 3. Average percent clear-ground "New Oust study by treatment and time of observation-TX.

Trt No.	Days After Treatment					
	30	60	90	120	150	180
	---------------------------------------percent--------------------------------					
1	85b[1]	64b	45c	39c	30d	24c
2	99a	94a	85ab	79cd	75bc	75bcd
3	98a	95a	90ab	86bcd	68c	68d
4	98a	93a	82b	86bcd	81abc	81abcd
5	99a	96a	92ab	91abc	86ab	86abc
6	100a	97a	99a	97ab	93a	93a
7	100a	99a	97ab	96ab	91ab	91ab
8	99a	96a	92ab	86bcd	81abc	75bcd
9	99a	95a	89ab	83bcd	75bc	74cd
10	99a	95a	86ab	75d	81abc	81abcd
11	100a	100a	99a	98a	95a	95a
12	99a	100a	98a	95ab	90ab	90ab

[1] values in a column followed by the same letter do not differ at ∝=0.05.

TIMING OF CHOPPER HERBICIDE RELATIVE TO BEDDING ON LOWER COASTAL PLAIN PINE SITES. D.K. Lauer* and H.E. Quicke; Silvics Analytic, Richmond, VA and BASF Corporation, Auburn, AL.

ABSTRACT

Vegetation control following different timings of Chopper application relative to bedding was examined at four Lower Coastal Plain study locations. Two bedding regimes, mid-year and late-year, were examined at each location. Up to nine Chopper application timings were replicated three times within each bedding regime with applications as early as February 24 and as late as November 19. The herbicide treatment was 48 oz ac^{-1} Chopper with 5 qts ac^{-1} methylated seed oil applied at a total mix volume of 10 gal ac^{-1}. Garlon 4 was included at 1 qt ac^{-1} at two locations that had primarily waxy-leafed shrubs and at 1 pt ac^{-1} at two locations that had shrub and arborescent hardwood. Pines were planted the winter following application and studies have not received any post-plant herbicide treatments.

Vegetation cover was assessed on beds of treated plots in June and September/October the growing season after treatment. Analysis of variance was used for each study to test if Chopper treatments performed better than the untreated check, and to test if there were differences between applications made before or after bedding. Of particular interest was to test if there were trends in control related to application timing.

Treatments were compared in terms of woody cover (blackberry, vines, shrubs, and trees) in October and total cover (woody + herbaceous) in June the year following herbicide application. All Chopper treatments improved vegetation control but there were differences in control between pre- and post-bed application timings with respect to mid-season and late-season bedding regimes (Table 1). Woody cover was significantly reduced by all Chopper timings for both bedding regimes. There were no significant differences in woody cover between pre- and post-bed Chopper with mid-season bedding at any location. Woody cover was significantly greater at 2 of 4 locations for post-bed Chopper applications following late-season bedding but this was due to the short period of time between bedding and application. Only 1 application occurred (within 0-3 days) after late-season bedding at 3 of 4 locations. Poorer woody control was observed for Chopper applications made just after mid-season bedding as well. Differences in control of total vegetation were related to application timing. Chopper treatments with mid-season bedding significantly reduced total cover at all locations but applications after bedding improved control over those made before bedding at 3 of 4 locations. Chopper treatments with late-season bedding significantly reduced total cover at all locations but applications after bedding achieved poorer control at 2 of 4 locations.

Chopper applications made in February-March and applications made immediately after bedding resulted in decreased control of some but not all species. February-March Chopper applications controlled evergreen species including gallberry and waxmyrtle but provided diminished control of deciduous shrubs, arborescent hardwoods, and blackberry. Control decreased for some species when applications were made the same day after bedding but improved when Chopper was applied at least several weeks after bedding. Applications made within hours to 3 days after bedding decreased control of blackberry, gallberry, and redroot under either bedding regime, greenbriar and bracken fern following late-season bedding, and panic grasses following mid-season bedding.

Chopper provided effective control of woody vegetation when applied any time up to the day before bedding except for early season applications on sites with dormant deciduous woody vegetation. Chopper provided effective control of woody vegetation after bedding when applied at least 4 weeks after bedding and before dormancy of deciduous woody vegetation, if present. All Chopper applications reduced herbaceous cover but best performance was achieved by applications made before late-season bedding and by applications made at least 4 weeks after mid-season bedding.

Table 1. Average woody and total cover the year following bedding and herbicide site preparation at four locations.

Herbicide treatment	Mid-season bedding (mid-May – July)		Late-season bedding (late-Sept – early Nov)	
	Woody cover in Oct	Total cover in June	Woody cover in Oct	Total cover in June
	…………………... .% ……………..		……………. % ………………………	
Untreated	42	78	40	42
Pre-bed Chopper	6	31	4	9
Post-bed Chopper	6	16	14*	17

* Applications all within 3 days of bedding apart from 1 site with a 3-week-after-bedding treatment.

ESTABLISHING HARDWOOD PLANTATIONS WITH CHOPPER, ACCORD, AND OUST COMBINATIONS. J.L. Yeiser; Arthur Temple College of Forestry, Stephen F. Austin State University, Nacogdoches, TX 75962.

ABSTRACT

Good weed control enhances the successful establishment of hardwood plantings. The objective of this study was to assess the impact of residual herbicide on plantation hardwoods planted after site preparation with different Chopper+Accord+oil rates and timings. The test site was chemically prepared with Chopper at four rates (16, 32, 48, 64 oz/ac), each with 2 qt of Accord and 1 qt of oil, applied in May, July or September of 1999. In April 2000, plots received a post-plant treatment of (1) over-the-top Oust (2 oz/ac) or (2) directed Accord (2%) (seedlings covered). An untreated check was also tested. Best noncrop oak and sweetgum control (approx. 90%) was achieved with 64 oz Chopper. May provided less control of oak and sweetgum than either the July or September timings. September was the best time to control both. Sweetgum was controlled at lower rates than oak. Percent height reduction of surviving noncrop oak and sweetgum increased with rate. Grass and forb cover was similar for the post-plant Accord and Oust treatments 30 through 120 days after treatment (DAT). In April 2000, occasional planted cherrybark oak seedlings in plots treated with 64 oz and planted sweetgum seedlings in plots treated with 48 and 64 oz of Chopper in September exhibited phytotoxicity. After one-growing season, survival and growth for post-plant Accord and Oust treatments were similar for sweetgum and Nuttall oak. For cherrybark oak, total height (0.2 ft) and ground line diameters (0.02 in) were significantly less on plots treated with Oust, suggesting there may be crop intolerance. Spring drought in 2001, reduced survival to 0% to 60% on most plots. Surviving seedlings commonly resprouted or had terminal dieback (70% sweetgum and cherrybark oak and 57% Nuttall oak) by June 2001. Sample size was dramatically reduced by drought rendering 2001 seedling data of limited value.

INTRODUCTION

Early survival and performance of planted bottomland species such as Nuttall oak, cherrybark oak, and sweetgum are often poor due to inadequate weed control. This is especially true for poor early competitors. Part of the lack of good weed control is the inadequacy of appropriate herbicides and good use guidelines.

The objective of this study is to compare (1) 16, 32, 48, and 64 oz of Chopper mixed with 2 qt Accord+5 qt oil and applied in May, July, and September for control of unwanted sweetgum and red oak in a secondary river bottom in East Texas and (2) the performance of planted sweetgum, cherrybark oak, and Nuttall oak seedlings receiving post-plant herbaceous weed control with Oust (2 oz) or directed sprays (crop seedlings covered) of Accord SP (2%).

METHODS AND MATERIALS

The study was located in the Neches River bottoms (Cherokee County) near Forest, TX. The mixed hardwood-pine stand was clearcut in the summer 1998. The soil is a sandy loam with pH 5.2 and organic matter 1.8. Plots are positioned along finger ridges between sloughs leading to the Neches River. The study site was not subject to overflow but access was often limited by backwater.

The major vegetation on this site was summarized as follows: Woody arborescents: sweetgum (Liquidambar styraciflua L. and mixed red oaks (southern red oak Quercus falcata Michx., Shumard oak Q. shumardii Buckl., and water oak Q. nigra L.); Shrub: American beautyberry (Calicarpa americana L.); Semi-woody: St. Andrew's-cross (Hypericum hypericoids (L.) Crantz); Bramble: blackberry (Rubus spp.); Grass: common broomsedge (Andropogon virginicus L.) , panicums (Dichanthelium spp), sedges (Cyperus spp), and spikegrass (Chasmanthium laxum var. laxum (L.) Yates); and Forb: poke (Phytolacca americana L.) , cudweed (Gnaphalium spp), American burnweed (Erechtites hieracifolia (L.) Raf. ex DC.), late boneset (Eupatorium serotinum Mich.), and purple eupatorium (Eupatorium coelestsinum L.).

Four herbicidal site-preparation rates were applied on each of 28-May, 22-July, and 9-September of 1999. For each site preparation rate and timing, two post-plant herbaceous weed control treatments were tested. An untreated check was also tested. The twenty-five test treatments are presented in Table 1. Mechanical site preparation was no performed as any part of this study.

Treatment plots were approximately 170 ft by 30 ft. Herbaceous weed plots were centered within treatment plots and were approximately 170 ft by 5 ft. Evaluation plots were approximately 150 ft by 10 ft for woody plant assessment and 150 ft by 5 ft for herbaceous plant assessment.

Site preparation rates of Chopper+Accord+oil were applied to treatment plots with a CO_2 pressurized backpack pole sprayer. Herbaceous weed treatments were applied either with a 4 (8002), nozzle “T-wand” (Oust 2oz, operational approach) or directed with a hand-held sprayer around covered seedlings (2% Accord SP). Oust was applied on March 17, 2000. Accord was applied on April 1 and again on June 1, 2000.

Woody rootstocks were tallied and total height recorded prior to treatment. Mortality counts and total height of surviving hardwoods were recorded in July of 2000. Herbaceous weeds were evaluated for control at 30, 60, 90, and 120 DAT.

Centered within each treatment plot was a row of planted hardwood seedlings. Seedlings were planted in sets of three-one sweetgum, one cherrybark oak, and one Nuttall oak- with 10 sets per row. Seedlings were planted on a 3 ft by 40 ft spacing. Seedlings were evaluated for survival at the middle (June) and at the end of the first- and second- growing seasons. Seedlings were measured for total height (cm) and ground line diameter (mm) in the middle of 2000 and after one- and two-growing seasons.

This study was established according to a randomized block design with three blocks, three timings, four rates, two herbaceous weed treatments and one check or 25 treatments per block. Percent reduction of hardwoods was computed as the sum of hardwood heights prior to treatment minus the sum of hardwood heights in July 2000 divided by sum of hardwood heights prior to treatment times 100.

RESULTS AND DISCUSSION

Major differences were detected for mortality and height reduction of noncrop oak and sweetgum (Table 1). May treatments provided less control and height reduction of oak and sweetgum than September treatments. Mortality for Oak was less than for sweetgum at all three timings. The range in mortality and height reduction for rate-date combinations is greatest at 16 oz and least at 64 oz of Chopper. Therefore, patterns for oak control indicate timing decreases in importance as rate increases. Timing seems to be less of a factor for sweetgum because even low rates of Chopper provide good sweetgum control. Managers seeking to minimize herbicide rate can use timing to tweak oak rates, with later applications being better than early. Sweetgum can be controlled with relatively low rates especially in July and September.

Post-plant weed cover was similar for overall, grass, or shrubs and semi-woody species at 30 through 120 days after treatment (Table 2). This suggests that the two, directed Accord SP treatments (with crop seedlings covered) and the single Oust treatment resulted in similar control of herbs and recolonization of plots.

At the April evaluation of plots, cherrybark oak seedlings (3%) in plots treated with 64 oz and sweetgum seedlings in plots treated with 48 (<7%) and 64 oz (<10%) of Chopper in September exhibited phytotoxicity (chlorotic and miniature leaves and shortened internodes). At the June evaluation, chlorosis was absent. Nuttall oak was completely free of the aforementioned symptoms. Numerous seemingly healthy Nuttall seedlings exhibited red leaves throughout the first growing season. Unfortunately, much of the evaluation period was without untreated check seedlings with which to contrast foliage. Because of the 1999 drought, herbicide degradation is assumed to be less than in more mesic years. For this reason, test conditions are thought to be worst case.

At the June 2000 evaluation, most check seedlings were totally brown (Table 3). Clearly major differences in growing conditions and seedling performance resulted early in the study, prior to drought, due to the presence of early weed competition. All check seedlings were dead at the December 2000 evaluation. These data emphasize the importance of good weed control from the onset of the hardwood rotation.

With minor exception, oak and sweetgum survival on plots receiving post-plant herbaceous weed control was excellent and similar through June 2000 (Table 3). A major drought occurred during the summer and fall of 2000. Seedling survival remained similar and high through December 2000. Winter months were wet, but no rain fell during April and May of 2001. Seedling mortality in June 2001 was significantly less than the previous December and it continued to decline through December 2001.

After one-growing season, overall total height and overall ground line diameters for post-plant Accord and Oust treatments were similar for sweetgum and Nuttall oak (Table 4). For cherrybark oak, total height (0.2 ft) and ground line diameters (0.02 in) were significantly less on plots treated with Oust, suggesting there may be crop intolerance. Another drought occurred during the spring of 2001, reducing survival from 0% to 60% on most plots. Numerous treatments had 3-5 total seedlings from which to record measurement. Of the surviving seedlings, over 70% of the sweetgum and cherrybark oak seedlings and 57% of the Nuttall oak seedlings had resprouted or terminal dieback by June 2001, dramatically reducing sample size and rendering 2001 survival and growth data of limited value.

In conclusion, data suggest a September application of Chopper at 48 oz of higher may have some risk to winter-planted, highly sensitive species, such as sweetgum. Earlier timings at 64 oz and below could be safely followed with plantings of sweetgum and cherrybark or Nuttall oaks.

Table 1. Mortality counts (%) and height reduction (%) was recorded in July 2000 for site preparation months and treatment rates of Chopper+Accord+oil applied to noncrop hardwoods in 1999 prior to planting commercial hardwoods in Feb 2000 near Forest, TX.

Herbicide	Oak						Sweetgum					
Treatment[1]	Mortality			Height Reduction			Mortality			Height Reduction		
oz prod ac^{-1}	Month	Treatment		Month	Treatment		Month	Treatment		Month	Treatment	
16-May		34	j[2]		28	i[2]		48	i[2]		54	g[2]
32-May		58	h		56	g		67	f		67	f
48-May		74	e		75	e		81	d		88	d
64-May	62.5 b[2]	84	c	62.8 b[2]	92	bc	71.5 b[2]	90	b	76.3 b[2]	96	ab
16-Jul		45	I		49	h		60	h		56	g
32-Jul		64	g		70	f		77	e		83	e
48-Jul		80	d		85	d		87	c		94	bc
64-Jul	69.3 b	88	bc	74.8 a	95	ab	78.0 a	88	bc	82.5 b	97	a
16-Sep		56	h		56	g		63	g		66	f
32-Sep		69	f		76	e		83	d		86	d
48-Sep		88	bc		90	c		88	bc		94	bc
64-Sep	76.3 a	92	a	79.5 a	96	a	81.5 a	92	a	86.0 a	98	a

[1] Herbicide treatment is a combination of Chopper rate and timing, e.g. 16-May=16 oz Chopper applied in May. All herbicide treatments also include 2 qt Accord+5qt oil.
[2] Treatment means within a column and sharing the same letter are not significantly different (Duncan's New Multiple Range test P$\leq$0.05).

Table 2. Herbicide treatment[1] and overall (all species), grass, and shrub plus semi-woody ground cover[2] (%) at 30 day intervals near Forest, TX.

Herbicide Treatment	30 Days After Treatment (17-APR-00)						60 Days After Treatment (18-MAY-00)					
	Overall		Grass		Shrub and Semi-Woody		Overall		Grass		Shrub and Semi-Woody	
	Acc[3]	Oust	Acc[3]	Oust	Acc[3]	Oust	Acc[3]	Oust	Acc[3]	Oust	Acc[3]	Oust
Check	97		15		40		97		20		45	
16-May	48	44	3	5	31	28	47	44	3	5	29	27
32-May	55	49	6	5	22	24	55	48	6	5	22	24
48-May	52	50	6	4	28	28	53	50	7	4	28	28
64-May	64	49	7	3	26	25	51	82	6	7	28	26
16-Jul	39	36	1	1	25	25	50	46	4	3	28	31
32-Jul	47	46	4	2	30	31	43	41	4	3	25	22
48-Jul	41	39	2	2	25	25	41	43	1	2	27	26
64-Jul	40	39	1	1	26	27	41	43	1	2	27	26
16-Sep	47	45	3	3	29	30	48	52	4	6	24	30
32-Sep	39	50	3	4	19	25	48	52	4	6	24	30
48-Sep	42	35	3	2	23	20	45	43	4	2	24	20
64-Sep	36	45	1	4	21	24	41	44	4	4	25	21

Herbicide Treatment	90 Days After Treatment (19-JUN-00)						120 Days after Treatment (18-JUL-00)					
Check	105		30		50		110		30		55	
16-May	65	57	11	10	35	30	67	56	12	11	36	29
32-May	69	69	12	11	33	30	68	70	12	13	31	31
48-May	69	66	13	9	32	35	69	66	13	10	31	34
64-May	74	75	11	10	31	35	76	78	12	11	32	36
16-Jul	54	58	10	10	29	30	59	58	13	11	32	29
32-Jul	66	66	14	10	29	30	66	72	14	13	34	41
48-Jul	61	60	14	9	33	30	64	61	16	9	34	33
64-Jul	60	53	12	9	31	30	60	55	13	9	30	31
16-Sep	59	73	8	11	33	40	62	71	9	11	33	38
32-Sep	60	65	8	9	29	36	63	65	10	10	30	35
48-Sep	63	59	10	6	31	28	63	58	11	7	30	28
64-Sep	55	65	9	11	30	32	58	67	11	13	31	33

[1] Herbicide treatment is a combination of Chopper rate and timing, e.g. 16-May=16 oz Chopper applied in May. All herbicide treatments also include 2 qt Accord+5qt oil.

[2] Pair-wise means for herbicide treatment and vegetation class were not significant (Duncan's New Multiple Range test P≤0.05).

[3] Acc=Accord.

Table 3. Herbicide treatment[1] and survival (%) for sweetgum, cherrybark oak, and Nuttall oak seedlings planted February 11, 2000 following a 1999 herbicide treatment for control of unwanted hardwoods.

Herbicide	June 2000						December 2000					
Treat-	Sweetgum		Cherrybark		Nuttall		Sweetgum		Cherrybark		Nuttall	
ment	Acc[3]	Oust	Acc[3]	Oust	Acc[3]	Oust	Acc[3]	Oust	Acc[3]	Oust	Acc[3]	Oust
Check	3		1		1		0		0		0	
16-MAY	100	100	100	100	100	100	92	100	100	96	100	100
32-MAY	100	100	100	94	100	100	78	72	100	94	96	100
48-MAY	94	100	94	100	94	100	61	78	89	100	94	100
64-MAY	92	100	100	100	100	94	69	83	100	100	100	89
16-JUL	100	94	100	94	100	94	100	89	94	94	100	83
32-JUL	100	94	100	100	100	94	89	89	100	89	88	89
48-JUL	94	100	100	100	100	100	94	89	100	94	95	100
64-JUL	94	72*[2]	100	100	100	100	56	59	94	82	94	94
16-SEP	100	94	100	100	100	100	61	78	94	89	100	94
32-SEP	100	100	100	100	100	100	61	72	100	100	95	100
48-SEP	100	94	100	100	94	94	67	61	100	94	100	100
64-SEP	81	83	100	94	100	100	38	56*	100	89	94	89

	June 2001						December 2001					
Check	0		0		0		0		0		0	
16-MAY	46	91*	70	68	56	53	38	91*	65	64	44	53
32-MAY	22	44*	41	59*	20	28	17	28	41	59*	20	22
48-MAY	17	11	33	41	39	37	0	39*	54	39	50	28
64-MAY	0	44*	58	44	56	33*	0	39*	54	39	50	28
16-JUL	59	33*	47	39	41	22*	59	33*	41	39	35	16
32-JUL	44	29	67	44*	41	39	39	24	61	44*	47	39
48-JUL	17	44	21	23	37	29	17	28	21	23	29	26
64-JUL	33	29	55	41	28	53*	28	29	44	35	28	47*
16-SEP	39	44	56	33*	33	67*	39	39	50	33*	33	61*
32-SEP	39	56*	56	83*	39	50	33	56*	56	83*	39	50
48-SEP	22	33	65	72	67	72	22	28	53	56	67	78
64-SEP	31	39	61	33*	56	44	31	22	56	17*	50	44

[1] Herbicide treatment is a combination of Chopper rate and timing, e.g. 16-May=16 oz Chopper applied in May. All herbicide treatments also include 2 qt Accord+5qt oil.

[2] Pair-wise means for herbicide treatment and vegetation class with an * are significantly different (Duncan's New Multiple Range test $P \leq 0.05$).

[3] Acc=Accord.

Table 4. Herbicide treatment[1], total height (HT, ft) and ground line diameter (GLD, in) for sweetgum, cherrybark oak, and Nuttall oak seedlings planted February 11, 2000 following chemical site preparation for control of unwanted hardwood.

Herbicide Treatment	HT June 2000						GLD June 2000					
	Sweetgum		Cherrybark		Nuttall		Sweetgum		Cherrybark		Nuttall	
	Acc	Oust	Acc	Oust	Acc	Oust	Acc	Oust	Acc	Oust	Acc	Oust
Check	1.5		1.6		1.5		.23		.23		.25	
16-MAY	1.5	2.1*	1.7	1.6	1.6	1.5	.22	.31	.21	.19	.24	.28
32-MAY	1.4	1.5	1.6	1.5	1.6	1.6	.22	.25	.21	.18	.24	.22
48-MAY	0.9	1.4*	1.6	1.7	1.5	1.5	.16	.24	.20	.22	.29	.24
64-MAY	1.4	1.4	1.5	1.6	1.5	1.4	.22	.26	.18	.20	.24	.25
16-JUL	1.5	1.2	1.6	1.6	1.4	1.3	.26	.22	.23	.20	.25	.26
32-JUL	1.8	1.7	1.9	1.4*	1.3	1.5	.29	.25	.25	.18*	.26	.24
48-JUL	1.9	1.4	1.8	1.6	1.6	1.7	.28	.26	.28	.23*	.29	.29
64-JUL	1.5	1.2	1.9	1.4	1.6	1.7	.25	.18	.23	.18	.33	.29
16-SEP	0.7	1.3*	1.6	1.3	1.6	1.5	.17	.19	.20	.22	.30	.27
32-SEP	0.8	0.9	1.6	1.6	1.5	1.4	.18	.15	.20	.21	.23	.25
48-SEP	1.1	1.1	1.5	1.3	1.8	1.6	.22	.17	.19	.17	.30	.31
64-SEP	0.6	1.0	1.7	1.3*	1.6	1.5	.14	.15	.25	.18*	.29	.28
Mean	1.3	1.4	1.7	1.5	1.6	1.5	.22	.22	.22	.20	.27	.27

	HT December 2000						GLD Dec 2000					
Check	-	-	-	-	-	-	-	-	-	-	-	-
16-MAY	1.8	2.4	1.9	1.8	1.8	1.7	.27	.34	.25	.22	.33	.31
32-MAY	2.0	2.4	1.8	1.7	1.8	1.6	.31	.38	.25	.20	.27	.28
48-MAY	1.5	2.0	1.8	1.9	2.0	1.7	.27	.35	.24	.25	.34	.35
64-MAY	2.1	2.0	1.6	1.7	1.7	1.7	.33	.34	.20	.23	.32	.33
16-JUL	1.6	1.4	1.8	1.7	1.5	1.6	.27	.24	.25	.21	.26	.30
32-JUL	2.2	1.9	2.0	1.7	1.5	1.7	.34	.28	.26	.21	.31	.26
48-JUL	2.0	1.7	1.9	1.8	1.8	1.8	.29	.30	.29	.25	.31	.30
64-JUL	2.1	1.9	2.1	1.8	1.8	1.8	.34	.30	.24	.22	.32	.36
16-SEP	1.1	1.5	1.7	1.5	1.7	1.5	.27	.23	.22	.25	.25	.29
32-SEP	1.3	1.3	1.6	1.5	1.7	1.6	.30	.20	.20	.21	.25	.22
48-SEP	1.7	1.8	1.5	1.4	1.5	1.5	.33	.26	.19	.19	.29	.24
64-SEP	1.4	1.5	1.8	1.3*	1.6	1.6	.31	.22	.25	.19	.26	.28
Mean	1.7	1.8	1.8	1.6*	1.7	1.7	.30	.29	.24	.22*	.29	.29

[1] Herbicide treatment is a combination of Chopper rate and timing, e.g. 16-May=16 oz Chopper applied in May. All herbicide treatments also include 2 qt Accord+5qt oil.
[2] Pair-wise means for herbicide treatment and vegetation class with an * are significantly different (Duncan's New Multiple Range test P≤0.05).
[3] Acc=Accord.

SCREENING IMPROVED OUST XP, ESCORT XP, AND VELPAR DF COMBINATIONS FOR WEED CONTROL AND SLASH PINE PERFORMANCE. J.L Yeiser; Arthur Temple College of Forestry, Stephen F. Austin State University, Nacogdoches, TX 75962.

ABSTRACT

Weed control, pine tolerance, and subsequent slash pine (Pinus elliottii Engelm.) growth for selected combinations of Oust XP, improved Oust XP (DPX-T5648-098 DPX), Velpar DF, Escort XP, and Arsenal were evaluated. All herbicide plots had less forb and grass cover than untreated checks. Forb and grass recolonization was low and very similar for all test treatments throughout the study. Specifically, weed free conditions were similar for improved and current formulations of Oust XP (3 oz), low improved Oust XP + high Velpar DF (2+16oz) and high improved Oust XP + low Velpar DF (3+8oz), Arsenal (6oz), Velpar DF (16oz), improved Oust XP with Escort (2+0.5oz; 2+1.0oz) and Oustar (10oz; 13oz). Seedling survival was excellent for all treatments, ranging from a high of 100 to a low of 92%. All treatments provided significantly more total height, ground line diameter, and seedling volume than checks. Some Arsenal (6oz) treated seedlings failed to terminal flush before July. Stunting was observed for 11 of 12 seedlings per plot. This probably explains why after one growing season, seedlings treated with Arsenal had less total height than seedlings in all other herbicide treatments, leaving only the check with less total height. Arsenal treated seedlings had ground line diameters and volume indices similar to several treatments, suggesting growth in height is impacted more than ground line diameter. Some Escort XP (1oz) treated seedlings failed to terminal flush before July. Stunting was observed for 3 of 12 seedlings per plot. Total height, ground line diameter and volume index on improved Oust XP+Escort (2oz+1oz) plots was intermediate. Improved Oust XP provided comparable weed control and seedling performance as the current formulation when used alone and in tank mixtures.

INTRODUCTION

Herbaceous weed control significantly improves the performance of newly planted pine seedlings. Managers need the best formulations for efficient weed control and enhanced seedling performance. Oust has long been an industry standard for herbaceous weed control. In 2000, DuPont introduced a new formulation called Oust XP. This is a study of a further refinement of Oust XP, hereafter called improved Oust XP (DPX-T5648-098). The objective of this study was to screen eleven test treatments for weed control and pine seedling tolerance as well as growth.

METHODS AND MATERIALS

The study was established in the lower coastal plain near Singer (Beauregard Parish) LA. The soil was a sandy loam over a silt loam. The site supported a slash pine stand that was harvested in the summer of 2001. Site preparation consisted of a May burn followed by bedding (no subsoiling) in August. The site was machine planted in November 2001.

Slash pine (Pinus elliottii Engelm.) seedlings were machine planted in November on an 8 ft X 10 ft spacing.

Herbicides were applied 21-Mar-02 in a 5 ft band centered over the seedling row. Herbicides were applied with a backpack CO_2 sprayer and a "T-boom" with 4, 8002 nozzles at a total volume of 10 GPA. The eleven test treatments are: (1) untreated check, (2) 10 oz Oustar, (3) 13 oz Oustar, (4) 2+16 oz improved Oust XP+Velpar DF (5) 3+8 oz improved Oust XP+Velpar DF , (6) 3 oz Oust XP, (7) 3 oz improved Oust XP, (8) 6 oz Arsenal, (9) 2 + 0.5 oz improved Oust XP+Escort XP, (10) 2+1.0 oz improved Oust XP+Escort, and (11) 16 oz Velpar DF.

Treatment plots were approximately 130 ft long and 5 ft wide. Plots were visually evaluated for cover at 30, 60, 90, and 120 days after treatment (DAT). Plots were bare on application day. Major recolonizing plants follow: Woody-sumac (Rhus spp.) and southern bayberry (Myrica cerifera L.); Semiwoody-St. Andrew's-cross (Hypericum hypericoids (L.) Crantz); Shrub-American beautyberry ((Calicarpa americana L.); Bramble-blackberry (Rubus spp); Grass-field paspalum (Paspalum laeve Michx.), Florida paspalum (P. floridanum Michx.), panicums (Dichanthelium spp), purple lovegrass (Eragrostis spectabillis (Pursh) Steud.), purple top (Tridens flavus (L.) A.S. Hitchc.), foxtail (Setaria glauca (L.) Beauv.), and sedges (Cyperus spp); Forb-dogfennel (Eupatorium capillifolium (Lam.), and purple eupatorium (Eupatorium coelesstinum L.).

Treatment plots contained 16 seedlings with the 12 inner seedlings comprising the measurement plot. Seedlings were measured for total height (cm) and ground line diameter (mm) before herbicide application and again in November 2002 after one growing season. Seedling volume index was computed as total height X ground line diameter^2 and expressed in cubic feet.

RESULTS AND DISCUSSION

Oust XP and improved Oust XP provided statistically similar weed free (total, forb, and grass) conditions at all evaluations (Table 1). Grass cover for improved Oust XP mixtures was similar at all evaluations. For all evaluations, grass cover was single-digit in herbicide treatments and double-digit in checks. Only minor statistical differences in grass control were observed among treatments throughout the study. Similar forb cover was observed on improved Oust XP plots at 30 and 60 DAT. At 90 and 120 DAT, forb recolonization was more on plots receiving the low rate of metsulfuron than most other improved Oust XP mixtures. After 120 DAT, forb cover was 10% to 26% on treatment plots while 48% in checks. Numerically best forb control throughout the study was achieved with Arsenal (6oz), hexazinone+sulfometuron mixtures and improved Oust XP+Escort (2+1oz).

Total ground cover at all evaluations was similar for many treatments (Table 1). For example, at 30 through 90 DAT, the untreated check and Velpar DF (16oz) had significantly more cover than all other treatments, which were all similar. At 120 DAT, ground cover on the untreated check > Velpar DF (16oz) > improved Oust XP+Velpar DF (2+16oz) = improved Oust XP+Escort XP (2+0.5oz) > improved Oust XP+Velpar DF (3+8oz) = all remaining six treatments. Clearly, some separation was occurring 120 DAT, but 6 of 11 treatments remained statistically similar. Survival ranged from a low of 92 percent to a high of 100 percent (Table 1). Three treatments exhibited 100 percent, three 98 percent, four 96 percent, and one 92 percent. Seedling survival was excellent for all treatments.

Stunting was observed in Arsenal (6oz) and high Escort (Improved Oust XP+Escort XP 2+1oz) treatments. In Arsenal plots, terminal flushing did not occur before the July evaluation for 11 of 12 seedlings per plot in each of the replications. Seedlings then seemed to resume normal height growth. In plots receiving 1 oz of Escort+improved Oust XP, 3 of 12 seedlings in each of the replications lacked terminal flushes prior to the July evaluation. This may explain why total height was less in Arsenal (6oz) plots than all other treatments, including the check, and why total height was intermediate for the high rate of Escort+improved Oust XP (1+2oz) (Table 2). Ground line diameter and volume index was intermediate for these treatments suggesting growth in height was impacted by the treatments more than ground line diameter (Table 2). Greatest total height, ground line diameter, and seedling volume resulted from treatments of Oust alone, low Oustar (10oz), and improved Oust XP+Velpar DF (3+8oz).

For paired comparisons of Oust XP and improved Oust XP, growth was very similar (Table 2). When Velpar was added to the tank (improved Oust XP+Velpar DF), when Escort XP went from 0.5 to 1.0 oz, when 6 oz of Arsenal was applied, and when Oustar went from 10 oz to 13 oz, growth decreased. None of the decreases were statistically significant. These use rates are considered safe and commonly used for loblolly pine. Patterns suggest that slash pine may be more sensitive to herbicide rate than loblolly pine. Managers should not automatically extend knowledge and experience from loblolly pine to slash pine until more data and experience is available.

In conclusion, improved Oust XP, Velpar DF, and Arsenal alone and improved Oust XP with Velar DF or Escort XP provided excellent herbaceous weed control throughout the growing season. Delayed terminal flushing suggests slash pine tolerance may be lacking for mixtures containing Escort 1oz and Arsenal 6oz. Rates and mixtures commonly used with loblolly pine produced reduced growth (numerical but not statistical) on slash pine. Managers should not automatically apply experiences with use rates for loblolly pine to slash pine until more information is known about crop tolerance.

Table1. Percent total, forb, and grass cover at 30-day intervals following herbicide application over the top of slash pine seedlings on 21-Mar-02 near Singer, LA.

TREATMENT	RATE	TOTAL	FORB	GRASS
30 DAT – 21-Apr-02				
Arsenal	6oz	2c[1]	1b[1]	1b[1]
Improved Oust XP+Velpar DF	3+8oz	2c	1b	1b
Oust XP	3oz	4c	2b	1b
Improved Oust XP+Escort XP	2+0.5oz	4c	1b	1b
Improved Oust XP	3oz	4cb	3b	2b
Improved Oust XP+Escort XP	2+1oz	6cb	2b	2b
Oustar	13oz	7cb	4b	2b
Improved Oust XP+Velpar DF	2+16oz	7cb	2b	1b
Oustar	10oz	10cb	2b	2b
Velpar DF	16oz	14b	6b	4b
Check	None	61a	30a	30a
60 DAT – 22-May-02				
Arsenal	6oz	8c	2c	1b
Improved Oust XP+Velpar DF	3+8oz	6c	3bc	2b
Oust XP	3oz	9c	3bc	2b
Improved Oust XP+Escort XP	2+0.5oz	8c	2c	2b
Improved Oust XP	3oz	13c	5bc	3b
Improved Oust XP+Escort XP	2+1oz	8c	3bc	2b
Oustar	13oz	12c	5bc	3b
Improved Oust XP+Velpar DF	2+16oz	13c	3bc	1b
Oustar	10oz	15c	3bc	3b
Velpar DF	160z	36b	9b	5b
Check	None	64a	31a	29a
90 DAT – 2-Jul-02				
Arsenal	6oz	24c	11bc	2d
Improved Oust XP+Velpar DF	3+8oz	17c	8c	3cd
Oust XP	3oz	31c	19b	4cd
Improved Oust XP+Escort XP	2+0.5oz	30c	20b	4cd
Improved Oust XP	3oz	29c	18b	3cd
Improved Oust XP+Escort XP	2+1oz	31c	15bc	5bcd
Oustar	13oz	26c	16bc	5bcd
Improved Oust XP+Velpar DF	2+16oz	29c	12bc	3cd
Oustar	10oz	32c	11bc	7bc
Velpar DF	16oz	47b	20b	9b
Check	none	83a	41a	34a
120 DAT – 22-Jul-02				
Arsenal	6oz	31dc	19bcde	3c
Improved Oust XP+Velpar DF	3+8oz	21d	10e	3c
Oust XP	3oz	35dc	23bc	4c
Improved Oust XP+Escort XP	2+0.5oz	39c	26b	7bc
Improved Oust XP	3oz	31dc	20bcd	4c
Improved Oust XP+Escort XP	2+1oz	35dc	18bcde	5bc
Oustar	13oz	31dc	20bcd	5bc
Improved Oust XP+Velpar DF	2+16oz	36c	16cde	3c
Oustar	10oz	32dc	11de	7bc
Velpar DF	16oz	52b	25bc	9b
Check	none	91a	48a	35a

[1]Treatment means within a column sharing the same letter are not significantly different (Duncan's Improved Multiple Range Test ($p \leq 0.05$).

Table 2. Herbaceous weed treatments and slash pine seedling survival (S1%), total height (H1, FT), ground line diameter (D1, IN) and volume index (V1, X 10^{-2} FT^3) after one growing season near Singer, LA.

TREATMENT	RATE oz product ac^{-1}	S1	H1	D1	V1
Oust XP	3	96ab[1]	2.48a[1]	0.89a[1]	1.615a[1]
Improved Oust XP	3	100a	2.35ab	0.86abc	1.389abc
Improved Oust XP+Velpar DF	3+8	100a	2.29abc	0.86ab	1.362abc
Oust XP+Escort XP	2+0.5	100a	2.25abc	0.79bcd	1.162bcd
Improved Oust XP+Escort XP	2+1	92b	2.22bc	0.80abcd	1.278abc
Velpar DF	16	98ab	2.14bc	0.76cd	1.013cde
Oust XP+Velpar DF	2+16	96ab	2.12bc	0.77bcd	1.001cde
Oustar	10	96ab	2.50a	0.84abc	1.437ab
Oustar	13	98ab	2.16bc	0.79bcd	1.142bcd
Arsenal	6	98ab	1.83d	0.73d	0.786de
Check	None	96ab	2.07c	0.62e	0.659e

[1]Treatment means within a column sharing the same letter are not significantly different (Duncan's New Multiple Range Test ($P \leq 0.05$).

A COMPARISON OF GARLON 4 AND TRICLOPYR 4E. J.L. Yeiser. Arthur Temple College of Forestry, Stephen F. Austin State University, Nacogdoches, TX 75962; A.W. Ezell. Department of Forest Resources, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

This is a screening study comparing the brownout and woody rootstock control of Garlon 4 and Triclopyr 4E alone and with Arsenal AC and Gly-Flo for the preparation of pine sites for planting. Triclopyr 4E is a new triclopyr generic manufactured by TopPro. A site in each of Mississippi and Texas were tested. Some statistical differences in brownout and stem control were detected for specific Garlon 4 and Triclopyr 4E comparisons in Mississippi and Texas eight weeks after treatment (WAT). Generally, both the Garlon 4 and the Triclopyr 4E formulations performed similarly. It was noted that for red maple in Mississippi, Triclopyr 4E control was consistently numerically, but not statistically, lower than Garlon 4, both alone and with tank partners. Furthermore, the magnitude of sweetgum control by both triclopyr formulations in mixtures in Mississippi was lower than expected. This was not observed for sweetgum and the same mixtures in Texas. Triclopyr 4E shows promise for woody plant brownout and control during the preparation of pine sites for planting.

INTRODUCTION

As the patent protection expires on herbicides labeled for forestry, new generic products will be developed. For acceptance, these products need field-testing. The purpose of these field trials is to compare the brownout and stem reduction of Garlon 4 (61.6% triclopyr) with Triclopyr 4E (61.6% triclopyr), both alone and in combination with Arsenal and Gly-Flo, a generic glyphosate. Garlon 4 is manufactured by Dow AgroSciences. Triclopyr 4E and Gly-Flo are produced by TopPro. Arsenal is made by BASF.

MATERIALS AND METHODS

Two sites were selected for testing. One site was near Chireno (Angelina County), Texas and one was near Brooksville (Noxubee County), Mississippi (Table 1).

Soil in Texas was a moderately well drained sandy loam with pH 5.3. The site supported a mixed stand of loblolly pine and hardwoods and was clearcut during September 2000. The Texas site was dominated by post-harvest oak (Quercus falcata Michx. and Q. alba L.), sassafras (Sassafras albidum (Nutt.) Nees), sweetgum (Liquidambar styraciflua L.) and blackberry (Rubus spp.) Major forbs were: dogfennel (Eupatorium capillifolium (Lam.) Small), small-headed goldenrod (Euthamia tenuifolia (Pursh) Greene) and American burnweed (Erechtites hieracifolia (L.) Raf. ex DC.). Major grasses were: common broomsedge (Andropogon virginicus L.), panicums (Dichanthelium spp), sedges (Cyperus spp), and spikegrass (Chasmanthium laxum var. laxum (L.) Yates).

Soil in Mississippi was a somewhat poorly drained Urbo silty clay loam with a pH of 5.1. The Mississippi site supported a natural pine-hardwood stand that was clearcut in September 2000. The post-harvest hardwood community was dominated by blackgum (Nyssa sylvatica Marsh.), white oak, sweetgum, and red maple. Major forbs were: American burnweed, Canada goldenrod (Solidago canadensis L.), and late boneset (Eupatorium serotinum Mich.). Major grasses included: signalgrass (Urochloa spp), roundhead sedge (Cyperus echinatus (L.) Wood), and panicums.

A backpack CO_2 aerial simulator supporting a single, KLC9 flood nozzle approximately 12 ft above the ground was used to broadcast herbicides in a total volume of 10 GPA. A single pass was used to spray treatment plots. The dimensions of treatment plots were 100 ft X 30 ft. Application day in Texas was 7-Sep-01 and in Mississippi it was 20-Aug-01. In Texas soil moisture was good and in Mississippi moderate on application day. Treatments are presented in Table 1.

Measurement plot were 80 ft X 10 ft and centered internally within the treatment plot. Measurement plots received a 100% pre-treatment inventory of woody species > 1 ft in height. An ocular evaluation of brownout by vegetation type was completed 8 WAT. Measurement plots were again inventoried approximately 12 months after treatment for woody rootstock control (mortality).

At each site, seven treatments were tested. Treatments were assigned to plots in a randomized complete block design with three blocks. Data were analyzed using the GLM procedure of SAS. Means were separated using Duncan's New Multiple Range test. All tests were conducted at the $P \leq 0.05$ level.

RESULTS AND DISCUSSION

In Mississippi, two frosts had occurred on the site prior to evaluation as can be noted by broadleaf brownout in the control areas (Table 1). However, the woody species were not seriously affected by the frosts. Triclopyr is not active on grasses, explaining the low values for brownout. The addition of imazapyr increased brownout of grasses, but not to the extent of adding glyphosate. Best grass brownout resulted from Gly-Flo+Garlon 4. Brownout of broadleaf species was greater with Garlon 4 alone and with Arsenal than Triclopyr 4E but all treatments were sufficiently browned to carry a fire. The frosts may have had an impact on the broadleaf activity. Woody brownout was similar with the only notable difference being in Gly-Flo mixtures where Triclopyr 4E gave better results than Garlon 4.

In Texas, grass control was: (1) less for triclopyr alone than with a tank partner and (2) for the triclopyr alone comparison, less for Garlon 4 than Triclopyr 4E (Table 1). The grass value of 52% for Triclopyr 4E is spurious because triclopyr does not control grass at this use rates. Broadleaf control was very similar across treatments (Table 1). For paired formulation comparisons: (1) triclopyr alone, (2) triclopyr+imazapyr, or (3) triclopyr+glyphosate, no differences were detected. Woody brownout was similar for all herbicide treatments and greater than the untreated check (Table 1).

Woody rootstock control is presented in Table 2. In this project, the comparison of formulations may be more important then the overall control of any single species.

In Mississippi, a comparison of stand-alone triclopyr formulations revealed statistically similar rootstock control of white oak, blackgum and total (all species) (Table 2). The control of sweetgum was greater with Garlon 4. Numerically, rootstock control of red maple and total was low. Neither triclopyr formulation was expected to achieve high levels of red maple control. Furthermore, total (all species) control was strongly influenced by the large number of red maple stems in the plots. In a review of "other" species on the plots such as southern red oak, winged sumac, hickory, winged elm, and willow oak, there was no difference in the two treatments. Thus, the only difference of concern is the lack of sweetgum control. Sweetgum is a major competitor on pine regeneration sites across the South and difficult to control with 64 oz of triclopyr alone.

Triclopyr formulations with Arsenal provided similar control of red maple, white oak and total (all species) (Table 2). Garlon 4 provided significantly less rootstock control than Triclopyr 4E of sweetgum and blackgum. Sweetgum is readily controlled with 20 oz Arsenal alone. The low level of sweetgum control suggests there may have been some antagonism. However, the same paired comparison in Texas provided much higher and statistically similar control of sweetgum, seemingly negating this explanation. Difference may be attributed to variable site and physiological conditions at Mississippi and Texas.

In Mississippi, triclopyr formulations mixed with Gly-Flo provided similar control of red maple, white oak, and blackgum (Table 1). Gly-Flo+Garlon 4 provided less control than Gly-Flo+Triclopyr 4E of sweetgum, a pattern seen in the triclopyr+Arsenal comparison as well. Rootstock control of total (all species) was better for Garlon4+Gly-Flo. A review of plot data sheets revealed that the red maple sample size did not influence total control in this comparison as in an earlier comparison. Total control was influenced strongly by the lack of control of red oaks (southern red oak, cherrybark oak) in the Gly-Flo+Triclopyr 4E plots.

In Texas, differences in paired triclopyr formulation comparisons were not detected for mixed oak and sweetgum (Table 2). For both species groups, triclopyr alone provided less rootstock control than triclopyr formulations mixed with either Arsenal or Gly-Flo. In a comparison of triclopyr formulations+Gly-Flo versus triclopyr formulations+Arsenal, the former provided more oak control but similar sweetgum control. Control of total (all species) was different for all treatments (Table 2). This may be due to the inclusion in the means of all species on the site, thus bringing unbalanced influences on the means.

In conclusion, Triclopyr 4E performed comparably to Garlon 4 in all paired comparisons. It is noted that for red maple in Mississippi, Triclopyr 4E control was consistently lower than Garlon 4, both alone and with tank partners. Furthermore, the magnitude of sweetgum control with mixtures in Mississippi was lower than expected for all treatments. However, this was not observed for sweetgum and the same mixtures in Texas. This illustrates the inconsistent performance sometimes accompanying variable site and treatment conditions that occurs in forestry.

Table 1. Mean brownout (%) eight weeks after application of Triclopyr 4E and Garlon 4 in Brooksville (Noxubee County), Mississippi and Chireno (Angelina County), Texas.

	MS-Treated 20-Aug-01			TX-Treated 7-Sep-01		
Treatment	Grass	Broadleaf	Woody	Grass	Broadleaf	Woody
	Percent					
64 oz Triclopyr 4E + 1% TimberLand (TL) 90 v/v	30c[1]	83b[1]	83a[1]	52b[1]	83ab[1]	86a[1]
64 oz Garlon 4 + 1 % TL 90 v/v	30c	93a	90a	27c	63b	83a
20 oz Arsenal AC + 32 oz Triclopyr 4 + 1% TL 90 v/v	50b	73c	80a	87a	80ab	82a
20 oz Arsenal AC + 32 oz Garlon 4 + 1% TL 90 v/v	57b	100a	83a	87a	87ab	79a
4 qts Gly-Flo + 32 oz Triclopyr 4 + 1% TL 90	63b	100a	90a	100a	96a	99a
4 qts Gly-Flo + 32 oz Garlon 4 + 1% TL 90	80a	100a	72b	99a	99a	96a
Untreated Check	23c	63c	13c	17	43	11

[1] Means within a column sharing the same letter are not significantly different (Duncan's New Multiple Range test $P \leq 0.05$).

Table 2. Herbicide treatments and control of major woody species treated with triclopyr formulations on 20-Aug-01 in Mississippi and 7-Sep-01 in Texas.

Treatment	Red Maple	White Oak	Sweet-gum	Black-gum	Total
Mississippi – Evaluated Oct 2002			--%--		
64 oz Triclopyr 4E + 1% TimberLand (TL) 90 v/v	-71b[1,2]	100a[1,2]	-30c[1,2]	92a[1,2].	18b[1,2]
64 oz Garlon 4 + 1 % TL 90 v/v	-40b	100a	55a	100a	27b
20 oz Arsenal AC + 32 oz Triclopyr 4 + 1% TL 90 v/v	82a	100a	54a	100a	76a
20 oz Arsenal AC + 32 oz Garlon 4 + 1% TL 90 v/v	95a	100a	22b	67b	86a
4 qts Gly-Flo + 32 oz Triclopyr 4 + 1% TL 90	61a	97a	63a	68b	42b
4 qts Gly-Flo + 32 oz Garlon 4 + 1% TL 90	89a	100a	20b	67b	75a
Untreated Check	-74b	17b	-22c	-39c	-56c

Texas – Evaluated Sep 2002		Mixed Oak[3]	Sweet-gum		Total
			--%--		
64 oz Triclopyr 4E + 1% TL 90 v/v	-	45c	43b	-	40f
64 oz Garlon 4 + 1 % TL 90 v/v	-	39c	42b	-	49e
20 oz Arsenal AC + 32 oz Triclopyr 4 + 1% TL 90 v/v	-	53b	98a	-	80a
20 oz. Arsenal AC + 32 oz Garlon 4 + 1% TL 90 v/v	-	59b	93a	-	59d
4 qts Gly-Flo + 32 oz Triclopyr 4 + 1% TL 90	-	75a	98a	-	71c
4 qts Gly-Flo + 32 oz Garlon 4 + 1% TL 90	-	76a	97a	-	77b
Untreated Check	-	-12	-17	-	-27

[1] Negative values indicate an increase in stems.
[2] Means within a column and sharing the same letters are not significantly different (Duncan's New Multiple Range test $P \leq 0.05$.
[3] A mixture of white (Q. alba L.) and southern red oaks (Q. falcata Michx.).

COMPARING ISOPROPYLAMINE AND DIAMMONIUM SALT FORMULATIONS OF GLYPHOSATE FOR FOREST SITE PREPARATION. L.R. Nelson and A.W. Ezell. Clemson University, Clemson, SC and Mississippi State University, Mississippi State, MS.

ABSTRACT

Chemical site preparation treatments were applied to recently cut-over sites in South Carolina and Mississippi. Efficacy of diammonium and isopropylamine salts of glyphosate were compared on various species of woody brush. Treatments included Accord (isopropylamine salt) and ZPP1560 (diammonium salt) each applied at 4,6 and 8 qt product/ac and each mixed @ 4 qt with 4 qt prod/ac Garlon 4 (triclopyr), 16 oz prod/ac Arsenal AC (imazapyr) and 2 qt prod/ac Vanquish (dicamba). Applications of 10 gal/ac total spray were conducted in late August with a CO_2 powered backpack sprayer with a pole extension and KLC-9 nozzle. Treatments included three replications in a randomized complete block experimental design at each location. Ocular estimates of percent brownout were collected 8 wks after treatment. Woody stem control based on the number of live stems per species was determined 14 mo after treatment. Dominant hardwood species in South Carolina included water oak (*Quercus nigra*), southern red oak (*Quercus falcata*) and black cherry (*Prunus serotina*), while species in Mississippi included white oak (*Quercus alba*), red maple (*Acer rubrum*), hickory (Carya spp.) and blackgum (*Nyssa sylvatica).*

Efficacy of formulations varied by species. Both formulations worked well on white oak and black cherry. All rates and mixtures of ZPP1650 except the Garlon 4 mix provided effective control (>70%) of water oak and southern red oak The Garlon 4 mix provided less than 70 and 10% for the two species, respectively. Accord @ 4 and 6 qt/ac and the Arsenal mix provided effective control (>80%) of water oak, but the 8 qt treatment and the Garlon 4 and Vanquish mix provided less than 50% control. The 6 and 8 qt treatment of Accord, and the Arsenal mix were effective on southern red oak, while the 4 qt rate and the other mixtures resulted in less 35% control. Only the ZPP1650 + Arsenal and the Accord + Vanquish were effective on hickory. Single rates of ZPP1650 gave less than 55% control of blackgum, while Garlon 4 and Arsenal mixtures and all Accord mixtures provided > 80 % control. Effective control of red maple resulted from ZPP1650 @ 4 and 8 qt and the Arsenal mix, while Accord was effective only at 8 qt/ac.

EFFECTS OF VELPAR AND SODIUM CARBONATE ON SOIL MOISTURE AND LOBLOLLY PINE GROWTH. C.L. Ramsey and S. Jose; University of Florida, Milton campus, Milton FL. 32583.

ABSTRACT

A herbaceous weed control field study was conducted in 2002 in northwestern Florida to investigate the effects of Velpar, Arsenal AC and sodium carbonate on weed control and loblolly pine survival, diameter and height growth. Sodium carbonate disperses clay particles in the surface layer of soil, leading to a thin crust formation and reduced water infiltration rates. The 2 x 4 factorial design included Velpar applied at (2.2 kg ai ha^{-1}), Arsenal AC applied at (0.4 kg ai ha^{-1}). Sodium carbonate was applied at 0,127, 254, and 381 g m^{-2} in 0.65 m bands along the centerline of the tree rows. Pines were planted in Jan. 8, sodium carbonate applied on Feb 12-17, and herbicides were applied on April 3, 2002. Weed evaluations were taken monthly and pine survival, diameter, and heights were taken 8 months after treatment. Soil moisture readings were taken on August 12 and 28, 2002. Weed control was not effected by sodium carbonate, but it was higher for the Velpar treatments after June. Pine survival in April, before herbicide application, decreased from 100 to 63% as sodium carbonate rates increased from 0 to 381 g m^{-2}, respectively. In December, there was an interaction between herbicides and sodium carbonate. There was no effect of sodium carbonate on survival for the Velpar treatments, but a negative, linear decrease in survival for Arsenal AC. Pine growth, in terms of diameters and heights, increased linearly with increasing sodium carbonate rates. Soil moisture linearly increased from 5.5 to7.8% for the August 12 measurements, as sodium carbonate increased from 0 to 381 g m^{-2}. There was no sodium effect on soil moisture for the August 28 measurements. There was conflicting results for diameter growth when compared to a similar field study conducted at Auburn University.

USE OF TERRASORB AND SEAWEED EXTRACTS TO IMPROVE LOBLOLLY PINE GROWTH. C.L. Ramsey and S. Jose; University of Florida, Milton campus, Milton FL. 32583.

ABSTRACT

A field study was conducted in 2002 in northwestern Florida to investigate the effects of Terrasorb, a soil moisture retention hydrogel, and Stimupro, a seaweed extract, on loblolly pine growth and survival. Stimupro contains cytokinins, auxins, and gibberellins, which are plant growth hormones. Terrasorb is a hydrogel polymer, which swells with water, to approximately 80 - 100 times its weight. Stimupro was mixed with water (5 ml l^{-1}) followed be 341 g Terrasorb. Swollen Terrasorb granules were then placed in 2, 3, or 4 eight inch holes placed near the pine roots. Velpar DF was band applied over top of the seedlings at the rate of 2.2 kg ai ha^{-1}. On separate treatments sodium carbonate was spot applied in a 1 foot diameter circle around each seedling at the rate of 327 g m^{-2}. Weed control was evaluated on a monthly basis, and pine survival, diameter and height growth was measured 8 months after treatment. The Terrasorb and Stimupro treatments had no effect on loblolly pine survival, groundline diameter, or height growth. The Velpar + sodium carbonate treatments did not improve pine survival, over the control. Survival for the Velpar + sodium carbonate and Velpar only (2.2 kg ai ha^{-1}) treatment was 56 and 23%, respectively. Groundline diameter growth for the Velpar + sodium carbonate and the Velpar only treatments was 9.5 and 7.8 mm, respectively (8 MAT). The sodium carbonate treatments did not extend the duration of weed control, relative to the Velpar treatment (2.2 kg ai ha^{-1}). There may be a delayed response to weed control that may reveal itself in second year pine responses.

SPLIT-SEASON HERBICIDE TREATMENTS FOR FULL SEASON HERBACEOUS WEED CONTROL: 2ND YEAR RESULTS. R.A. Williams, J.A. Earl, J.L. Yeiser, and A.W. Ezell; University of Arkansas at Monticello, University of Arkansas at Monticello, Stephen F. Austin State University, Nacogdoches TX, and Mississippi State University, Starkville.

ABSTRACT

A total of 12 plots replicated four times was established at three sites in the Western Gulf Region of the southern U.S. One study was located near Monticello, Arkansas, the Texas study was located near Hutington, Texas and Una, Mississippi was the location of the third study site. These studies were established to evaluate herbaceous weed control in planted loblolly pine seedlings using several herbicides and a split season application. Applications at all study locations included Early (pre-emergent), Late (post-emergent) and Full (both pre- and post-emergent). Seedlings with herbaceous weed control had slightly higher levels of survival compared to untreated seedlings. Height and ground line diameter growth was significantly greater on treated seedlings compared with untreated seedlings, in fact, GLD growth of seedlings with weed control was more than twice the ground line diameter growth of seedlings left untreated.

INTRODUCTION

Herbaceous weed control studies are typically dual-purpose: they allow the chemical companies to test new products and also develop guidelines for industrial spraying. In this study, we are testing different rates of a fairly new product called Oustar, which is a granular mixture of both Oust and Velpar, along with the industry standard rates of Oust alone, Arsenal+Oust and Velpar alone. Split season refers to two treatment periods. The first treatments were applied pre-emergent and the second application was applied post-emergent. This study had four basic treatment applications: 1) no herbaceous weed control, 2) pre-emergent only (early), 3) post-emergent only (late), and 4) full treatment means that the plots received both pre- and post-emergent applications of herbicide.

MATERIALS AND METHODS

All of the study sites were located in 2001. The Monticello, Arkansas site's soil type is a silt loam (Henry or Calloway series). Site index for loblolly pine at age 50 is 85 feet. This site was harvested and site prepared using a shear in combination with bedding. Hand planting occurred during January of 2001 with improved loblolly pine seedlings on an approximate spacing of 8'x10'. The Huntington, Texas site has a clay/loam soil. The Texas site was site prepared using Arsenal and Garlon applied in July 2001. Burning was conducted in October 2001 followed by plowing. The site was hand planted in January 2001. The Una, Mississippi location has a silt loam soil. The site was site prepared by shearing and windrowing in September 2000 and hand planted in January 2001.

Each study established four blocks with twelve treatment plots within each block. Each plot is a 100-ft strip down a row of planted pine seedlings. Because of the variability in spacing, each plot initially contained between 12 and 17 planted seedlings. In Arkansas, all measurement trees were alive at establishment, but some have not survived the spring either due to poor planting or being browsed by deer. In Arkansas, initial survival rates were determined in late spring while the plants had good moisture. After the plots were established and before spraying, treatments were assigned randomly to all 48 plots, giving the experiment a Randomized Compete Block Design (RCBD) with 12 treatments and 4 replications. This method was applied to all three study sites.

There are both pre- and post-emergent applications among the eleven herbicide combinations (Table 1). Four rates are classified as EARLY and were applied in early March 2001 to pre-emergent plots. One treatment is called LATE and only had a post-emergent application in mid-

May to early June 2001. The seven FULL plots received herbicide applications in both March and May/June. Finally, there was one UNTREATED control. All herbicide applications were done with a CO_2-powered backpack sprayer using a two nozzle boom and stainless steel 110-015 tips. The boom was centered over the seedlings and sprayed over-the-top of the pine seedlings at a volume equal to 10 gallons per acre. All of the study locations in the three states used the same type of equipment to minimize variations in the delivery of herbicides for herbaceous weed control.

Heights (ft) and ground line diameters (in) were measured before treatment and after the first growing season. Initial measurements were evaluated using the Shapiro-Wilkes test to make sure the data was normal before analysis. Means were separated using Duncan's at an alpha level of 0.05. All 48 plots were tallied for initial survival. Because of a poor planting job on the Arkansas site, survival was tallied in mid-May to get an idea of how planting affected survival. Survival was taken again at the end of growing season one. The percentages were transformed using the Arcsine Squareroot technique to take them to an approximately normal distribution, then taken into SAS for analysis of variance.

For herbicide efficacy, two trees per plot were evaluated every 30 days after treatment (DAT) through 150 DAT, and then again at the end of the first growing season (approximately 270 DAT). At each evaluation period, a one square meter frame was placed over a randomly-selected seedling, and the percent bare ground and percent of brownout were estimated visually. From these two measures, a percent green was calculated. Around July 1st, twelve biomass samples were taken from the 6 untreated areas adjacent to the treated plots using a square frame one meter long on each side. Major herbaceous competitor species were identified, and then the samples were oven-dried and weighed. Projections for biomass per unit area were calculated after the vegetation was dried.

RESULTS AND DISCUSSION

All of the treatments were applied during pre-determined windows of operation. Early spraying or pre-emergent application occurred between March 6 and March 15, 2001. The late season spraying or post emergent application occurred between May 15 and June 1, 2001. Rainfall varied by site for both years 2001 and 2002. Monticello, Arkansas had good rainfall (exceeding 4 inches) during March, April and May, 2001. The months of June and July were low in rainfall with July barely getting an inch of rain. August and September, 2001 were better months for rain as totals neared 4 inches per month. The fall and winter months saw over 8 inches of rainfall per month. Monticello had a total of 44.9 inches of rain between March and December, 2001. The Mississippi site had nearly the same rainfall totals as did Monticello with 43 inches between March and December. However, the pattern was much different with April and May barely topping 2 inches of rain. June had over 5 inches and July fell back to nearly 2 inches for the month. August (8 inches) and September (4 inches) brought large amounts of water with high rain totals for these months. The Texas site had only 32.7 inches of rainfall over the same time period. The months of April, May, July and August were 2 inches or less on rainfall per month. The one month of June with over 9 inches of rainfall provided most of the total. Rainfall totals for 2002 were Arkansas with 42 inches, Mississippi with 42.6 inches and Texas with 27.8 inches.

Seedling height growth over all of the sites were greater on treated plots compared to the untreated control. The early and full treatments appeared to be better for seedling height growth on the Mississippi and Texas studies while the full and late treatments appeared to be better at the Arkansas location. Height growth responses were greater at the Arkansas and Texas locations than the Mississippi location. The Texas site had treated seedlings growing 1.5 times taller than untreated seedlings while Arkansas had 1.3 times the height growth (Table 1). Seedling height growth was impacted by an infestation of Nantucket pine tip moth (*Rhyacionia frustrana* Comstock) in Arkansas during 2001. Tip moths were readily apparent from late spring throughout the summer. While another study we were monitoring at the same time showed about 98 percent tip die-back by season's end, this study had very few signs of tip moth by December 2001, probably less than one percent (visually noted). Tip moths infested seedlings in every plot so no one treatment were impacted more than others.

Ground line diameter growth followed the same pattern as seedling height growth with seedlings growing in plots treated for herbaceous weed control growing better than seedlings in plots with no treatment. The early and full treatments had better GLD growth on the Mississippi and Texas sites while the full and late treatments were better in Arkansas. The Texas site saw the largest gain in GLD with the full treatment where seedlings grew over 2 times more than seedlings not receiving weed control. The Arkansas and Mississippi sites had GLD growth of released seedlings exceeding 1.5 times the untreated seedlings (Table 1).

Untreated seedlings in Texas had significantly less survival that did seedlings receiving herbaceous weed control. The untreated seedlings in Texas had 54 percent mortality. The Arkansas site had survival rates ranging from 77 percent on untreated plots to 91 percent on a full treatment (treatment 7). The Mississippi site had survival rates ranging from 80 to 95 percent. The untreated plots had an 81 percent survival rate and the highest survival was noted on treatment 12 (Table 1).

CONCLUSIONS

Herbaceous weed control was very effective in increasing pine seedling growth at all three study locations. Height and ground line diameter growths were all greater on seedlings treated for herbaceous weed control compared to seedlings without control. Herbicide effectiveness was evident throughout the growing season as determined by the percent of bare ground and still some evidence is present during 2002.

All herbicide treatments were effective in increasing seedling growth. In Texas and Mississippi the early and full treatments were the most effective while in Arkansas, the full and late treatments appeared to show better growth compared to untreated seedlings.

Herbaceous weed control is an effective method for ensuring newly planted pine seedlings survive and gain early growth in GLD and height. Seedlings without weed control have significantly less height and GLD growth and in Texas showed very poor survival. The herbaceous weed control in Texas made the difference in a fully stocked stand when the rainfall amounts were low.

Table 1. Treatments by height growth, ground line diameter growth and survival.

Trt	Pre-emerge	Post-emerge	TX Ht	TX Gld	TX Surv
1	Untreated	Untreated	2.54 e*	0.44 e	46 d
2	Untreated	2 oz OU XP+1/2 oz ES+12 oz Eagre	3.35 d	0.78 e	79 ab
3	3 oz Oust XP	Untreated	3.92 bc	0.95 c	71 bc
4	13 oz Oustar	Untreated	4.44 ab	1.07 bc	75 abc
5	19 oz Oustar	Untreated	4.49 ab	1.06 bc	92 a
6	13 oz Oustar	½ oz Escort	4.03 bc	1.01 bc	58 cd
7	13 oz Oustar	2 oz Oust XP	4.69 a	1.23 a	90 ab
8	13 oz Oustar	12 oz Eagre	4.12 abc	0.97 bc	71 bc
9	13 oz Oustar	2 oz OU XP+1/2 oz ES+12 oz Eagre	4.06 bc	1.01 bc	79 ab
10	4 oz AR + 2 oz Oust XP	Untreated	4.67 a	1.12 ab	75 abc
11	4 oz AR + 2 oz Oust XP	2 oz OU XP+1/2 oz ES+12 oz Eagre	3.67 cd	0.93 c	83 ab
12	32 oz Velpar	2 oz OU XP+1/2 oz ES+12 oz Eagre	4.35 ab	1.13 ab	77 ab
			AR	AR	AR
Trt	Pre-emerge	Post-emerge	Ht	Gld	Surv
1	Untreated	Untreated	3.87 c	0.74 c	77 a
2	Untreated	2 oz OU XP+1/2 oz ES+12 oz Eagre	4.99 ab	1.26 a	88 a
3	3 oz Oust XP	Untreated	4.61 abc	1.03 ab	72 a
4	13 oz Oustar	Untreated	4.80 ab	1.08 ab	80 a
5	19 oz Oustar	Untreated	4.47 abc	1.06 ab	91 a
6	13 oz Oustar	½ oz Escort	5.17 ab	1.24 ab	68 a
7	13 oz Oustar	2 oz Oust XP	5.28 a	1.27 a	91 a
8	13 oz Oustar	12 oz Eagre	4.58 abc	1.08 ab	77 a
9	13 oz Oustar	2 oz OU XP+1/2 oz ES+12 oz Eagre	4.65 abc	1.16 ab	83 a
10	4 oz AR + 2 oz Oust XP	Untreated	4.38 bc	0.97 bc	75 a
11	4 oz AR + 2 oz Oust XP	2 oz OU XP+1/2 oz ES+12 oz Eagre	4.46 abc	1.13 ab	75 a
12	32 oz Velpar	2 oz OU XP+1/2 oz ES+12 oz Eagre	5.15 ab	1.29 a	80 a
			MS	MS	MS
Trt	Pre-emerge	Post-emerge	Ht	Gld	Surv
1	Untreated	Untreated	3.1 a	0.61 d	81 b
2	Untreated	2 oz OU XP+1/2 oz ES+12 oz Eagre	3.3 a	0.82 b	88 a
3	3 oz Oust XP	Untreated	3.4 a	0.80 bc	90 a
4	13 oz Oustar	Untreated	3.4 a	0.82 b	93 a
5	19 oz Oustar	Untreated	3.8 a	0.95 a	80 b
6	13 oz Oustar	½ oz Escort	3.7 a	0.95 a	93 a
7	13 oz Oustar	2 oz Oust XP	3.5 a	0.89 b	88 a
8	13 oz Oustar	12 oz Eagre	3.2 a	0.90 ab	90 a
9	13 oz Oustar	2 oz OU XP+1/2 oz ES+12 oz Eagre	3.4 a	0.92 a	87 a
10	4 oz AR + 2 oz Oust XP	Untreated	3.0 a	.078 c	96 a
11	4 oz AR + 2 oz Oust XP	2 oz OU XP+1/2 oz ES+12 oz Eagre	3.3 a	0.94 a	80 b
12	32 oz Velpar	2 oz OU XP+1/2 oz ES+12 oz Eagre	3.7 a	0.96 a	95 a

*different letters denote significant differences at the 0.5 level.

VANTAGE USE IN PINE PLANTINGS FOR BERMUDA CONTROL. J.A. Earl and R.A. Williams; Arkansas Agricultural Experiment Station and School of Forest Resources, University of Arkansas at Monticello, 71656.

ABSTRACT

Vantage and another experimental herbicide (TPX) were applied over-the-top to a second-year loblolly pine plantation in an effort to control bermudagrass. Timings varied between dual applications in May/July to single ones in June, October and November. Four replications of each treatment were sprayed at 15 gallons per acre in 5-foot bands using a pressurized backpack rig. Rainfall totals were close to average for the year, but below average through most of the growing period. There was no significant difference in height growth for the early season treatments for any of the plots. These same treatments had a significant difference in groundline diameter growth, with June Vantage and the control having smaller diameters than the rest. There are no measurements yet to compare the late-season treatments. All of these second-year trees survived at 100 percent. Brownout and bermudagrass control were not as effective as expected. The treated areas showed little or no brownout; if anything, they just seemed to have reduced biomass. Some of this poor control may be explained by below average rainfall during the growing season.

SECTION V. UTILITY, RAILROAD & HIGHWAY RIGHTS-OF-WAY, INDUSTRIAL SITES

EFFECTS OF OUTRIDER TANK-MIXED WITH ROUNDUP PRO OR MON 59166 FOR CONTROL OF JOHNSONGRASS (*Sorghum halepense*).

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ABSTRACT

Two experiments were established to evaluate Outrider tank-mixed with Roundup Pro or MON 59166 for johnsongrass control on highway rights-of-way. Applications were made using a CO_2 backpack sprayer to 18 to 24 inch tall johnsongrass. Visual ratings were made up to 3 months after treatment (MAT) in both experiments.

The first experiment was conducted at 2 locations in 2002. The purpose of this experiment was to determine if johnsongrass control would be reduced when tank-mixing Outrider and Roundup Pro. Outrider was applied at 1.33 oz/A alone or tank-mixed at the same rate with Roundup Pro at 10, 12, 14, or 16 fl oz/A. At location 1, all treatments provided similar control (58 to 70%) of johnsongrass 1 MAT. Outrider tank-mixed with Roundup Pro at 12 fl oz/A provided 73% and 63% 2 and 3 MAT, respectively, compared to Outrider alone which provided 90% and 88% 2 and 3 MAT, respectively. At location 2, all treatments provided similar control (48 to 60%) of johnsongrass 1 MAT. At 2 MAT, Outrider tank-mixed with Roundup Pro at 10 fl oz/A provided 70% control of johnsongrass, which was less compared to Outrider alone. Outrider tank-mixed with Roundup Pro at 10, 12, or 16 fl oz/A provided 55 to 70% control of johnsongrass 3 MAT. Outrider at 1.33 oz/A, at this location, provided 90% control of johnsongrass 2 or 3 MAT.

The second experiment was conducted in 2001 and 2002 to evaluate Outrider tank-mixed with MON 59166. The objective of this experiment was to evaluate lower use rates of Outrider when tank-mixed with MON 59166 for johnsongrass control. The rates of Outrider were 0.5, 0.75, or 1.0 oz/A alone or tank-mixed with MON 59166 at 0.05 or 0.1% v/v. In 2001, data indicated that Outrider at 0.5 oz/A tank-mixed with MON 59166 at 0.1% v/v, which provided 83% control of johnsongrass, provided similar control compared to Outrider at 1.0 oz/A alone, which provided 90% control of johnsongrass 2 MAT. In 2002, Outrider at 0.5 oz/A tank-mixed with MON 59166 at 0.1% v/v provided 63% control of johnsongrass, compared to Outrider at the same rate alone, which provided 40% control of johnsongrass 1 MAT. At 2 MAT, the addition of MON 59166 provided no beneficial increase for johnsongrass control.

INTEGRATED APPROACHES TO COGONGRASS [*Imperata cylindrica* (L.) Beauv.] MANAGEMENT. M.C. Barron, G.E. MacDonald, B.J. Brecke, and D.G. Shilling; Department of Agronomy, University of Florida, Gainesville, FL, 32611; West Florida Research and Education Center, Jay, FL, 32565; Mid-Florida Research and Education Center, Apopka, FL, 32703.

ABSTRACT

Cogongrass [Imperata cylindrica (L.) Beauv.], a rhizomatous perennial grass, is a serious pest in many areas and situations, covering over 500 million acres throughout the world. Cogongrass has and continues to spread rapidly throughout the southeastern U.S., covering several thousand acres in Florida, Mississippi, and Alabama. Current control strategies rely heavily on chemical control, often with little or no long-term impact. This weedy species has an extensive rhizome system that allows for persistent regrowth and spread. Desirable native species are threatened by cogongrass because of their inability to compete directly with the weed. However, it may be possible to suppress cogongrass regrowth by introducing native plants after initial chemical control measures have been employed. In doing this, factors such as discing systems and grass species will be studied as a component of long-term control of cogongrass.

In Hernando County, Florida, plots were separated into two levels, one being disced in August and the other undisced. Four treatments of herbicides were applied three months later, including glyphosate at 4.0 lb ai/A, glyphosate at 2 lb ai/A + imazapyr at 0.75 lb ai/A, imazapyr at 1.0 lb ai/A, and an untreated control. After herbicide application, three revegetation schemes were established in the plots the following spring. The grasses used were bahiagrass (*Paspalum notatum*), bermudagrass (*Cynodon dactylon*), and a native species mix (*Crotalaria lanceolata* and *Crotalaria juncea)*. Twelve months after treatment, plots sprayed with imazapyr alone or the imazapyr/glyphosate mix provided the best control of cogongrass, regardless of revegetation scheme. Discing did not influence control strategies at 12 MAT. However, at 18 MAT, the plots that were initially disced had substantially high control of cogongrass regrowth. Bahiagrass provided higher control of cogongrass than the bermuda and native mix. An additional study involved the natural recruitment patterns after cogongrass treatment with variable rates of imazapyr and imazapic. Both chemicals were overlapped at 0.25 lb ai/A, 0.5 lb ai/A, and 1.0 lb ai/A. Evaluations were taken 3 MAT, with hairy indigo (*Indigofera hirsuta*) being the predominant native species successor. Interestingly, there was little variability in the percent cover of hairy indigo throughout all rates of herbicides. This indicates that hairy indigo has a high tolerance for these two herbicides and may be a potential species used in revegetation schemes to suppress cogongrass.

MUSK THISTLE CONTROL ALONG OKLAHOMA ROADSIDES. D.P. Montgomery, L.M. Cargill and D.L. Martin; Horticulture and Landscape Architecture Department, Oklahoma State University, Stillwater, OK 74078.

ABSTRACT

Two similar studies were conducted during the spring and early summer of 2001 and 2002 in north central Oklahoma to evaluate the effects of several herbicides in controlling musk thistle (*Carduus nutans L.*). Treatments of Distinct at 2, 4 and 8 oz. prod./A, Banvel at 16 and 32 oz. prod./A, Transline at 8 oz. prod./A and Vista at 16 oz. prod./A were evaluated each year. Additional treatments of Campaign at 64 oz. prod./A alone and combined with AMS were evaluated in 2002. All treatments received the addition of a non-ionic surfactant at 0.25% V/V along with ammonium sulfate at 17 lbs./100 gallon of water. Campaign treatments did not receive additional surfactant. Treatments were applied on 5 April (2001) and 11 April (2002) to musk thistle rosettes ranging in size from 2 to 16 inches in diameter. Treatments were applied to 5 by 15 foot plots using a CO_2- pressurized bicycle sprayer calibrated to deliver 20 gallons of water per acre. Treatments were arranged in a randomized complete block design with three replications. Visual evaluations of percent musk thistle control and common bermudagrass injury were made at 1 and 2 months-after-treatment (MAT).

The current standard musk thistle control treatment in Oklahoma, Transline at 8 oz./A, has proven to consistently produce 100% control of both 1st and 2nd year musk thistle plants. The following discussion will consist of comparisons between new treatments and the standard. In 2001 treatments of Distinct at 2 oz., Banvel at 16 oz. and Vista were producing less musk thistle control (40 to 85%) when compared to Transline(99%) at 1 MAT. Higher rates of Distinct were producing 97 to 99% control while Banvel at 32 oz./A produced 93% control at 1 MAT. By 2 MAT all treatments, excluding Vista, were producing at least 97% musk thistle control. In the 2002 study Distinct at 2 oz./A was producing 79% musk thistle control while higher rates produced 97 to 98% control at 1 MAT. Treatments of Banvel produced 86 to 90% control at 1 MAT while the standard Transline produced 100% control. Vista produced 38% control and Campaign with or without ammonium sulfate produced 44 to 67% control at 1 MAT. By 2 MAT musk thistle control for all Distinct and Banvel treatments had increased to 100%. Musk thistle control for Vista had increased to 90% and Campaign treatments increased to 80 to 89% control. No common bermudagrass injury was observed for any treatments throughout the duration of the 2001 or 2002 studies.

AN UPDATE ON SERICEA LESPEDEZA (*Lespedeza cuneata* [Dumont] G. Don) CONTROL FROM ROADSIDE TRIALS IN OKLAHOMA. L.M. Cargill, D.P. Montgomery and D.L. Martin; Department of Horticulture and Landscape Architecture, Oklahoma State University, Stillwater, OK 74078.

ABSTRACT

Duplicate field experiments were conducted at four locations in north central Oklahoma during 2001 and 2002 to evaluate several postemergent herbicides for the selective control of sericea lespedeza and common bermudagrass tolerance along highway roadsides. Nine herbicide treatments were applied to sericea lespedeza plants ranging in height from 12 to 24 inches on 24 May 2001, 1 June 2001 and 31 May 2002 to plots 5 by 15 feet. Three Escort treatments were fall-applied to sericea lespedeza plants 6 to 24 inches tall on 12 September 2001 and 25 September 2002 (no data available). The Escort treated plots had been previously mowed at an approximate height of six inches with a sicklebar mower on 24 July and 3 August (2001 studies) and 23 July (2002 studies). Applications were made with a CO_2 pressurized R&D brand boom-type bicycle sprayer equipped with three TeeJet 8002 VS XR flat-fan spray tips and calibrated to deliver 20 gallons per acre at a pressure of 24 PSI. Herbicide treatments evaluated and expressed in product rates per acre, included Garlon 4 at 8.0, 16.0 and 24.0 fluid ounces; Vista at 8.0, 16.0 and 21.0 fluid ounces; Escort at 0.3, 0.5 and 1.0 ounces and Distinct at 4.0, 8.0 and l2.0 ounces. All herbicide treatments had a non-ionic surfactant and ammonium sulfate (AMS) added at a rate of 0.25% v/v and 3.4 lbs. product, respectively. Treatments were arranged in a randomized complete block design with three replications. Percent sericea lespedeza control and percent bermudagrass phytotoxicity were visually evaluated 1, 2, 3 and 12 months-after-treatment (MAT). The sericea lespedeza control ratings ranged from 0 percent or no control to 100 percent or complete eradication. Percent bermudagrass phytotoxicity ratings were scaled from 0 to 100, where 0 equals no injury and 100 equals complete brownout or complete necrosis of the bermudagrass. Only data from the two duplicate experiments conducted during 2001 will be reported, since data collection from the two duplicate experiments initiated during 2002 is incomplete. Final evaluations of the 2002 studies will be conducted in spring 2003. Common bermudagrass was present at only 1 of 2 sites and data will be reported from this one study. Data for percent sericea lespedeza control is pooled and will be presented for the 12 MAT evaluations.

Throughout the 2001 and 2002 growing seasons, no bermudagrass phytotoxicity (0% injury) was produced from any of the herbicide treatments tested in these experiments.

Excellent sericea lespedeza control was produced by the two higher rates of Garlon 4 at 16.0 fl.oz./A (91%) and 24.0 fl.oz./A (98%); the two higher rates of Vista at 16.0 fl.oz./A (96%) and 21.0 fl.oz./A (99%); and the three treatments of Escort at 0.3 oz./A (91%), 0.5 oz./A (95%) and 1.0 oz./A (96%). These treatments provided significantly better control than the remaining treatments. Only moderate sericea lespedeza control (58% to 78%) was achieved with the lowest rates of both Garlon 4 and Vista (8.0 fl.oz./A) and the two higher rates of Distinct (8.0 and 12 oz./A). Poor control of sericea lespedeza (47%) was provided by the lowest rate of Distinct (4.0 oz. /A).

EFFECT OF SPRAY SOLUTION pH and TANK-MIXES ON OUTRIDER FOR JOHNSONGRASS CONTROL. J.M. Taylor, G.E. Coats, and R.S. Wright; Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Experiments were conducted to evaluate johnsongrass control when Outrider was tank-mixed with other herbicides as well as johnsongrass control with tank-mixes of Outrider plus Roundup Pro at various spray solution pH's. In the first experiment, Outrider was applied at 1 oz pr/A alone or tank-mixed with 10 fl oz/A Transline, 2 lb ae/A 2,4-D amine, 32 fl oz/A Garlon 3A, or 16 fl oz/A Roundup Pro. Roundup Pro was also applied alone at 16 fl oz/A. All treatments with the exception of Roundup Pro alone were applied with or without a 0.125% v/v ammonium hydroxide buffer. Dyne-Amic spray additive was added to each treatment at 0.5% v/v with the exception of treatments containing Roundup Pro. Treatments were applied to 18-20 in johnsongrass (5-Lf) on June 13, 2001. The pH of the spray solutions was recorded immediately prior to application with a model AP62 Accumet portable pH meter. The pH of the water source was 7.1 prior to the addition of herbicides. With no buffer added, Outrider, alone or tank-mixed with Transline, 2,4-D amine, or Garlon 3A had a spray solution pH range of 6.8 to 7.0. Outrider plus Roundup Pro or Roundup Pro alone had a pH of 5.2. With the buffer added, spray solution pH ranged from 9.2 to 10.3. Control of johnsongrass at 92 DAT was 76% with Outrider alone. Outrider plus Transline of Garlon 3A provided 80 to 83% control. Johnsongrass control decreased to 38% when 2,4-D was added to Outrider and 55% when Roundup Pro was added to Outrider. The ammonium hydroxide buffer did not have any effect on johnsongrass control with Outrider, Outrider plus 2,4-D, or Outrider plus Roundup Pro compared to these treatments applied without buffer. Control with Outrider plus Garlon 3A with the buffer decreased to 49% compared to 83% without the buffer. At 427 DAT, control ratings were similar. In the second experiment, Outrider was applied alone at 1 oz/A or tank-mixed with 32 fl oz/A Garlon 3A or 16 fl oz/A Vista. All treatments were applied with 0.5% MON 0818 (surfactant) and treatments were applied with or without 0.1% v/v MON 59166. Johnsongrass was treated at the 6-lf stage and height averaged 12-18 in on June 19, 2002. The water source had a pH of 6.2 and the Outrider spray solution had a pH of 6.3. Outrider plus Garlon 3A or Vista had a pH of 7.4 or 7.3, respectively. When MON 59166 was added to the treatments, spray solution pH's were 7.2, 7.0, or 6.7 for Outrider, Outrider plus Garlon 3A, or Outrider plus Vista, respectively. Outrider, with or without MON 59166 controlled johnsongrass 80 to 85% 63 DAT. When Garlon 3A was added to Outrider no control was observed and control with Outrider plus Vista was 33% without MON 59166 and 55% with MON 59166. In experiment three, 1.33 oz/A Outrider, 12 fl oz/A Roundup Pro, or 1.33 oz/A plus 12 fl oz/A Outrider plus Roundup Pro were evaluated for johnsongrass control when applied at spray solution pH's of 4, 7, or 10. Spray solution pH was adjusted using sodium hydroxide or hydrochloric acid and were within 0.1 pH units of the desired pH. Treatments were applied to 24 in johnsongrass (8-lf) on June 19, 2002. The tank-mixes of Outrider plus Roundup Pro were similar to Outrider alone and pH did not have an effect on control except with Roundup Pro applied at a pH of 10. By 63 DAT, control with Roundup Pro at a pH of 10 was 28% compared to 53 to 55% with Roundup Pro applied at a pH of 4 or 7, respectively. All Outrider or Outrider plus Roundup Pro treatments provided 80 to 85% control at the same rating date.

COGONGRASS (*IMPERATA CYLINDRICA*): MANAGEMENT TACTICS ON RIGHTS-OF-WAY. W.H. Faircloth, M.G. Patterson, D.H. Teem, Auburn University, Auburn, AL; and J.H. Miller, U.S.Forest Service, Southern Research Station, Auburn, AL.

ABSTRACT

Cogongrass [*Imperata cylindrica* (L.) Beauv] is a non-native plant rapidly invading right-of-way areas throughout the Gulf coastal plain of Alabama. Cogongrass is an undesired species on highway rights-of-way due to its displacement of native and/or more manageable grasses, unsightly growth characteristic, and propensity for fire which not only poses a danger to motorists but could cause property loss to adjoining landowners. In addition, rights-of-way provide corridors to uninfested areas, therefore, expanding the range of this noxious plant. As one phase of a comprehensive cogongrass management effort, studies were begun in Alabama in the fall of 2000 to study economical methods of cogongrass control in right-of-way areas. Two projects were located on Interstate 10 in Baldwin Co., near the towns of Loxley (est. 2000) and Malbis (est. 2001). Both projects integrated chemical control with the revegetation of more desirable grass species. Herbicides used included glyphosate (2.2 lb ae/A), imazapyr (0. 75 lb ai/A), and glyphosate plus imazapyr at ½x rates. Replacement species were bahiagrass (*Paspalum notatum* var. Pensacola), common bermudagrass (*Cynodon dactylon*), and browntop millet (*Panicum ramosum*). Winter cover crops that served as soil stabilizers and also as early season competitors were crimson clover (*Trifolium incarnatum* var. AU Robin) and annual ryegrass (*Lolium multiflorum* var. Gulf). Treatments consisted of various combinations of herbicides and replacement plants with four replications: Loxley,14 treatments plus untreated check; Malbis, seven treatments plus untreated check. Studies were established in triplicate such that a time factor could be examined (i.e. all studies treated year one, two of three treated year two, and one treated year three). Plots were 10ft.x25ft. and herbicides applied at 15 GPA with an ATV-mounted CO_2 sprayer. Replacement species were broadcast at Loxley and drilled at Malbis. All treatments reduced cogongrass cover significantly from the untreated after one year of treatment, however, cogongrass remained in all plots. Imazapyr, whether alone or tankmixed with glyphosate, gave most consistent control without affecting replacement species. Imazapyr reduced cogongrass populations >80% after two years of continuous treatment. Glyphosate plus imazapyr (fall) followed by (fb) crimson clover (fall) fb glyphosate (spring) fb bahiagrass (spring) gave complete above-ground control with two years continuous treatment. The presence of a winter cover crop reduced the incidence of cogongrass versus no cover. Revegetation with bahiagrass and bermudagrass was not achieved at the Loxley location, but was more effective at the Malbis site, likely due to the drought conditions that persisted from summer 2000 through spring 2001. At least two years of continuous treatment is needed to obtain practical cogongrass control at both locations.

A third study was conducted during the summer of 2002 in Mobile Co., near Theodore, to examine the effect of intense mowing, a common form of right-of-way management, on cogongrass. Treatments consisted of a 5 (mowing) by 4 (herbicide) factorial arrangement in a RCB design. Mowing schedules were: 1x/month, 2x/month, 1x/2 months, 1x/3 months, and none. Herbicides were: glyphosate (2.2 lb ae/A), imazapyr (0.5 lb ai/A), glyphosate applied twice (1.1 lb ae/A), and none. Plots were 10ft.x20ft. and maintained for a 6 month period from May-Oct. A herbicide main effect superceded all other effects or interactions. The split application of glyphosate reduced cogongrass coverage 99% regardless of mowing treatment. Mowing alone decreased cogongrass coverage a maximum of 3%. This study will be continued in 2003.

SINGLE- AND DOUBLE-PASS HERBICIDE TREATMENTS WITH SAME SEASON PLANTING FOR YAUPON INFESTED PINE SITES IN SOUTHERN LOUISIANA. J.L. Yeiser; Arthur Temple College of Forestry, Stephen F. Austin State University, Nacogdoches, TX 75962.

ABSTRACT

Yaupon (Ilex vomitoria Ait.) is a major competitor of pines on numerous Coastal Plain sites in the SE United States. A study was initiated in 2002 near Elizabeth (Allen Parish), LA. The objective was to: (1) compare single- and double-pass site preparation treatments for controlling yaupon, and (2) document performance from same-season planting of containerized loblolly, slash, and longleaf pine seedlings. Eight treatments were tested: (1) Velpar ULW (4lb), (2) Velpar ULW (4.67lb), (3) Velpar ULW (5.33lb), (4) Velpar ULW (4lb) applied in March followed two months by a foliar spray of Weedmaster (2qt)+Escort XP (1oz), (5) Velpar ULW (4lb) applied in March followed two months by a foliar spray of DuPont Glyphosate VMF (2qt)+Improved Oust XP (2 oz), (6) Velpar ULW (4lb) applied in March followed two months by a foliar spray of Garlon 4 (2qt)+Improved Oust XP (2oz), (7) Velpar ULW (4lb) applied in March followed two months by a foliar spray of Garlon 4 (2qt)+DuPont Glyphosate VMF (2qt) and (8) untreated check. ULW was applied 8-March-02. Foliar treatments were applied on 22-May-02. Thirty days after treatment (DAT), overall, woody, southern bayberry, and yaupon exhibited 86%, 83%, 81% and 85% brownout from double-pass treatments, respectively. In this same period, single-pass treatments provided 74%, 61%, 62%, and 64% of overall, woody, southern bayberry, and yaupon. Brownout was higher 60 DAT. Herb control was excellent 30 and 60 DAT. March ULW treatments did not negatively impact December survival of June planted pine seedlings. Herbicide treatments enhanced total height for loblolly pine, ground line diameter for loblolly, slash, and longleaf pines, and volume index for slash and loblolly pines. March Velpar ULW treatments followed by May foliar treatments (double-pass) and planting with containerized seedlings two weeks later is a viable option for treating yaupon and regenerating loamy soils in southern Louisiana.

INTRODUCTION

Yaupon is an evergreen shrub or small tree ranging along the Coastal Plain from Arkansas and Texas east to Florida and Virginia. It often forms dense impenetrable thickets with a single tall stem above numerous short, root-originating sprouts. Its largest size is in the East Texas bottomlands. Yaupon is often found growing in low moist forests with slash pine and moderately well drained sites with loblolly pine.

Yaupon is thought to be a major consumer of water and nutrients, thus managers seek its control for enhanced pine production. The objective of this study is to compare (1) single- and double-pass herbicide treatments for yaupon control and (2) the performance of containerized loblolly, slash, and longleaf pine seedlings planted two months following herbicide application.

METHODS AND MATERIALS

A site in southern Louisiana near Elizabeth (Allen Parish) was selected for testing. The Lower Coastal Plain site was moderately well drained. Soil was loam over a silty clay loam. The site supported a mixed slash pine hardwood stand prior to clearcutting in the January of 2001.

Major vegetation on this site was: Woody Arborescent—sassafras (Sassafras albidum (Nutt.) Nees), common persimmon (Diospyros virginiana L.), sweetgum (Liquidambar styraciflua L), red maple (Acer rubrum L.) and ash (Fraxinus spp); Shrub—yaupon, southern bayberry (Myrica cerifera L.), vaccinium (Vaccinium spp), and American beautyberry (Calicarpa americana L.); Bramble—blackberry (Rubus spp.); Grass—purple lovegrass (Eragrostis spectabillis (Pursh) Steud.), panicums (Dichanthelium spp), sedges (Cyperus spp), common broomsedge (Andropogon virginicus L.), and Florida paspalum (Paspalum floridanum Michx.);

Forb—common ragweed (Ambrosia artemisiifolia L.) , small-headed goldenrod (Euthamia tenuifolia (Pursh) Greene), and wooly croton (Croton capitatus var. capitatus). This site was selected for testing because of the yaupon and southern bayberry that dominated the site.

Treatment plots were 100 ft by 30 ft. The measurement plot was 80 ft by 10 ft, and centered internally within the treatment plot.

A modified backpack mist blower was used to apply Velpar ULW on 8-March-02. A backpack CO_2 aerial simulator supporting a single, KLC9 flood nozzle approximately 12 ft above the ground was used to broadcast foliar herbicides in 22-May-02 at a total volume of 10 GPA. Available foliage for herbicide uptake was poor (15% foliated), as woody plants were commonly between defoliations. A single pass was used to apply ULW and a second single pass was used to spray liquid herbicide. Herbicide treatments are presented in Table 1. Dupont Glyphosate VMF contains glyphosate without any surfactant. Optima is a 90%, nonionic surfactant made by Helena. Weedmaster is manufactured by BASF and contains 16% dicamba and 36% 2,4-D. Soil moisture was excellent on application day.

Containerized (6 in plugs from Meek's Farms, Kite, GA) loblolly, slash, and longleaf pine seedlings were planted in measurement plots 6-Jun-02, approximately two weeks following the foliar application. Initial total height (cm) and ground line diameter (mm) were recorded the next weekend. Moisture was somewhat moderate on planting day.

Measurement plots were visually evaluated for brownout 30 and 60 days after treatment (DAT). Seedling survival was recorded after 30 and 60 DAT. Survival (%), total height (cm), and ground line diameter (mm) were determined after one growing season. Seedling volume index was computed as total height X ground line diameter^2 and expressed in ft^3.

RESULTS AND DISCUSSION

Overall brownout of all species 30 DAT, was greater for double-pass treatments containing Garlon and VMF and the high rate of ULW alone (5.33 lb) than other test treatments (Table 1). Significantly less brownout resulted from the double-pass treatment containing Weedmaster+Escort than other double-pass treatments. Least overall brownout resulted from single-pass treatments of ULW (4 lb; 4.67 lb). Sixty DAT, brownout was similar for most treatments with double-pass treatments and the high rate of ULW (5.33 lb) providing more brownout than the low rate of ULW (4 lb).

Woody species 30 DAT were browned more by double-pass treatments, with the exception of Weedmaster+Escort, than single-pass treatments (Table 1). Intermediate brownout resulted from the high rate of ULW (5.33 lb) and the double-pass treatment containing Weedmaster+Escort. Least brownout resulted from a single-pass of ULW (4 lb; 4.67 lb). By 60 DAT, brownout was similar for all woody species.

Southern bayberry, 30 DAT, exhibited greatest brownout if treated with double-pass treatments containing Garlon and VMF, intermediate brownout if treated with ULW (5.33 lb), and least brownout with a double-pass treatment containing Weedmast+Escort or single-pass treatments of ULW (4 lb; 4.67 lb) (Table 1). By 60 DAT, the double-pass treatments containing Garlon or VMF provided more brownout of southern bayberry than a single-pass treatment of ULW (4 lb).

Thirty DAT, yaupon brownout occurred in three distinct groups: (1) greatest brownout resulted from double-pass treatments containing Garlon and VMF, (2) intermediate brownout was achieved with ULW (5.33 lb) and a double-pass treatment containing Weedmaster+Escort, and (3) least brownout occurred from a single-pass treatment of ULW (4 lb; 4.67 lb) (Table 1). By 60 DAT, the double-pass treatments and the high rate of ULW (5.33 lb) exhibited greater brownout than the single-pass treatment of ULW (4 lb).

Differences in aforementioned brownout were partly a function of time since treatment and the modes of action. Hexazinone defoliated individual rootstocks at different times, the liquid spray (double-pass treatments) contributed to browning of the leaves present on application day with Garlon browning more rapidly than VMF or Weedmaster combinations. Single-pass treatments did not have this opportunity. Furthermore, foliage was estimated at about 15% of normal when the liquid sprays were applied. This will likely influence future stem reduction since these liquid test herbicides have little soil active. Brownout for species groups (Overall and Woody) was influenced by composition. For example, the contribution of liquid sprays to American beautyberry, Vaccinium, persimmon, and sassafras brownout was important since ULW browned these species very little.

Thirty DAT, control of all herbs was excellent for all treatments (Table 1). Some minor statistical differences were detected but these are probably not of biological significance. For example, single- and double-pass treatments averaged 95 and 91, 95 and 92, and 95 and 92 percent control for all herbs, grass, and forbs, respectively. Sixty DAT, differences decreased as no statistical differences were detected for all herbs and grass. Only minor differences were detected for forbs. Here, single-pass (91%) provided less control than double-pass (99%) treatments.

Survival was not negatively impacted by March-applied, site-preparation rates of ULW (Table 2). Loblolly, slash, and longleaf pine survival on checks was intermediate and commonly similar with survival for all herbicide treatments. Therefore, survival on herbicide plots was no worse than plots without herbicide. The significant increase in survival often associated with herbaceous weed control about newly planted seedlings was not detected. Perhaps this was partly due to the high survival after one growing season of check seedlings for longleaf (91%). This explanation is not valid for slash (82%), and loblolly (77%) pines. Survival data may reflect worse case conditions in that significant rainfall occurred shortly after planting (Figure 1). Soils were saturated with puddling. Conditions were ideal for herbicide movement. Had hazardous levels of hexazinone still existed in plots, water movement would likely have contributed to higher mortality.

Double- and single-pass treatments provided similar growth (Table 2). For example, loblolly pine total height and ground line diameter were 1.42 ft and 0.37 in for double-pass and 1.36 ft and 0.31 in, for single-pass, respectively. Values for the same seedling parameter are very similar. For loblolly, slash, and longleaf pines, double-pass treatments had growth values that were numerically greater than single-pass, but not statistically different. Growth will be monitored over time. Table 2 illustrates the closeness of treatment means and allows managers the opportunity to review treatments of particular interest.

Herbicide treated seedlings out performed untreated checks (Table 3). For example, weed control with herbicides enhanced total height for loblolly pine, ground line diameter for loblolly, slash, and longleaf pines, and volume index for loblolly and slash pines. Furthermore, herbicide treated loblolly seedlings averaged 1.4 ft in total height while checks averaged 1.1 ft. Ground line diameter for loblolly was 0.35 in if herbicide treated and 0.22 in if not treated. For slash pines, total height and ground line diameter for treated plots were 1.6 ft and 0.41 in while untreated plots exhibited 1.5 ft and 0.27 in, respectively. Ground line diameter for longleaf seedlings on herbicide treated plots was 0.65 in and for check plots 0.47 in. These values consistently show significant increases in growth. This indicates pine tolerance was adequate for single- and double-pass test treatments. In conclusion, March Velpar ULW treatments followed by May foliar treatments (double-pass) and planting with containerized seedlings two weeks later is a viable option for treating yaupon and regenerating loamy soils in southern Louisiana.

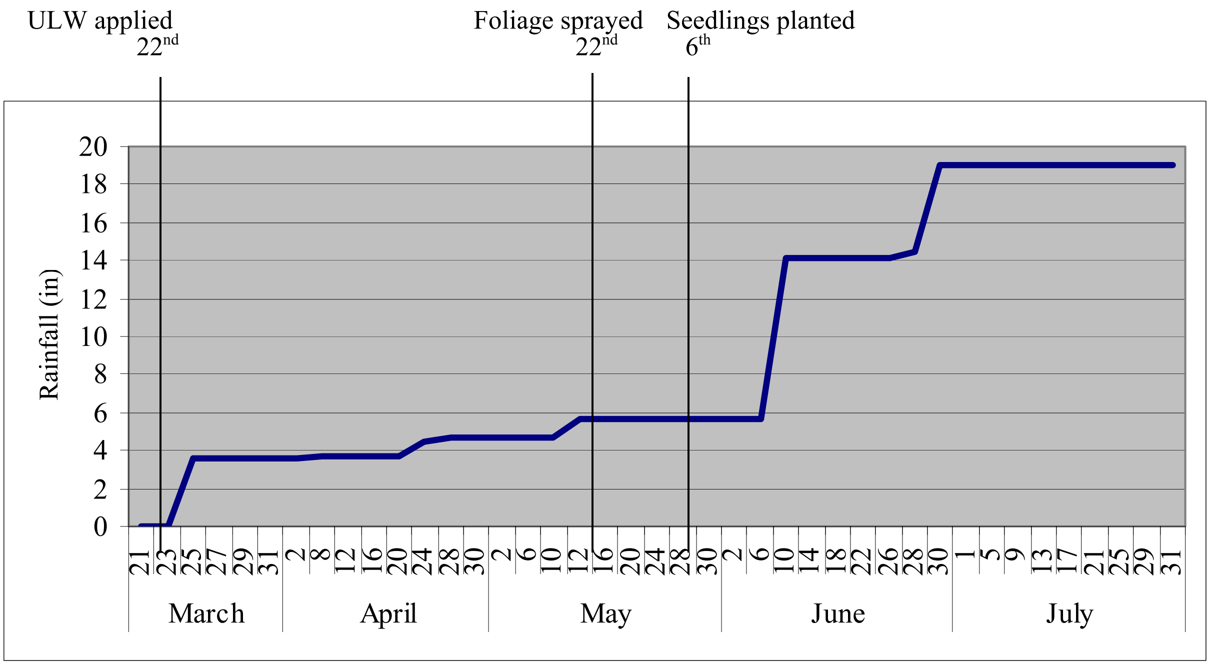

Figure 1. Precipitation 21-March through 31-July of 2002 for the study of yaupon control integrated with same-season planting near Elizabeth (Allen Parish), LA.

Table 1. Brownout for all (overall), woody, southern bayberry, and yaupon species as well as control of all herbs, grass, and forbs 30 and 60 days after treatment (DAT) with single- and double-pass site preparation treatments on a slash pine site near Elizabeth, LA.

HERB-ICIDE[1]	HERB-ICIDE[2]	HERB-ICIDE[2]	HERB-ICIDE[2]	OVERALL		WOODY		SOUTHERN BAYBERRY		YAUPON	
30 DAT (22-Jun-02)											
ULW 4lb	VMF[4] 2q	Oust[4] 2oz	Opt[4] 1q	88	a[3]	88	a[3]	88	a[3]	88	a[3]
ULW 4lb	VMF 2q	Gar 4	Opt 1q	88	a	88	a	88	a	88	a
ULW 4lb	Gar[4] 4 2q	Oust 2oz	Opt 1q	88	a	88	a	88	a	88	a
ULW 5.33lb	None			85	a	68	b	70	b	75	b
ULW 4lb	Weed[4] 2q	Escort 1oz	Opt 1q	78	b	68	b	58	c	75	b
ULW 4.67lb	None			68	c	58	c	58	c	58	c
ULW 4lb	None			68	c	58	c	58	c	58	c
60 DAT (23-Jul-02)											
ULW 4lb	VMF 2q	Oust 2oz	Opt 1q	92	a	92	a	99	a	97	a
ULW 4lb	VMF 2q	Gar 4	Opt 1q	98	a	95	a	99	a	98	a
ULW 4lb	Gar 4 2q	Oust 2oz	Opt 1q	92	a	86	a	99	a	95	a
UL 5.33lb	None			93	a	88	a	94	ab	95	a
ULW 4lb	Weed 2q	Escort 1oz	Opt 1q	90	a	91	a	92	ab	92	a
ULW 4.67lb	None			83	ab	80	a	90	ab	87	ab
ULW 4lb	None			73	b	73	a	70	b	73	b

				ALL HERBS		GRASS		FORBS	
30 DAT (22-Jun-02)									
ULW 4lb	VMF[4] 2q	Oust[4] 2oz	Opt[4] 1q	96	a[3]	96	ab[3]	96	ab[3]
ULW 4lb	VMF 2q	Gar 4	Opt 1q	95	ab	95	ab	95	ab
ULW 4lb	Gar[4] 4 2q	Oust 2oz	Opt 1q	99	a	99	a	99	a
ULW 5.33lb	None			95	ab	95	b	95	ab
ULW 4lb	Weed[4] 2q	Escort 1oz	Opt 1q	90	bc	90	c	88	c
ULW 4.67lb	None			90	bc	90	c	90	c
ULW 4lb	None			88	c	90	c	92	bc
60 DAT (23-Jul-02)									
ULW 4lb	VMF 2q	Oust 2oz	Opt 1q	96	a	93	a	99	a
ULW 4lb	VMF 2q	Gar 4	Opt 1q	99	a	99	a	99	a
ULW 4lb	Gar 4 2q	Oust 2oz	Opt 1q	99	a	99	a	99	a
ULW 5.33lb	None			94	a	93	a	96	ab
ULW 4lb	Weed 2q	Escort 1oz	Opt 1q	99	a	99	a	99	a
ULW 4.67lb	None			93	a	93	a	93	ab
ULW 4lb	None			83	a	83	a	83	b

[1] Velpar ULW was applied 8-Mar-02 to the soil.
[2] This was part of a tank mix applied 22-May-02 to the foliage.
[3] Treatment means within a column sharing the same letter are not significantly different (Duncan's New Multiple Range test ($p \leq 0.05$).
[4] VMF=DuPont Glyphosate VMF; Opt=Optima; Gar 4=Garlon 4; Weed=Weedmaster.

Table 2. Herbicide treatment and containerized seedling survival (%) 30 and 60 days after application of liquid herbicides and after one growing season (S1, %).

HERB-ICIDE[1] lb ac^{-1}	HERB-ICIDE[2] q ac^{-1}	HERB-ICIDE[2]	HERB-ICIDE[2] v/v	LOBLOLLY[3]			SLASH[3]			LONGLEAF[3]		
				S30	S60	S1	S30	S60	S1	S30	S60	S1
ULW 4	Weed[4] 2	Escort 1oz	Opt[4] 1q	98a	91a	91a	89ab	82ab	82ab	100a	100a	98a
ULW 4	VMF[4] 2	Gar 4	Opt 1q	89ab	78ab	80ab	89ab	62b	64b	98a	96ab	91ab
ULW 4	Gar[4] 4 2	Oust 2oz	Opt 1q	80bc	69b	69b	78b	62b	64b	98a	80c	80b
Check	None			79bc	79ab	77ab	93ab	82ab	82ab	98a	98a	91ab
ULW 5.33	None			78bc	64b	64b	82ab	64b	64b	100a	89abc	87ab
ULW 4	VMF 2	Oust 2oz	Opt 1q	76bc	71b	71b	89ab	80ab	80ab	98a	89abc	84ab
ULW 4	None			71bc	67b	64b	98a	91a	91a	100a	93ab	91ab
ULW 4.67	None			67c	62b	60b	87ab	64b	67b	98a	84bc	84ab

[1] Velpar ULW was applied 8-Mar-02 to the soil.
[2] This was part of a tank mix applied 22-May-02 to the hardwood foliage.
[3] Treatment means within a column sharing the same letter are not significantly different (Duncan's New Multiple Range test ($p \leq 0.05$).
[4] Weed=Weedmaster; VMF=DuPont Glyphosate VMF; Gar 4=Garlon 4; Opt=Optima.

Table 3. Herbicide treatment, containerized seedling total height (H, ft), ground line diameter (GLD, in) and volume index (V, X10^{-2} ft^3) after one growing season.

HERB-ICIDE[1] lb ac^{-1}	HERB-ICIDE[2] q ac^{-1}	HERB-ICIDE[2]	HERB-ICIDE[2] v/v	LOBLOLLY[3]			SLASH[3]			LONGLEAF[3]	
				H[3]	GLD[3]	V[3]	H[3]	GLD[3]	V[3]	H[3]	GLD[3]
ULW 4	Weed[4] 2	Escort 1oz	Opt[4] 1q	1.40ab	.35bcd	.14bc	1.55bc	.41bc	.19b	.13ab	.63ab
ULW 4	VMF[4] 2	Oust 2oz	Opt 1q	1.47a	.41a	.20a	1.61abc	.38c	.20b	.15a	.71a
ULW 4	Gar[4] 4 2	Oust 2oz	Opt 1q	1.35ab	.36bc	.14bc	1.68ab	.45ab	.27a	.14ab	.70a
ULW 4	VMF 2	Gar 4 2q	Opt 1q	1.47a	.37ab	.16ab	1.72a	.49a	.31a	.13ab	.69a
ULW 4	None	None	None	1.37ab	.32de	.11bc	1.58abc	.39c	.19b	.13ab	.66a
ULW 4.67	None	None	None	1.30b	.30e	.10c	1.57abc	.38c	.19b	.13ab	.55bc
ULW 5.33	None	None	None	1.42ab	.32cde	.12bc	1.67ab	.38c	.19b	.16a	.62ab
Check	None	None	None	1.12c	.22f	.04d	1.49c	.27d	.09c	.10b	.47c

[1] Velpar ULW was applied 8-Mar-02 to the soil.
[2] This was part of a tank mix applied 22-May-02 to the hardwood foliage.
[3] Treatment means within a column sharing the same letter are not significantly different (Duncan's New Multiple Range test ($p \leq 0.05$).
[4] Weed=Weedmaster; VMF=DuPont Glyphosate VMF; Gar 4=Garlon 4; Opt=Optima.

SECTION VI. PHYSIOLOGICAL AND BIOLOGICAL ASPECTS OF WEED CONTROL

CHARACTERIZATION OF PUTATIVE HYBRIDS BETWEEN IMAZETHAPYR RESISTANT RICE AND RED RICE (*ORYZA SATIVA* L.). V.K. Shivrain, N.R. Burgos, E.N. Stiers, K.A.K. Moldenhauer, and D.R. Gealy; Department of Crop, Soil and Environmental Sciences, University of Arkansas, AR 72701 and USDA-ARS, Dale Bumpers - National Rice Research Center, Stuttgart, AR 72160.

ABSTRACT

Red rice has been recognized as a weed of rice since 1846. Despite many approaches and methods for management and control, red rice continues to be the major problem, in rice-growing areas of Arkansas, Louisiana, Texas, Missouri and Mississippi. Herbicide-resistant rice is a new technology for the control of red rice, but it has raised some ecological concerns.

Red rice and rice belongs to the same genus and species. Both are self pollinated plants, but some outcrossing between rice and red rice has been documented. Due to outcrossing there are chances of resistant gene transfer from herbicide-resistant rice to red rice, which may increase the weediness of red rice. In 2000 simultaneous flowering was observed between CL2551 and red rice at the RREC, Stuttgart, AR. In 2001 the same field was prepared conventionally and natural population of red rice was sprayed three times with imazethapyr @ 0.07 kg/ha. Seven hundred twenty plants (F1) survived these applications, and 283 plants (39%) were presumed crosses. These plants had either vegetative or seed characteristics somewhere in between red rice and resistant rice. One hundred fifty eight F1 plants were selected from the above mentioned plants, and classified in eight different categories on the basis of their phenotypes. Of 158 F1 plants 54% had pale, rough, and droopy leaves (PRD); 10% pale, rough, and erect (PRE); 12% pale, smooth, and droopy (PSD); 2% pale, smooth, and erect (PSE); 5% green, smooth, and erect (GSE); 3% green, smooth, and droopy (GSD); 9% green, rough, and erect (GRE); 5% green, rough, and droopy (GRD). F2 seed from these plants was classified under four major categories: 54% as pubescent, red, and medium sized; 10% pubescent, tawny, and medium; 10% pubescent, white and medium; 9% glabrous, red and medium sized, and 17% under various smaller categories. In total, 81% seeds were pubescent and 19% were glabrous whereas, 67% were red, 19% tawny, and 14% white.

A field experiment was conducted in 2002 to compare the morphological and phenological characteristics of presumed crosses from the above mentioned entries at RREC, Stuttgart, AR. One hundred fifty seeds from each plant were planted in four- row plots measuring 1.5 X 6m. Stuttgart strawhull and Clearfield® rice were used as standards. All plots except red rice plot were sprayed 3 times with imazethapyr @ 0.07kg/ha at 3,4 and 5 WAP. Twenty F2 plants/plot were selected for characterization and were placed in 12 categories. Thirty one percent of characterized F2 plants had leaves that were intermediate between green and pale, rough, and droopy (IRD); 16% intermediate color, rough, and erect (IRE); 14% GRD, 12% PRD, 8% GRE, 6% intermediate color, smooth, and droopy (ISD); 4% intermediate, smooth, and erect (ISE); 3% PRE, 1% PSD, 1% PSE, 2% of GSE and GSD. F2 plants from the F1 PRD group fell under the following groups: 39% IRD, 17% IRE, 17% PRD, 8% GRD, 5% GRE, 4% PRE and ISD; 1% PSD, PSE, GSE, and GSD. Fifty two percent seeds from the above mentioned plants were pubescent, red, and medium; 10% Pubescent, tawny and medium; 11% pubescent, white, and long, 10% pubescent, tawny, and medium, 9% glabrous, red and medium, 7% pubescent, red, and long remaining 12% were in different samll categories. Clearfield® rice had 19 tillers on average whereas, red rice produced forty tillers per plant. Plants under the PRD, PRE, PSD, PSE, and GRD categories were similar to red rice in tiller production. GSE, and GSD F2 plants produced 26 and 30 tillers respectively, whereas GRE had the highest tillers with 47 tillers per plant. The height of Clearfield® rice was 81cm and that of red rice was 145 cm. All F2 plants in the above mentioned categories were intermediate in height (100-130cm). Seventy two

percent of F3 seeds were pubescent, and 28% were glabrous; 69% were red, 24% white, and 7% were tawny in color. Two percent F3 plants flowered 11WAP. Thirty percent of all the plants flowered 13 WAP. In this period 50% of Clearfield® rice and 10% of red rice flowered. Of all the F2 plants 60% flowered 14 WAP. At this time 50% of Clearfield® rice and 90% of red rice flowered. Eight percent plants did not flowered. Majority of herbicide-resistant F2 plants and their seed maintained weedy characteristics from red rice. There was also synchronization in flowering between Clearfield® rice, red rice, and the crosses. The presence of herbicide resistant gene in red rice still needs to be confirmed at molecular level.

EFFECT OF GLYPHOSATE ON POLLINATION AND SEED SET IN GLYPHOSATE-RESISTANT CORN. W.E. Thomas, W.A. Pline*, J.W. Wilcut, K.L. Edmisten, J.F. Thomas, and R. Wells; Department of Crop Science, North Carolina State University, Raleigh, NC; * Lead Characterisation, Syngenta, Bracknell, Berkshire, UK.

ABSTRACT

Recent research has shown that registered and non-registered glyphosate treatments to glyphosate-resistant cotton can negatively affect floral morphology and pollen viability. Therefore, similar experiments using glyphosate-resistant corn were designed to evaluate its reproductive response to registered and non-registered treatments. Experiments were conducted in the North Carolina State University Phytotron and field locations in Clayton, Rocky Mount, and Lewiston-Woodville, NC with varieties represented from both resistance events, GA21 and CP4-EPSPS. All glyphosate treatments were applied at 1.12 kg ai/ha. Glyphosate can be applied up to the V8 stage or 30 inches in corn height according to the supplemental label. Treatments for phytotron studies included an untreated check, a V6 foliar (POST) application, a V10 POST, and a V6 POST followed by (fb) a V10 POST. For the field trials, treatments included untreated check, V4 POST, V8 POST, V4 fb V8 POST, V4 fb V10 POST, and V4 POST fb V10 postemergence directed (PDS). Alexander's stain was used to estimate pollen viability in all trials. Phytotron experiments showed that glyphosate treatments applied after the V4 stage negatively influenced total pollen production and pollen viability. Pollen viability for treatments later than V6 growth stage were reduced by more than 35% in both varieties. Pollen and anther production for treatments later than the V6 growth stage was reduced by 35 and 50% for varieties containing the CP4-EPSPS and GA21 events, respectively. In field trials, pollen viability was significantly reduced in both varieties with any herbicide treatment after V4. The GA21-event variety had greater pollen viability than the CP4-EPSPS-event variety with glyphosate treatments at V8 POST, V4+V8 POST, and V4+V10 POST. Scanning electron (SEM) and transmission electron microscopy (TEM) techniques were used to evaluate differences in pollen anatomy. Both techniques showed distinct differences among the treatments with reduced pollen viability. SEM showed external surface abnormalities while TEM revealed internal changes in pollen structure and composition. The untreated check and the V4 treatment were not significantly different in pollen viability, pollen and anther production, and visual electron microscopy evaluations. We conclude that glyphosate treatments applied between emergence and the V4 stage will not have a negative effect on pollen viability or pollen and anther production.

THE INFLUENCE OF GLYPHOSATE ON FRUIT RETENTION IN ROUNDUP READY COTTON. J.C. Sanders, D.B. Reynolds, L.T. Barber, and M.T. Kirkpatrick. Mississippi State University. Mississippi State, MS 39762.

ABSTRACT

Approximately 86% of the Mississippi cotton acreage in 2002 was Roundup Ready. This high percentage indicates how well farmers have accepted Roundup Ready technology as a weed management tool despite current limitations, such as the over-the-top application cutoff at the 4-leaf stage to prevent injury. Concerns regarding topical and post-directed tolerance continue to be investigated, and results have been variable. The utility of Roundup Ready technology would be enhanced with the ability to topically apply glyphosate to cotton after the 4-leaf stage and thus increase production flexibility.

The effect of glyphosate rate and placement (topical vs. post directed) on fruit retention, and yield of Roundup Ready cotton was evaluated in experiments conducted in 2001 and 2002 at the Plant Science Research Center, Starkville, MS and the Black Belt Branch Experiment Station, Brooksville, MS. Plots were 40 ft long by 26 ft wide. The cotton variety planted at both locations both years was Stoneville 4892 BG/RR. Data collected included plant mapping at squaring and maturity, and yield. Treatments consisted of 0.75 and 1.5 lb ae/A glyphosate, which correspond to 1 and 2X the maximum rate currently labeled. Two treatment regimes were followed for each of the previously defined rates. The first regime consisted of four topical applications at the 1-, 4-, 8-, and 14-leaf stages. The second regime consisted of topical applications at the 1 and 4 leaf stages followed by post directed applications at the 8- and 14-leaf stages. An untreated control was also included in the experiment.

Plant mapping data at squaring indicated 91% square retention with no differences among treatments at either location or year. Mapping data at maturity indicated that at 1.5 lb/A, applied as 4 topical applications, early-season boll retention at nodes 6 to 10 decreased 18 to 31% when compared to the untreated at both locations both years. With this same treatment, percent boll retention at nodes 16 to 20 in Brooksville in 2001 and Starkville 2002 increased 20% and 28%, respectively, when compared to the untreated. Additionally, this treatment reduced seed cotton yield at Brooksville in 2001 and 2002 1503 and 612 lbs/A, respectively, when compared to the untreated. Cotton plants attempted to compensate for glyphosate-induced early-season fruit loss by setting late-season fruit. Compensatory fruit set may minimize early-season fruit losses as indicated by the mapping data at maturity, if late-season growing conditions are favorable. The yield data at Brooksville in 2001and 2002 indicates the possibility that cotton cannot achieve full compensation for early-season glyphosate-induced fruit loss, even with favorable weather conditions present late in the growing season. These data also indicate that square retention is not a good indicator of subsequent boll shed and yield loss from off-label topical applications of glyphosate.

BIOLOGY OF SLENDER AMARANTH SEED GERMINATION. W.E. Thomas, J.F. Spears, I.C. Burke, and J.W. Wilcut; Department of Crop Science, North Carolina State University, Raleigh, NC.

ABSTRACT

Slender amaranth (*Amaranthus viridis*) germination was evaluated for its response to environmental conditions including temperature, moisture stress, depth of emergence, and solution pH. Seed were collected from the Central Crops Research Station in Clayton, NC in 1999. Temperature response was measured using a series of constant temperature regimes of 15, 20, 25, 30, 35, and 40 C and alternating day/night regimes of 35/20, 30/20, 30/15, and 25/10 C. Osmotic potentials of 0, -0.3, -0.4, -0.6, -0.9, and –1.2 MPa and pHs of 3, 4, 5, 6, 7, 8, and 9 were evaluated in all alternating temperature regimes. Depth of emergence was evaluated at 0, 0.5, 1, 2, 4, and 6 cm. Initial experiments under constant temperature regimes indicated that 30 C was the optimum temperature for germination. Cumulative germination at 21days was 80, 82, 84, and 77% for alternating temperature regimes of 35/20, 30/20, 30/15, and 25/10 C, respectively. Slender amaranth preferred acidic growing conditions yet were able to overcome basic conditions in a 35/20 C germination environment with germination greater than 50% at all evaluated solution pHs. As with other *Amaranthus sp*., germination declined in all temperature regimes with increasing water stress. Germination in the 35/20 C regime was reduced by 43 and 89 percentage points with osmotic potentials of –0.3 and -.04 compared to deionized water, respectively. Since slender amaranth is a small seeded broadleaf, its germination and emergence is greatly influence by planting depth. It emerged from all evaluated depths with the optimal depth being 0 (on the soil surface) to 2 cm planting depth. Therefore, slender amaranth has the capability of germinating in a wide array of environmental conditions and likely will germinate throughout an extended portion of the growing season. These attributes coupled with tolerance to a number of postemergence herbicides will likely result in this weed becoming more problematic in the southern region.

HERBICIDE IMPACTS ON TOMATO SPOTTED WILT VIRUS IN PEANUT. *(ARACHIS HYPOGAEA*). N.P. Shaikh, G.E. MacDonald and B.J. Brecke, Department of Agronomy, University of Florida, Gainesville, FL, 32611

ABSTRACT

Field studies were conducted to investigate the effect of several pre and post emergence herbicides on the incidence of tomato spotted wilt virus (TSWV) in peanut. Studies were conducted at Gainesville and Marianna FL, in 2001 and 2002. All studies were planted within the first two weeks of May and utilized the variety “Georgia Green”. Plots were maintained weed-free throughout the study period. The insecticide phorate was applied in-furrow at the time planting at 1.0 lbs ai/A. Pre-emergence herbicides included flumioxazin, metolachlor, diclosulam, imazethapyr, norflurazon, prometryn, and oxyfluorfen applied at 0.094, 0.9, 0.023, 0.063, 1.2, 1.25, 0.2 lb ai/A, respectively. An untreated control was also included. Post-emergence herbicide treatments consisted of paraquat + (bentazon + acifluorfen), paraquat + bentazon, paraquat + bentazon + metolachlor applied at cracking at 0.125 + (0.5+0.25), 0.125 + 0.5, 0.125 + 0.5+0.9 lb ai/A, respectively. Imazapic, (bentazon + acifluorfen) + 2,4-DB, pyridate + 2,4-DB and imazapic + 2,4-DB were applied post-emergence at 0.063, (0.5+0.25) + 0.2, 0.9 + 0.2, 0.063 + 0.2 lb ai/A, respectively. An untreated control was also included. Visual observations of tomato spotted wilt virus incidence were taken at mid-season and prior to harvest. Peanut yield (lb/A) was determined for all studies. In the pre-emergence herbicide experiment in Gainesville in 2001 and 2002 there was no significant difference in the incidence of TSWV and peanut yield for all treatments in both years. In the pre-emergence herbicide experiment in Marianna in 2001, there was higher TSWV incidence in norflurazon and metolachlor treated peanut compared to control. The yield of diclosulam was at par to control whereas the yields of all other treatments were significantly lower compared to control. In Marianna in 2002 there was a greater overall incidence of TSWV, but all the treatments were at par for TSWV and yield. In post emergence herbicide experiments the TSWV incidence was higher in paraquat + (bentazon + acifluorfen) and (bentazon + acifluorfen) + 2,4-DB compared to control at Gainesville in 2002. However the yield was at par for all treatments. In Marianna, the incidence of TSWV was significantly higher for (bentazon + acifluorfen) + 2,4-DB compared to pyridate +2,4-DB and all other treatments were at par to control. The yields for all the treatments were at par. These studies indicate that the different pre and post herbicides tested did not influence the incidence of TSWV and yield.

PHYSIOLOGICAL BEHAVIOR OF ROOT-ABSORBED FLUMIOXAZIN IN PEANUT, IVYLEAF MORNINGGLORY, AND SICKLEPOD. A.J. Price, J.W. Wilcut, and J.R. Cranmer, North Carolina State University and Valent USA.

ABSTRACT

Previous research has shown that flumioxazin has the potential to cause peanut injury. In response to this concern, laboratory experiments were conducted to investigate the influence of temperature on flumioxazin-treated peanut seed germination. Also, greenhouse experiments were investigated the influence of six different irrigation intervals after soil-applied flumioxazin preemergence (PRE) application on peanut emergence and injury. Laboratory experiments utilizing ^{14}C-flumioxazin were also conducted to investigate differential tolerances exhibited by peanut, ivyleaf morningglory, and sicklepod to flumioxazin. Flumioxazin treatments containing either water dispersible granular (WDG) or wettable powder (WP) formulation at 1.4 µmol/L did not influence germination compared to non-treated peanut across all temperature regimes. Peanut treated with a WDG or a WP formulation of flumioxazin PRE and receiving irrigation at emergence and at 2 and 4 d after emergence were injured between 40 and 60%, while peanut treated at 8 and 12 d after emergence were injured between 25 and 15%, respectively. Total ^{14}C absorbed by ivyleaf morningglory was 57% of applied while sicklepod absorbed 46%, at 72 hours after treatment (HAT). Peanut absorbed > 74% of applied ^{14}C 72 HAT. A majority of absorbed ^{14}C remained in roots for sicklepod, ivyleaf morningglory, and peanut at all harvest times. Ivyleaf morningglory contained 41% of the parent herbicide 72 HAT while sicklepod and peanut contained only 24 and 11% parent compound, respectively. Regression slopes indicated slower metabolism by ivyleaf morningglory compared to sicklepod and peanut.

PHYSIOLOGICAL AND MORPHOLOGICAL RESPONSE OF GLYPHOSATE-RESISTANT AND NON-GLYPHOSATE-RESISTANT COTTON SEEDLINGS TO ROOT-ABSORBED GLYPHOSATE. J.W. Wilcut, W.A. Pline, K.L. Edmisten, and R. Wells; North Carolina State University, Raleigh, NC; Syngenta Crop Protection, Bracknell, Berkshire, UK.

ABSTRACT

The level of tolerance in herbicide-resistant plants may vary among different tissues or growth stages. Studies were conducted to determine relative tissue sensitivity in glyphosate-resistant (GR) and non-GR cotton seedlings to the herbicide glyphosate (Roundup). Glyphosate is often applied as a pre-plant treatment in minimal tillage cotton production systems to remove any unwanted, emerged vegetation. Timing of these glyphosate applications may be in close proximity to the time of planting and seedling emergence. As glyphosate leaches from roots of nearby senescing weeds, it may be absorbed into the roots of cotton seedlings. Therefore, cotton seedlings were grown in hydroponic solutions containing technical grade glyphosate to ensure constant exposure to glyphosate. In all tissues, GR cotton required a greater concentration of glyphosate to reach 50% fresh weight reduction than non-GR cotton. Glyphosate inhibited the growth on non-GR cotton cotyledons, hypocotyls, and roots 50% at concentrations of 23, 69, and 27 μM glyphosate, respectively. In contrast, growth of GR cotton cotyledons, hypocotyls, and roots was inhibited by 50% at 3.5-, 8-, and 5-fold greater glyphosate concentrations, respectively, than non-GR cotton tissues. Correspondingly, shikimic acid, an intermediate in the shikimic acid pathway, which accumulates upon 5-enolpyruvyl 3-shikimate phosphate synthase (EPSP synthase) inhibition, reached levels of 17.3, 21.6, and 8.8 μM g-1 fresh weight at 1 mM glyphosate in non-GR cotyledons, hypocotyls, and roots, respectively. In contrast, shikimic acid levels in GR cotton were 4.2, 14.0, and 8.2 μM g-1 fresh weight at 1 mM glyphosate for cotyledons, hypocotyls, and roots, respectively. Thus, roots of GR and non-GR cotton accumulate similar amounts of shikimic acid, whereas GR cotyledons and hypocotyls accumulated less shikimic acid than the corresponding non-GR cotton in response to glyphosate treatments. Additionally, glyphosate inhibited the development of lateral roots at concentrations of 0.01 or 0.1 μM glyphosate greater, in GR and non-GR cotton, respectively. Lateral roots of GR and non-GR cotton inhibited by glyphosate appeared shorter and were surrounded by a thick layer of necrotic cells or root exudate which was not present in roots from plants grown in media not containing glyphosate. The quantity of GR CP4-EPSP synthase was 4.7 and 6.6 times greater in cotyledons than in hypocotyls and roots, respectively. Tissues from dark-grown GR cotton seedlings contained 1.2-2.1 times less Cp4-EPSP synthase than their light grown counterparts. Because lateral root development was inhibited, fresh weight was reduced, and shikimic acid accumulated following treatment with glyphosate in both GR and non-GR cotton, potential exists for glyphosate to negatively affect cotton seedling establishment.

INVESTIGATION OF POTENTIAL QUINCLORAC RESISTANCE MECHANISMS IN A MULTIPLE-RESISTANT BARNYARDGRASS BIOTYPE. M.L. Lovelace, R.E. Talbert, R.E. Hoagland, and E.F. Scherder. University of Arkansas, Fayetteville, Arkansas.

ABSTRACT

Quinclorac (Facet) has been used extensively in Arkansas rice for control of many problematic weeds, such as propanil-resistant and -susceptible barnyardgrass. Extensive use has led to the selection of barnyardgrass populations that are multiple resistant to both propanil and quinclorac. Studies were initiated to evaluate possible mechanisms of resistance in a multiple-resistant barnyardgrass biotype. First, absorption and translocation studies were conducted as a potential mechanism of resistance. Four-leaf resistant and susceptible barnyardgrass plants were treated with quinclorac at 420 g ai/ha, and then the third leaf of the barnyardgrass plant was spotted with radiolabeled quinclorac (1.67 kBq $plant^{-1}$). Plants were harvested at 0, 3, 6, 12, 24, 48, and 72 h after application to determine absorption and translocation throughout the plant. Absorption of the radiolabeled quinclorac did not differ between resistant and susceptible barnyardgrass plants, with approximately 95% of all radiolabeled absorption occurring by 72 h after application. More radiolabeled quinclorac remained in the spotted leaf of the susceptible barnyardgrass (55% of the total absorbed) compared to the quinclorac-resistant barnyardgrass (40% of the total absorbed). This may be due to differential interaction of quinclorac with binding sites, organic molecules, compartmentalization, and/or sequestration. Basipetal movement of radiolabeled quinclorac ranged between 15 to 20% of the total absorbed, with no differences occurring between resistant- and susceptible-barnyardgrass biotypes. Acropetal movement was 5% greater in resistant barnyardgrass than susceptible barnyardgrass. No differences were detected in radiolabeled quinclorac concentration in the roots of resistant- and susceptible-barnyardgrass, but 17% of the total absorbed radiolabeled quinclorac was exuded from the roots of the quinclorac-resistant barnyardgrass compared to 10% exuded from susceptible barnyardgrass. Differential absorption does not seem to be involved in the mechanism of resistance to quinclorac in barnyardgrass, but differential translocation could be influencing resistance.

A mutation in the auxin binding protein is expected to be a mechanism of quinclorac resistance by being insensitive to quinclorac. This mutation is also expected to yield insensitivity to IAA. Therefore, studies were conducted to evaluate phototropic responses of barnyardgrass plants. Since resistant plants would be insensitive to IAA, they would be expected to have no phototropic response. A study was conducted in which 5-, 10-, and 20-cm-tall plants were rotated to grow horizontally in the presence of light. Stem bending toward light was then measured in degrees at 1 and 3 days. Both plants showed similar plant bending responses toward light and indicate that if an alteration has occurred in the auxin binding protein, this alteration yields sensitivity to IAA but not quinclorac.

Quinclorac application to susceptible barnyardgrass increases the level of ACC synthase in plants, which ultimately results in the production of ethylene. Ethylene can be measured to determine effects of quinclorac on the physiology of barnyardgrass plants. Plants were grown in hydroponic solution in glass cylinders and treated with 1mM of quinclorac at the 3-leaf stage. After treatment, the glass cylinders were capped, and ethylene was measured by taking a 1-ml gas sample from the head space of the glass cylinders and identifying and quantifying the ethylene using gas chromatography. Susceptible barnyardgrass plants produced 10-fold greater ethylene when treated plants compared to untreated plants. Ethylene production from resistant barnyardgrass plants was not influenced by treatment with quinclorac. Although the multiple-resistant biotype did not exhibit a phototropic response, findings suggest that a target site insensitivity is the primary source of resistance.

WEED SHIFTS FOLLOWING PASTURE CONVERSION WITH FIVE YEARS OF SOYBEAN PRODUCTION. C.J. Gray, D.R. Shaw, F.E. LaMastus-Sanford and J.W. Easley. Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

A 5-year experiment with Roundup Ready soybean [*Glycine max* (L.) Merr.] was initiated in 1998 at the Black Belt Branch Experiment Station near Brooksville, MS. The experiment was designed to observe weed population shifts in a continuous monoculture Roundup Ready production system. The field size was 7.8 ha, and prior to 1998 was in tall fescue (*Festuca arundanacea* Schreb.) pasture. Each year a 10-m by 10-m grid was imposed on the field using a global positioning system. At each grid location, a 1-m^2 quadrate was used to determine the weed species present. The six most prevalent weed species were yellow nutsedge (*Cyperus esculentus* L.), horsenettle (*Solanum carolinense* L.), large crabgrass [*Digitaria sanguinalis* (L.) Scop.], broadleaf signalgrass [*Brachiaria platyphylla* (Griseb.) Nash], smallflower morningglory [*Jacquemontia tamnifolia* (L.) Griseb.], and hophornbeam copperleaf (*Acalypha ostryifolia* Riddell). These weed species and the total weed populations were interpolated by kriging into weed maps based on 10-m by 10-m blocks. These data were then subjected to analysis using spatial trends, temporal stability, and correlation by year.

The greatest temporal stability came with hophornbeam copperleaf and yellow nutsedge. These species were predominately located in the higher and lower elevations of the field, respectively. Overall, the temporal stability of the field tended to be very variable and unstable. However, this result could be expected do to the varying environmental conditions from year to year, as well as changes in herbicide programs each year.

The two perennial weed species, yellow nutsedge and horsenettle, and hophornbeam copperleaf produced the greatest correlation over all years with the exception of 2000. In 2000, a severe drought occurred and weed populations were significantly reduced for all species. Overall, the correlation of the perennial weed species was greater then those of the annual weed species. This could be attributed to the perennial plants reproducing vegetatively. Annual species populations tended to be very erratic and unpredictable. The perennial weed species populations also tended to increase, which maybe the result of glyphosate not completely controlling these species.

INFLUENCE OF CROWNBEARD (VERBESINA ENCELIOIDES) DENSITIES ON PEANUT (ARACHIS HYPOGAEA) YIELD. R.L. Farris and D.S. Murray. Department of Plant and Soil Sciences. Oklahoma State University, Stillwater, OK 74078.

ABSTRACT

Field experiments were conducted at the Caddo Research Station near Ft. Cobb and at the Agronomy Research Station near Perkins to measure the effects of seven crownbeard *(Verbesina encelioides*) densities on peanut *(Arachis hypogaea)* yield. The experimental design was a randomized complete block with four replications. The plot size was 3.7 m wide by 10 m long. The soil at the Caddo Research Station was a sandy loam with a pH of 6.4 and a 0.3% organic matter content, while the soil at the Agronomy Research Station was a sandy loam with a pH of 5.6 and a 0.3% organic matter content. The Tamspan 90 peanut cultivar was planted at a rate of 90 kg/ha. The seven densities evaluated were 0, 2, 4, 8, 16, 24, and 32 weeds/10 m of row. Data collected consisted of weed weights and peanut yields within the seven weed density treatments. Crownbeard plants at the various densities were allowed to grow full-season with a plot maintained weed-free for the entire season. Crownbeard plants from the center two rows of the four row plots were clipped off at soil level, dried for 7 days, and dry weights recorded. Throughout the growing season, unwanted weeds were controlled by herbicide use, hoeing, and hand pulling. The center two rows of each plot were dug and inverted, field cured, combined, dried, and weighed to determine the impact of the crownbeard density on peanut yield. Correlation between weed density vs. dry weed weight, dry weed weight vs. peanut yield, and weed density vs. peanut yield were determined.

Correlations for all variables measured had a good linear fit with the data from both locations (R^2 = 0.88 to 0.99). Peanut yields decrease linearly due to increasing crownbeard competition. For each weed/10 m of row, dry weed weight increased by 0.24 kg/plot and 0.42 kg/plot at Ft. Cobb and at Perkins, respectively. Dry weed weight was a good predictor of peanut yield. For each kg/plot of dry weed weight, a 4.2% and 4.9% reduction in peanut yield occurred at Ft. Cobb and Perkins, respectively. Weed density was a good predictor of peanut yield. For each weed/10 m of row, a 1% and 2% peanut yield reduction occurred at Ft. Cobb and Perkins, respectively. At the highest crownbeard density of 32 weeds/10 m of row, peanut yield was reduced approximately 38% and 64% at Ft. Cobb and Perkins, respectively.

CENTIPEDEGRASS (*EREMOCHLOA OPHUROIDES)* / CARPETGRASS (*AXONOPUS COMPRESSUS)* TOLERANCE TO POSTEMERGENCE HERBICIDES. C.J. Cox, L.B. McCarty, J.E. Toler, and A.G. Estes. Clemson University. Clemson, South Carolina 29634-0375.

ABSTRACT

Centipedegrass and carpetgrass, both perennial warm season grasses, are used throughout the Southeast for home lawns, highway medians and multipurpose common areas. When established each provide a suitable turf stand with reduced maintenance. However, morphological differences between the species often make their use as a mix stand undesirable. Centipedegrass infested with carpetgrass appears patchy and digitate seedheads produced by carpetgrass are unsightly and reduce centipedegrass quality. The objective of this study was to observe the injury potential of selected postemergence herbicides to each grass species.

Two studies were conducted at Clemson University investigating the injury potential of commercially available herbicides. Treatments included: Envoy (clethodim) at 0.25 lb ai/A, Vantage (sethoxydim) at 0.25 lb ai/A, Illoxan (diclofop) at 1.0 lb ai/A, Manor (metsulfuron) at 0.02 lb ai/A, Acclaim Extra (fenoxaprop) at 0.15 lb ai/A, Fusilade II (fluazifop) at 0.1 lb ai/A, Atrazine at 2.0 lb ai/A, Drive (quinclorac) at 0.75 lb ai/A, MSMA at 2.0 lb ai/A, Asulox (asulam) 2.0 lb ai/A, Sencor (metribuzin) at 0.5 lb ai/A, MSMA + Sencor at 1.0 + 0.25 lb ai/A, Envoy + Turflon Ester (triclopyr) at 0.25 + 0.5 lb ai/A, Vantage + Turflon Ester at 0.25 + 0.5 lb ai/A, Oust (sulfometuron) at 0.19 lb ai/A, and TranXit (rimsulfuron) at 0.015 lb ai/A. Each study subjectively rated product injury to the grass species with 0% injury representing no injury and 100% representing plant death. Any rating above 30% was deemed unacceptable.

Both studies were designed in a randomized complete block arrangement. Each grass species was seeded into 15.2cm pots at a rate of 2 lbs/A and grown in a greenhouse until the plant reached maturity. The grasses were mowed using cordless ornamental shears to a height of 3.8cm to simulate a typical home lawn. Treatments were applied using a CO_2 backpack sprayer calibrated to deliver 20 GPA. Treatments for study one were applied January 2, 2002 with a sequential application on February 2 (30 DAI). Treatments for study two were applied on March 29, 2002 with a sequential application on April 29. For each study, ratings were taken at the first sight of injury ~ 20 DAI and continued until injury could no longer be determined.

In study one, Acclaim Extra, Fusilade II, MSMA, Sencor, MSMA + Sencor all provided >75% injury to centipedegrass by 25 days after the initial (DAI) application. Acclaim Extra, Fusilade II, MSMA, Sencor, MSMA + Sencor and Asulox provided >80% injury by the final rating date (75 DAI). Envoy, Vantage, Manor, Envoy + Turflon Ester, Vantage + Turflon Ester, and TranXit all rated < 30% injury by the final rating date (75 DAI).

In study two, Envoy, Vantage, Illoxan, Acclaim Extra, Fusilade II, Drive, MSMA, MSMA + Sencor, Envoy + Turflon Ester and Vantage + Turflon Ester all provided >80% injury to carpetgrass by 20 DAI. Vantage, Acclaim Extra, Drive, MSMA and MSMA + Sencor provided unacceptable injury by the final rating date (60 DAI), while Envoy, Illoxan, Fusilade II, Envoy + Turflon Ester and Vantage + Turflon Ester all provided 100% injury. Manor, Atrazine, and Asulox had < 30% injury by the final rating date (60 DAI).

In summary, selective removal of carpetgrass from centipedegrass may be achieved using Envoy at 0.25 lb ai/A, Vantage at 0.25 lb ai/A, Envoy + Turflon Ester at 0.25 + 0.5 lb ai/A and Vantage + Turflon Ester at 0.25 + 0.5 lb ai/A. Selective removal of centipedegrass from carpetgrass may be achieved using Asulox at 2.0 lb ai/A and Sencor at 0.5 lb ai/A.

Future research in this area will investigate these products in replicated studies to ensure product performance and to field test products in mixed stands to determine successful rates and selective removal.

MORPHOLOGICAL IDENTIFICATION AND CHARACTERIZATION OF ARKANSAS PITTED MORNINGGLORY (*IPOMOEA LACUNOSA*) ACCESSIONS. D.O. Stephenson, IV, and L.R. Oliver; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville.

ABSTRACT

Pitted morningglory (*Ipomoea lacunosa*) is the most prominent morningglory species in the Mississippi Delta and is one of the most troublesome weeds in crop production due to its prolonged vegetative growth and seed production. The native range of pitted morningglory covers the southeastern United States. A study was conducted at Fayetteville, AR, in 2000, 2001, and 2002 to morphologically characterize pitted morningglory accessions collected from across their indigenous range, specifically Arkansas. Arkansas was divided into six regions, northwest (NW), northeast (NE), west-central (WC), east-central (EC), southwest (SW), and southeast (SE). Two accessions were randomly chosen from a group of accessions within each region for this presentation.

Single-plant accessions were germinated in a greenhouse and transplanted to the field within 2 days of germination. Original single-plant seed sources were used for each accession in all 3 years of experiment. Accessions were grown without competitive or environmental restriction until physiological maturity, with trellises supporting growing plants. Leaf size, runner length, and leaf shape were recorded 8 weeks after emergence (WAE). Flowering date and flower color were recorded on the day of first flower initiation. Leaf pubescence was recorded 12 to 14 WAE by counting four 1-cm^2 sections on the adaxial side of two leaves per plant per accession. Total plant weight, seed number, and capsule and sepal pubescence were recorded at harvest. Capsule and sepal pubescence was determined by counting pubescence on 10 capsules and sepals per plant per accession.

Four leaf shapes were documented (arrow, heart, arrow/heart mixture, and heart with lobes), along with two flower colors (white and purple) in Arkansas. No differences among regions for leaf size were measured, with sizes ranging from 40 to 45 cm^2. NW Arkansas had a shorter vine length compared to other regions, which were not statistically different. In Arkansas, average runner length 8 WAE ranged from 70 to 89 cm. The date of first flower initiation increased with decreasing latitude. The date of first flower initiation ranged from August 18th to the 26th. Northern and central Arkansas regions flowered earlier than the southern regions. Total plant weight increased with decreasing latitude, but total seed number decreased. The decrease in seed number based on latitude is due to accessions not reaching physiological maturity because of the occurrence of a killing frost, thus not producing seed to their full capability. NW and SW Arkansas regions were documented with higher leaf pubescence counts than NE, EC, SE, and WC Arkansas. WC Arkansas possessed the least leaf pubescence of all Arkansas regions. There was not a clear trend for capsule and sepal pubescence. Capsule pubescence ranged from 90 to 140 trichomes per capsule, and sepal pubescence ranged from 30 to 85 trichomes per sepal. No differences were seen for sepal length. Sepal width differences were noted, but no trend was seen across Arkansas. Morphological variability was documented within Arkansas pitted morningglory accessions based upon flowering date, leaf shape, flower color, and leaf and capsule pubescence.

HERBICIDE TOLERANCE/WEED CONTROL IN WILDLIFE FOOD PLOTS-SESAME, CHUFA, JAPANESE MILLET, BROWNTOP MILLET, LAB-LAB. E.C. Murdock, L.R. Nelson, J.E. Toler, and R.F. Graham, Clemson University, Florence, SC 29506.

ABSTRACT

Tolerance of sesame(Sesamum indicum), chufa (Cyperus esculentus), Japanese millet (Echinochloa crus-galli), browntop millet (Panicum ramosum), and lab-lab (Dolischos lablab) to commonly used agronomic herbicides was evaluated in 2002 at the Pee Dee Research and Education Center, Florence, SC. Sesame injury 4 weeks after planting (WAP) was 0, 4, and 17% following preemergence (PRE) applications of Prowl (2.4 pt/ac), Cotoran (1.5qt/ac), and Micro-Tech (2 qt/ac), respectively. Command @ 2 pt/ac applied PRE caused 37% injury. Sesame injury following PRE applications of Scepter (2.9oz/ac), Reflex (1.5pt/ac), and Spartan (8oz/ac) ranged from 95 to 98%. Sesame exhibited marginal to very poor tolerance to postemergence (POST) applications of classic, Permit, Accent, Scepter, Basagran, Berctril, 2, 4-D, and Blazer at their respective normal use rates.

Chufa exhibited excellent tolerance(0 to 3% injury 5 WAP) to PRE applications of Prowl (2.4pt/ac), Aatrex (1 to 1.5qt/ac), and Princep (1 to 1.5qt/ac). Cotoran (2 qt/ac) and Micro-Tech (2qt/ac) applied PRE caused 53 and 80% stand loss, respectively. Excellent tolerance [0 to 5% injury 5 weeks after application (WAA)] to POST applications of Select (16oz/ac), Blazer (1.5pt/ac), Clarity (8oz/ac), 2, 4-D (0.5 and 1pt/ac), and2,4-DB (1.5pt/ac) was also observed. First Rate (0.3oz/ac), Aatrex + crop oil concentrate (1.2qt+1qt/ac), and Classic (0.5oz/ac) applied POST caused 47, 42, and 77% injury 5 WAA. Eighty-three to 99% stand loss was observed following POST applications of Roundup UltraMax @ 13 to 26 oz/ac.

Aatrex applied PRE@ 1 and 2qt/ac injured Japanese millet 52 and 72 % 4 WAP, respectively. Dual Magnum (1.33pt/ac) and Micro-Tech (2qt/ac) applied early-POST Japanese millet in 2-leaf stage,0.5f inch tall) caused 99 and 88% stand loss, respectively. No injury occurred following POST applications 2, 4-D (1pt/ac), Basagran (1qt/ac), and Clarity (8oz/ac). However, Aatrex + crop oil concentrate (1.2qt + 1%v/v) applied POST caused 62% stand loss. The same herbicide treatments were evaluated in browntop millet. In contrast to Japanese millet, browntop millet was tolerant (0 to 2% injury) to all PRE and POST herbicides evaluated.

No lab-lab injury was observed when Micro-Tech, Dual Magnum, Frontier 6, Prowl, Canopy, Spartan, Scepter, and Reflex were applied PRE at their respective normal use rate. However, unacceptable injury (25 to 70% 5 WAA) occurred when FirstRate, Classic, Blazer, Basagran, Reflex, Scepter, and Cobra were applied POST at their normal use rates to 3- to 4- trifoliate lab-lab seedlings.

TROPICAL SPIDERWORT COLONIZES NORTH CAROLINA: ECOLOGY AND CONTAINMENT OF A NOXIOUS WEED. M.G. Burton, A.C. York, J.F. Spears and T.W. Rufty; Department of Crop Science, NC State University, Raleigh.

ABSTRACT

Tropical spiderwort (*Commelina benghalensis*) was observed surviving in an herbicide resistant crop near Goldsboro, NC, in September 2001. Due to its tolerance of many herbicides, tropical spiderwort is included on the federal noxious weed list. The discovery of this weed was of considerable concern not only because of its herbicide tolerance, but also because it was not previously known to occur north of Georgia. Affected states now include California, Florida, Georgia, and North Carolina. Tropical spiderwort is also known to be a host to diseases affecting tobacco, peanut, vegetable, and ornamental crops. Careful surveys were conducted in the surrounding fields during the summer of 2002. The size, density and distribution of observed populations suggests that the infestation has been present for several years but escaped notice due to its similar appearance to naturalized populations of other dayflower species such as Asiatic and spreading dayflower, that have also increased in abundance under rotations of herbicide resistant crops.

In addition to herbicide tolerance, other features of tropical spiderwort's biology have allowed it to succeed within intensively managed agricultural systems. The most striking feature is the presence of subterranean flowers borne on rhizomes. Subterranean flowers can be initiated prior to aerial flowers while plants are still small (i.e. less than 3-cm in some instances). Both aerial and subterranean flowers are protected by structures called "spathes". Aerial flowers emerge from their spathes with showy lavender or blue petals, subterranean spathes do not open and flowers are cleistogamous. Subterranean spathes usually contain one large and two small seeds. Aerial spathes usually contain one large and four small seeds. Cut stems of tropical spiderwort are reportedly capable of rooting and emerging from shallow depths (e.g. less than 8-cm). The broad germination period of tropical spiderwort is also of particular concern. Germination is favored under warm, moist soil conditions, and appears to continue as long as adequate soil moisture is available. In controlled environment studies, the temperature optima for growth and reproduction was observed to range from 30 to 35C, which suggests that all of the southeast may be suitable habitat. In tropical climates, tropical spiderwort reportedly grows as a perennial, which may pose additional problems as a disease host.

With the discovery of multiple affected fields in the area, our focus (as well as the focus of governmental agencies with oversight on noxious weed species) has shifted from eradication to containment. Eradication from a location may be possible, however. Methyl bromide was observed to be 100% effective in destroying the soil seedbank of tropical spiderwort. To reduce the possibility of spread from affected fields, all visible soil and plant debris are cleaned from equipment before it is moved to another site. Additionally, we are collaborating with other stakeholders to assure that mowing and agricultural operations are conducted by persons who are aware of the problem and appropriate measures to prevent the further spread of the weed.

SIMPLE SEQUENCE REPEATS ANALYSIS OF HYBRIDIZATION BETWEEN IMI RICE AND RED RICE. L.E. Estorninos Jr[1]., D.R. Gealy[2], T.L. Baldwin[1], F.L. Baldwin[3], and N.R. Burgos[1]. Dept. of Agronomy, University of Arkansas, Fayetteville, AR[1], Dale Bumpers National Rice Research Center, USDA-ARS, Stuttgart, AR[2], and Practical Weed Consultants, L.L.C., Austin, AR[3]

ABSTRACT

Conditions favorable for growing cultivated rice are also favorable for the growth, development, and reproduction of red rice, due to their morphological similarities. Such conditions create a concern for hybridization between rice and its weedy relatives, especially when the rice cultivar is herbicide-resistant. Our objectives were to determine the incidence and rate of hybridization between imidazolinone-resistant (imi) rice lines and red rice. Experimental fields that had been seeded with red rice and the imi rice lines, CF2551 (CL121), CF3291 (CL141), or CF0051 in 2000, were sprayed with three imazethapyr applications in 2001 to kill susceptible plants. The predominant red rice in these fields was a strawhull, awnless type, but others were also present. The estimated initial red rice population in each field (91.5 m by 30.5 m) in 2001 was 3.7 million plants, but this could be greater or less than the number of red rice seeds actually produced in the 2000 crop. Numerous volunteer imi rice plants survived the imazethapyr applications. Genomic DNA was extracted from mostly non-volunteer survivors. Of the 305 such survivors in CF2551 plots in which red rice and rice had flowered synchronously, 168 plants were considered probable F_1 hybrids. This determination was based on the presence of pubescent leaves (dominant trait) and DNA fragment sizes that were consistent with both imi rice and strawhull red rice for one or more of the SSR markers, RM215, RM234, RM251, and RM 253. By contrast, only 85 such survivors were present in CF3291 plots in which rice flowered several weeks after red rice, and only 50 of these were probable F_1 hybrids. Similarly, 50 probable F_1 hybrids were detected from 180 survivors in CF0051 plots in which flowering of rice and red rice overlapped slightly. Thus, estimated outcrossing rates between CF2551, CF3291, and CF0051 imi rice and red rice can be calculated as 0.0045% (e.g. 168/3.7 million), 0.0014%, and 0.0014%, respectively. In addition to the probable F_1 hybrids, numerous heterozygous imi survivors produced DNA fragment sizes that were not consistent with imi rice or strawhull red rice, or else produced glabrous leaves. These individuals could not have been F_1 hybrids from homozygous imi rice with glabrous leaves (recessive trait) and strawhull red rice parents with pubescent leaves, but they could have resulted from crosses between heterozygous parents or from pre-existing red rice hybrid derivatives (e.g. F_2, F_3, etc.) or from other *Oryza* germplasm lines present in soil at these experimental field sites. Although small numerically, the levels of hybridization reported here may result in hundreds or thousands of plants per field depending on the level of red rice infestation.

PHENOTYPIC AND GENOTYPIC CHARACTERISTICS OF HAND-CROSSED MALE STERILE RICE X RED RICE HYBRIDS IN THE SOUTHERN U.S. D.R. Gealy, W. Yan, and J.N. Rutger. Dale Bumpers National Rice Research Center, USDA-ARS, Stuttgart, AR

ABSTRACT

Concerns over the consequences of outcrossing between rice and red rice in the U.S. have increased in recent years with the development of herbicide resistant rice cultivars. In this study we investigated the phenotypic characteristics of parental, F_1 and F_2 populations resulting from hand crossed hybrids between non-resistant rice (female) and non-resistant red rice (male). The rice parents were Kaybonnet-1789 (dominant male sterile) and Cypress-1819 (recessive male sterile), and produced glabrous leaves, long-grain, white seeds, and few tillers. The red rice parents were StgS (strawhull, awnless, early flowering) and LA3 (straw-brownhull, awned, late flowering), and produced pubescent leaves, medium-grain, red seeds, and many tillers. F_1 and F_2 hybrids and parental plants were planted in a greenhouse in Stuttgart, AR in early June 2002, and later transplanted to the field. All F_1 plants produced red seed indicating that red is dominant over white seed color. To date, all F_1 populations have produced plants with red:white seeds in a 3:1 ratio. Occasionally, the red seeds in the F_2 were light red or pink. All F_1 plants produced pubescent leaves confirming that the pubescent trait found in red rice is dominant over glabrous. To date, our analysis has revealed that F_2 populations derived from LA3 crosses produced pubescent:glabrous plants in a 3:1 ratio suggesting single gene inheritance whereas F_2 populations derived from StgS crosses produced ratios substantially greater than 3:1 suggesting a more complex inheritance. F_1 plants from crosses between either Kaybonnet or Cypress rice and awned red rice (LA3) had purple lower stems even though both parents had green stems. In the F_2, 65 and 67%, respectively of Kaybonnet and Cypress plants had purple stems, some of which were very dark purple. Conversely, all F_1 plants and nearly all (96%) F_2 plants from StgS crosses had green stems suggesting that the gene(s) controlling this trait may be different in LA3 and StgS. Crosses that included LA3 produced F_1 plants with awns and F_2 plants with awn lengths ranging from zero to the length of the LA3 parent. All of the F_1 and F_2 offspring from StgS crosses were awnless. F_1 plants had culm angles (GRIN rating 3) similar to the red rice parents while F_2 plants produced culm angles ranging from erect (GRIN rating 1) to more open (GRIN rating 5) than the red rice parent. F_1 plants from LA3 crosses headed during the same time period as both parents while F_2 plants headed over a period extending earlier and later than the F_1, as well as the parents. Conversely, F_1 plants from StgS crosses headed long after the parents and about half of the F_2 plants headed later than the parents. Based on our results, true F_1 hybrids of rice and red rice (assumed homozygous) should be characteristically pubescent and red seeded with an open plant type. Depending on the red rice parental type, F_1 hybrids may be awned or awnless, have purple or green stems, and have normal or delayed heading. F_2 hybrids can possess a much broader range of phenotypic characteristics including combinations of all parental traits. For instance, some are pubescent with white seeds, others glabrous with red seed, and still others erect and pubescent with purple stems and red seeds, suggesting independent inheritance of these traits.

GROWTH AND REPRODUCTIVE ABILITY OF IMIDAZOLINONE-SENSITIVE AND –RESISTANT SMOOTH PIGWEED. W.A. Bailey and H.P. Wilson. Virginia Tech, Eastern Shore Agricultural Research and Extension Center, Painter VA 23420

ABSTRACT

Greenhouse, growth chamber, and field studies were conducted in 2000 and 2001 to compare growth and development, seed production, and seed germination of one imidazolinone-susceptible (S) and five –resistant (R1, R2, R3, R4, and R5) smooth pigweed biotypes under noncompetitive and competitive conditions. Under noncompetitive conditions in the greenhouse, rate of height increase in S smooth pigweed was similar to those in R1, R2, R3, and R5. However, growth rate at 3 to 5 wk after planting (WAP) was greatest in the R4 biotype. In both noncompetitive conditions in the greenhouse and in noncompetitive and competitive conditions in the field, R4 had a more rapid rate of height increase at 3 to 5 WAP. However, height of S and R4 biotypes were similar by 8 to 9 WAP. In the greenhouse, S produced more total biomass than all R biotypes, although a greater relative proportion of total biomass was attributed to reproductive biomass in R4. Seed production in the greenhouse was similar between S and R4 biotypes, and greater than seed production of R1, R2, R3, or R5 biotypes. Seed of R4 also displayed a more rapid initial rate of germination than S, although final germination after 12 d imbibition was similar between S and R4. Vegetative and reproductive biomass accumulation in the field was density-dependent but was similar for all biotypes. Collectively, these results suggest that not all imidazolinone-resistant smooth pigweed biotypes suffer fitness penalties compared to imidazolinone-susceptible smooth pigweed, particularly under competitive conditions in the field.

MORPHOLOGICAL CHARACTERISTICS OF THE ARKANSAS DICLOFOP-RESISTANT RYEGRASS POPULATION. M.T. Bararpour, L.R. Oliver, and N.R. Burgos; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville.

ABSTRACT

Resistance in *Lolium sp.* is one of the most economically important examples of herbicide resistance in world agriculture, and diclofop-resistant ryegrass is the number one weed problem in Arkansas wheat. A field experiment was conducted in 2001 at the Agricultural Experiment Station, Fayetteville, AR, to determine morphological differences among *Lolium sp.* and Arkansas diclofop-resistant ryegrass populations. Ryegrass seeds were collected from Craighead, Crittenden, Cross, Desha, Faulkner, Independence, Lawrence, Lee, Lonoke, Monroe, Perry, Poinsett, Prairie, Randolph, St. Francis, White, and Woodruff counties in Arkansas, and Dunkin, Premiscot, and Stoddard counties in Missouri. Ryegrass populations from New Jersey, Mississippi, and Oregon and five populations from overseas (Turkey, Uruguay, Netherlands, Soviet Union, and Australia) were included in the study. Seeds were planted October 18 in paper cups and placed in the greenhouse and transplanted 1.5 m apart in the field on November 12. The experimental design was a randomized complete block with ten replications. During the growing season, plant height, plant growth habit, plant color, and node color were recorded. At maturity, plant height and number of tillers and spikes were recorded. Two spikes from each plant were collected to measure spike and spikelet length, distance between spikelets, awn length, number of spikelets/spike, number of seed/spikelet, and number of seed/spike. Seed production from each ryegrass plant was calculated from the following equation:
Total seed number/plant = (number of seed/spikelet)(number of spikelet/spike)(number of spike/plant)

In general, three growth characteristics were noted: erect, prostrate, and moderately prostrate or spreading ascending. Three ryegrass color types were noted: reddish for prostrate and moderately prostrate; less reddish (red at node and at base of the plant) for erect and moderately prostrate; and greenish for erect and prostrate. Node color was red or green. The populations from Arkansas, Missouri, Mississippi, Uruguay, and the Netherlands were identified as *Lolium multiflorum* Lam. (Italian ryegrass). Recently taxonomic keys have changed *L. multiflorum* to *L. perenne* L. *ssp. multiflorum* (Lam.) Husnot. New Jersey and Oregon populations were identified as *Lolium perenne* L. (perennial ryegrass), populations from Soviet Union and Australia were identified as *Lolium rigidum* Gaud. (rigid ryegrass), and the population from Turkey was identified as *Lolium temulentum* L. (poison ryegrass). At the seedling stage *L. temulentum* can be distinguished by a larger diameter main stem (2 to 3 times) and droopy leaves with a wider leaf blade, and at maturity, *L. temulentum* had the lowest number of tillers (58), spikes (38), seed/spikelet (6), and seed/plant (4,224); fat seed with long awns (12 mm); and glumes longer than spikelet (21 mm) compared to the others. *L. perenne* was also easy to distinguish due to prostrate growth habit, a greenish node, short and narrow leaf blade, small seed (<5 mm) with no awn, and glume shorter than spikelet (11 mm). *L. perenne* had 188 tillers, 100 spikes, and 18,000 seed/plant and flowered 3 weeks later than the other species.

All of the resistant-ryegrass populations from Arkansas were identified as *L. multiflorum,* which had erect to prostrate growth habit, greenish to reddish in color, green to red node, glume shorter than spikelet (10 to 14 mm), and medium seed size (>5 mm) with 1- to 3- mm awns. Within Arkansas, the *L. multiflorum* from Woodruff county accessions had the highest number of tillers (287). Plants from Stoddard and St. Francis counties had the highest number of spikes, with 261 and 226 spikes, respectively. Number of tillers and spikes from Independence county populations did not differ from those of Woodruff, Stoddard, or St. Francis, but Independence county populations had the highest number of tillers (262), spikes (210), spikelet/spike (25), seed/spikelet (13), and seed/plant (71,234). White county populations had the lowest number of tillers (136), spikes (126), spikelet/spike (22), seed/spikelet (10), and seed/plant (28,063). Therefore, morphological variability exists in Arkansas *L. multiflorum*.

CHARACTERIZATION OF GLYPHOSATE INTERACTION WITH TRIFLOXYSULFURON ON GRASS AND BROADLEAF WEEDS. C.H. Koger* and K.N. Reddy; USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS 38776.

ABSTRACT

Glyphosate provides broad-spectrum postemergence (POST) control of annual and perennial weeds. However, several weed species, such as pitted morningglory (*Ipomoea lacunosa*), hemp sesbania (*Sesbania exaltata*), and velvetleaf (*Abutilon theophrasti*), typically exhibit some tolerance to glyphosate. Trifloxysulfuron (CGA-362622) is a new ALS-inhibiting sulfonylurea herbicide in the registration process for postemergence weed control in cotton. It has activity on broadleaf, grass, and sedge weed species and may have potential for a tank-mix option in glyphosate-tolerant cotton. However, potential interactions of tank-mix combinations of trifloxysulfuron and glyphosate for weed control and cotton injury have not been investigated.

Greenhouse and field studies were conducted in 2002 to evaluate glyphosate and trifloxysulfuron on barnyardgrass (*Echinochloa crus-galli*), browntop millet (*Brachiaria ramosa*), hemp sesbania, pitted morningglory, prickly sida (*Sida spinosa*), sicklepod (*Senna obtusifolia*), and velvetleaf control and cotton (DP 436RR) injury. In the greenhouse, glyphosate at 560 (1/2x) and 1120 (1x) g ai/ha and trifloxysulfuron at 2.5 (1/2x) and 5 (1x) g ai/ha were evaluated on two- and four-leaf plants. Combinations of both herbicides were evaluated at both rates and plant growth stages. A nonionic surfactant was added to trifloxysulfuron treatments at 0.25% (v/v). Shoot fresh weights were recorded three wk after treatment and data were expressed as percent shoot biomass reduction (% control). Treatments were in a split plot arrangement with growth stage as the main plot and herbicide rate as the subplot. Treatments were replicated four times and the experiment was repeated three times. In the field, cotton was planted in 100-cm rows and weeds (previously mentioned) were drilled in 19-cm rows perpendicular to cotton rows. Glyphosate, trifloxysulfuron, and combinations of both were evaluated at 1x rates on two- and four-leaf weeds and three- and five-leaf cotton. Post-directed (PD) applications of glyphosate (1x), trifloxysulfuron (1x), or glyphosate (1x) plus trifloxysulfuron (1x) following fluometuron at 840 g ai/ha plus pendimethalin at 560 g ai/ha PRE were evaluated on 2- to-3 leaf weeds and 6-leaf cotton. The experimental design was a randomized complete block with a factorial arrangement of treatments. Each timing-by-herbicide treatment was replicated four times. Weed control and cotton injury was evaluated two wk after treatment.

Barnyardgrass and browntop millet control by glyphosate was not reduced when trifloxysulfuron was added to glyphosate. Addition of trifloxysulfuron to glyphosate did not improve control of prickly sida, sicklepod, and velvetleaf compared with glyphosate alone. Barnyardgrass, browntop millet, prickly sida, sicklepod, and velvetleaf control with glyphosate (1x) was 94 to 99% at the 2- to 3-leaf growth stage and 77 to 95% at the 4- to 5-leaf growth stage. Mixing high rates of trifloxysulfuron and glyphosate was additive in controlling larger pitted morningglory and hemp sesbania (77 and 79%) compared with glyphosate (1x) alone (54 and 55%). When applied over-the-top of cotton, trifloxysulfuron (1x) resulted in 20% injury to 2-leaf cotton and 6% to 4- to 5-leaf cotton. Post-directing both herbicides alone and in combination resulted in no injury to cotton. Weed control was inadequate with trifloxysulfuron alone, however mixing trifloxysulfuron with glyphosate has potential to improve control of pitted morningglory and hemp sesbania compared to glyphosate alone.

A COMPARISON OF RIMSULFURON TRANSFORMATION RATES IN TOMATO (*LYCOPERSICUM ESCULENTUM*) AND PEPPER (*CAPSICUM ANNUM*). R.S. Buker III, W.M. Stall, B. Rathinasabapathi, G. MacDonald, and S.M. Olson.

ABSTRACT

Rimsulfuron uses in fresh market tomato and pepper has been tested under Florida conditions. Unacceptable yield losses from rimsulfuron have been consistently observed in pepper. The role of rimsulfuron metabolism was investigated in these species. Experiments were conducted using explants, removed at the four to six-leaf stages, treated with technical grade (>95%) pure rimsulfuron. The level of rimsulfuron in each extract was quantified using an external rimsulfuron standard curve created with technical grade rimsulfuron. The uptake and rimsulfuron recovery was monitored to adjust the μmoles of rimsulfuron supplied and remaining in each explant after 24 hours.

Tomato and pepper absorbed 98 and 80%, respectively, of the ^{14}C rimsulfuron supplied. The percentage of original rimsulfuron remaining in pepper after twenty four hours varied with each experiment, but more rimsulfuron was always discovered in pepper than tomato. Rimsulfuron retention times of tomato and pepper were similar in the HPLC system used. Tomato metabolized 43 and 17nmoles of rimsulfuron/hour in first and second experiment, respectively. Pepper metabolized rimsulfuron 5.7 and 0.33 nmoles/hr, in the first and second experiments, respectively. Rimsulfuron was metabolized between eight and 52 times faster in tomato than pepper. In these experiments, tomato metabolized 80 to 98% more rimsulfuron than pepper. These experiments provide evidence rimsulfuron transformations may be the basis for differences in whole plant tolerance.

EFFECT OF TEMPERATURE, LIGHT, PH AND OSMOTIC POTENTIAL ON THE GERMINATION OF SOME CITRUS WEEDS. S. Singh and M. Singh, University of Florida-IFAS, Citrus Research and Education Center, Lake Alfred, Florida.

ABSTRACT

Weed accounts 25% of total production cost in Florida citrus. Even after the best available practices, a large number of weed species infest citrus groves causing concern for sustainable weed management. Understanding the weed bio-ecology can help in effective weed management practices. Studies were conducted with several weed species in growth chambers to evaluate the effect of temperature, osmotic potential, pH and dark conditions on seed germination.

Annual morningglory (*Ipomoea purpurea* (L. Roth.), beggarweed (*Bidens pilosa* L. var radiata Sch. Bip.), Brazil pusley (*Richardia brasiliens* (Moq.), ivyleaf morningglory (*Ipomoea hedracea* (L.) Jacq.), Johnsongrass (*Sorghum halepense* (L.) Pers.), milkweed vine (*Morrenia odorata* (Hook & Arn.) Lindl.), pigweed (*Amaranthus retroflexus* L.), common ragweed (*Ambrosia artemisiifolia* L.), sicklepod (*Cassia obtusifolia* L.), small flower morningglory (*Jacquemontia tamnifolia* (L.) Griseb.), Spanishneedles (*Bidens bipinnata* L.), teaweed (*Sida spinosa* L.) and yellow nutsedge (*Cyperus esculentus* L.) were sown on double layered filter papers in petridishes with 10 seeds of each species. After adding 5 mL water, Petridishes were shifted to growth chambers maintained at 15/10, 20/10, 25/15, 30/20, 35/25, 40/30 and 45/35 ^{O}C (day/night) temperatures. In another experiment, osmotic potential of -0.1, -0.2, -0.4, -0.8 & -1.2 MPa was created with Polyethylene Glycol (PEG) for watering the Petridishes and compared with control (no stress) for germination in growth chambers at 30^{O}C. Effect of temperature (15, 20 & 30^{O}C) and osmotic potential (0, -0.1, -0.5 and -1.0 MPa) was also studied on germination. Similarly, germination was recorded using a range of pH (3, 5, 7, 9 & 11) values. Potassium hydroxide and citric acid was used to regulate the pH of water. Also the effect of light/dark period on germination was studied on seed germination. Seeds were exposed to light for 0, 0.5, 1, 2, 4, 8 & 16 hours after putting them in petridishes and adding 7 mL water and then covered with double layer of aluminum foil and placed in growth chambers at 30^{O}C for a week. Comparison was made with seeds placed in growth room at 12/12 h light/dark period. All the experiments were repeated under similar conditions with 4 replications per treatment. Percent germination was observed periodically at weekly interval. Data was arcsin transformed for ANOVA using SPSS software and One-Way ANOVA performing Tuckey's b and Duncan's multiple range tests for multiple comparisons.

Maximum germination was observed at 30^{O}C, when averaged over species. A temperature range of 25-35^{O}C was ideal for most of the weed species to germinate; any increase or decrease in temperature resulted in significant inhibition of germination. Lower temperature of 15^{O}C inhibited germination of most weed species except annual morningglory and Spanishneedles. Pigweed, Johnsongrass, beggarweed and teaweed were less affected by higher temperature. Germination was greatly inhibited at -0.4 MPa osmotic potential for most of the weed species, except beggarweed and annual morningglory. Higher germination was observed with an increase in temperature from 15 to 30^{O}C and water stress. A germination of 11% was recorded for beggarweed at 30^{O}C and -1.0 MPa water potential compared to no germination at lower temperature with similar water stress. No germination was recorded at pH 3, except 4% in yellow nutsedge; higher pH values were statistically at par. There was no effect on dark period on inhibition of germination of the test species.

EVALUATION OF RED RICE GENETIC DIVERSITY USING SSR PRIMERS. S.N. Rajguru, N.R. Burgos, J.M. Stewart, D.R. Gealy, and C.H. Sneller. Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72701, USDA-ARS, Dale Bumpers National Rice Research Center, Stuttgart, AR 72160, and Horticulture and Crop Science, Ohio State University, Columbus, OH 43210

ABSTRACT

In 2002, 1.5 million acres of land in Arkansas were planted to rice. However, one of the major problems in rice production is red rice. Red rice belongs to the same genus and species *Oryza sativa* and, therefore, is very similar to rice. Genetic introgression can occur between rice and red rice in nature, and this may contribute to the genetic diversity of red rice.

This study was conducted to analyze the genetic relationships between red rice populations and cultivated rice in Arkansas and to determine the number and distribution of red rice biotypes in Arkansas. Red rice samples were collected from 11 rice dryers in Arkansas in 1999. Sample origins were Dixie Dryer, DeWitt, Eudora, Fair Oaks, Marianna, Pine Bluff, Stuttgart, Truman, Tyronza, Wilmont, and Wynne. These samples originated from fields planted to one of the following rice cultivars: Bengal, Cypress, Drew, Jefferson, Kaybonnet, LaGrue, Leah, and Lemont. Five random accessions were chosen for each dryer and five seeds from each of the accessions were grown in the greenhouse. 'Bengal' was used as a standard cultivar along with the other seven rice cultivars. DNA was extracted from young leaves using a modified CTAB protocol. Fingerprinting of red rice samples was done using twenty-four simple sequence repeat (SSR) primers for rice. DNA amplification was done by polymerase chain reaction (PCR), separated by polyacrylamide gel elecrophoresis (PAGE) and visualized by staining with CYBR green. Individuals were evaluated for the presence or absence of a genetic fragment. Data were used to generate similarity coefficients and genetic distances. Red rice samples were grouped by cluster analysis.

The 24 primers used in this study were also able to differentiate rice cultivars from one another as well as the red rice samples from rice. Cluster analysis of the individuals tested showed that samples from DeWitt, Truman, and Fair Oaks were more genetically uniform. In contrast, samples from Marianna and Wynne were more heterogeneous. The genetic variations in the samples were analyzed by dryer, county, rice cultivars as well as by combination of all these factors. The greatest variation in the diversity among the red rice population was attributed to dryer ($R^2 = 0.54$). The average genetic distance among red rice, rice, and between red rice and rice was 0.46, 0.28, and 0.76 respectively. There was substantial genetic diversity among individuals tested and various genotypes of red rices are evident in Arkansas. Differences amongst red rice in Arkansas were most strongly associated with the region of collection and probably reflect geographic distances. Our study also indicates that there is spread of red rice populations to other regions probably by human activities. Of the primer pairs tested, primer pair D63901 produced the most distinctive bands between rice and red rice. We have used this primer in gene flow studies to detect hybridization between rice and red rice.

EFFECT OF POPULATION DENSITY AND DURATION OF INTERFERENCE OF PURPLE NUTSEDGE ON THE YIELD OF BELL PEPPER. J.P. Morales-Payan and W.M. Stall; Horticultural Sciences Department. University of Florida, Gainesville.

ABSTRACT

A field study was conducted in Citra, FL, to determine the influence of duration of interference and population densities of purple nutsedge (*Cyperus rotundus*) on the yield of bell pepper (*Capsicum annuum*). Purple nutsedge (0, 20, 40, 60, and 80 viable tubers.m^{-2}) was allowed to interfere with transplanted 'Camelot' bell pepper (6 plants.m^{-2}) for 2, 3, 4, 5 and 12 weeks after transplanting (WAT). Nutsedge height and shoot dry weight were determined 12 WAT. Nitrate nitrogen ($N0_3$-N) in pepper petiole sap was determined at flowering, and pepper fruit yield and shoot dry weight were determined at final harvest (12 WAT). Purple nutsedge height increased as time of removal was delayed, but pepper was always taller than nutsedge. As nutsedge density and duration of interference increased, purple nutsedge shoot dry weight increased and pepper shoot dry weight and fruit yield decreased. $N0_3$-N in pepper sap decreased as nutsedge density and duration of interference increased (2000 ppm in weed-free pepper, and 900 ppm at 80 nutsedges.m^{-2} for 12 WAT). Maximum yield loss was 70% when pepper competed season-long with 80 nutsedges.m^{-2}. Yield was reduced by 10% when nutsedge interfered with pepper for 3 weeks at densities of 40-80 plants.m^{-2}, and for 4 weeks at the density of 20 plants.m^{-2}.

INFLUENCE OF BARNYARDGRASS ON RICE STINK BUG POPULATIONS IN RICE.
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ABSTRACT

The rice stink bug, *Oebalus pugnax* (F.), is an important pest of rice *Oryza sativa* L., in the United States. The host range of the rice stink bug primarily consists of monocotyledonous plants. Barnyardgrass is thought to be a preferred host for rice stink bug. Thus, presence of barnyardgrass in rice fields may alter populations of both insects.

Field experiments were conducted to determine if presence of barnyardgrass influences infestations of rice stink bugs on rice. Experiments were conducted in northeast Louisiana at the Macon Ridge Research Station, Winnsboro (Franklin Parish), La., during the summers of 2001 and 2002. The soil at Winnsboro is a loessial upland soil (Gigger silt loam). Experimental design was a randomized block design with three replications in 2001 and four replications in 2002. Each plot measured 4 m X 3 m. Mixed plots of barnyardgrass and rice were cultivated such that either rice was surrounded by barnyardgrass or barnyardgrass surrounded by rice. Sampling for stink bugs began approximately two weeks prior to panicle emergence of rice and continued weekly for five weeks. Stink bugs were collected from rice portions of mixed plots and compared to numbers collected from the respective location in whole plots of rice. Contrast statements were used to compare densities of insects found on rice from interior portion of whole plots of rice and insect populations on rice collected from the interior portion of mixed plots. Likewise, comparisons were made between insect populations on rice from outer margins of whole plots of rice and insect populations on rice collected from outer margins of mixed plots. Numbers of insects collected were log transformed prior to analysis to meet the assumption of normality.

In 2001, rice grown in association with barnyardgrass had greater numbers of rice stink bugs than rice grown in association with rice at several sampling points. In all but four cases, numbers of adults, nymphs, or total number of stink bugs were numerically greater in samples from mixed plots. However, significant treatment effects were found only on Aug 24 and Sept. 5. Densities of nymphs and total number of stink bugs were at least five times greater in rice in either spatial arrangement of mixed plots on Aug. 24. Nine times more nymphs were collected on rice surrounded by barnyardgrass than rice surrounded by rice on Sept. 5.

Presence of barnyardgrass also influenced densities of stink bugs collected from rice in 2002. Stink bugs were numerically greater in mixed plots compared to whole plots for the first three dates samples were collected, with the exception of adults on Aug. 7. However, numbers of stink bugs on the last two sample dates were variable. There were numerically more nymphs on rice in whole plots of rice compared to rice in mixed plots for both arrangements on Aug. 28; adults and total number of stink bugs were numerically higher on rice in mixed plots. On Sept. 8, nymphs and total number of stink bugs were numerically greater in whole plots, whereas adults were greater on rice in mixed plots. Significant treatment effects were found on Aug. 7, 15, and Sept. 8. Number of nymphs collected on rice in the exterior of whole plots was greater than rice in the exterior of mixed plots on Aug. 7. On Aug. 15, nymphs and total number of stink bugs were at least four times greater on rice in mixed plots when rice was in the interior of plots. There were 1.5 to 2 times more nymphs found in rice of whole plots than in rice in mixed plots in either arrangement of barnyardgrass on Sept. 8. Also, total number of stink bugs was 1.5 times greater on rice in whole plots compared to rice in mixed plots.

Presence of barnyardgrass influenced rice stink bug populations on rice. More stink bugs were found in rice of mixed plots before panicle emergence of rice in both years. After panicle emergence of rice, results varied from 2001 and 2002. In 2001, stink bugs were up to nine times more abundant on rice in mixed plots of barnyardgrass and rice compared to whole plots of rice. Rice stink bugs were up to four times greater on rice in whole plots of rice than in mixed plots in

2002. Differences are likely a result of the developmental stage of barnyardgrass relative to rice. Data suggests the presence and developmental stage of barnyardgrass influence the severity and timing of rice stink bug infestations. Barnyardgrass requires approximately 50-55 days after emergence to produce mature seed. Panicle emergence of rice was 90-100% approximately 90 days after planting. Since barnyardgrass produces seed heads before rice, barnyardgrass can serve as a source of stink bug infestation in rice, as data suggest in 2001. However in 2002, emergence of barnyardgrass was delayed, and barnyardgrass seed heads were present when panicle emergence of rice occurred. Therefore, it is likely that lower numbers of stink bugs were present on rice in mixed plots because stink bugs stayed confined in barnyardgrass. Data suggests the presence and developmental stage of barnyardgrass influence the severity and timing of rice stink bug infestations.

SECTION VII. EDUCATIONAL AND REGULATORY ASPECTS OF WEED MANAGEMENT

EFFECT OF SOYBEAN ROW SPACING ON HADSS YIELD LOSS ESTIMATES. A. Rankins, Jr. and M.C. Smith, Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

In 1999, a USDA-funded regional project was initiated to validate and implement HADSS use, with scientist participating from AL, AR, GA, LA, MS, NC, OK, SC, TN, and TX. Participating cooperators meet annually to discuss ways to improve the utility of HADSS, and to initiate research to answer questions related to HADSS use. The influence of row spacing on the accuracy of yield loss estimates generated by HADSS has been identified as a question among cooperating weed scientists.

In 2002, experiments were conducted at the Black Belt Branch Experiment Station near Brooksville, MS to evaluate the effect of soybean row spacing on HADSS yield loss estimates under conventional and Roundup-Ready weed control programs. The experimental design was a randomized complete block in both experiments. Soybean planted on 7.5, 15, and 30-inch row spacings were evaluated. Weed counts were compiled and HADSS generated postemergence recommendations 21 and 30 days after planting. At the POST1 timing, the average weed size was 6", weed density ranged from 0.25 to 5.00 plants/100-ft^2, and moisture conditions were adequate. At the POST2 timing, the average weed size was 4", weed density ranged from 0.25 to 12.50 plants/100-ft^2, and moisture conditions were adequate. At both timings, recommendations were made based on an estimated soybean selling price of $4.62/bu and a weed-free soybean of 40 bu/A. Weed control and soybean injury were evaluated weekly until canopy closure in plots planted on 30". Weed control, soybean injury, soybean yield, and HADSS yield loss estimates were subjected to analysis of variance and means were separated using Fisher's protected LSD at the 5% significance level.

Weed pressure was low to moderate in these experiments, and as a result, in the conventional study, the only instance HADSS recommended a POST treatment was at the POST2 timing on 30" rows (0.42 oz/A Frontrow). However, in the Roundup Ready study, HADSS recommended not to spray at the POST1 timing on 7.5" rows and the POST2 timing on 30" rows. Glyphosate at 0.38 or 0.56 lb ae/A was recommended in the other treatment scenarios.

In the conventional study, by 8 weeks after planting Frontrow controlled pitted, entire, and smallflower morningglory greater than 90%, and prickly sida 83%. In the Roundup Ready study, glyphosate controlled all four species greater than 90% in most instances. The exception was 0.38 lb ae/A glyphosate at the POST2 timing on 7.5" rows, which was not preceded by a POST1 treatment. No visual soybean injury was observed with any treatment in the conventional or Roundup Ready study.

Although HADSS recommended not to spray in most instances in the conventional study, yield did not statistically differ from weed-free soybean yield, regardless of row spacing. Soybean yield ranged from 36 to 43 bu/A. In the Roundup Ready study, yields following HADSS recommendations did not differ from weed-free soybean yield, regardless of row spacing. Soybean yields in the Roundup Ready study ranged from 39 to 40 bu/A.

In the conventional study, predicted and actual yield losses after treatment did not differ by more than 4 and 5 bu/A at the POST1 and POST2 timings, respectively, regardless of row spacing.

Similarly, in the Roundup Ready study, predicted and actual yield loss after treatment did not differ by more than 2 and 4 bu/A at the POST1 and POST2 timings, respectively, regardless of row spacing.

Results from these data indicate that when marginal economic threshold weed densities are present, soybean row spacing does not affect HADSS yield loss estimates after treatment.

HADSS VALIDATION FOR USE IN MISSISSIPPI COTTON. A. Rankins, Jr., W.F. Bloodworth, and D.B. Reynolds, Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

The initial HADSS cotton database was developed by North Carolina State University under local conditions. In order to expand the utility of HADSS, validation of the model in other environments is needed. Modifications of competitive indices and herbicide efficacy values in North Carolina State's original database may be necessary to refine the model for use in Mississippi. As a part of a USDA-funded regional project, research was initiated in 1999 to validate HADSS use in Mississippi cotton.

Existing databases (North Carolina soybean, North Carolina cotton, and Mississippi soybean) were used to derive competitive indices for the Mississippi cotton database. Herbicide efficacy ratings were derived from the Mississippi Weed Control Guidelines. Herbicides and rates were added, deleted, or modified to best fit Mississippi conditions.

Field experiments were conducted in 1999 and 2000 at the Black Belt Branch Station near Brooksville, MS, Plant Science Research Center near Starkville, MS, and Delta Branch Station near Stoneville, MS to validate recommendations generated by HADSS. A fourth location, the Northeast Mississippi Branch Station near Verona, MS, was also included in 2000. The experimental design was a split-split-plot arrangement of treatments in a randomized complete block with 4 replicates. The main plot factor was system with 3 levels (Roundup Ready, BXN, and conventional). The sub-plot factor was preemergence (PRE) herbicide, with 2 levels (no pre and 1.25 lb/A fluometuron + 1.00 lb/A pendimethalin). The sub-sub-plot factor was postemergence (POST) HADSS recommendations at 2 levels [early POST (EPOST) and mid POST (MPOST)]. EPOST and MPOST recommendations were applied to 2-4 and 6-8 leaf cotton, respectively. HADSS recommendations were generated based on a weed-free cotton lint yield of 1000 lb/A and expected selling price of $0.70/lb. Applications were made with a CO_2 -powered backpack sprayer delivering 15 gallons per acre. Weed control and cotton injury were evaluated at 2-week intervals until 10 weeks after planting. Weed control and net economic gain were subjected to analysis of variance and means were separated using Fisher's protected LSD at the 5% significance level. Following cotton harvest, the HADSS model was re-executed using actual weed-free cotton lint yield for each treatment scenario to compare yield loss estimates based on projected weed free yield to estimates based on actual weed-free lint yield.

Weed pressure was generally high at each location, and as a result, HADSS recommended a POST application in each treatment scenario both years. In the Roundup Ready system, HADSS recommended glyphosate or glyphosate + pyrithiobac. However, recommendations were more variable in the BXN and conventional system. When a PRE was used, treatments recommended by HADSS controlled common purslane at least 95%, regardless of year, location, system, and application timing. HADSS treatments controlled large crabgrass at least 85%, regardless of year, location, PRE, system, and application timing. Hemp sesbania, common cocklebur, entireleaf morningglory, and pitted morningglory were controlled at least 87% by HADSS treatments, regardless of year, location, PRE, system, and application timing.

When a PRE was included, HADSS yield loss estimates after treatment were generally overestimated, when compared to actual yield losses after treatment; however, estimated yield loss based on projected weed-free lint yield did not differ from estimated loss based on actual weed-free lint yield by more than 40 lb/A. Across systems, HADSS yield loss estimates differed from actual yield loss by < 200 lb/A in 4 out of 6 and < 150 lb/A in 3 of 6 treatment scenarios. When no PRE was included, again HADSS yield loss estimates after treatment were generally

overestimated, when compared to actual yield loss after treatment; however, estimated yield loss based on projected weed-free lint yield did not differ from estimated loss based on actual weed-free lint yield by more than 70 lb/A. Across systems, HADSS yield loss estimates differed from actual yield loss by < 200 lb/A in 4 out of 6 treatment scenarios.

Although, HADSS generally overestimated yield loss after treatment, these overestimations did not result in recommendations that were not economical. A positive net economic return resulted from HADSS recommendations in each treatment scenario, regardless of year and location. Net gain was highest when applications were made EPOST, when compared to MPOST, regardless of year, location, and PRE. When no PRE was applied, net gain was $80/A higher when applications were made EPOST in the BXN and Roundup Ready system, when compared to the conventional system.

INCREASING EXPERIENCE OF USING HADSS IN PEANUT BY COOPERATIVE EXTENSION FIELD FACULTY. A. Cochran, C. Ellison, M. Shaw, A. Whitehead, M. Williams, M. Rayburn, G. Wilkerson, and D. Jordan. North Carolina State University, Raleigh, NC 27695-7620.

ABSTRACT

Pocket HERB and HADSS (Herbicide Application Decision Support System) have been developed to assist growers and their advisors with selection of herbicides for postemergence applications in peanut (*Arachis hypogaea*). A project was initiated in 2002 to enhance Cooperative Extension field faculty understanding of threshold-based weed management using Pocket HERB. Field faculty from six counties in North Carolina surveyed fields, collected weed population data, and made herbicide recommendations to producers. Fields were also monitored later in the season to determine effectiveness of herbicides. A series of questions were asked growers and County field faculty on the usability of Pocket HERB and possible ways to improve this approach to weed management in peanut. Most comments from growers were positive, although they were not directly involved in scouting, entering data, and determining the Pocket HERB recommendation. County agents were also positive relative to this approach to weed management. Greater promotion of this approach to weed management accompanied by more instruction on weed identification was suggested by the county agents. The project will be expanded in 2003 to additional county agents with peanut responsibilities.

DEVELOPMENT AND IMPLEMENTATION OF A LARGE SCALE HYDRILLA CONTROL MONITORING PROGRAM. D.E. Sanders and T.M. Hymel; LSU AgCenter, Idlewild Resarch Station, Clinton, LA 70722 and Iberia Research Station, Jeanerette, LA 70544.

ABSTRACT

Hydrilla verticillata Royle. has infested many parts of the Atchafalaya River basin in Louisiana and is a serious pest in most of the backwater areas of the basin. The Atchafalaya River basin is the largest riverine swamp ecosystem in North America. The basin encompasses approximately 2500 square miles in south central Louisiana. Located within the basin is Henderson Lake, a natural lake now managed with water control structures to maintain a minimum water level. The lake encompasses approximately 4,500 acres of open water and cypress hammocks. The lake is widely used by sportsmen since it is located between two main metropolitan areas and has direct access from a major interstate highway. The lake also supports a thriving ecotourism business. The lake developed an infestation of hydrilla over the past eight to ten years. Since 95% of the lake is shallow (less than three feet in depth at mean low water) most of the lake had become unuseable due to the extensive mats of hydrilla. Control was attempted in 2000 and 2001 by the Louisiana Department of Wildlife and Fisheries using a winter draw down method, essentially draining 95% of the lake. This method was achieving some success, but was ruining the ecotourism business which operates year round. Draining the lake for three to five months of the year was having a major negative financial impact on the lake's stakeholders.

In May of 2002 the Louisiana Legislature appropriated $1,000,000 for the control of hydrilla in the lake with the express directions that the lake not be drained and a herbicidal control program be implemented by a private contractor. The money was appropriated through the Louisiana Department of Natural Resources (LDNR) that had no expertise in weed control programs. LDNR contracted with the LSU AgCenter to develop and conduct a monitoring program. The monitoring program that was developed had five main goals: 1. Determine the hydrilla infestation levels prior to treatment, 2. Oversee that the contractor complied with all state and federal safety regulations in an effort to forestall any environmental problems. 3. Monitor levels of the herbicide chosen for the project (Avast). 4. Determine hydrilla infestation levels 90 days after the final application to determine if the contractor had fulfilled the requirement of a minimum of 80% control at 90 DAT as specified in the contract. 5. Continue to monitor hydrilla populations in the lake for the following 24 months and make control recommendations.

Applications of Avast could not begin until the lake had reach a static state with the water level slightly below the mean low water stage with no projected major rainfall events. The contractor decided to begin applications on July 25. The authors selected 20 sample sites on July 17. The sites were selected at random with the only qualification being that the hydrilla had to have formed a visible mat at the surface at a water depth of 3-4 feet. The sites were recorded using a Trimble GPS unit and a Guideline GPS unit as a backup. Eight bottom samples were taken at each site and a composite green weight was recorded.

The applications of Avast were begun on July 25 and concluded on August 7. Surface applications using airboats with trailing hoses were made on July 25,26,27 and August 1,2 and 7. A total of 120 gallons of Avast 4L was applied to 3,985 acres. Aerial applications using a fixed wing aircraft were made on July 29 and August 5 applying a total of 19,000 pounds of Avast pellets to the same 4,000 acres. The authors were present for all applications and requested and received cooperation from the local sheriff's department and US Army Corps of Engineers who supplied boats and personnel for the two days of aerial applications to prevent any misapplication to boaters. Water samples were taken on August 2,16 and 29 and were analyzed using standard GC pesticide analysis methods by the LSU Department of AgChemistry. Biweekly surveys were made to determine progress and to check for environmental problems

such as fish kills and poor water quality. Hydrilla samples were taken again on October 25 at 17 of the original 20 samples sites (low water levels prevented sampling at 3 sites). Again 8 bottom samples were taken and a composite green weight was recorded.

No fish kills or other environmental concerns were reported. Residue analysis by the LSU GC method averaged 4.53 PPB and was compared to the 5.34 PPB average provided by the Griffin LLC (manufacturer of Avast) ELISA method at the conclusion of the contract. The target level of 3-4 PPB for 60 days had been obtained. Initial green weight average for each sample site averaged nearly 6 pounds. The average green weights at 92 DAT was less than 1 pound with numerous sample sites having only trace amounts or no hydrilla present. The average green weight reduction was 87%, well withing the contract requirements of 80%. These findings were presented to LDNR and the contractor was paid for the contract.

This was an unusual project for the authors in that we were solely responsible for determining if the contractor had met the contract obligation. Aside from that the project provided valuable insight into large scale aquatic weed control and its inherent complexities.

THE POWER OF STATISTICAL TESTS OF HERBICIDE TRIALS IN FOREST NURSERIES. C.L. VanderSchaaf, D.B. South; School of Forestry and Wildlife Sciences, Auburn University, AL 36849 and P.F. Doruska. School of Forest Resources, University of Arkansas, Monticello, AR. 71656.

ABSTRACT

Statistical power tests were conducted on 17 herbicide trials in southern pine nurseries. Tests with low power can have a high probability of a Type II error (i.e. rejecting a true alternative hypothesis). Improvements in experimental design (e.g. increasing the number of experimental units or adequately lowering error sum of squares by blocking or use of a covariate) will increase the power of the test. We conducted *a priori* power tests to determine if our tests were sensitive enough to detect a 10% difference from the overall mean. Analyses indicate that trials with 12 to 16 experimental units generally have sufficient power to a detect a 10% difference in seedling height, root-collar diameter, seedbed density and shoot dry weight. We also conducted *post priori* power analyses at the 0.05 alpha level. However, we soon realized that a *post priori* power test provided us with no meaningful information beyond knowing the P-value. This is because the P-value and the *post priori* power are highly related.

INTRODUCTION

Herbicide research is based upon the concept that studies have proper replication and sampling so that most real differences between treatments will be declared statistically significant. The confidence in the decision of whether to reject or accept the null hypothesis (H_o) is based on the chosen alpha level, the inherent amount of variability in the data (also known as standard deviation), the degree to which the true state of nature departs from the H_o, and the sample size (1, 4). There is always a trade-off between costs (in terms of time and money) and the sample size required to detect a desired difference. Power analysis is an often neglected tool that can help researchers determine what sample size is needed for a given test.

Power can be defined as the probability when the H_o is false, the test will reject the H_o (4). In other words, it is the probability that a statistical test will correctly reject the H_o or the ability to detect a specified effect size if an effect actually exists (1, 2). Power is also defined as the 1 - Type II error rate (or the failure to reject a false null hypothesis). Power gives the researcher a measure of the degree (a probability value) to which the statistical test avoids making a Type II error. Researchers usually state what alpha level they use in their tests (e.g. $\alpha = 0.05$) but rarely do they list a desired power level for their tests (e.g. 0.80). When power is extremely low (e.g. 0.30), the chance of detecting a “real” treatment difference is low. Obviously, the more replications a researcher conducts, the greater the chance of making the correct decision concerning a hypothesis. Power can be increased by using alpha levels greater than 0.05 (0.10, 0.20); however, this is usually not recommended because it increases the chance of making a Type I error. A well designed test is one that has a high degree of success in detecting even small departures from the H_o (4). Some statisticians recommend a minimum power value of 0.80 (3).

There are two types of power analyses; *a priori* and *post priori*. An *a priori* test can be conducted prior to the actual statistical analysis and helps to answer what sample size is sufficient to detect a certain biological or economical difference between treatment means. A *post priori* test is calculated after the statistical test has been conducted and uses the observed differences in means. Therefore, the values obtained for *a priori* and *post priori* tests can vary greatly (since the observed differences in means are not necessarily the same as a pre-determined biological difference).

Many researchers assume there are only two statistical outcomes from an experimental trial (i.e. there was not or was a treatment effect). Most researchers simply reject the alternative hypothesis when a nonsignificant difference is determined without even considering the power of the test (1). However, a third outcome exists – there was so much variation within groups that no treatment differences were detected and the probability of making a Type II error is high. Therefore, when the null hypothesis is not rejected, a researcher should want some idea about whether it was due to the fact that the test was not powerful enough to detect a difference or was it due to the fact there actually was no statistical difference between the treatments? This explains why some reviewers prefer to see Least Significant Difference (LSD) values reported regardless of the observed difference between treatments. This is also a situation when a power test is helpful because it provides insight into how well the study was designed.

We at the AUSFNMC have been guilty of not determining the power of our herbicide trials. For example, many of our trials suggest that a 10% reduction in root weight was not statistically significant ($\alpha = 0.05$). Although the power may have been low for an herbicide trial at a particular nursery, we did not take this into consideration when reporting the results for seedling root weight. We based our management decisions only on the P-values. This may have lead to incorrectly assuming that a herbicide was not stunting roots at a particular nursery.

Making a Type II error can sometimes have large economic consequences. Therefore, we wanted to create an easily understandable methodology to determine *a priori* power for our randomized block designs. Additionally, we were interested in determining whether we needed to increase the number of replications to achieve the recommended power of 0.80. Although this analysis applies directly to herbicide trials in forest nurseries, it also applies to other areas of forest research.

METHODS

Data from actual herbicide trials were used to calculate the *a priori and post priori* power of each test. *Post priori* power was determined by following procedures outlined by others (2, 3). For each RCB design, an ANOVA was conducted using Proc GLM of SAS (5). From this analysis the mean squares for both the herbicide treatment (MSBG) and the error term (MSWG) were obtained for the *post priori* analyses. For the *a priori* analyses, we determined the overall mean for each nursery and variable combination and we used the MSWG from the ANOVA as an estimate of σ^2_ϵ. Following this, we multiplied the mean value by 10 %, squared this value, and then multiplied it by the number of treatments, also referred to as $\Sigma\, \alpha_j^2$.

This allows us to determine the sum of the squared treatment effects from the overall mean assuming a 10% difference in each treatment from the overall mean. We then calculated the non-centrality parameter (λ):

$$\lambda = n\,(\Sigma\, \alpha_j^2)/\,\sigma^2_\epsilon \qquad (1)$$

where: n = the number of replications,

We then determined v_1 and v_2 where v_1 is $p - 1$ and $v_2 = (n\text{-}1)(p\text{-}1)$. n = the number of replications. We then used two functions in SAS called FINV and PROBF to calculate power.

$$\text{F-value} = \text{FINV}\ (\text{PR}, v_1, v_2, 0) \qquad (2)$$

Where: PR = 1- α

$$\text{Power} = 1\text{- PROBF}\ (\text{F-value}, v_{1,}\, v_{2,}\, \lambda) \qquad (3)$$

Where: F-value = F-value that must be exceeded at the selected alpha level to determine that there is a significant difference between at least two treatments.

The following is a SAS printout example of seedling height in an herbicide trial conducted with four herbicide treatments (*p*) and four replications (*n*).

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	112.3073500	18.7178917	15.55	0.0003
Error	9	10.8316250	1.2035139		
Corrected Total	15	123.1389750			

R-Square	Coeff Var	Root MSE	height Mean
0.912037	4.326965	1.097048	25.35375

Source	DF	Type III SS	Mean Square	F Value	Pr > F
rep	3	45.62247500	15.20749167	12.64	0.0014
treat	3	66.68487500	22.22829167	18.47	0.0003

The randomized block ANOVA yielded a MSError term of 1.2035. This value can also be referred to as MSWG or σ^2_ϵ. The overall mean is 25.354. Ten percent of the mean is 2.535, this value squared is 6.426. To determine $\Sigma\ \alpha_j^2$, we multiply this by the number of treatments which is four (4 * 6.426 = 25.705). Plugging these values into equation 1 yields, λ = 4(25.705)/1.2035, so that λ = 85.434. The values of v_1 (4 – 1) and v_2 (4-1)(4-1) are 3 and 9; respectively. Placing these values into equation 3, F-value = FINV (0.95, 3, 9, 0) yields a value of 3.8625. This value can then be entered into equation 4, Power = 1- PROBF (3.8625, 3, 9, 85.434), yielding a power value of 1.000.

Results from several *a priori* power analyses are included in Tables 1-3. All reported analyses in tables and figures were conducted using an alpha level of 0.05.

RESULTS

All height and RCD tests had sufficient replication to detect a 10% difference at the 0.05 alpha level (Table 2). For the most part, 5 replications would be sufficient to detect a 10% difference for density and dry-shoot weight (Tables 1 and 3). Dry-root weight showed more variability (Table 3). Overall, measurements of height and RCD had the best *a priori* power values (average value 0.98). Density was third with 0.81, dry-shoot weight was fourth with an average power value of 0.76, and dry-root weight had the lowest average power value of 0.59. Height and RCD require an average of 3 replications to detect a 10% difference (at the 0.05 alpha level) while dry-shoot weight, density and dry-root weight require 5, 6, and 8 replications, respectively.

Table 1. *A priori* power analyses of density for herbicide trials with three different herbicides conducted on slash and loblolly pine seedlings in forest nurseries across the Southeast United States. Where: $\alpha = 0.05$, P = number of treatments, N = number of replications, MSWG = mean square within groups, Mean = average number of seedlings per square foot across all treatments, 10% diff = ten percent of Mean, LSD = least significant difference, Sample = the number of replications necessary to achieve a power of 0.80, the P-value obtained from the ANOVA table.

Site/study	Variable	P	N	MSWG	Mean	10 % diff	LSD	Power	Sample	P-value
0a	Density	3	4	3.292	19.396	1.940	3.139	0.720	5	0.572
0b	Density	2	4	1.570	18.344	1.834	2.820	0.780	5	0.368
1a	Density	3	4	0.887	19.750	1.975	1.630	0.999	3	0.509
1b	Density	2	4	0.362	20.469	2.047	1.354	1.000	3	0.278
2a	Density	3	4	1.974	13.917	1.392	2.431	0.652	5	0.005
2b	Density	2	4	13.469	13.250	1.325	8.259	0.114	33	0.386
3a	Density	4	4	1.788	27.688	2.769	2.139	1.000	3	0.433
3b	Density	4	4	0.819	19.500	1.950	1.448	1.000	3	0.063
4a	Density	4	4	3.678	22.672	2.267	3.067	0.901	4	0.322
5a	Density	4	4	3.191	19.813	1.981	2.857	0.859	4	0.680
5b	Density	4	4	2.495	17.750	1.775	2.681	0.868	4	0.171
6a	Density	4	4	5.070	16.766	1.677	3.602	0.503	7	0.651
6b	Density	4	4	0.928	13.828	1.383	1.540	0.979	3	0.193
7a	Density	3	4	3.130	22.542	2.254	3.061	0.860	4	0.149
7b	Density	2	4	3.031	23.750	2.375	3.918	0.728	5	0.529
7c	Density	4	4	2.507	17.688	1.769	2.533	0.864	4	0.255
7d	Density	4	4	1.851	20.641	2.064	2.176	0.988	3	0.379

Table 2. *A priori* power analyses of total seedling height (Height) and root-collar diameter (RCD) for herbicide trials with three different herbicides conducted on slash and loblolly pine seedlings in forest nurseries across the Southeast United States. Where: $\alpha = 0.05$, P = number of treatments, N = number of replications, MSWG = mean square within groups, Mean = average height or RCD across all treatments, 10% diff = ten percent of Mean, LSD = least significant difference, Sample = the number of replications necessary to achieve a power of 0.80, the P-value obtained from the ANOVA table.

Site/study	Variable	P	N	MSWG	Mean	10% Diff	LSD	Power	Sample	P-value
0a	Height	3	4	0.743	25.047	2.505	2.055	1.000	3	0.067
0b	Height	2	4	0.235	25.825	2.583	1.092	1.000	3	0.040
1a	Height	3	4	3.607	34.457	3.446	3.730	0.991	3	0.191
1b	Height	2	4	2.787	34.915	3.492	3.757	0.963	4	0.046
2a	Height	3	4	2.068	21.362	2.136	2.206	0.944	4	0.018
2b	Height	2	4	1.473	22.675	2.268	2.731	0.924	4	0.067
3a	Height	4	4	1.848	30.473	3.047	2.174	1.000	3	0.115
3b	Height	4	4	2.536	18.988	1.899	3.211	0.907	4	0.398
4a	Height	4	4	1.204	24.540	2.454	1.886	1.000	3	0.000
5a	Height	4	4	0.477	26.513	2.651	1.105	1.000	2	0.191
5b	Height	4	4	0.313	26.629	2.663	1.528	1.000	2	0.364
6a	Height	4	4	1.192	25.308	2.531	1.746	1.000	3	0.123
6b	Height	4	4	0.857	27.960	2.796	2.072	1.000	2	0.614
7a	Height	3	4	0.768	31.533	3.153	1.711	1.000	2	0.015
7b	Height	2	4	0.944	32.725	3.273	2.186	1.000	3	0.231
7c	Height	4	4	0.369	28.938	2.894	0.972	1.000	2	0.219
7d	Height	4	4	0.851	30.523	3.052	1.476	1.000	2	0.143
0a	RCD	3	4	0.012	3.023	0.302	0.193	1.000	3	0.065
0b	RCD	2	4	0.039	3.233	0.323	0.444	0.855	4	0.021
1a	RCD	3	4	0.016	3.506	0.351	0.223	1.000	3	0.969
1b	RCD	2	4	0.009	3.608	0.361	0.213	1.000	3	0.015
2a	RCD	3	4	0.089	4.564	0.456	0.452	0.955	4	0.046
2b	RCD	2	4	0.071	4.946	0.495	0.598	0.922	4	0.957
3a	RCD	4	4	0.026	3.947	0.395	0.259	1.000	2	0.187
3b	RCD	4	4	0.042	4.433	0.443	0.379	1.000	3	0.266
4a	RCD	4	4	0.049	4.007	0.401	0.496	0.999	3	0.351
5a	RCD	4	4	0.025	3.894	0.389	0.253	1.000	2	0.122
5b	RCD	4	4	0.028	3.751	0.375	0.417	1.000	3	0.978
6a	RCD	4	4	0.048	3.633	0.363	0.350	0.996	3	0.490
6b	RCD	4	4	0.053	4.189	0.419	0.438	0.999	3	0.647
7a	RCD	3	4	0.017	4.893	0.489	0.193	1.000	2	0.116
7b	RCD	2	4	0.010	4.799	0.480	0.223	1.000	3	0.063
7c	RCD	4	4	0.038	4.603	0.460	0.311	1.000	2	0.764
7d	RCD	4	4	0.021	4.265	0.426	0.231	1.000	2	0.913

Table 3. *A priori* power analyses of dry-root and dry-shoot weight for herbicide trials with three different herbicides conducted on slash and loblolly pine seedlings in forest nurseries across the Southeast United States. Where: α = 0.05, P = number of treatments, N = number of replications, MSWG = mean square within groups, Mean = average dry-root or dry-shoot weight across all treatments, 10% diff = ten percent of Mean, LSD = least significant difference, Sample = the number of replications necessary to achieve a power of 0.80, the P-value obtained from the ANOVA table.

Site/study	Variable	P	N	MSWG	Mean	10% Diff	LSD	Power	Sample	P-value
0a	Dryroot	3	4	0.000	0.230	0.023	0.034	0.790	5	0.061
0b	Dryroot	2	4	0.002	0.250	0.025	0.088	0.248	12	0.106
1a	Dryroot	3	4	0.003	0.281	0.028	0.096	0.216	15	0.630
1b	Dryroot	2	4	0.000	0.280	0.028	0.044	0.771	5	0.079
2a	Dryroot	3	4	0.029	1.051	0.105	0.296	0.299	11	0.056
2b	Dryroot	2	4	0.067	1.133	0.113	0.581	0.144	23	0.248
3a	Dryroot	4	4	0.000	0.317	0.032	0.034	0.986	3	0.011
3b	Dryroot	4	4	0.013	1.061	0.106	0.183	0.705	5	0.211
4a	Dryroot	4	4	0.006	0.651	0.065	0.122	0.629	6	0.124
5a	Dryroot	4	4	0.000	0.203	0.020	0.032	0.793	5	0.010
5b	Dryroot	4	4	0.001	0.260	0.026	0.049	0.670	5	0.556
6a	Dryroot	4	4	0.003	0.321	0.032	0.081	0.378	9	0.559
6b	Dryroot	4	4	0.001	0.360	0.036	0.058	0.761	5	0.361
7a	Dryroot	3	4	0.006	0.449	0.045	0.130	0.283	11	0.210
7b	Dryroot	2	4	0.001	0.392	0.039	0.067	0.701	5	0.655
7c	Dryroot	4	4	0.001	0.481	0.048	0.055	0.974	3	0.182
7d	Dryroot	4	4	0.002	0.412	0.041	0.071	0.707	5	0.850
0a	Dryshoot	3	4	0.013	1.498	0.150	0.197	0.880	4	0.070
0b	Dryshoot	2	4	0.045	1.712	0.171	0.478	0.355	9	0.235
1a	Dryshoot	3	4	0.017	2.581	0.258	0.229	0.997	3	0.717
1b	Dryshoot	2	4	0.043	2.496	0.250	0.469	0.630	5	0.174
2a	Dryshoot	3	4	0.172	2.399	0.240	0.717	0.269	12	0.074
2b	Dryshoot	2	4	0.045	2.628	0.263	0.475	0.652	5	0.053
3a	Dryshoot	4	4	0.077	3.016	0.302	0.443	0.844	4	0.454
3b	Dryshoot	4	4	0.167	3.058	0.306	0.653	0.507	7	0.571
4a	Dryshoot	4	4	0.059	2.723	0.272	0.387	0.867	4	0.057
5a	Dryshoot	4	4	0.043	2.138	0.214	0.332	0.801	4	0.468
5b	Dryshoot	4	4	0.037	2.595	0.260	0.324	0.962	3	0.464
6a	Dryshoot	4	4	0.140	2.651	0.265	0.599	0.461	7	0.638
6b	Dryshoot	4	4	0.060	3.360	0.336	0.390	0.968	3	0.515
7a	Dryshoot	3	4	0.013	3.336	0.334	0.200	1.000	3	0.916
7b	Dryshoot	2	4	0.023	3.310	0.331	0.342	0.973	4	0.898
7c	Dryshoot	4	4	0.107	3.429	0.343	0.522	0.815	4	0.514
7d	Dryshoot	4	4	0.036	3.260	0.326	0.303	0.998	3	0.814

DISCUSSION

A priori power was typically high for all studies. With a power of 0.80, we can sufficiently detect a 10% difference using 4 replications for height and RCD, and 5 replications for density. Power was lower for dry-root weight. To determine a 10% difference in dry-root weight at some nurseries will require more time and money for installing extra replications and measuring additional samples.

A priori power can often be increased by adding additional experimental units (either by increasing replication or by increasing the number of herbicide treatments). During the 1980’s, nursery herbicide trials often included 14 treatments and 4 replications. During the 1990’s, this was changed to 7 treatments and 8 replications. In some cases, power can also be improved by pooling data (when similar trials are conducted at a number of nurseries).

Do we need to be concerned about *post priori* power when interpreting results? No; as *post priori* power decreases, the ability to detect significant differences decreases (Figure 2). When the *post priori* power was greater than 0.55, a significant difference among treatments was always detected. However, we already knew this from the P-value. This strong relationship between *post priori* power and P-value (Figure 1) demonstrates why a *post priori* power analysis is not worthwhile in forest nursery research. In contrast, an *a priori* power analysis is meaningful since we are able to input into the power analysis a biologically or meaningful difference between treatments (i.e. a 10% difference). When conducting a *post priori* power analysis, the power value is not necessarily based on a biologically or meaningful treatment difference.

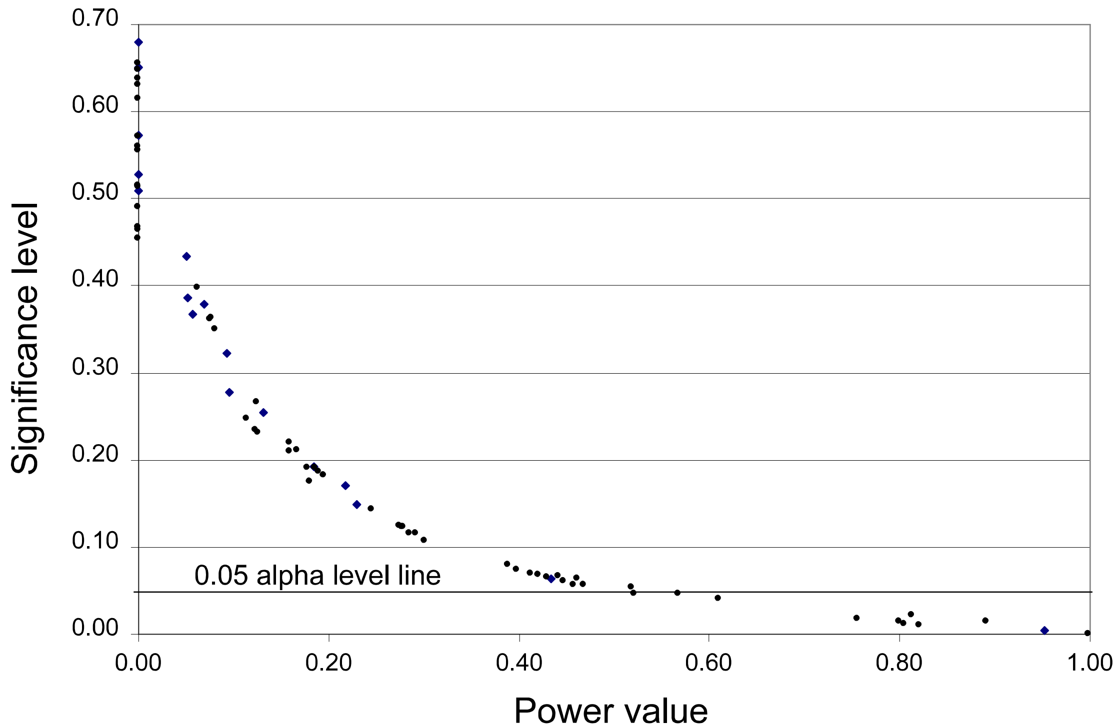

Figure 1. Significance levels over *post priori* power for 17 selected nursery trials in the southern United States (*post priori* power was calculated using an alpha level of 0.05).

Since *post priori* analyses are based on MSBG and MSWG, and the degrees of freedom, they are highly related to the P-values. This relationship exists because both variables are determined using MSBG and MSWG. In contrast, an *a priori* power analysis does not require the MSBG term.

A priori tests provide us with useful information about our studies. For example, tests 2b and 7d both had P-values of 0.38 (Table 1). However, the ability to detect a 10% difference in means was very low for test 2b (*a priori* power = 0.114) while the power was very high for test 7d. Therefore we can say with confidence that the herbicide treatment had no effect for study 2b but we are still uncertain the herbicide did not harm seedlings in test 7d.

Obviously a lot of money and time are spent on conducting these herbicide trials. It is difficult to control all variation in our tests because of the widespread differences in practices from one nursery to the next (sowing methods, herbicide application methods, etc.), the differences in soil types, etc. Different nurseries may require more replication depending on their particular cultural practices. This effect would most likely be even greater in hardwood seedling studies since they are more variable in growth than slash and loblolly pine seedlings.
At certain nurseries, the amount of variability within the seedlings prior to the application of herbicides may have been so great that a statistical test with four treatments and four replications

had no real relevance. Stated differently, the probability of making a Type II error for dry root weight was high in five trials (Table 3). We suspect a lack of sufficient replication also exists for certain variables in other branches of forest research (6).

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Appendix 1. SAS code to calculate *a priori* power for randomized block and completely randomized designs using data from a previous trial to determine the number of replications necessary to detect a 10% difference from the mean.

* Randomized block using an alpha level of 0.05. In a previous step, you must determine the overall mean of the variable. The number of treatments must be entered manually (p). You can use various percent differences by manipulating perdiff (for example, “0.05*mean”, is a 5% difference). You can also increase the number of potentially required replications by manipulating “do n = 2 to 100”. These two manipulations can be seen in the completely randomized design code. The inclusion of "by site" allows a user to conduct power on many different studies/sites/locations, etc. at the same time (“site” can be replaced with any name of a variable). If you want to determine power for only one analysis, remove "by site". ;

```
proc GLM outstat = t1 ;
class rep treat ;
model ht = rep treat ;
by site ;
run ;

data t2 ; set t1 ; if  SOURCE_ = "ERROR" ; MSWG = SS/DF ; drop
_SOURCE_ _TYPE_ F SS ; run ;

data t3 ; merge t2 xx (the file with the overall variable mean) ;
by   ; run ;

data t4 ; set t3 ;
p = 4 ; perdiff = 0.10*mean ; sqpd = perdiff*perdiff ;
sumtreat = sqpd * p ;
do n = 2 to 100 ;
phi = sqrt((sumtreat /p)/(MSWG/n)) ;
noncen = (phi*phi)*p ;
F = FINV(0.95, p-1, (p-1)*(n-1), 0);
POWER = 1 - PROBF(F, p-1, (p-1)*(n-1), noncen); output ;
if power ge 0.80 then leave ;
end ;
run ;


* Completely randomized design using an alpha level of 0.10.  The
SAS code to determine power is the same with the exception that
v2 = p*(n-1) ;

data t3 ; set t2 ;
p = 4 ; perdiff = 0.05*mean ; sqpd = perdiff*perdiff ;
sumtreat = sqpd * p ;
do n = 2 to 1000 ;
phi = sqrt((sumtreat /p)/(MSWG/n)) ;
noncen = (phi*phi)*p ;
F = FINV(0.90, p-1, p*(n-1), 0);
POWER = 1 - PROBF(F, p-1, p*(n-1), noncen); output ;
if power ge 0.80 then leave ;
end ;
run ;
```

AN OVERVIEW AND TUTORIAL ON THE USE OF ADOBE ACROBAT TO SEARCH THE PROCEEDINGS OF THE SWSS. D.B. Reynolds, Mississippi State University, Mississippi State.

ABSTRACT

Advances in computer technology have resulted in the implementation and utilization of digital media as an alternative to hardcopies. Electronic files have the advantages of being easily archived, searched, printed, and shared with others. Along with these advantages come some disadvantages. Documents produced with a specific software program are often incompatible with other software products thus necessitating all parties who share the information to have the same software. Further more, documents created with different version of the same software are often incompatible. In some instances, the same version of a particular software program will result in different results because of difference in printers. These problems are but a partial list of why there was a need for a universal file format capable of preserving fonts, formatting, graphics, and color regardless of the program or operating system (Windows or Macintosh) used to created the file.

In response to these needs, Adobe Corporation produced the portable document format (PDF). It has become the de facto standard for electronic document distribution. This format preserves all fonts, formatting, graphics, and color of the original document. These files are produced by using Adobe Acrobat which consists of Acrobat Reader and Acrobat Writer. The Adobe Acrobat Writer software must be purchased and it is necessary to create PDF files. The Acrobat Reader is free to anyone via the internet and can be used to read and fill out forms of any PDF file created with the Acrobat Writer software (http://www.adobe.com/products/acrobat/readstep2.html). The author of the PDF document has complete control over the content of the PDF files. They can password protect the document entirely thus limiting access or they may choose to limit the users ability to copy & paste from the document or even print the document.

Publishing of the Proceeding of the Southern Weed Science Society (SWSS) is a major expense to the Society. Electronic copies of the document are less costly, highly archievable, and completely searchable. For these and other reasons the SWSS Board of Directors have decided to make the Proceedings available on CD. This facilitates easy storage of multiple volumes as well as extensive document searches. By utilizing this system the user can easily search for keywords over multiple volumes with just a few keystrokes. A sophisticated search engine utilizes search indexes and metadata for each file to yield speedy and highly accurate queries.

Currently, the SWSS Proceedings contains the complete Proceedings for 1999-2002. Each year additional information will be added until storage becomes limited. At that time we may either have multiple volumes of CDs or DVD technologies may have progressed to the point to migrate to DVD media.

THE SITE SELECTION PROCESS FOR THE SWSS ANNUAL MEETING. T.C. Mueller, University of Tennessee, Knoxville, TN.

ABSTRACT

The selection of the location of the annual meeting is an important decision the SWSS executive board makes each year. This presentation outlined the history of locations the SWSS has previously met, some background into attendance patterns, and a brief overview of the process used in selecting a site for the annual meeting.

Historically, the SWSS meeting location was a simple rotation between several major towns, with the meeting often being held at the same hotel in each city. The major cities in the rotation were Atlanta, Dallas, Memphis, and sometimes New Orleans. A rotation still is used, but currently the site selection committee is directed to rotate the location through certain sections of the society in rotating years, with the divisions being western (TX, OK, AR, LA), central (KY, TN, MS, AL), and eastern (VA, NC, SC, GA, FL). Attendance peaked at about 900 people in the mid-1980s, with the highest single year attendance in Nashville, TN. Since about 1990, there has been a relatively constant decline in attendance each year, such that current attendance is about 450, and appears to be stabilizing at that level.

There are several factors that are considered when selecting a location for the annual meeting, including quality of meeting space, room rate, airport facilities, food capabilities, recreational opportunities, whether the hotel is large enough to hold all attendees in a single property, and the availability of a local arrangements chairperson.

The SWSS uses three general types of meeting space at our meeting. Large rooms are needed to house the general session, the banquet, and the poster session. We also operate four oral sessions at one time, and each room needs to have a capacity of about 150. The third type of room are those used in committee meetings, and other small groups. In previous years, we have used as many as 10 small rooms simultaneously, but now we could reduce this number to accommodate smaller properties that can now host our meeting.

Room rates have increased substantially in recent years, and this an attribute of a meeting site that is easily quantifiable. People cannot put a number on “quality meeting space”, but they can easily see that $110 per room is more than $80 per room. Room rates are more of a concern to personnel that attend several meetings and may have limited travel budgets, since graduate student rooms are supported by funding directly from SWSS.

Available airport connections vary widely between different cities. Besides low fares, it is best if several major carriers fly to the destination location. Distance to the airport is also a factor, both from a cost and convenience factor.

To really get people upset at a SWSS meeting, ask them to pay a high price for bad food, such as a boxed lunch. People under-estimate the task of feeding 400 (or more) hungry weed scientists simultaneously, since most eat lunch at the same time. The ability to walk to some restaurants for some meals is also highly desirable. The “food functions” provided by a hotel, including breaks during the sessions and the banquet, are a major source of revenue to the hotel and a major expense to SWSS. Other points to consider include whether there is anything to do in that city, which varies tremendously throughout the region.

The process of selecting a property actually begins three years in advance of the meeting. The site selection committee, under the direction of a rotating chairman, solicits proposals from the respective region of the SWSS. The chairman then ranks the proposals and submits them to the SWSS board, which selects the property, usually about 2 ½ years in advance of the meeting.

SECTION VIII. DEVELOPMENTS FROM INDUSTRY

UTILIZING AIM HERBICIDE AS A HARVEST AID TREATMENT.

T.I. Crumby, H.R. Mitchell and J.P. Reed, FMC Corporation, Bolton MS, Louisville MS and North Little Rock AR.

ABSTRACT

FMC discovered and conducted field research with several PPO inhibitor herbicides leading to the Section 3 registrations of sulfentrazone and carfentrazone. Field research was conducted with several of these candidate herbicides as pre-plant and at-plant burndown, post-directed, lay-by and harvest aid treatments in cotton, resulting in a decision to seek a Section 3 registration for the use of carfentrazone in cotton. That registration was granted in August 2001, just prior to the harvest aid use season. Carfentrazone is sold under the brand names Aim EC herbicide and Shark herbicide.

Aim EC has been positioned as a harvest aid to be used alone in situations where cotton leaves were mature and cotton bolls were sufficiently open. In situations where boll-opening capabilities were required as well as additional defoliation, Aim was positioned to be tank-mixed with ethephon products. Where there was concern over potential cotton plant regrowth, Aim was positioned to be used in tank-mix combinations with thidiazuron products. In situations of rank cotton plant growth, Aim was positioned as a sequential treatment to be used in conjunction with Aim or other harvest aid products. Aim demonstrated excellent desiccation of problem weeds such as morningglories and defoliation of pigweeds and has proven to be very effective in the removal of juvenile growth. The performance of Aim as a harvest aid weed desiccant in cotton prompted the specific research efforts in other crops during 2002.

In replicated small plot spindle picker research trials, Aim applied alone at 0.016 lb. ai/a, and in combination with Prep at 0.75 lb. ai/a provided 73% and 78% defoliation, respectively, at 7 days after treatment as compared to 78% defoliation provided by Prep at 1.0 lb. ai/a plus Def at 0.75 lb. ai/a. When evaluated 14 days after application, these treatments provided 82% and 82% defoliation, respectively, as compared to 83% defoliation provided by the standard Prep plus Def treatment. Aim and the Aim mixture treatments provided very similar cotton leaf desiccation and regrowth control as compared to the standard Prep plus Def treatment. In sequential application programs, Aim at 0.016 lb. ai/a followed by Aim at 0.016 lb. ai/a and Aim at 0.016 lb. ai/a plus Prep at 0.075 lb. ai/a followed by Aim at 0.016 lb. ai/a provided 92% and 88% defoliation, respectively, at 7 days following the second application as compared to 83% defoliation provided by a single treatment of Def at 0.75 lb. ai/a plus Prep at 1.0 lb. ai/a. The Aim sequential treatments provided superior regrowth control.

In small plot stripper cotton research trials, Aim EC applied at 0.016 and 0.025 lb. ai/a provided 80% defoliation as compared to Cyclone treatments at 0.125, 0.025 and 0.50 lb. ai/a that provided 80%, 77% and 50% defoliation, respectively, at 7 days following treatment. In sequential treatments of Aim at 0.016 lb. ai/a followed by Cyclone at 0.25 lb. ai/a or Cyclone at 0.25 lb. ai/a followed by Aim at 0.016 lb. ai/a, both treatments provided very similar results of 70% and 69% defoliation, respectively, at 7 days after treatment and 89% and 92% defoliation, respectively, at 14 days after treatment.

In a small plot replicated study, Aim applied at 0.016 lb. ai/a provided 92%, 94% and 97% leaf desiccation and 63%, 86% and 97% stem desiccation of morningglory species at 3,7, and 13 days after treatment, respectively. In other replicated studies Aim at 0.016 lb. ai/a provided 95% desiccation of velvetleaf as compared to 49% and 41% desiccation provided by Roundup at 1.0 lb. ai/a and Gramoxone at 0.25 lb. ai/a respectively. Aim at 0.016 lb. ai/a provided 90% desiccation of morningglory species as compared to 59% and 84% desiccation provided by Roundup at 1.0 lb. ai/a and Gramoxone at 0.25 lb. ai/a respectively.

Future research plans for Aim include additional investigations for use in cotton as preplant burndown, at-plant burndown, post-directed and lay-by treatments. Field research trials as a cotton harvest aid will further define product use rates, utilization in spindle and stripper production systems and use as a harvest aid in other crops such as rice, grain sorghum, soybeans and corn.

TRIFLOXYSULFURON SODIUM FOR CONTROL OF WEEDS IN WARM SEASON GRASSES IN THE SOUTH. L.D. Houseworth, R.J. Keese, D.M. Mosdell. Syngenta Crop Protection, Greensboro, NC 27419.

ABSTRACT

Trifloxysulfuron sodium is an ALS (acetolactate synthase) inhibitor under development by Syngenta for use in turf and other crops. The turf label is being reviewed by EPA and a Section 3 label is expected to be approved in 2003. It will be marketed in turf as Monument®.

Trifloxysulfuron sodium (TSS) is formulated as a 75% WG. Bermudagrass and Zoysiagrass are very tolerant and St. Augustinegrass is moderately tolerant to this compound at proposed use rates. All common cool season grasses are very sensitive to TSS to the point that most of them can be effectively controlled by TSS.

At 7-12 gm ai/A, TSS provides control of *Poa annua*, *Poa trivialis,* ryegrass, yellow nutsedge, purple nutsedge, green kyllinga, carpetweed, broadleaf signalgrass, dandlelion, henbit, oxalis, spotted spurge, tall fescue and others. It also has activity on Virginia buttonweed, Dallisgrass, Torpedograss and Bahigrass. Multiple applications will be needed for control of several weed species.

TSS has utility as a tool to manage overseeded cool season grasses in Bermudagrass. Rates of 2-6 gm ai/A will selectively remove overseeded grasses from Bermudagrass. The rate to be used will depend on the speed of removal that is desired.

FORAMSULFURON (REVOLVER™): SPRING TRANSITION OF PERENNIAL RYEGRASS TO BERMUDAGRASS. L.C. Mudge, A.M. Wiese, J.E. Merrick, D. Myers, H.C. Olsen and J.L. Corbett, Bayer Environmental Science, Montvale, NJ. 07645

ABSTRACT

Foramsulfuron,1-(4,6-dimethoxypyrimidin-2-yl)-3-[2-(dimethylcarbamoyl)-5-formamidophenylsulfonyl]urea, is a sulfonylurea herbicide being developed for use on certain warm season turf grass species by Bayer Environmental Science. The trade name of this new product is Revolver™. Revolver has activity on many cool season grassy weeds including perennial ryegrass (*Lolium perenne*). Revolver was evaluated in 2001 and 2002 for control of perennial ryegrass overseeded onto bermudagrass (*Cynodon dactylon*). This is a common practice in the transition zone of the U.S. for winter color on bermudagrass fairways that go dormant in the fall and winter. In the spring, superintendents wish to have smooth transition from a dormant bermudagrass base overseeded with ryegrass, to one of pure bermudagrass. Revolver rates of 0.2 to 0.6 fl. oz. product/1000 ft2 are recommended for control of perennial ryegrass. Nitrogen, when applied at 0.5 lb. 1000ft2, did improve fill in of the bermudagrass and turf quality. No phytotoxicity to the bermudagrass was reported. The Revolver label is expected the 1st quarter of 2003 with initial listed weeds including ryegrass (*Lolium spp.*), tall fescue (*Festuca arundinacea* Schrreb.), *Poa trivialis* and *Poa annua* L. and goosegrass (*Elusine indica*).

FORAMSULFURON (REVOLVER™): WARM SEASON TURF TOLERANCE AND WEED CONTROL. A.M. Wiese, J.E. Merrick, L.C. Mudge, D. Myers, H.C. Olsen and J.L. Corbett, Bayer Environmental Science, Montvale, NJ. 07645

ABSTRACT

Foramsulfuron, 1-(4,6-dimethoxypyrimidin-2-yl)-3-[2-(dimethylcarbamoyl)-5-formamidophenylsulfonyl]urea, is a sulfonylurea herbicide being developed for warm season turf use by Bayer Environmental Science. The trade name of this new product is Revolver™. For control of one to three leaf goosegrass (*Eliusine indica* (L.) Gaertn.), Revolver rates of 0.4 to 0.6 oz product/1000 ft2 are recommended. For tillered goosegrass, a tank mix of Revolver at 0.4 to 0.6 + Sencor at 0.3 oz product/1000 ft2 with sequential applications is recommended. Dallisgrass (*Paspalum dilatatum* Poir.) broadcast and spot treatments will continue on an experimental basis in 2003. For 2002, spot treatment results indicate that 3 applications of Revolver at 2 oz/gallon alone gave 100% dallisgrass control at 2 months. Two applications of Revolver at 2, 1 and 0.5 oz/gallon plus MSMA at 1 oz/gallon also gave 100% control at two months. One application of Revolver alone or tank mixed with MSMA gave 50% control of dallisgrass at 2 months. *Poa annua* and *Poa trivialis* control can be achieved using 0.1 to 0.4 oz/1000 ft2 with lower rates used for warmer temperatures and smaller weeds. Revolver will be labeled for weed control on Bermudagrass (*Cynodon dactylon* (L.) Pers.) and Zoysiagrass (*Zoysia japonica*). Southern turf species that show insufficient tolerance include Kikuyugrass (*Pennisetum clandestinum* Hochst. Ex Chiov.) and centipedegrass (*Axonopus affinis* Chase). Injury levels in St. Augustinegrass (*Stenotaphrum secundatum)* and Seashore paspalum (*Paspalum vaginatum*) have ranged up to 45%. The Revolver label is expected the 1st quarter of 2003 with initial listed weeds including ryegrass, (tall fescue (*Festuca arundinacea* Schrreb.), *Poa trivialis* and *Poa annua* L. and goosegrass.

TRIFLOXYSULFURON-SODIUM (CGA362622) AS AN OVERSEEDING TRANSITION AID. R.J. Keese, L.D. Houseworth and D. Ross. Syngenta Crop Protection, Greensboro, NC.

ABSTRACT

Trifloxysulfuron is a sulfonylurea with activity on cool season grasses and sedges. Registration is expected under the trade name Monument^{TM} 75WG in Summer/Fall 2003. Use rates will be in the 0.33 to 0.56 range or 0.1 to 0.56 oz/A for the full range. When applied post dormancy to bermudagrass, Monument will effectively remove perennial ryegrass (*Lolium perenne*) and *Poa trivialis*. Data will be presented from studies conducted over the past 3 years in AL, AZ, GA, KY, NC and VA. 28-days after treatment (DAT), rates greater than 4 gai/A will remove +90% of perennial ryegrass (VA). In AZ the perennial ryegrass was significantly reduced compared to the untreated plots. Tifway bermudagrass density in AL was significantly increased and *Poa trivialis* population was decreased. A 10 gai/ha application of Monument in NC provided >80% control of perennial ryegrass at 21-DAT. GA and KY trials both demonstrated rapid removal of perennial ryegrass from Bermudagrass. Applications are made post dormancy, when there is an adequate Bermudagrass base. Some delay of green-up is possible following herbicide treatment, however this is very unusual at this mid May timing or at the 0.1 to 0.3 oz/A rate.

ATTRIBUTES OF ROUNDUP WEATHERMAX™, AN ALTERNATE SALT FORMULATION OF GLYPHOSATE. J.A. Koscelny, D.H. Heering, J.J. Sandbrink and P.G. Ratliff, Monsanto Company, St. Louis, MO 63167.

ABSTRACT

The first glyphosate formulation was commercialized in the US in 1974. Since then, there has been continuous research and innovation efforts to further enhance product performance and handling. The introduction and acceptance of glyphosate tolerant crops has led to an increased use of glyphosate for broad-spectrum weed control over-the-top of these crops. Despite previous formulation breakthroughs, customers continue to ask for complete, more concentrated formulations that consistently perform across a wide range of environments. The objectives of this research were to develop a complete glyphosate formulation with 1) state-of-the-art handling efficiencies, 2) bioefficacy consistency even under challenging conditions and 3) maintain excellent glyphosate tolerant crop safety. Due to the low water solubility of the glyphosate molecule, it is commonly formulated as a salt using counter ions. Many counter ions can be used to formulate glyphosate as a liquid, however, for each there is a glyphosate concentration versus viscosity tradeoff. To achieve the desired higher glyphosate concentration and improved viscosity characteristics, the potassium salt of glyphosate was chosen. Greenhouse, growth chamber and field research trials were conducted to evaluate this new potassium salt of glyphosate formulation. At labeled rates, this new glyphosate formulation provided excellent broad-spectrum weed control. Under challenging conditions, the new formulation provided statistically better weed control when compared to competitive glyphosate formulations. Glyphosate tolerant corn, cotton and soybean crop safety to this formulation was excellent. As a result of accomplishing these objectives, Roundup WeatherMAX, a 4.5 lb ae/gal potassium salt of glyphosate formulation, has been commercialized in the US.

ANNUAL RYEGRASS CONTROL WITH OSPREY HERBICIDE IN WINTER WHEAT.
M.D. Paulsgrove, S.S. Hand, J. Sanderson, L. Hall, M. Rosemond, M. Ehlhardt, S. Garris; Bayer CropScience RTP, NC 27709.

ABSTRACT

Osprey Herbicide is a new postemergence herbicide being developed by Bayer CropScience for weed control in winter wheat. Osprey Herbicide is comprised of the active ingredient mesosulfuron-methyl. This herbicide acts as an inhibitor of acetolactate synthase (ALS). Mesosulfuron-methyl will control many important grass weeds in winter wheat and is highly active on wild oat and annual ryegrass as well as some broadleaf weeds such as wild mustard. Osprey Herbicide exhibits excellent winter wheat tolerance at 10 to 15 g ai /ha.

In field experiments in North America, mesosulfuron-methyl controlled annual ryegrass, annual bluegrass, wild oat, and canarygrass as well as wild mustard, Tansy mustard and blue mustard. Osprey Herbicide is applied to grass weeds up to 2-tiller in size and 1-2 leaf mustards. Applications of Osprey Herbicide must include a tankmix partner of a high-quality MSO with 10% emulsifier or greater at 1.5 pt/a. In certain circumstances where Osprey Herbicide is tankmixed with a herbicide that prohibits the addition of a MSO, a NIS plus ammonium nitrogen fertilizer may be used instead.

Osprey Herbicide has a very favorable ecological, ecotoxicological and environmental profile with low acute mammalian toxicity and no genotoxic, mutagenic or oncogenic properties noted. Microbial degradation is the primary degradation pathway of mesosulfuron-methyl in the environment. Mesosulfuron-methyl is rapidly degraded and unlikely to pose any risk to succeeding crops. Excellent control of ACC-ase resistant wild oat (*Avena fatua* L.) biotypes have been attained with Osprey Herbicide in field trials. Osprey Herbicide also controls diclofop-resistant annual ryegrass (*Lolium multiflorum* L.).

The low use-rate, excellent weed control and crop safety combined with very favorable toxicological, ecotoxicological and environmental properties will make this product a valuable new tool for winter wheat farmers.

BARRAGE® HF, A NOVEL 2,4-D FORMULATION TECHNOLOGY FOR PRE-PLANT BURNDOWN. M.M. Kenty, J.M. Thomas, S. Pace, and F. Yopp. Helena Chemical Company, Collierville, TN.

ABSTRACT

Barrage HF is a unique Low Volatile 2,4-D Ester product utilizing Helena Chemical Company Patented Formulation Technology. It is fully compatible with most liquid fertilizers and capable of working at lower than conventional LV ester labeled rates. Barrage HF is designed to maximize broadleaf weed control while minimizing spray application and mixing problems. It controls many annual broadleaf species while aiding in the suppression of certain perennial or biennial broadleaf weeds. The average use rate is 8-12 oz/acre depending on weed species and environmental conditions. Applications may be made by ground or air equipment, although ground applications may provide more thorough coverage and better weed control given the GPA of the spray solution.

EPA currently allows use of Barrage HF in fallowland applications (to specifically include “cotton regrowth”). The labeled rates are 6 – 13 oz/A, although use rates are generally 9 –10 oz/A tankmixed with products such as glyphosates, dicamba, sulfonylureas, and others. Currently the shortest cotton pre-plant interval is 30 days if applied to fallowland. Under normal conditions, any crop may be planted without risk of injury if at least 90 days of soil temperatures above freezing have elapsed since application.

In 2003 Helena Chemical Company will be submitting documentation to the agency to substantiate the use of Barrage HF for a pre-plant (burndown) application on cotton. The application timing will be less than 30 days prior to planting of cotton. The granting of this amendment to the Barrage HF label will resolve ambiguity for EPA, state regulatory agencies and the producer on the proper, legal way to use Barrage HF in the control broadleaf weeds prior to planting cotton.

A trial was initiated at the request of cotton weed scientists across the cotton belt to generate a broad database to support a lower and better defined pre-plant interval to cotton. The trial was conducted at 11 locations in 2001 and 27 in 2002. Each trial consisted of four or more replicates. Treatments were Barrage HF at 0.54 and 1.08 Kg ai/ha (13 and 26 oz/A) applied with Roundup™ UltraMax @ 2.3 Kg ai/ha (26 oz/A) at different pre-plant interval. Pre-plant intervals of 21, 14, 7, and 0 days in 2001 and 28, 21, and 14 days pre-plant in 2002 were evaluated. Stand counts, crop phytotoxicity (visual symptomology), and yield were taken for all plots both years. If any visual symptomology was detected, plant mapping was conducted on all plots.

The average crop injury symptoms exhibited across all locations and pre-plant interval were less than 8% for either rate of Barrage HF in 2001 and 2002. In all incidences of crop phytotoxicity the injury was an expression of leaf symptomology. There were no stand losses attributed to Barrage HF at either rate or any pre-plant interval. The seed cotton yield for Barrage HF at 0.54 and 1.08 Kg ai/ha applied at 21 and 14 days pre-plant were averaged across years. No statistical differences between yields from the treatments (P=0.05, Waller-Duncan K-ratio Test) were detected.

Weed control trials were initiated in 2002 at 5 locations (MS, TN, NM, AR, & LA) to evaluate the low use rate potential of Barrage HF in the cotton burndown market to aid in the control of broadleaf weeds. Barrage HF at 0.25 and 0.5 Kg ai/ha (6 and 12 oz/A) tank-mixed with Roundup UltraMax at 1.24 kg ai/ha (14 oz/A) were evaluated at 28, 21, and 14 days pre-plant. Weed control ratings were made at 7, 14, 28, and 56 DAT. All weed control ratings presented are Barrage HF at 0.25 Kg ai/ha + Roundup UltraMax at 1.24 Kg ai/ha. Barrage HF at 0.5 Kg ai/ha did not add to the weed control of the weed species tested. The weed control for all

broadleaf weed species tested increased relative to the days after treatment as well as the weed size as present at the pre-plant interval.

In conclusion, Helena Chemical Company will be submitting a data package to EPA requesting a cotton pre-plant interval of less than 30 days. The use rates will be 0.25 – 0.54 Kg ai/ha (6 – 13 oz/A). Barrage HF offers cotton producers another tool to combat troublesome weeds in the pre-plant burndown market.

Barrage HF is a registered trademark of Helena Chemical Company.
Roundup is registered trademark of Monsanto Company.

ENVOKE™: COTTON TOLERANCE AND YIELD. S.M. Schraer, H.S. McLean, J.C. Holloway, C.A.S. Pearson, and C. Foresman; Syngenta Crop Protection, Greensboro, NC.

ABSTRACT

ENVOKE™ herbicide (CGA-362622) is being developed as a post-emergence weed control in cotton. Application for registration is pending with US EPA. Federal registration is anticipated during 2003. Envoke will be registered for use in the Southeast and Mid-south regions of the US, as well as Eastern Texas. Subsequent registrations in CA, AR, and NM are planned. The proposed ISO common name is trifloxysulfuron-sodium. Envoke is formulated as a 75% water dispersible granule. At low use rates Envoke will provide systemic control of many of the more troublesome weeds in cotton, including pitted and entireleaf morningglories (*Ipomoea lacunosa* and *I. hederacea*), sicklepod (*Senna obtusifolia*), and nutsedge (*Cyperus esculentus* and *C. rotundus*). Envoke is compatible with conventional, Roundup Ready® and BXN® cotton production systems.

Proposed Envoke rates for post-emergence over-the-top (POT) application, starting at a minimum of 5 true leaves in picker-type cotton varieties, are 0.10-0.15 oz per acre. Proposed rates for post-emergence directed (PD) application are 0.15-0.25 oz per acre. A non-ionic surfactant (NIS) should be included at 0.25% v/v.

A summary of data from 1998-2002 supports the proposed rates and application timings to picker-type varieties of cotton. Initial crop response in stripper cotton varieties was greater than that seen with picker-type cotton varieties. In picker-type varieties, applications of Envoke 0.15 oz/A resulted in greater crop response when applied early-POT (E-POT, <5 leaf cotton) compared to POT (5-8 leaf cotton) and late-POT (>8 leaf cotton) applications, >25% and <15% respectively. Crop recovery time was longer with E-POT applications compared to POT applications, >28 and 22 days after treatment respectively. When applied POT, mean initial crop response was <15% when Envoke was applied at 0.1-0.15 oz/A. At 0.2-0.3 oz/A, mean initial crop response was 15-18%. Typical cotton response to Envoke applications consists of chlorosis (leaf yellowing) and shortening of the internodes. Crop response when observed was transient and had no impact on cotton yield. By 21 days after application, crop response was <5% for Envoke 0.1-0.25 oz/A and <10% for the 0.3 oz/A rate.

Envoke's spectrum of activity on difficult to control weeds will complement current cotton herbicide systems. In Roundup Ready® cotton, a typical program would consist of Touchdown® + Dual Magnum® applied E-POT followed by Envoke POT followed by a PD application of Suprend™ (a mixture of trifloxysulfuron and prometryn with registration also expected during 2003). In conventional cotton a program starting with a pre-plant incorporated or preemergence herbicide followed by Envoke POT followed by a PD application of Suprend should provide control of troublesome weeds.

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*Important Notice: ENVOKE and SUPREND herbicides are not currently registered for sale or use in the United States and they therefore are not being offered for sale. This abstract does not constitute an offer for sale. ENVOKE and SUPREND herbicides will not be available for sale until EPA has approved registration and all necessary state authorizations have been granted.

SUPREND™, A POST DIRECTED HERBICIDE FOR COTTON. J.C. Holloway, Jr., S.M. Schraer, C.A.S. Pearson, C. Foresman, H.S. McLean. Syngenta Crop Protection, Greensboro, NC

ABSTRACT

Suprend™ is a new post-directed herbicide for use in Cotton developed by Syngenta Crop Protection. Suprend™ is a pre mix of Trifloxysulfuron sodium and Prometryn, formulated as an 80 WG in a 1:112 ratio. Use rates will be 1 to 1.5 pounds of formulated product per acre. Do not apply more than 2.65 pounds of formulated product per year nor do not apply 60 days before harvest. Suprend™ is expected to be available for the 2003 cotton use season.

Suprend™ can be used in all picker cotton varieties from across a large section of the southern cotton growing areas, including the Southeast, Mid-South as well as portions of Texas. Applications can be made post directed to lay by timings beginning in cotton as small as 8 inches in height.

Suprend™ contains two herbicide modes of action that aids weed control as well as provide sound glyphosate resistance management. Importantly, Suprend™ also exhibits excellent residual weed control in this crop. Suprend™ is flexible and may be used in conventional as well as herbicide tolerant crops.

Tank mix options include several commonly used herbicides in cotton such as MSMA, Touchdown, Dual Magnum, Aim, Diuron, Linuron, Cobra, Caparol, and Buctril. Do not tank mix Suprend with Malathion, profenofos (Curacron®) or emamectin-benzoate containing insecticides (Denim®), acephate, Bidrin®, Capture®, Karate® or unacceptable cotton injury can occur.

Economically important weeds controlled by Suprend™ in cotton include but not limited to: Coffee Senna (*Cassia obtusifolia)*, Hemp Sesbania (*Sesbania exaltata)*, Sicklepod (*Senna obtusifolia)*, Common Cocklebur (*Xanthium strumarium)*, Pitted morningglory (*Ipomoea lacunose)*, Ivyleaf Morningglory (*Ipomoea hederacea)*, Entireleaf Morningglory (*Ipomoea hederacea var. integriuscula)*, Redroot Pigweed *(Amaranthus retroflexus)*, Smooth Pigweed (*Amaranthus hybridus),* and suppression of Seedling Johnsongrass (*Sorghum halepense)*, Yellow Nutsedge (*Cyperus esculentus)*, and Purple Nutsedge (*Cyperus rotundus)*.

Rotation restrictions include: 3 months: wheat, oats, barley, sorghum (cover crops); 7 months: field corn, grain sorghum, peanuts, rice soybeans, and transplanted tobacco; 9 months: seeded tomato; and 12 months: all other crops.

2002 FIELD RESULTS OF ROUNDUP READY® FLEX COTTON TRIALS. J. Hart, A. Martens, B. Sammons, E. Cerny, S. Huber, M. Oppenhuizen, Monsanto Company, St. Louis, MO

ABSTRACT

The current Roundup Ready® cotton (Gossypium hirsutum) provides excellent vegetative tolerance to the glyphosate [N-(phosphonomethyl)-glycine] herbicide Roundup® when applied topically through the four-leaf stage. However, under certain environmental conditions when Roundup® is applied after the four-leaf stage, reproductive tolerance can be compromised. New Roundup Ready® Flex cotton events were produced to develop a commercial event that would expand the window of Roundup application beyond the four-leaf stage. Field trials with several Roundup Ready® Flex cotton events were conducted at multiple locations during the 2000 and 2001 seasons to evaluate vegetative and reproductive tolerance to off-label applications of Roundup Ultramax®. These events showed improved tolerance to Roundup Ultramax applied after the four-leaf stage compared to the current commercial Roundup Ready cotton.

Additional trials were initiated in the summer of 2002 at multiple locations across the cotton belt to further evaluate Roundup Ultramax tolerance and agronomic characteristics of three superior Roundup Ready Flex cotton events. The tolerance study was conducted at 15 locations using off-label, sequential applications of Roundup Ultramax rates at 1.50 lb a.e. (acid-equivalent) A^{-1} and 2.25 lb a.e. A^{-1} at the 3, 6, 10, and 14-leaf stages. Yield and fiber quality of the treated plots were compared to untreated controls within each event by location and across locations. The current commercial event demonstrated significantly lower yield after receiving the off-label Roundup Ultramax treatments. The Roundup Ready Flex cotton events demonstrated improved tolerance over Roundup Ready cotton and no effect on yield or fiber quality from either of the application rates at any timing compared to the untreated control.

The agronomic study was conducted at 15 locations. This trial was designed to evaluate key agronomic parameters of the three superior Roundup Ready Flex cotton events. Comparisons were made between the positive and negative isolines within each event. There were no negative transgene effects detected in cotton growth, yield, or fiber characteristics for all three Roundup Ready Flex cotton events.

From the three lead events, one will be selected for further testing for a full commercial launch in 2006.

SECTION IX. APPLICATION TECHNOLOGY

WEED CONTROL WITH LIGHT ACTIVATED SPRAYER: A THREE YEAR STUDY.
D.A. Peters, Texas Tech University, Lubbock, TX; P.A. Dotray, Texas Tech University and Texas Agricultural Experiment Station; and J.W. Keeling, Texas Agricultural Experiment Station.

ABSTRACT

Field experiments were conducted in 2000, 2001, and 2002 near New Deal, TX to compare weed control in a Roundup Ready cotton production system using mechanical cultivation, a conventional hooded sprayer, and a light-activated hooded sprayer. Treatments included Treflan at 1.5 pt/A applied preplant incorporated (PPI) followed by Caparol at 1.2 qt/A applied preemergence and mechanical cultivation as needed; Treflan PPI followed by a postemergence over-the-top (POT) broadcast application of Roundup Ultra at 1 qt/A at the four leaf growth stage, and Roundup Ultra applied at 1 qt/A with a conventional hooded sprayer (HS) as needed; Treflan PPI followed by Roundup Ultra POT broadcast and Roundup Ultra applied at 1 qt/A with a light-activated hooded sprayer (LAS) as needed; and Treflan PPI followed by a POT application of Roundup Ultra at 1 qt/A on a fourteen inch band over the row at the four leaf stage and Roundup Ultra applied at 1 qt/A with LAS as needed. 'Paymaster 2326 RR' cotton was planted at a seeding rate of 15 lb/A on 40 inch rows on May 9, 2000, and May 10 of 2001 and 2002 and harvested November 20, 2000, December 10, 2001, and December 13, 2002. Experimental design was a randomized complete block consisting of four replications. Plots were 8 rows by 600 feet. Preplant incorporated treatments were applied February 29, 2000, March 2, 2001, and March 18, 2002 and incorporated with a springtooth harrow. Preemergence applications were made on May 10 all three years. Postemergence treatments were applied on June 9, July 3, and July 18 in 2000; June 9 and July 5 in 2001; and June 14 and July 10 in 2002. Weeds were 1 to 6 inches in height at the time of application. Control of Palmer amaranth, common cocklebur, and silverleaf nightshade was visually rated on June 17 (early season), July 28 (mid season), and August 14 (late season) in 2000; June 23, July 19, and August 2 in 2001; and June 21, July 12, and August 8, 2002. The amount of spray solution used by the LAS was determined by subtracting the volume remaining after spraying a single plot from the initial volume in the tank. Percent herbicide savings was calculated based on the amount of solution required to apply a broadcast treatment.

In 2000, control of Palmer amaranth ranged from 83-88% for all treatments at the early rating. At the mid and late season ratings, the LAS treatments provided at least 88% 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 ratings, LAS provided control similar to HS and greater than cultivation.

In 2001, Palmer amaranth and common cocklebur control at all rating dates was similar to HS and ranged from 75-93% for both weeds when LAS was used following a POT broadcast application of Roundup Ultra. However, when LAS was used following a band application, Palmer amaranth control at the mid and late season ratings was reduced when compared with LAS following a broadcast application. At the early and late season ratings, silverleaf nightshade control with LAS was similar to HS, but mid season control was greater for HS (80% vs 68%).

In 2002, Palmer amaranth control with the LAS ranged from 83-97% and was similar to HS and greater than cultivation at all ratings. LAS controlled 78% of common cocklebur at the late season rating when used after Roundup Ultra applied either band or POT at the four-leaf stage. Control was greater than cultivation and similar to HS. Silverleaf nightshade control with LAS

was similar to HS at all rating dates and control for all treatments ranged from 55-64% at the late season rating.

Herbicide savings in 2000 were 85% for the June application, 63 and 67% for the July 3 application, and 56 and 71% on July 18. In 2001, observed herbicide savings were 73% for the June application and 84 and 62% for the July application. In 2002, herbicide savings were 84% for the June 14 application, and 69 and 52% for the July 10 application. Lint yields ranged from 380 to 430 lb/A in 2000; 500 to 940 lb/A in 2001 and 930 to 1180 lb/A in 2002. No significant differences were observed in yield in any year. These data indicate that weed control programs utilizing LAS control weeds similar to a conventional hooded sprayer and significant herbicide savings were observed.

UTILIZING SITE-SPECIFIC TECHNOLOGIES TO RECOMMEND AND APPLY PESTICIDES AND GROWTH REGULATORS IN COTTON. J.C. Sanders, D.B. Reynolds, N.W. Buehring, D.G. Wilson, and C.G. O'Hara. Mississippi State University. Mississippi State, MS 39762.

ABSTRACT

Due to a number of factors, the type and rate of chemicals needed for specific areas within most cotton (*Gossypium hirsutum* L.) fields can greatly vary. The presence of weeds is spatially variable due to population dynamics and the tendency for patchy aggregation. The herbicide type and rate necessary for effective weed control in a field is influenced by the density and species of weeds present. Fertility, moisture, herbicides, insect pests, and various other adverse conditions inadvertently cause variation in cotton growth and maturity. The rate of mepiquat chloride necessary for effectively regulating plant growth is influenced by the internode length of the top five nodes, plant height, and previous mepiquat chloride applications. Harvest-aid type and rate depends on level of maturity, boll opening, regrowth potential, and weed pressure. With the ability to site-specifically apply a chemical based on a particular site's needs, producers could maximize chemical application performance in addition to potential profits.

The possibilities of site-specifically applying chemicals in cotton using a differentially corrected global positioning system (DGPS) controlled point injection sprayer were evaluated in an experiment conducted at the Black Belt Branch Experiment Station near Brooksville, MS. There were approximately 20 acres in the field of interest, and the cotton variety was 'Deltapine 451 BG/RR'. Ground-truthed data for herbicide, growth regulator, and defoliant applications were collected on half-acre grids. Weed density sampling and visual weed control ratings were collected for herbicide applications. The data for plant growth regulator applications included internode length of the top five nodes and plant height. Ground-truthed data for defoliation included percent open bolls, nodes above cracked boll (NACB), and visual defoliation ratings. Ground truthing data were used to produce site-specific treatment maps for all three application types, and chemical applications were made with the use of the respective treatment map. The east half of the field received a broadcast herbicide application and the west half of the field received a site-specific herbicide application. The entire field received site-specific plant growth regulator applications. Site-specific and broadcast harvest-aid applications covered one-half of the field each, but in two replications for method of application.

Weed density and weed control ratings indicated no differences in weed control between site-specific and broadcast herbicide applications. After application of plant growth regulators, effective plant growth regulation was deemed in 41 out 48 sites, with effective regulation deemed if plant height increased less than 15 percent from cutout to maturity. Percent open bolls and visual defoliation ratings indicated no differences between site-specific and broadcast defoliant applications. The development of treatment maps for herbicide, growth regulator, and defoliant applications can possibly be aided with the incorporation of NDVI and other vegetation indices calculated from spectral data.

EVALUATION OF VARIABLE-RATE HERBICIDE APPLICATION IN SOYBEAN.
A.J. Price, D.W. Krueger, G. Roberson, G.G. Wilkerson, and A.C. Bennett, North Carolina State University and The University of Florida.

ABSTRACT

Field experiments were conducted at two North Carolina locations in 1999, 2000, and 2001 and on-farm in Port Royal, VA in 2000, 2001, and 2002 to evaluate scouting software as well as theoretical gains from site-specific herbicide application at these locations. Three on-farm experiments were also conducted in Lenoir, Wayne, and Wilson Counties in North Carolina in 2002 to evaluate a systems approach to site-specific herbicide application and compare the system to whole field herbicide applications. Analysis of data from the studies in North Carolina from 1999 to 2001 and Virginia showed that site specific herbicide applications could have reduced the volume of herbicides sprayed from 25 to 68%. In 2002, for the Lenoir Co. site, HADSS recommended reduced rates in 13 of 30 cells and the addition of a second herbicide in one cell, compared to the whole field recommendation. The Wilson Co. site had a weed infestation that met treatment threshold in only 6 of 39 cells. Thus, site specific treatment at this location increased herbicide use compared to the whole field recommendation. The Wayne Co. site was not amendable for site-specific application.

DIFFERENTIATION OF TURFGRASS STRESS WITH HYPERSPECTRAL RADIOMETRY. K.C. Hutto, D.R. Shaw, and G.E. Coats; Department of Plant and Soil Sciences, Mississippi State University, Mississippi State.

ABSTRACT

Turfgrass stress is an issue golf course superintendents want to avoid. Unfortunately, stress is a daily factor in golf course management. Every time turf is mowed, it is exposed to some degree of stress because it is being prohibited from doing what is natural, growing. There are numerous biotic and abiotic stresses that superintendents must manage. Constant monitoring of soil fertility, irrigation management, and soil compaction are some of these factors. Biotic stresses such as disease, insect control, and the accumulation of thatch also need to be carefully managed to prevent plant death. These factors can result in thinning of the turfgrass canopy and further problems such as weed infestation. Temperature, foot traffic/machine traffic, and chemical applications can also cause undesired stress to turfgrass.

Research was performed in the summer of 2002 to identify specific spectral characteristics of stressed turfgrass, different turfgrass and weed species using hyperspectral radiometry. The stress treatments were simulated traffic, herbicide application, and drought stress. The traffic treatment was simulated by using a hydraulic-driven barrel traffic simulator at three different treatment levels. The MSMA treatment was applied at 2 lb ai/A every ten days, while Trimec Classic was applied at 3 qt/A every 3 weeks. Rain shelters were constructed and placed on individual plots to induce drought stress. An overall classification accuracy of 71% was obtained for all turfgrass stresses; with drought stress being the most accurately classified (98%) using 778 to 805 nm. When the MSMA and Trimec treatments were compared to the drought treatment, overall classification accuracies were 93 and 87%, respectively, using 746 to 760 nm. Low classification accuracies were obtained when comparing high-level stress to low-level stress (55%), and MSMA to Trimec (57%).

Reflectance from turfgrass and weed species were also analyzed to determine separability of species. These species were bermudagrass [*Cynodon dactylon* (L). Pers. x *transvaalensis* Burtt-Davy], St. Augustinegrass [*Stenotaphrum secundatum* (Walt.) Kuntze], centipedegrass [*Eremochloa ophiuroides* (Munro) Hack.], zoysiagrass (*Zoysia japonica* L.), crabgrass [*Digitaria ciliaris* (Retz.) Koel.], dallisgrass (*Paspalum dilatatum* Poir.), eclipta (*Eclipta prostrata* L.), and Virginia buttonweed (*Diodia virginiana* L.). An overall classification accuracy of 87% was obtained for all plant species using 350 to 390 nm. When comparing St. Augustinegrass to crabgrass or dallisgrass, classification accuracies were 92 or 82%, respectively. However, when comparing crabgrass to dallisgrass, the accuracy decreased to 68%. Eclipta was classified 100% compared to Virginia buttonweed. The spectral range of 350 to 362 nm was used to obtain accuracies for dallisgrass (95%) and crabgrass (88%), compared to bermudagrass.

SECTION X. SOIL AND ENVIRONMENTAL ASPECTS OF WEED SCIENCE

ADSORPTION AND DESORPTION OF ATRAZINE FROM VARIOUS LAKE SEDIMENTS IN TEXAS. J.A. Vader, and S.A. Senseman, Department of Soil and Crop Sciences, Texas Agricultural Experiment Station College Station, Texas 77843 and M.C. Dozier, Department of Soil and Crop Sciences, Texas Cooperative Extension College Station, Texas 77843.

ABSTRACT

Atrazine, a widely used herbicide in corn and sorghum, has been detected in various surface water sources in Texas. Detection of atrazine in surface water has been well documented, but it's partitioning onto sediment has received little attention. This study was conducted to determine the relative adsorption and desorption of atrazine to various lake sediments in Texas. Results from this study will help determine if sediment is a significant reservoir for atrazine and a periodic source of atrazine lake contamination. Sediment from eight Texas lakes was collected using an Eckman dredge. The samples were placed in a sealed plastic bag and placed on ice until they were returned to the laboratory. Upon arrival, the samples were dried and sieved through a 2-mm sieve. A portion of the sediment (100 g) was used for characterization. Sub samples of 2-g were placed in 35-mL centrifuge tubes. Initial standard solutions were made using a radiolabeled atrazine standard combined with analytical grade atrazine in methanol. One hundred uL of the initial standard solution was placed in a centrifuge tube for each sample along with *5* mL of 0.01M $CaCI_2$ solution. Radiolabeled atrazine was added such that each sample contained approximately 2500 disintegrations per minute (dpms). The samples were then placed on a table shaker and shaken for 24 h. Tubes were then removed and centrifuged for 10 minutes at a speed of 3.2 x g relative centrifugal force (RCF). For adsorption determinations, 2-mL aliquot was then removed from the supernant of each sample and placed in glass scintillation vial along with 10 mL of scintillation fluid. Then the remaining solution from the centrifuge tubes was removed. Three mL of fresh 0.01M $CaCI_2$ solution was placed in the centrifuge tubes and the samples were shaken for 24 h. A 2-mL aliquot was again removed and placed in glass scintillation vial along with 10 mL of scintillation fluid for analysis of atrazine desorption. This procedure was repeated two more times in a 48-h period. All scintillation vials were placed on a Beckman LS6500 Multipurpose scintillation counter. Each sample was counted for 20 minutes. The entire experiment was replicated four times. Values for Kd were determined by the Freundlich equation. The experiment was done in a completely randomized block design. Using a general linear model procedure, it was determined that there were significant differences between Kd values among the different lakes. Tukey's studentized range was used for mean separation. Average adsorption values for Kd ranged from 0.21 mL/g to 0.32 mL/g. Average desorption ranged from 23.1% to 27.4%. The differences in adsorption Kd values were assumed to be due to sand, silt, clay content, percent organic matter, and pH differences of the sediment samples. Desorption of atrazine was similar for all eight sediments. The sediment from Lake Big Creek and Lake Joe Pool had the highest Kd values of 0.32 mL/g and 0.31 mL/g, respectively. The sediment from Lake Tawakoni, and Lake Richland Chambers had the lowest Kd values of 0.21 mL/g and 0.21 mL/g, respectively. The high Kd value for the sediment from Lake Big Creek is attributed to its 3.0% organic matter content and its lower pH of 6.4. Both high organic matter and low pH favor atrazine adsorption. All other sediments had a pH of approximately 7.5. Lake Joe Pool had a high Kd due to its higher silt and 1.9% organic matter content. Lake Tawakoni, and Lake Richland Chambers had lower Kd values due to their higher loam and sand content combined with lower organic matter. Based on these data the potential exists for varying atrazine adsorptivity to lake sediments based on sediment characteristics.

DISSOLVED ATRAZINE AND ATRAZINE METABOLITE RETENTION IN BUFFALOGRASS FILTER STRIPS. L.J. Krutz[1]*, S.A. Senseman[1], M.C. Dozier[2], D.W. Hoffman[3], and D.P. Tierney[4]. [1]Department of Soil and Crop Sciences, Texas Agricultural Experiment Station, Texas A&M University, College Station, TX, [2]Department of Soil and Crop Sciences, Texas Cooperative Extension, Texas A&M University , College Station, TX, [3] Blackland Research Center, Texas Agricultural Experiment Station, Temple, TX, [4]Environmental Stewardship and Regulatory Policy, Syngenta Crop Protection, Greensboro, NC.

ABSTRACT

Vegetated filter strips (VFS) potentially reduce the off-site movement of herbicides from adjacent agricultural fields by increasing herbicide mass infiltrated (M_{inf}) and mass adsorbed (M_{as}) compared to bare field soil. However, there are conflicting reports in the literature concerning the contribution of M_{as} to the VFS herbicide trapping efficiency (TE). Moreover, no study has evaluated TE among atrazine and atrazine metabolites. This study was conducted to compare trapping efficiency (TE), M_{inf}, and M_{as} among atrazine, diaminoatrazine (DA), deisopropylatrazine (DIA), desethylatrazine (DEA), and hydroxyatrazine (HA) in a buffalograss VFS. Runoff was applied as a point source up slope of a 1 X 3 m watershed at a rate of 750 L/h. The point source was fortified at 0.1 µg/mL atrazine, DA, DIA, DEA, and HA. After crossing the length of the plot, water samples were collected at 5-min intervals. Water samples were extracted using solid phase extraction (SPE) and analyzed by high performance liquid chromatography-photodiode array detection (HPLC-PDA). During the 60-min simulation, the buffalograss VFS retained approximately 21% of the incoming dissolved atrazine and atrazine metabolite load. Approximately 67 and 33% of the TE was attributed to M_{inf} and M_{as}, respectively. These results demonstrate that herbicide adsorption to the VFS grass, grass thatch, and/or soil surface is an important retention mechanism, especially under saturated conditions. M_{as} was significantly higher for atrazine compared to atrazine's metabolites. There was a significant linear relationship between K_{oc} and M_{as} for atrazine, DA, DIA, and DEA (r^2=0.92). However, K_{oc} was not a good predictor for HA M_{as}. The M_{as} data indicate that atrazine was preferentially retained by the VBS grass, grass thatch, and/or soil surface compared to atrazine's metabolites.

REDUCED METHANE EMISSIONS FROM RICE GROWN USING INTERMITTENT IRRIGATION. J.H. Massey, E.F. Scherder, R.E. Talbert, R.M. Zablotowicz, M.A. Locke, M.A. Weaver, M.C. Smith, R.S. Steinreide, and B.V. Ottis, Mississippi State University, Starkville 39762; University of Arkansas, Fayetteville 72704; USDA-ARS Southern Weed Science Lab, Stoneville, MS 38776.

ABSTRACT

A number of air and water issues will impact future rice production practices in the United States. Included in these issues are the decline in readily available water resources for irrigation and increasing concerns of global warming. It is generally recognized that many of the nation's groundwater aquifers are being overdrawn. For example, it has been estimated that current rice production techniques in the Arkansas Grand Prairie may not be viable in 10 years due to sharply declining levels of groundwater and associated rise in pumping costs. Groundwater depletion can also result in land subsidence and saltwater intrusion into freshwater supplies, further exacerbating a serious situation. Thus, reducing water use by rice will become increasingly important as competition for water resources among various municipal, industrial, agricultural and environmental interests intensifies.

Rice is typically grown under flooded conditions. Flooding serves not only to meet rice's relatively high water demand but also to prevent the germination of a variety of grass and broadleaf weeds that do not tolerate anaerobic conditions. However, these same flooded (anaerobic) conditions also result in the formation of methane, a greenhouse gas. Globally, rice production is the single largest source of man-made methane (CH_4), emitting approximately 20% of anthropogenic CH_4. This is significant because, according to the US Environmental Protection Agency, CH_4 is responsible for about 15 to 20% of the total current observed increase in average global temperatures. Given that CH_4 is 70-times more effective than CO_2 at absorbing infrared radiation and the relatively long atmospheric residence time of CH_4 (5 to 10 yrs), there is international interest in reducing CH_4 emissions from rice and other sources.

One technique that is being investigated to reduce both water consumption and CH_4 production by rice is known as *intermittent irrigation*. Unlike conventional rice production where floodwaters are maintained by nearly continuous pumping to achieve a constant height of about 3 to 6 inches in the paddy, intermittent irrigation allows the floodwaters to naturally subside over a period of about 4 to 7 days before replenishment. Field studies conducted in Arkansas comparing conventional and intermittent irrigation regimes indicated that water consumption by intermittent irrigation is reduced by up to 50% of that of conventional irrigation with no significant impacts on weed control or rice yield (see Scherder et al., these proceedings). Significant fuel savings were also realized using intermittent irrigation.

In these same field trials, we used closed chamber techniques to measure CH_4 fluxes during key periods of CH_4 production. Our preliminary results indicate that intermittent irrigation reduced CH_4 emissions by as much as 70% when compared to continuously flooded rice plots. These reductions occur because soil redox potentials are generally higher with intermittent irrigation due to the alternating water levels and oxidation states which give rise to less overall CH_4 production when compared to continuously flooded soils.

BARNYARDGRASS (*ECHINOCHLOA CRUS-GALLI*) CONTROL IN AN INTERMITTENT RICE IRRIGATION SYSTEM. E.F. Scherder, R.E. Talbert, M.L. Lovelace, B.V. Ottis, M.S. Malik, and J.D. Branson. University of Arkansas, Fayetteville, AR 72704 and University of Arkansas, Stuttgart, AR 72160.

ABSTRACT

An experiment was conducted at the Rice Research and Extension Center at Stuttgart, Arkansas, in 2000, 2001, and 2002 to evaluate weed control and rice yield components with intermittent flooding (48, 41, 34, 27, or 21% volumetric water contents in the soil prior to reflooding) versus a permanent flooded system in dry-seeded rice. The treatment structure was a split-plot design with the main plot consisting of six moisture regimes and the subplot factor consisting of seven herbicide treatments. The herbicide treatments included clomazone at 0.34 and 0.67 kg ai/ha applied preemergence (PRE), quinclorac at 0.42 kg ai/ha PRE, pendimethalin at 1.12 kg ai/ha delayed preemergence (DPRE), thiobencarb at 4.48 kg ai/ha DPRE, and propanil at 4.48 kg ai/ha at a 2- to 3-leaf stage of rice growth followed by (fb) propanil at 4.48 kg/ha + quinclorac at 0.42 kg/ha preflood. When weed control fell below 80% an application of fenoxaprop + isoxadifen was applied at 0.09 kg ai/ha. Rice was dry-seeded, and plots remained unflooded until the time of the permanent flood establishment at a 5- to 6-leaf rice growth stage. The flood was established at a 8 cm depth in each moisture regime and then allowed to decline naturally through evapotranspiration except in those bays designated as permanent flood. When the soil reached the targeted volumetric water content in each bay, the flood was reintroduced. This cycle of flooding and draining was continued until rice maturity. Observations for the experiment were total irrigation water usage, annual grass control, and various crop yield parameters.

An intermittent irrigation system reduced the amount of water used, with total water savings ranging from 10 to 15% for the 48% moisture regime, compared to permanent flood, to a 30 to 40% savings in water with the 20% moisture regimes. Broadleaf signalgrass and propanil-resistant and -susceptible barnyardgrass control were generally >90% in all years at the time of initial flood establishment (28 DAE). After the intermittent irrigation had been implemented, 56 DAE, control of these three species were generally still >90% with all herbicide programs. This high level of control demonstrates the effectiveness of the current herbicide technologies available to growers in these intermittent irrigation systems. When evaluating rice yield, water management had more influence than herbicide treatments on rice yield reduction. No significant differences were observed in rice yield among the main plot treatments of permanent flood, 48, 41, and 34% moisture regimes, with yield ranging from 8000 to 10,000 kg/ha. The 20 and 27% moisture regimes gave a severe reduction in rice yield, which ranged from 3,500 to 5,000 kg/ha which was attributed to moisture stress caused by the intermittent irrigation levels. This research demonstrates the overall potential water savings of an intermittent irrigation system while maintaining overall weed control and rice yield.

Intermittent irrigation techniques promise to help with two environmental issues facing future rice production, groundwater depletion and global warming due to CH_4 production. Future rice research will need to assess, in terms of weed control and rice yield, the ruggedness/reliability of intermittent irrigation techniques under a variety of soil and environmental conditions and to determine the impacts of intermittent irrigation on soil denitrification processes that produce greenhouse gases, such as nitrous oxide (N_2O).

WATER SAMPLING FOR HERBICIDE ANALYSIS IN THE UPPER PEARL RIVER WATERSHED: A TMDL APPROACH. M.L. Tagert, J.H. Massey, D.R. Shaw, and M.C. Smith. Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

As a result of recent legislation, the nonpoint source component of the 1972 Clean Water Act is now being implemented by the Environmental Protection Agency (EPA). Each state must submit a list of impaired waters to the EPA, and a Total Maximum Daily Load (TMDL) must eventually be established for each waterbody listed as impaired. Mississippi currently has 732 waters listed as impaired, with 25 of those impairments occurring in the Upper Pearl River Watershed. Contamination by pesticides if often listed as the reason for impairment in these and other Mississippi surface waters. In addition, the Upper Pearl River ultimately feeds into the Ross Barnett Reservoir, which is the drinking water supply for Jackson, MS. However, due to changes in land use/land cover in the Upper Pearl River Watershed, waters that were once impaired by pesticides may not currently be impaired. To assess the current level of impairment by pesticides in this watershed, a sampling regime was implemented to collect grab samples at seven gauged locations within the watershed. Samples were collected weekly from May through August 2002, and monthly thereafter. Samples were extracted via Solid Phase Extraction (SPE). Each extracted sample set includes two-liter samples from the seven selected sites, two lab spikes in deionized (DI) water, a field spike, a DI water blank, and a glassware wash. A multi-residue method was then used to analyze the surface water samples for fifteen pesticides: triclopyr, 2,4-D, tebuthiuron, simazine, atrazine, metribuzin, alachlor, metolachlor, cyanazine, norflurazon, hexazinone, pendimethalin, DDT insecticide degradation product p,p'-DDE, diuron, and fluometuron.

Mean percent recoveries for spiked samples ranged from 39% for metribuzin to 120% for norflurazon. However, most average spike recoveries fell within an acceptable range (i.e., 85 to 95% recovery). Tebuthiuron, 2,4-D, metolachlor, and hexazinone were detected in ten or more samples out of a possible 36 samples. Fluometuron, metribuzin, and pendimethalin were the only compounds that were not detected at any of the seven sites. The following ranges of concentrations were detected for the remaining compounds: 0.10 – 0.48 ppb for 2,4-D, 0.11 – 0.67 ppb for triclopyr, 0.24 – 0.57 ppb for diuron, 0.21 – 0.43 ppb for tebuthiuron, 0.15 – 0.18 ppb for simazine, 0.10 – 0.18 ppb for atrazine, 0.13 – 0.20 ppb for alachlor, 0.14 – 0.29 ppb for metolachlor, 0.20 – 0.32 ppb for cyanazine, 0.10 – 0.15 ppb for p,p'-DDE, 0.21 – 0.23 ppb for norflurazon, and 0.12 – 0.84 ppb for hexazinone. Duplicate samples have not yet been extracted to confirm these detections.

QUINCLORAC: SOIL BEHAVIOR AND FOLIAR VERSUS ROOT ABSORPTION BY TORPEDOGRASS (*Panicum repens*). W.A. Williams, G.R. Wehtje, and R.H. Walker; Alabama Agric. Exp. Stn., Auburn University, AL 36849-5412.

ABSTRACT

Selective placement studies were conducted under greenhouse conditions to determine the relative importance of root versus foliar absorption of postemergence-applied quinclorac by torpedograss. Foliar + soil and soil-only applications were more effective than foliar-only in reducing torpedograss foliage over a relatively short period, i.e. 4 weeks after treatment (WAT). However, foliar-only and foliar + soil were more effective than soil-only in suppressing regrowth at 10 WAT. Quinclorac foliar absorption by torpedograss and subsequent translocation, as determined with radiotracer techniques, was minimal. After 72 h, only 26% of the applied quinclorac had been absorbed. And the majority of the amount absorbed remained within the treated leaf. Only 0.3% of applied was recovered in the roots, and none was detected in the developing rhizomes. Quinclorac was readily absorbed and translocated by the root. After 6 h, a 26.7 *u*g/plant dose of quinclorac had been absorbed. And only 54% of amount absorbed remained in the roots; the remaining 46% having been translocated throughout the plant. The youngest leaf and the immature rhizomes accumulated 5 and 9% of the amount absorbed, respectively. Quinclorac was not readily soil adsorbed as determined by soil solution experiments. And quinclorac was displaced nearly concomitant with the wetting front in soil chromatography. Both soil mobility and propensity for quinclorac to remain in soil solution was greater at pH 6.7 than at 5.7.

EVALUATION OF CLOPYRALID, FLUROXYPYR, IMAZAPYR, AND TRICLOPYR FOR SCOTCHBROOM CONTROL. M.P. Blair, S.M. Zedaker; Department of Forestry, Virginia Tech, Blacksburg, VA 24061; P.L. Burch; Dow Agrosciences, Christiansburg, VA 24073.

ABSTRACT

Scotchbroom (*Cytisus scoparius* L.) is a federally listed noxious woody shrub that occurs in 35 of the 50 United States. This native species of Europe is a troublesome weed species in the Pacific Northwest (PNW) and populations in the eastern United States are increasing. Scotchbroom has been known to cause complete failure of Douglas fir (*Pseudotsuga menziesii*) plantations due to its rapid growth rate and prolific seed production. Utility right-of-way managers in the PNW have reported scotchbroom plants as tall as 17' under power lines, thereby restricting access. This shade intolerant species has presented a problem to forest vegetation managers due to its difficulty to control and aggressive nature.

A study was initiated at the Reynolds Homestead Forest Resources Research Center, located in Patrick County, VA, in August 2002. Objectives of this study included testing for significant treatment differences between broadcast release and directed application chemistries common to loblolly pine (*Pinus taeda*) silviculture. Eighteen plots (6' x 20') were established in a 5-year-old loblolly pine plantation. Six treatments with three replications were evaluated to determine significant differences in efficacy. Treatments included Arsenal AC® (imazapyr) @ .25 lbs a.i. per acre, Arsenal AC® (imazapyr) @ .25 lbs a.i. per acre + Vista ® (fluroxypyr) @ .246 lbs a.i. per acre, Arsenal AC® @ .25 lbs a.i. per acre + Transline® (clopyralid) @ .35 lbs a.i. per acre, Arsenal AC® @ .25 lbs a.i. per acre + Transline® @ .492 lbs a.i. per acre, Garlon 4® (triclopyr) @ .5 lbs a.i. per acre, and Transline® @ .492 lbs a.i. per acre. All treatments included a nonionic surfactant at .25% v/v and were applied at 20 GPA using a CO_2 powered backpack. Plots were evaluated pre-application, 7 WAT, and 19 WAT. Measurements included visual estimation of percent cover and percent cover determined by point intercept. Data analysis was performed on percent cover by point intercept method using analysis of covariance (pre-application percent cover as a covariate) and the Tukey-Kramer test for significant differences was used at p = .05 with the adjusted percent cover means per treatment.

No one treatment completely controlled scotchbroom. Only the Garlon 4® treatment provided a reduction in percent cover at 7 WAT and 19 WAT. Treatments using Arsenal AC® failed to provide a reduction in percent cover. The Garlon 4 treatment was significantly different from treatments that included Arsenal at 7 WAT and 19 WAT. There was no significant difference in the adjusted mean percent cover at 7 WAT and 19 WAT for the Garlon 4® treatment and the Transline® treatment.

Research needed in the future to further evaluate potential scotchbroom control options include the use of higher rates and timing of application of the Garlon 4® and Transline® treatments for directed application treatments. Metsulfuron methyl should be evaluated due to its effectiveness on legumes. This study should also be re-evaluated at 52 WAT since imazapyr is characteristically slow to show symptomology in treated woody plants.

SELECTIVE CRABGRASS REMOVAL FROM TALL FESCUE AND ZOYSIAGRASS.
M.F. Gregg*, L.B. McCarty, and A.G. Estes. Department of Horticulture, Clemson University, Clemson, S.C. 29634-0375.

ABSTRACT

Crabgrass (*Digitaria spp.*) is a common summer annual in all turfgrasses. Crabgrass often thrives in closely mowed areas such as home lawns, sports fields, and golf course fairways and roughs. However, selective control attempts in tall fescue and zoysiagrass often provides inadequate control and/or excessive turf phytotoxicity. The objectives of these studies were to: (1) evaluate herbicides for postemergence control of crabgrass; (2) turf tolerance in tall fescue and zoysiagrass turf.

Trials were evaluated in Clemson, S.C., at Clemson University. 'Barlexas' tall fescue was maintained at 7.62 cm and 'Meyer' zoysiagrass maintained at 1.43 cm. Plot size for crabgrass removal in tall fescue measured 2 x 2 meters with three replications and 1.5 x 1.5 meters for zoysiagrass with three replications. Experimental design for each study was a randomized complete block. Data was subjected to ANOVA with means separated using Fisher's LSD test with α=0.05.

Crabgrass control had a duplicate treatment list for tall fescue and zoysiagrass with a single application applied August 13th, 2002. Treatments included: Fusilade T&O II 2 EC (fluziafop-butyl) at 0.09 lb ai/A; Acclaim Extra 0.57 L (fenoxaprop) at 0.11 lb ai/A; MSMA 6.6 L (monosodium acid methanearsonate) at 1.5 lb ai/A; flazasulfuron 25 DG at 0.05 lb ai/A + Induce L (LI–700) at 0.25% v/v; and Drive 75 DF (quinclorac) at 0.75 lb ai/A. Treatments were applied with a CO_2 pressurized sprayer calibrated to deliver 187 Liters/hectare.

Crabgrass control and turfgrass injury were visually rated September 3rd, 2002, 3 weeks after treatment (WAT) and September 23rd, 2002, 6 WAT. Control and turfgrass injury was rated on a 0-100%scale with 0=no control or injury, and 100% = complete control or total death to turf. Value of 30% was considered maximum commercially acceptable level for turf injury.

No products provided > 50% control in tall fescue at 3 WAT. However, 6 WAT, Acclaim Extra at 0.11 lb ai/A provided ≥ 65 % crabgrass control. Tall fescue injury (≥30%) was noted 3 WAT with flazasulfuron at 0.05 lb ai/A. At 6 WAT, complete death of tall fescue was observed with flazasulfuron treatment.

All treatments provided between 65-85% crabgrass control in zoysiagrass 3 WAT. At 6 WAT, Fusilade T&O II at 0.09 lb ai/A, Acclaim Extra at 0.11 lb ai/A, and Drive at 0.75 lb ai/A provided best crabgrass control (70, 75, and 78%, respectively). Zoysiagrass injury was acceptable (< 30%) for all treatments.

In conclusion, a single application of Acclaim Extra at 0.11 lb ai/A provided best crabgrass control with most tolerance in tall fescue. Flazasulfuron at 0.05 lb ai/A caused complete death to tall fescue. Drive at 0.75 lb ai/A provided best crabgrass control in zoysiagrass when applied once. Future research will continue to investigate the economics of control options, experimental herbicides, different rates and timings, and sequential applications.

DOWNWARD MOVEMENT OF PESTICIDES IN BERMUDAGRASS VS FALLOW SOIL SYSTEMS. H.D. Cummings, F.H. Yelverton, J.B. Weber, and R.B. Leidy; Crop Science Department, North Carolina State University, Raleigh, NC 27695-7620

ABSTRACT

Regulatory issues of pesticides based on the downward movement of pesticides in fallow soil systems may not be appropriate for turf systems. If the fate of pesticides in turf were better understood, management plans that preserve their use in turf may be implemented. Previous studies have characterized the downward movement of some pesticides in conventional till systems; however, in turf, pesticides are rarely applied to bare soil, and this knowledge is lacking. In turf, a lower fraction of pesticides reaches soil as a portion is intercepted by the turf canopy. In addition, some pesticides are adsorbed and metabolized by plants. Managed bermudagrass turf systems are likely stratified by pH, and the thatch layer may contain high levels of organic matter which can influence some pesticides' movement. Thatch layers also may contain diverse microbial populations which degrade pesticides and benefit from the regular applications of nutrients and irrigation to managed bermudagrass. Thus, the objective was to compare the downward movement of pesticides in a turf system to movement in a fallow system in times of rapid growth and dormancy.

At the Sandhills Research Station near Pinehurst, NC, 581 m^2 of 'Tifway' bermudagrass was sprayed with glyphosate, removed with a sod cutter, tilled, and fumigated with methyl bromide in May 2001. In a split-plot design, two replications of lysimeters 15 cm in diameter and 91 cm long were driven in June and August 2001 into fallow soil and established 'Tifway' bermudagrass mowed at 1.9 cm. Imazaquin, prodiamine, pronamide, and simazine were applied during times of rapid growth and dormancy at 0.56, 0.56, 1.7, and 2.2 kg ai/ha, respectively, in July and November 2001 to unique lysimeters in 2.3 m^2 plots. The treatments were watered in with 1 cm of water after application. An infiltration study indicated that movement of water into bermudagrass was about half the rate as for fallow soil. In November 2001 and April 2002 120 days after application, the lysimeters were removed and divided into the following depths: 0-2, 2-4, 4-8, 8-15, 15-30, 30-45, 45-60, 60-91 cm. The soil was dried and sieved. The residues were extracted analyzed by gas chromatography. The reported concentrations are the means of two replications determined using zero for nondetects.

In summer, prodiamine was detected in fallow soil at 285, 23, and 16 parts per billion (ppb) in the 0-2, 2-4, and 4-8 cm depths, respectively and 451 and 64 ppb in the 0-2 and 2-4 cm depths, respectively, in turf. In summer, pronamide was detected in fallow soil at 96 and 20 ppb in the 0-2 and 2-4 cm depths, respectively and 116 and 135 ppb in the 0-2 and 2-4 cm depths, respectively, in turf. Perhaps greater concentrations were detected in bermudagrass because the rate of microbial degradation was greater for these pesticides in the fallow soil system which may have less free carbon available but similar fertility. In summer, imazaquin was detected at 83, 24, and 19 ppb in the 0-2, 2-4, and 4-8 cm depth, respectively, in fallow soil and was not detected in any turf samples. Simazine was detected in fallow soil at 23, 96, 11, and 3 ppb in the 0-2, 2-4, 4-8, and 8-15 cm depths, respectively and only 33 ppb in the 0-2 cm depth in turf in summer. However, in winter during dormancy, simazine was detected in fallow soil at 110, 110, 100, 90, and 23 ppb in the 0-2, 2-4, 4-8, 8-15, 15-30 cm depths, respectively and was detected in turf at 1200, 350, 100, and 32 ppb in the 0-2, 2-4, 4-8, and 8-15 cm depths, respectively. In winter, bermudagrass is dormant and not absorbing and metabolizing pesticides. Residues for the remaining pesticides applied in winter have not been analyzed. Although more downward movement and greater concentrations of simazine were reported in winter, there was never greater downward movement in bermudagrass in summer or winter, and the degree of movement should not be problematic because the greatest depth reporting residues was 15 cm. Thus, the bermudagrass system may inhibit the downward movement of some pesticides applied in times of rapid growth. However, in time of dormancy, the bermudagrass system may not inhibit the downward movement of some pesticides.

CAN VARIOUS APPLICATION METHODS IMPROVE COGONGRASS [*Imperata cylindrica* (L.) Beauv.] CONTROL? K.D. Burnell and J.D. Byrd. Jr.; Mississippi State University, MS.

ABSTRACT

Two field studies were conducted during 2002 at three locations, Grand Bay Wildlife Refuge (GBWR) and Morgan in south MS, and at Preston located in central Mississippi. The objectives were to determine if 1) glyphosate applied in a single application or sequentially up to 4 times at reduced rates of 1 and/or 2.5 qt/A provided equivalent control to higher rates of 5 qt/A for cogongrass control and 2) a single application of selected herbicides in increased spray volumes applied to burned or natural stands will influence cogongrass control. Treatments for test 1 were a 3 by 4 factorial plus a check, arranged in a RCB with three replications. Treatments for test 1 included: 0, 1, 2.5, and 5 qt/A of Roundup Pro 4L and were initially applied March 12 to 36 to 40 inch tall cogongrass which was 36 to 40 in tall, then sequentially at monthly intervals through June. Visual control data were taken and analyzed monthly until dormancy and presented as days after initial treatment (DAIT) and days after final application (DAFA). Treatments for test 2 included: Arsenal 2AS at 16 fl oz/A, Roundup Pro 4L and Touchdown 3L at 128 fl oz/A, Asulox 3.34L at 192 fl oz/A, Dowpon 85WG at 4 lbs/A, and Hyvar 2L at 64 fl oz/A. Treatment design was a 6 by 3 factorial arranged in a RCB with 3 replications with stand type being on location, either intact at Preston or burned at GBWR. Cogongrass was burned on May 3 at GBWR and treatments were applied to 12 in regrowth on June 6 at GBWR and to 24 to 36 inch tall stands at Preston on June 7. Treatments were applied in plots 6 by 15 ft, using a CO_2 pressurized backpack equipped with either 4 nozzle boom sprayer delivering 20 or 40 GPA with 8002 or 04XR nozzle tips or an 8 nozzle boom to deliver 80 GPA at 40 PSI with 8008XR tips.

Results for test 1 indicated control was comparable 120 days after initial treatment (DAIT) with between 87 to 98% with 3 or 4 applications (x) of 2.5 or 5 qt/A or 4x of 1 qt/A. By 175 DAIT, only 4x or 2.5 or 5 qt/A provided similar control with 88 and 94%. Control with all treatments was less than 75% 210 DAIT. From these data, control in day after final application (DAFA) was determined. All rates (1, 2.5 and 5 qt/A) applied 4x and 2.5 and 5 qt/A applied 2x or 3x provided above 90% control 30 DAFA. All 1 qt/A treatments provided less than adequate control below 77%, 60 DAFA. In addition, 60 DAFA, only 2.5 and 5 qt/A applied 2 or more times provided between 87 and 93% control. By 90 DAFA, control ranged between 86 and 94% with 5 qt/A applied 3x or 4x or 2.5 qt/A applied 4x. Control by any treatment was less than 75% 120 DAFA.

Results for test 2 suggested that Roundup Pro and Touchdown applied at 128 fl oz/A were the most effective and consistent chemicals evaluated, with better that 90% control seen 60 DAIT and beyond irrespective of GPA or stand type (burned or natural). Control with Arsenal of 80 and 90% was achieved sooner (60 or 90 DAIT) on burned stands compared to 150 DAIT on natural stands. Averaged over treatments and replications, control with 20 GPA was better than 80 GPA. Overall, Roundup Pro and Touchdown were the most effective and consistent chemicals evaluated, with better than 90% control 60 DAIT and beyond, regardless GPA or stand type (burned or natural). Dowpon and Asulox control was inconsistent and Hyvar was ineffective.

Conclusions from objective 1 suggest multiple applications are needed, lower use rates of 1 or 2.5 qt/A control were comparable to 5 qt/A applied multiple times, and each additional application provided about 30 days additional control beyond the previous application. Objective 2 data suggested that increased control was seen with applications made to regrowth (burned) stands compared to natural stands. Also, control with a 20 GPA spray volume was better than 80 GPA. Overall, Roundup Pro and Touchdown were the most effective and consistent chemicals evaluated, with better that 90% control seen 60 DAIT and beyond irrespective of GPA or stand type (burned or natural).

POSTEMERGENCE *POA ANNUA* CONTROL IN DORMANT BERMUDAGRASS. B.T. Bunnell*, L.B. McCarty, C.J. Cox, and A.E. Estes. Clemson University, Department of Horticulture, Clemson, SC. 29634-0375.

ABSTRACT

Poa annua control in dormant bermudagrass is commonly performed in non-overseeded golf course fairways, roughs, and home lawns with non-selective herbicides. The growth habit and noxious seedhead production of *Poa annua* reduces the quality and aethestic value in non-overseeded areas of golf courses and home lawns during winter and spring months. Herbicide use and application timing is critical for long term *Poa annua* control throughout the spring season without injuring the bermudagrass. The objective of this research was to control *Poa annua* following a variety of herbicide applications in December and February.

Two *Poa annua* control studies were performed during the winter and spring of 2001-2002 on dormant common bermudagrass (*Cynodon dactylon*). In study one, treatment applications were made on December 20, 2001 and study two on February 5, 2002. Each study was performed on a golf course rough in Pendleton, SC. Treatments included single applications of: atrazine and simazine at 1.0 lbs a/A (Dec) and 2.0 lbs ai/A (Feb), Reward 2 EC (diquat) + Optima (NIS) at 0.5 lbs ai/A + 0.25% v/v, Round-Up Pro 4 EC (glyphosate) at 0.5 lbs ai/A, Finale 1 SC (glufosinate) at 1.5 lbs ai/A, Round-Up Pro + Envoy 0.94 EC (clethodim) at 0.5 + 0.25 lbs ai/A, Finale + Round-Up Pro at 1.5 + 0.5 lbs ai/A, Finale + Envoy + Optima at 1.5 + 0.25 lbs ai/A + 0.25% v/v, Kerb 50 WP (pronamide) at 1.5 lbs ai/A, Image 1.5 LC (imazaquin) at 0.5 lbs ai/A, metsulfuron 60 DF at 0.025 lbs ai/A, TranXit (rimsulfuron) at 0.031 lbs ai/A, Velocity 80 WP (bispyribac-sodium) at 0.035 lbs ai/A, sulfosulfuron 75 DG at 0.02 lbs ai/A, sulfosulfuron 75 DG + NIS at 0.02 lbs ai/A + 0.5% v/v, and flazasulfuron 25 DG at 0.045 lbs ai/A.

Visual ratings were taken weekly. *Poa annua* control was rated on a 0-100% scale with 0%=worst and 100%=best. Control < 80% was deemed commercially unacceptable control.

In the December application study, at 5 weeks after treatment (WAT) only Reward provided > 90% *Poa annua* control. By 10 WAT, all treatments including non-selective herbicides provided 100% *Poa annua* control. TranXit and Flazasulfuron provided ≈70% control. All other treatment application provided < 50% *Poa annua* control.

In the February application study, at 5 WAT, all treatments containing Finale provided from 95-100% *Poa annua* control. All other treatments provided < 50% *Poa annua* control. By 10 WAT, best *Poa annua* control (> 90%) followed applications of Finale + Envoy, Kerb, and the increased rates of simazine and atrazine. Finale alone and Finale + Round-Up Pro provided 85 and 70% *Poa annua* control, respectively. All other treatments provided < 70% *Poa annua* control at 10 WAT.

In summary, good long-term *Poa annua* control followed applications containing Finale when applied both in December and February. Finale + Envoy was the only treatment providing > 90% *Poa annua* control at both application timings. Treatments containing Reward were successful controlling *Poa annua* when applied in December. February applications of Reward provided 0% *Poa annua* control at 10 WAT. Triazine herbicides provided > 90% control in the February study after the rate was increased to 2.0 lbs ai/A. Additionally, Kerb showed 95% *Poa annua* control when applied in February and only 50% control in December at 10 WAT. Research will continue on long-term *Poa annua* control with varying pesticide combinations, timings, and rates. Sulfonylurea herbicides may potentially open new avenues of *Poa annua* control in dormant bermudagrass.

ENVIRONMENTAL INFLUENCE ON LEAF COLOR OF COGONGRASS. C.T. Bryson* and C.H. Koger, USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS 38776; and J.D.Byrd, Jr., Department of Plant and Soil Sciences, Mississippi State University, MS 39762.

ABSTRACT

Cogongrass [*Imperata cylindrical* (L.) Beauv.] is an aggressive perennial grass that is considered to be the world's seventh worst weed. Because of its aggressive, weedy habit in other countries, cogongrass was placed on the Federal Noxious Weed List after it was introduced into the United States. It was accidentally and purposely introduced into the southern United States between 1900 and 1920. Cogongrass has been reported as a weed in Alabama, Florida, Georgia, Louisiana, Mississippi, South Carolina, Texas, and Virginia, and it continues to spread northward. Unfortunately, some nurseries have sold cogongrass with reddish to maroon foliage as an ornamental grass under the names "Japanese bloodgrass" or "Red Baron." Several ornamental grass manuals provide warning statements to immediately remove these cultivars if they spread and/or revert back to the typical weedy green plants. Because reddish or maroon colors were observed in weedy cogongrass patches at various sites in temperate climates of the southern United States, we hypothesized that leaf color in some cogongrass biotypes might be attributed to environmental conditions, and that the leaves of red ornamental cultivars might also turn green under certain environmental conditions. Objectives of this research were to evaluate several cogongrass biotypes to determine environmental factors that may alter leaf color and to determine if there were leaf color differences among cogongrass biotypes exposed to various environmental conditions. The following cogongrass collections were evaluated for leaf color in differing temperature regimes: 2 - Askikalak, Iraq; 3 - Mobile, Mobile Co., Alabama; 7 - Basrah, Iraq; AL-CAM - Camden, Wilcox co., Alabama; MS-2 - Picayune, Pearl River Co., Mississippi; MS-3 - McNeil, Pearl River Co., Mississippi; and Red-1 - a red cultivar obtained from a bonsai garden in Ann Arbor, Michigan in 1986. Plants were maintained from rhizomes in a greenhouse (25/35 C N/D) at Stoneville, MS in 12-cm diameter pots and transferred into growth chambers for two weeks prior to data collection. Growth chamber experiments were conducted at temperature regimes of 10/10, 10/20, 10/30, 10/40, 20/20, 20/30, 20/40, 30/30, and 30/40 C night/day (N/D). Plants were watered daily. Newly formed, fully expanded leaves were removed from each cogongrass plant and digitally scanned. A digital library was maintained for leaves from each cogongrass biotype and temperature regime. Leaf color (red, green, and blue) was determined with Computer Image Analysis System software available from CID, Inc., Vancouver, WA and data were converted to percentage of an untreated control (20/30 N/D). Leaf color changed among temperature regimes for each of the cogongrass collections; however, the degree of color change varied among biotypes. At lower temperatures, Red-1 was red, but turned green at 30/30 and 30/40 C. Weedy cultivars were green at the higher N/D temperatures and all turned red to varying degrees at the lowest night temperature (10 C) or at the greatest N/D temperature differences (10/40 and 10/30 C). These studies demonstrated that leaf color in cogongrass is temperature dependent; however, research is needed to determine effects of additional temperature regimes and other environmental conditions on leaf color in cogongrass.

RELATIONSHIP OF TOPOGRAPHY TO EDAPHIC FACTORS AND *KYLLINGA BREVIFOLIA* POPULATIONS IN GOLF COURSE FAIRWAYS. J.S. McElroy, F.H. Yelverton, and M.G. Burton, North Carolina State University, Raleigh, NC 27695-7620.

ABSTRACT

Within natural ecosystems, elevation is a significant topographic feature influencing vegetative pattern and edaphic characteristics. However, no information is available regarding the influence of elevation on the spatial heterogeneity of soil fertility, moisture characteristics, or weed populations in managed turfgrass systems. Greater understanding of the spatial variability of soil characteristics and weed populations is necessary for the development of effective integrated pest management practices. Therefore, two golf courses in North Carolina, Fairfield Harbour Country Club (New Bern, NC) and Echo Farms Golf Course (Wilmington, NC), were selected to investigate the spatial relationship of elevation to soil characteristics and green kyllinga (*Kyllinga brevifolia*) populations in golf course fairways. Both sites have green kyllinga infested bermudagrass (*Cynodon* spp.) fairways and success in controlling green kyllinga with herbicides has been poor. Parallel transects spaced 2 to 3 meters apart were positioned along the major elevation gradient within a green kyllinga infested fairway. Quadrats (0.09 m^2) were spaced evenly along each transect every 0.6 or 0.7 meters, with 30 to 40 quadrats per transect. At each quadrat, soil samples, soil volumetric water content, and a green kyllinga % cover rating were taken. Elevation measurements were taken to cm precision on a 2m grid. Slope of the elevation gradient at Fairfield Harbour and Echo Farms was approximately 2 and 3%, respectively.

At both sites, green kyllinga was observed at lower elevations. Additionally, both sites had greater soil volumetric water content, pH, and Na levels at the lower elevations. The spatial structure of soil K concentrations was not consistently correlated with elevation. At Fairfield Harbour, greater soil K was observed at lower elevations, while at Echo Farms, greater soil K was observed at the higher elevation. Soil P was not correlated with elevation at either site. At both sites, green kyllinga populations were consistently correlated with saturated soil moisture conditions, pH levels >5, and high soil Na. However, soil Na did not exceed a toxic level of >20% of the soil CEC at either site. Green kyllinga populations varied with respect to correlation to soil K. At Echo farms, green kyllinga was correlated with K deficient soils, but at Fairfield Harbour, green kyllinga was not observed in K deficient areas. Green kyllinga populations were not correlated with soil P at either site.

These data indicate spatial heterogeneity of soil edaphic characteristics and weed populations within managed turfgrass does exist. Furthermore, the influence of elevation on edaphic factors (e.g., soil volumetric water content, pH, and Na) may effect the spatial distribution of green kyllinga populations. Thus, management of turfgrass systems that reflects the spatial heterogeneity of weed populations, and soil fertility and moisture variables could be both economically and environmentally beneficial.

BEST MANAGEMENT PRACTICES IN CORN TO REDUCE OFF-TARGET LOSSES OF ATRAZINE IN SURFACE RUNOFF. M.C. Dozier, P.A. Baumann, S.A. Senseman, K.H. Carson, F.T. Moore, L.M. Etheredge, and A.S. Sciumbato, Texas Cooperative Extension And Texas Agricultural Experiment Station; Department of Soil and Crop Sciences, Texas A&M University, College Station, TX 77843-2474

ABSTRACT

Off-target losses of atrazine for corn production fields have been documented in the Central Texas Blacklands. Eight public water supply reservoirs have reported detections of atrazine in finished drinking water samples used for public drinking water. Banning the use of atrazine in these watersheds is an option that is being considered. However, such action has been projected to reduce corn yields and increase production costs. Other methods other than banning the use of the product need to be studied to effectively reduce off-target losses of atrazine in surface runoff while maintaining acceptable weed control and yields.

Studies to compare the amount of atrazine lost in surface runoff, % weed control, and corn yield from various atrazine application methods were conducted on the Texas A&M University Stiles Farm (SF) located near Thrall, Texas and the Impact Center (IC) near Snook, Texas. The application methods studied were surface broadcast (broad), 13 inch over the crop row banded treatment followed by an early season field cultivation (band), and preplant incorporation (ppi). The treatments were replicated three times at both locations. First flush runoff was collected from each plot and atrazine concentrations determined along with total runoff volume captured. % Palmer and/or Tall pigweed control was rated each year and yields determined.

At both sites (SF and IC), Band and PPI off-target losses of atrazine were reduced compared to Broad applications during both years. % Palmer or Tall pigweed control was not significantly reduced between any of the treatments at either site or year. Only yields for the PPI treatments at IC in 2002 were lower than the Broad treatments though not significantly.

Based on these results, banding of atrazine and the preplant incorporation of atrazine can reduce off-target losses of atrazine in surface runoff with little major reduction in percent weed control and corn yield.

Acknowledgements: Special appreciation is extended to the Texas Corn Producers Board, the Texas Department of Agriculture, Syngenta, and the USDA-NRCS of Texas for providing financial support for this project. Thanks to the farm services staff of the Stiles Farm Foundation and the Texas A&M Impact Center for managing the crop for this study and to the lab staff of the TAES Herbicide Fate laboratory for sample analysis.

SECTION XI. POSTERS

THE NATIONAL PESTICIDE USE DATABASE. L.P. Gianessi and S. Sankula. National Center for Food and Agricultural Policy, Washington, DC.

ABSTRACT

Accurate information delineating the usage of individual pesticide active ingredients by state, crop, and year is a critical component for the design and evaluation of pesticide regulatory and monitoring programs. Pesticide use trend data are useful in evaluating the impacts of policies that lead to introductions of new products, cancellation of older products, and policies that affect farming practices such as tillage. The US does not have a comprehensive pesticide use reporting program and does not have a comprehensive set of farmer surveys of pesticide use. The federal government surveys farmer's use of pesticides in major producing states only. In order to have a publicly available organized national pesticide use database, the federal government has supported the National Center for Food and Agricultural Policy (NCFAP) to prepare five year updates based on available survey information, other reports, and the expert opinions of Extension Service Specialists. NCFAP has released two updates of the database (for 1992 and 1997) and is currently working on an update for 2002.

NCFAP's database covers 87 crops. Usage estimates are made for all states with appreciable acreage of each of the crops. The crop acreage estimates are drawn from the Census of Agriculture, which is conducted every five years. NCFAP's records delineate the use of a specific active ingredient by state and crop. Each line of data contains a reference code that identifies the source of the data. There are two usage parameters: the percent of acreage treated with the chemical and the average annual application rate per treated acre. By multiplying these estimates by the estimates of crop acreage, estimates of total treated acres and pounds used statewide are computed. The major sources of data are as follows:

- In the south, NASS regularly surveys pesticide use for the following crops: cotton (GA, MS, AR, AL, LA, TX, NC, TN), corn (GA, NC, TX, KY), soybean (AR, LA, MS, TN, KY, NC), wheat (NC, KY, AR, OK, TX), major vegetables (GA, FL, NC, TN, TX, SC), and major fruits (NC, GA, FL, SC).
- USDA has supported the development of a series of short documents that describe the management of pests on a state and crop basis. These Crop Profiles are available at http://ipm.ncsu.edu/. Most of the crop profiles have some information on usage patterns. In some cases the Crop Profile use estimates are from NASS while in other cases they are from independent farmer surveys conducted for the Crop Profile or are based on expert opinions of Extension Service specialists
- NCFAP sends questionnaires to Extension Service specialists for those states and crops for which adequate data are not available from other sources. For the 1997 update, 277 Extension Service specialists provided estimates
- For some states and crops, NCFAP receives no Extension Service specialist estimates to fill in gaps. In order to assemble a database for these states and crops, NCFAP assigns usage profiles from a neighboring state. Approximately 20% of the NCFAP's database is based on these assignments.
- Prior to releasing its database, NCFAP sends the data for each active ingredient to the chemical registrant companies for review purposes. In some cases companies identify gaps, under or over estimates, which causes NCFAP to collect additional data in an attempt to resolve discrepancies.
- In some cases industry registrants provide a set of usage estimates for inclusion in the NCFAP database.

The NCFAP's 1997 pesticide use database contains 17,098 records, which are an integration of records from the sources described above. The NCFAP's database is available at

www.ncfap.org. For all states in the south, the NCFAP's database is the only organized source of information on pesticide use amounts. For many crops in the south the NCFAP's database is the only source of any kind for pesticide use. NCFAP provides its database directly to USEPA and USGS where it is regularly consulted and cited in regulatory and monitoring programs. The 1992 herbicide use estimates from the NCFAP's database were published in their entirety in WSSA's report: Crop Losses Due to Weeds in the United States 1992. Numerous types of summaries can be made from the NCFAP's database.

GROWTH RESPONSES OF OUST APPLIED TO MULTIPLE SPECIES PLANTINGS IN THE MISSISSIPPI RIVER DELTA. R.A. Williams and J.A. Earl; Arkansas Agricultural Experiment Station and School of Forest Resources, University of Arkansas at Monticello, 71656.

ABSTRACT

Since hardwood pulp is increasing hard to find close to the mills that use it, it seems that the supply needs to be increased. But producing just hardwood pulp alone would not be profitable enough by itself; therefore, a multiple species planting scheme was developed to include higher-value sawtimber trees like pine and oak while using green ash for pulpwood. The shumard oaks in the study were either containerized or bareroot. Also, half the plots were sprayed with a mixture of 2 oz Oust per treated acre. The end result was a split plot design where we could observe treated versus untreated seedlings of three species, as well as containerized versus bareroot oaks. Survival in the first year was excellent with ninety-five percent or greater for green ash, loblolly pine, and containerized oak. The bareroot oak survived at nearly eighty percent. Containerized oaks grew an average of four times more than bareroot oaks for height, and had three times the growth on groundline diameter. Treated ash seedlings had two-and-a-half times the height growth as untreated ash, and twice the diameter growth. Loblolly pines also grew better in treated plots as compared to untreated ones, especially for diameter. Measurements will be taken again at the end of the second growing season and of course when the stand is nearing the first thinning. The real challenge will be to evaluate if this plantation can provide hardwood pulpwood in the process of growing high quality sawlogs.

INTRODUCTION

The Forest Statistics for Arkansas Counties – 1995 showed 1.8 million acres of planted pines. Each year the number of planted pine seedlings adds to this 1.8 million acres (London 1997). Arkansas is now growing more pine volume than it is removing. Arkansas only has five operating pulp mills to use this tremendous amount of pine fiber. A pulp mill located in northeast Louisiana uses some pine fiber from Arkansas, as does a mill in northeast Texas. Another important fact is that hardwood pulpwood is increasingly difficult to find close to the mills that use hardwood fiber for pulp. In the southwest region of Arkansas, hardwood growth was 100 M. ft3 while removals exceeded 150 M. ft3 (Rosson et al. 1995). These conditions led us to the conclusion that southern Arkansas needs to increase its supply of hardwood pulpwood. Thus, this study is an attempt to grow hardwood trees in a profitable manner. Hardwood pulpwood alone would not pay for itself because hardwood pulpwood prices are not that great. However, if hardwood pulpwood could be grown in conjunction with other tree species that do produce higher valued products such as pine and hardwood sawtimber, then this plantation may offer an attractive alternative. Thus the idea of a "Multiple Species" plantation appears to be a possible alternative to providing hardwood pulpwood in the process of producing high quality pine and hardwood sawtimber.

METHODS

This study is a first attempt at planting multiple tree species (more than two) in a plantation. The tree species used were green ash (*Fraxinus pennsylvanica*), loblolly pine (*Pinus taeda*) and shumard oak (*Quercus shumardii*). These species were selected because they would grow naturally on the site selected for this study. The seedlings were hand planted in rows of like species (oak – ash – pine – ash – oak – ash….). Planting seedlings in rows allows for mechanical harvesting of desired trees. The initial target is to harvest the green ash before age 20 as hardwood pulpwood. The second cut will include pine sawtimber and some pine and hardwood pulpwood. The green ash should have re-sprouted after the first cut and could be harvested again as the third harvest. The resulting stand is red oak sawtimber which is a highly desirable product for the final harvest. If the lumber market changes over the course of growing this plantation, the final product could shift from hardwood to pine by altering the intermediate harvests.

A 10 acre portion of a field in eastern Drew County, AR was divided into ten one-acre blocks. Each acre received the same number of ash, oak and pine seedlings, however, the difference is whether the acre received containerized or bareroot oak seedlings. The determination as to the acre being planted with containerized or bareroot oak seedlings was randomly selected. Two measurement plots were placed in each of the ten one-acre plots. Half of these plots were treated with 2 ounces of Oust herbicide for herbaceous weed control. The study followed a Completely Randomized Split-Plot Design.

RESULTS

This study had excellent survival at the end of the first growing season. Adequate rainfall occurred throughout the growing season with at least 2 inches of rain per month. One-hundred percent of the green ash seedlings survived. This included both treated and untreated green ash seedlings. Ninety-five percent of the loblolly pine seedlings survived with 100 percent survival on pine seedlings treated for herbaceous weed control and 85 percent survival without weed control. Containerized oak seedlings survival was 100 percent on both treated and untreated sites for herbaceous weed control. Bareroot oak seedlings had 85 percent survival on areas untreated for herbaceous weed control and 78 percent on areas receiving weed control (Table 1).

Seedlings receiving herbaceous weed control had significantly more height growth compared to seedlings without weed control. The height differences were apparent through all three species planted on this site except for bareroot oak seedlings. Containerized oak seedlings had 4 times the height growth compared to bareroot oak seedlings. Treated containerized oak seedlings had 10 times more height growth compared to treated bareroot oak seedlings (Table 2). Treated green ash seedlings grew 2.5 times more than untreated ash seedlings. Loblolly pine height growth was greater on treated plots compared to untreated plots.

Similar growth responses were observed in ground line diameter growth as well. Ground line diameter (GLD) growth was greater on the containerized oak seedlings compared to the bareroot oak seedlings, in fact 3 times greater. The treated containerized oak seedlings had 4 times the GLD growth compared to bareroot oak seedlings. All treated seedlings including ash, pine and oak had greater GLD growth than untreated seedlings. Treated green ash seedlings had twice the GLD growth compared to untreated ash seedlings. Pine seedlings on plots treated for herbaceous weed control had almost twice as much GLD growth than seedlings on untreated plots (Table 2).

CONCLUSIONS

Containerized oak seedlings out grew the bareroot oak seedlings in both height and ground line diameter. Survival was also greater on treated plots. All seedlings receiving herbaceous weed control out grew those that did not receiving weed control. This study is off to a good start with regard to initial growth and survival. Measurements will be taken again at the end of the second growing season and of course when the stand is nearing the first thinning. The real challenge will be to evaluate if this plantation can provide hardwood pulpwood in the process of growing high quality sawlogs.

LITERATURE

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Table 1. Seedling survival rates (percent).

Species	Treated	Untreated
Green Ash	100	100
Loblolly Pine	100	95
Containerized Oak	100	100
Bareroot Oak	77	85

Table 2. Height growth (ft) and groundline diameter growth (in)

Species by treatment	Height	GLD
Containerized Oak	0.204 a	0.880 a
Bareroot Oak	0.052 b	0.033 b
Treated C. Oak	0.260 a	0.127 a
Untreat C. Oak	0.146 b	0.048 b
Untreat C. Oak	0.146 a	0.048 a
Untreat BR Oak	0.078 b	0.030 b
Green Ash treated	0.399 a	0.241 a
Green Ash untreated	0.153 b	0.158 b
Loblolly pine treated	1.240 a	0.277 a
Loblolly pine untreated	0.694 b	0.152 b

*Different letters denotes significant differences at .05 level

PRE- AND POST-EMERGENT HERBICIDE EFFECTS ON SURVIVAL AND GROWTH FOR MIXED HARDWOOD PLANTING OF CRP LANDS IN THE MISSISSIPPI RIVER DELTA. J.A. Earl and R.A. Williams; Arkansas Agricultural Experiment Station and School of Forest Resources, University of Arkansas at Monticello, 71656.

ABSTRACT

Many of the tree plantings in the Conservation Reserve Program have shifted from loblolly pine to hardwood mixes. Because of this, some new research has focused on controlling competing herbaceous competition in beginning hardwood tracts. This study looked at the first-year effects of ten herbicide combinations and one control on a planting in the Mississippi River Delta of Southeast Arkansas. Each treatment plot was replicated four time and sprayed over-the-top with a pressurized backpack rig in a five-foot band. Six species were planted, but only three were present in sufficient numbers in the plots: green ash, shumard oak, and persimmon. The seedlings survived at a rate of 97 percent or better. Height and groundline diameter showed little differences among treatments within species. Only green ash showed significant a difference between treated and untreated plots. The initial site prep of 2 oz Oust did an excellent job of producing bare ground, and the April applications kept good bare ground percentages into July. However, the late-season herbaceous competition took control of the site by September, leading us to think a mid-season herbicide application could keep that control going through year one.

INTRODUCTION

The Conservation Reserve Program (CRP) has had a shift in recent years from controlling erosion to enhancing wildlife. In the Mississippi Delta that change has meant CRP tree plantings have gone from loblolly pine to various hardwood species. Because of this, more research is now being devoted to finding effective controls for the sometimes tenacious herbaceous species competing in these plantings. The goal is to aid survival while enhancing the growth characteristics of the trees. This study takes a casual look at a site planted with hardwood trees that have been treated with ten combinations of herbicides and one untreated control.

MATERIALS AND METHODS

The study site is next to the Mississippi River levee in eastern Chicot County, AR (Section 1, T18S, R1W). Soils are either Sharkey clay or Commerce silty clay loam. These soils are mildly acid and fine-textured, with poor drainage, medium organic matter, and good moisture-holding capacity. In December 2001, a pre-emergent application of 2 ounces Oust was applied to a 10-acre tract to prepare the site for planting. Six species were unsystematically planted on the prepared area in early 2002: green ash, shumard oak, water oak, persimmon, autumn olive, and pecan.

Plots were set up for each of the ten treatments and one control by measuring 75 feet of distance along a planted row of seedlings. We wanted four replications, so a total of forty-four plots were established. The control was simply set up outside the boundary of the area initially sprayed with Oust; all other treatments were chosen randomly from the remaining forty plots. The experiment is a Completely Randomized Design (CRD) with 4 replications.

In mid-April 2002, the post emergent applications were sprayed. Post emergent in this instance refers to areas outside of the Oust treatment, because there was very little emerging vegetation where the December Oust was applied. All treatments were sprayed over-the-top of the hardwood seedlings unless there was foliage – in which case the spray was interrupted briefly so none reached the leaves. A pressurized backpack system was used to spray the herbicide/water mixtures at a volume of 15 gallons per acre. A single TeeJet AI110-04VS nozzle at 15 PSI produced a 5-foot band of coverage that had large enough droplet size to resist our 5-10 mph winds.

At thirty day intervals, plots were evaluated for bare ground, brownout, and green-up. Two observers made ratings for two trees in each plot. Near the end of June, biomass was sampled using a meter-square frame at eight locations in the control areas. Competing species were identified and recorded.

RESULTS

Because we did not select rows with equal numbers of each species, we ended up with three main species that made up 97 percent of the plots: green ash, shumard oak, and persimmon. When looking at the numbers of trees by treatment, we set a minimum of two trees per rep (8 trees total). Unfortunately, this eliminated some comparisons of treatments among the species. For green ash, all treatments were statistically the same for gld and height growth except the control (Table 1). Shumard oaks had very little growth above ground and there were no significant differences among treated or untreated plots. Persimmon grew very little and most treatments produced similar growth results among treatments. In a slightly above average rainfall year (total=59.75 in), all trees survived at 97 percent or higher.

The initial treatment of 2oz Oust was very effective at preventing early-season species from emerging. By the time applications were made in April, the bare ground percent was better than 95 percent. What did emerge in May was affected by the herbicide, and the peak brown out was only 15 percent…mainly because of the large amount of bare ground. In May, the average bare ground was 75 percent, with 10 percent green. Fifty percent greenup did not occur until late July. Table 2 shows the efficacy of herbicide treatments throughout the first growing season. Average bare ground dropped a little in May, and reached a peak in July (78 percent average on all treatments). By August, the average had dropped to 27 percent. At the end of the growing season, there was little evidence that any herbicide had been sprayed on the tract. One thing we found interesting was the untreated control at times had a higher bare ground percentage than treated plots.

Biomass sampling resulted in an average of 1506 lbs/ac (0.75 tons/ac, 1691 kg/ha), with a standard deviation of 485 lbs/ac. Major late-season herbaceous competitors were pigweed, balloonvine, redvine, morningglory, johnsongrass, teaweed, marestail, and various docks and spurges.

CONCLUSIONS

While the persimmon and shumard oak did not grow very much, they did survive a critical first season in the ground at a high percentage. The green ash survived very well and also showed good growth. Atrazine, 1 oz PCC 1195, and the 1 oz Oust treatments did the poorest in providing bare ground for the trees. Considering that the tract began in bare ground and stayed nearly so through June, it was not enough to keep the late season species from taking over the site by late August. We think a second, mid-season application might prove more effective at keeping the ground weed free through year one.

Table 1. Average groundline diameter growth (in) and height growth (ft) for year one[1]

	Green Ash		Shumard Oak		Persimmon	
Chemical	Gld	Ht	Gld	Ht	Gld	Ht
Atrazine, 2.5 lb ai/ac post spray	--	--	0.07 a	0.12 a	0.08 ab	0.49 ab
Goal 4F, 1 lb ai/ac post spray	--	--	--	--	0.1 a	0.63 ab
Oust XP, 0.75 oz ai/ac post spray	0.36 a	1.22 a	--	--	--	--
Oust XP, 1.50 oz ai/ac post spray	--	--	--	--	0.04 b	0.34 ab
Pendulum, 3.3 EC post spray	--	--	--	--	0.06 ab	0.32 ab
Strongarm (DE564) post spray	--	--	0.06 a	0.16 a	0.04 b	0.11 b
Vantage, 2.25 pts/ac	0.3 ab	1.03 ab	0.09 a	0.19 a	0.06 ab	0.36 ab
Oust, 2 oz/ac pre-emergent	0.25 ab	0.72 ab	0.08 a	0.29 a	0.05 b	0.37 ab
PCC 1195, 1 oz/ac post spray	0.31 ab	0.88 ab	0.08 a	-0.14 a	--	--
PCC 1195, 2 oz/ac post spray	0.26 ab	0.85 ab	0.07 a	0.13 a	--	--
Untreated check	0.15 b	0.21 b	0.05 a	0.03 a	--	--

[1]Means within a column sharing the same letter are not significantly different (Duncan, p=0.05); treatments with eight total trees or fewer are not shown

Table 2. Percent bare ground by month[1]

Color	Chemical	Amt	May	June	July	Aug
Yellow	Goal 4F, 1 lb ai/ac post spray	32 oz	77 a	92 a	82 a	36 a
Green	Vantage, 2.25 pts/ac	2.25 pts	80 a	88 ab	75 ab	29 ab
Or-Or	Oust, 2 oz/ac pre-emergent	2 oz	83 a	86 abc	74 ab	35 a
Orange	Pendulum, 3.3 EC post spray	64 oz	78 a	83 abc	71 abc	31 ab
Blue-Blue	PCC 1195, 2 oz/ac post spray	2 oz	78 a	79 abcd	66 abc	29 ab
Red-Red	Oust XP, 1.50 oz ai/ac post spray	2 oz	82 a	78 abcd	66 abc	26 abc
Yel-Yel	Strongarm (DE564) post spray	1.2 oz	74 ab	75 abcd	70 abc	28 ab
White	Untreated check	-	67 ab	74 abcd	66 abc	31 ab
Red	Oust XP, 0.75 oz ai/ac post spray	1 oz	67 ab	73 bcd	61 bc	23 bc
Silver	Atrazine, 2.5 lb ai/ac post spray	80 oz	70 ab	68 cd	56 c	17 c
Blue	PCC 1195, 1 oz/ac post spray	1 oz	59 b	63 d	54 c	16 c

[1]Means within a column sharing the same letter are not significantly different (Duncan, p=0.05)

SMOOTH PIGWEED AND LIVID AMARANTH INTERFERENCE WITH CUCUMBER. A.D. Berry, W.M. Stall, B. Rathinasabapathi, Horticultural Sciences Department, University of Florida, Gainesville, FL 32611, G.E. MacDonald, Agronomy Department, University of Florida, Gainesville, FL 32611, and R. Charudattan, Plant Pathology Department, University of Florida, Gainesville, FL 32611.

ABSTRACT

Additive series experiments were conducted under field conditions to determine the effect of season-long interference of different population densities of smooth pigweed (AMACH) and livid amaranth (AMALI) on the fruit yield of cucumber. There was no significant difference or interaction by weed species. There were differences in the total percent yield loss by location, however the critical densities and biological thresholds were very similar. Losses in cucumber fruit number and weight were greater at Live Oak when compared with Gainesville. The results of the additive study indicated that densities as low as 1 to 2 amaranths per m^2 can cause a 10% reduction in cucumber yield. The biological threshold of AMACH and AMALI with cucumber appears to be at 6 to 8 amaranths per m^2. With increasing AMACH and AMALI density cucumber weight per fruit remained fairly constant, while fruit number decreased. Consequently, AMACH and AMALI competition significantly decreased cucumber yield by reducing cucumber fruit production.

EFFECT OF CLOMAZONE AT DRIFT RATES ON SEEDLING PECANS *(Carya illinoesis)*. M.S. Malik, R.E. Talbert, E.F. Scherder, M.L. Lovelace. Department of Crop, Soil and Environmental Sciences, University Of Arkansas, Fayetteville, AR 72701

ABSTRACT

In 1993 clomazone, (Command 4 EC) was extensively used in cotton; however off-target drift to pecans frequently occurred, thus, growers became reluctant to use this formulation. Changing to the less volatile Command 3 ME markedly reduced reports of off-target spray drift. With the reduced potential of off-target drift, an aerial label may be granted for Command 3 ME use in rice for Arkansas.

To address this issue an experiment was conducted to evaluate the potential hazard of Command 3 ME drift to off-target vegetation. The experiment was conducted at University of Arkansas Agricultural Experiment Station, Fayetteville, AR. Command 3 ME, Command 4 EC, and propanil (Stam M4) tank mixed with Command 3 ME were compared by direct application to seedling pecans in 2001 and 2002. The 1-X rate of clomazone was 0.4 lb/A and the 1-X rate of propanil was 3 lb/A. All formulations and tank mixture were used at 0.1-X, and 0.01-X rates. Two-seedling pecan trees 2- to 3- feet tall were utilized in each plot. Seedling pecans were transplanted on April 2, 2001. Pecan trees with 2 to 9 leaves were sprayed on July 18, 2001 and at 4 to 12 leaf on June 7, 2002. One plant was covered with plastic bag and other plant was sprayed in order to differentiate foliar from soil or vapor uptake of clomazone. The experimental design was 4x3 factorial with four replications. An untreated check was also included. The plants were rated weekly for bleaching and overall injury symptoms.

Slight bleaching in form of whitening of leaf veins and some leaf necrosis was observed (maximum of 8%) from 1-X rate of each clomazone formulation. In 2002, with more rainfall following treatment bleaching symptoms from both formulations of clomazone were initially higher (25%) in the beginning but later in the season, plants recovered. Overall bleaching from Clomazone 3 ME during 2002 from 1-X rates was about 10% as compared to 5% in 2001. Also bleaching from 1-X rate of Clomazone 4 EC was 14% in 2002 as compared to 9% in 2001. Injury, in 2001 in the form of necrosis of leaves was initially 62% from 1-X rate of tank mixture of propanil plus command 3 ME. In the year 2002 initial injury was less (25%), as there was wash off of propanil from rainfall. Overall injury, 7 weeks after treatment was 10% in 2002 as compared to 20% in 2001. Minor bleaching occurred from the 0.1-X and 0.01-X rates with either formulation applied alone or in a tank-mix with propanil during both years. The untreated check plants and covered plants showed no visual symptoms of soil uptake or volatility. New leaf development was not affected by any treatment.

WEED CONTROL IN WATERMELON (*CITRULLUS LANATUS*) AND SQUASH (*CUCURBITA PEPO* L .) WITH STRATEGY. K.D. Brewer, B.A. Besler, W.J. Grichar, and J.J. LeClair; Texas Agricultural Experiment Station, Yoakum, TX 77995 and United Agric Products, Corinth, TX 76210.

ABSTRACT

Watermelon and squash yields can be significantly reduced when exposed to high levels of early season weed competition. It is important for producers to eliminate weeds early to allow plant to efficiently utilize soil moisture and nutrients. Field studies were conducted in south Texas during the 2002 growing season to evaluate Strategy (ethalfluralin+clomazone) for weed control and crop tolerance in watermelon and squash. Strategy applied PRE at 2, 3, 4, and 5 pt/A was compared with Sonalan applied PRE at 2 pt/A in areas with a natural infestation of weed pressure. These studies were conducted in soils with 60-70% sand content.

No crop injury was noted with Strategy at any rate on watermelon or squash at either location.

On watermelon,. tumble pigweed (*Amaranthus albus* L.) control at Yoakum 21 days after planting (DAP) with strategy was >80%. Strategy at 4 and 5 pt/A provided better control than the standard treatment of Sonalan at 2 pt/A. Control of tumble pigweed with all rates of Strategy 35 DAP was > 90%. The 3, 4, and 5 pt/A of Strategy provided better control than Sonalan. Residual control of Strategy started to breakdown by 57 DAP and with a new flush of pigweed, control was 70% or less. Large crabgrass [*Digitaria sanguinailis*(L.) Scop.] control at 21 DAP was greater than 85% with all rates of Strategy. Good to excellent large crabgrass control continued 35 DAP with all rates of Strategy and provided better control than Sonalan.

On squash, all rates of Strategy resulted in >93% pigweed control at 21 DAP. All rates of Strategy provided control better than Sonalan alone. Excellent pigweed control was evident 35 DAP with Strategy controlling at least 95%. However, pigweed control at 57 DAP with all rates of Strategy was less than 65%. Sonalan alone provided 82% control. Strategy provided excellent (95%) control up to 35 DAP but control dropped off dramatically 57 DAP due to conditions conducive for a new flush of large crabgrass.

TOLERANCE OF SWEET POTATO TO DIMETHENAMID AND METOLACHLOR.

S.T. Kelly[1], H.L. Carroll[2] and J.M. Cannon[2], LSU AgCenter, Winnsboro[1], LA 71295 and Sweet Potato Research Station, Chase[2], LA 71324

ABSTRACT

Experiments were initiated on June 28, 2002 to evaluate the effects of Dual Magnum (metolachlor) or Outlook (dimethenamid) on sweet potato. 'Bearegaurd' sweet potato was planted 9 inches apart on rows spaced 40 inches on center. Plant material was cuttings from field-grown plants, and planted 5 to 6 inches deep by hand. Dual magnum (0, 16, 20, 24, 32, 40, 48, or 56 oz/A) or Outlook (0, 10, 12, 14, 16, 18, 20 or 22 oz/A) was applied immediately after transplanting using a CO_2 backpack sprayer delivering 20 gpa. Experimental design was a randomized complete block with each treatment replicated four times. Plot size was 2, 40 inch rows, 20 ft long. Soil type was a silt loam. Normal agronomic practices were utilized throughout the growing season and irrigation was applied in-furrow as needed. Sweet potato injury was evaluated weekly for three weeks after transplanting. Sweet potato yield was taken at 146 days after transplanting. Potatoes were mechanically harvested and graded by separating into three fractions: # ones and twos, canners, and jumbos. Total yield was obtained by addition of the three fractions. Potatoes were also inspected for deformities.

No foliar injury was observed with either Dual Magnum or Outlook. Carpetweed control ranged from 53 to 78% at 24 days after application (DAA). Total yield or canner yield was not reduced by Dual Magnum. Although some reduction in the yield of #ones & twos, and jumbos were observed, these reductions did not follow a pattern. Injury observed by some producers appears to be a moving target and the exact cause or circumstances that produce injury when Dual Magnum is applied has yet to be determined.

Greatest carpetweed control with Outlook was 70% with 22 oz/A. Sweet potato total yields were equal among all Outlook rates and the untreated. No differences in yield of # ones and twos, or jumbos were observed. As observed in the Dual Magnum plots, few differences in canner yields were observed, but followed no discernable pattern, suggesting natural yield variation in this parameter. No malformed potatoes were observed.

Although further investigations need to be conducted, preliminary data suggests that Outlook has the potential to be used in place of Dual Magnum in sweet potato production.

EFFECT OF COVER CROP, TILLAGE, AND WEED COMPETITION ON BLACK BEAN YIELDS. C.L. Webber III and J.W. Shrefler; USDA, Agricultural Research Service, South Central Agricultural Research Laboratory and Oklahoma State University, WWAREC, Lane, OK 74555.

ABSTRACT

The selection and use of a winter cover crop may have both long-term benefits, such as reduced soil erosion, and short-term consequences such as decreased weed competition and nutrient availability. In addition, the selection of a spring tillage/planting system following the winter cover crop may either be beneficial or injurious to dry bean production by affecting weed growth and soil moisture availability. The objective of this research was to determine the effect of winter cover crops, tillage/planting systems, and weed control on black bean yield components.

A two-year field study was conducted at Lane, OK (southeast Oklahoma), on a Bernow fine sandy loam, 0 - 3% slope, (fine-loamy, siliceous, thermic Glossic Paleudalf). The research was designed as a split-split-plot design with five winter cover crop treatments as main plots, two tillage/planting systems as sub-plots, four weed control treatments as sub-sub-plots, and four replications. The five winter cover crop treatments included “barley” (*Hordeum vulgare* L.) cv. ‘Tambar’, oats (*Avena sativa*) cv. ‘Nora’, “rye” (*Secale cereale*) cv. ‘Maton’, “wheat” (*Triticum aestivum* L.) cv. ’Coker’, and “None” (no winter cover crop). The winter cover crops were planted in the fall of 1999 and 2001. Two weeks prior to spring planting, May 2000 and 2002, the no-tillage sub-plots within each cover crop were sprayed with a tank mix of Roundup Ultra (glyphosate), – (phosphonomethyl) glycine, 4.7 L/ha, 1% by weight of ammonium sulfate, and 1% by volume of Latron CS-7 spreader/binder (60% active ingredients). Two days prior to spring planting the no-tillage sub-plots were mowed and the conventional tillage sub-plots were disked, and fertilizer was applied at a rate of 84-84-84 kg/ha –P-K to all plots. Black beans (*Phaseolus vulgaris* L.) cv. ‘Black Knight’ were planted in the spring of 2000 and 2002 on 91-cm row spacings at 222,400 seeds/ha. The four weed control treatments included a “weedy check”, a “early season”, a “late season”, and a “full season” treatment. In the weedy check treatment the weeds were allowed to grow throughout the 90-day growing season. Weeds were removed by handweeding during the first 45 days for the early season weed control, during the last 45 days for the late season weed control, and during the entire growing season for the full season weed control treatment. At harvest a 2.4-m length of plant row was harvested and used to determine seed yield (kg/ha), pod number (pods/plant), seed number (seeds/pod), seed weight (g/100 seeds), and plant populations (plants/ha). When the F-test indicated statistical significance at the P = 0.05 level, the least significant difference (LSD) test was used to separate means.

ainfall during both growing seasons was below the 30-yr average for the location; therefore, the soil moisture conservation in the no-tillage planting system and plant stress resulting from weed competition became significant factors in affecting the black bean yield components. When averaged across tillage/planting systems and weed control levels, the black beans following oats produced significantly greater yields (372 kg/ha) than either rye (214 kg/ha) or wheat (164 kg/ha). The oat cover crop also resulted in a greater number of black bean pods per plant (3.5 pods/plant) than the wheat cover crop (2.1 pods/plant). The black bean plant populations were significantly less following the rye and wheat cover crops than the barley. The conventional tilled/planted black beans had 17% lower plant populations (110,000 plants/ha) than the no-tillage beans (132,300 plants/ha). Early weed removal was more beneficial than weed removal during the second half of the season. The best production system included oats as a cover crop, the no-tillage planting system, and either an early or a full season weed control.

IR-4 PROJECT: UPDATE ON WEED CONTROL PROJECTS. M. Arsenovic, F.P. Salzman, M.P. Braverman, D.L. Kunkel, and J.J. Baron.

ABSTRACT

The IR-4 Project is a publicly funded effort to support the registration of pest control products on minor use crops. Despite a climate in which there are fewer new herbicides available for evaluation in minor crops the IR-4 Project continued to be active in weed science in 2003, conducting residue studies and submitting petitions for weed control.

Petitions submitted the EPA by IR-4 since October, 2001 include: 2,4-D on hops; bentazon on peach; cycloate on swiss chard; clethodim on spinach, leafy Brassica subgroup (includes collards, mustard greens, kale, and turnip greens), and mint; clomazone on mint; DCPA on basil, chives, coriander, dill, ginseng, oriental radish, marjoram, and parsley; dichlobenil on rhubarb; ethalfluralin on potato and rapeseed (includes mustard seed); glufosinate on blueberry; glyphosate on garlic; linuron on horseradish; mesotrione on popcorn; oxyfluorfen on strawberry (annual and perennial) and hops; pendimethalin on pome fruits (includes apple and pear), stone fruits (includes apricot, cherry, peach, and plum), and pomegranate; s-metolachlor on green onion (includes leek); and sulfentrazone on potato, lima bean, and asparagus. In addition, a petition requesting that imazamox be exempt from tolerance (covers requests for chicory (roots), Belgian endive, foliage of legume vegetables and soybeans, and clover grown for seed) was submitted.

To date during the 2002 EPA work year, Notices of Filing have been published in the Federal Register for: clopyralid on flax, strawberry, hops, rapeseed, canola (includes crambe and mustard seed), spinach, stone fruit (includes apricot, cherry, peach, plum), garden beet (tops and roots), leafy Brassica subgroup (includes collards, mustard greens, kale), turnip (tops and roots), cranberry, head and stem Brassica subgroup (includes broccoli, Brussels sprouts, cabbage, cauliflower, kohlrabi, Chinese cabbage), and sweet corn; dicamba on sweet corn forage and stover; ethalfluralin on canola and safflower; glufosinate on blueberry; halosulfuron on snap bean and dry bean; and sethoxydim on the herb subgroup (excludes lemongrass), lingonberry, juneberry, and salal; and imazamox on all RAC.

During their 2002 work year to date, the EPA has established tolerances for: bentazon on clover; clethodim in leafy Brassica subgroup (includes mustard greens, collards, kale), turnip tops, and mint; clomazone on mint; diflufenzopyr on forage grass, sweet corn, and popcorn; ethalfluralin on canola (includes crambe); halosulfuron on melon subgroup (includes cantaloupe and watermelon); imazamox on legume vegetables (includes snap bean, dry bean, succulent pea, dry pea, lima bean, guar, garbanzo); mesotrione on popcorn; paraquat on dry pea; triflusulfuron on chicory root.

TIMELY MOWING DRASTICALLY REDUCES SICKLEPOD REPRODUCTIVE BIOMASS IN SWEETPOTATO. M.G. Burton; Department of Crop Science, NC State University, Raleigh.

ABSTRACT

The short canopy of sweetpotato may provide an opportunity for long-term mechanical weed control through mowing. Although losses in yield due to crop competition may occur at levels equivalent to no mowing, the long-term effect may be to reduce the seed rain of many taller weed species to provide a net loss from the seedbank. Because sicklepod (*Senna obtusifolia*) and other weeds (e.g. *Amaranthus* spp.) tend to produce nearly all of their reproductive structures above the short (approx. 30 cm) sweetpotato canopy, mowing just above the crop canopy may nearly eliminate or drastically reduce weed seedbank return. Such practices may be especially useful in the increasing markets for organically produced crops (e.g. baby food producers, etc.). As an indeterminate weed, sicklepod continues vegetative (vertical) growth after flowering begins. Consequently, in a taller crop, such as soybean, many fruit are borne below the final height of the crop. However, since sicklepod quickly grows above the canopy of sweetpotato. Because the sweetpotato canopy does not have pronounced increase in height, nearly all sicklepod fruit are set above the canopy of sweetpotato. On 17 September 2001 (repeated in 2002), 25 sicklepod plants were selected and marked with flagging tape in soybean field and 46 sicklepod plants were selected and marked in a sweetpotato field in Goldsboro, NC. Both fields were managed without the use of pesticides. One-half of the sicklepod plants (23) in sweetpotato were then mowed with a bushhog just above the crop canopy. The bushhog deck height was set as low as possible such that few sweetpotato leaves would be removed during the mowing operation. Two-weeks later, the day before scheduled sweetpotato harvest, all fruit were removed from the sicklepod plants. These pods were sorted into size and color classes (small green, large green, or yellow). Sicklepod fruit collected from the soybean field were also separated into “above” or “below” categories based upon where they occurred relative to the canopy of adjacent soybean plants. Pods were counted and dried to constant weight at 60 C. Average reproductive biomass of mowed sicklepod plants was reduced by 97%. Although regrowth of branches on many sicklepod plants was as much as 0.5 m, nearly all fruit of mowed plants were borne on regrown branches and were small due to the short time for growth development. Seeds within small green pods have almost no cotylendonary resources and are not believed to be capable of producing viable seedlings. On average, sicklepod plants in the unmowed treatment had about 10 pods that were yellow, which is the point believed to be associated with seed physiological maturity. Optimal mowing practices would be so low as to remove few leaves of the crop and would occur before viable seed have been formed in sicklepod fruit, but must also consider the reproductive phenology of other weeds that are present. Studies are underway to determine if sicklepod seeds dispersed from immature pods by mowing are capable of producing viable seedlings.

CRABGRASS CONTROL IN COOL-SEASON TURF WITH THE WET BLADE SYSTEM. W.L. Barker, J.B. Beam, and S.D. Askew; Department of Plant Pathology, Physiology, and Weed Science, Virginia Polytechnic Institute & State University, Blacksburg, VA 24061.

ABSTRACT

The wet blade system (WBS) directs chemicals to the cut surface during mowing thus eliminating the need for a separate application. Applying chemical only to cut plants reduces the likelihood of herbicide movement compared to broadcast application. A field study was conducted to compare WBS to foliar spray applications of quinclorac, fenoxaprop, and MSMA for postemergence large crabgrass (*Digitaria sanguinalis* (L.) Scop.) control and Kentucky bluegrass (*Poa pratensis* L.) tolerance. The study was initiated at Blacksburg, VA on August 20, 2002 in established 'Midnight' Kentucky bluegrass turf infested with large crabgrass. The experimental design was a randomized complete block with treatments replicated three times in a split-plot design. Main plots had four levels consisting of quinclorac at 0.56 lb ai/A and 1.13 lb ai/A, fenoxaprop at 0.07 lb ai/A, and MSMA at 1.25 lb ai/A. Subplots consisted of either foliar spray or WBS application methods. Application volumes were 1 and 30 gal/A for WBS and foliar spray, respectively. Large crabgrass control was visually estimated at 1, 2, and 4 weeks after treatment (WAT) as a percentage compared to the nontreated control.

Fenoxaprop controlled crabgrass significantly more with broadcast application (85%) compared to WBS (35%) at 4 WAT. Quinclorac and MSMA controlled crabgrass less than 40% regardless of application method. All treatments injured Kentucky bluegrass injury 13% or less 4 WAT. Suboptimal environmental conditions slowed turf and weed growth and likely influenced herbicide efficacy. Results suggest herbicides applied via foliar spray may produce visual symptoms of control faster than the WBS. Under drought conditions, fenoxaprop controls crabgrass better when applied as a foliar spray compared to the WBS. However, effects of WBS-applied fenoxaprop, quinclorac, and MSMA on long-term large crabgrass control are inconclusive due to inherent environmental conditions of this study.

HORSENETTLE (*SOLANUM CAROLINENSE*) CONTROL WITH GRAZON P+D® IN TALL FESCUE PASTURES. J.E. Beeler, T.C. Mueller, G.N. Rhodes Jr., and G.E. Bates; University of Tennessee, Department of Plant Science and Landscape Systems, Knoxville, TN 37996.

ABSTRACT

Industries associated with pastures (beef and dairy cattle) and hay production accounted for over 32% of Tennessee's total agricultural income between 1994 and 1999. Successful weed control is a vital part of any forage or haying operation. Horsenettle (*Solanum carolinense*) is a problematic weed in Tennessee pastures and hayfields. Its tuberous root system makes it difficult to control with either mowing or herbicides. Grazon P+D® has shown promise for horsenettle control. This herbicide is a premix combination of 2 lb/gal ai 2,4-D salt and 0.5 lb/gal ai picloram.

Two experiments were conducted in Hamilton County, TN to evaluate Grazon P+D® for horsenettle and buttercup control and ladino clover tolerance in a tall fescue pasture. Treatments included 2 and 4pt/A early (4-6"), mid (early flower), and late (1st fruit) POST. All applications included 0.25% non ionic surfactant and were made using a CO_2 backpack sprayer calibrated to deliver 10 gallons per acre of water carrier. Due to sporadic density of this weed, a large plot size (10X30ft) was used and two untreated control plots per replication were included. Treatments were applied between 12 June and 30 July (early summer experiment) and then repeated between 30 July and 7 Sept. (late summer experiment). Plots were mowed prior to applications. Visual evaluations (based on a scale of 0-100%, with 0 indicating no forage injury or weed control and 100 indicating forage death or complete weed control) were recorded every 2 weeks between 25 June and 26 Sept. for the early summer treatments, and 10 Aug. to 26 Sept. for the late summer treatments. Horsenettle stem density was measured from a 4' X 10' sample in all plots on 26 Sept. The sample area equaled approximately 13% of the plot area. Red and Ladino clover was drilled across all plots in late February. Clover survival, residual horsenettle control, and horsenettle density was evaluated the following summer. Data was subjected to analysis of variance and means were separated using Fischer's Protected LSD test at the 0.05 level of probability.

For ease of discussion, all results will focus on late season (Sept. 26) evaluation time. Buttercup control and ladino clover injury was >95% for all treatments. All early summer treatments provided greater than 80% control of horsenettle. All late summer treatments applied early and mid post provided 99% control. Late summer treatment applied late post provided < 60% control at 20 days after treatment, although this was similar to the control provided by all other applications at 20 days after treatment. Plant senescence did not allow for evaluations of these treatments after 26 Sept. The number of horsenettle stems in all early summer treatments plots was statistically equal to 0 plants/sample on 26 Sept., while untreated checks contained >30 stems/sample. Late summer treatments applied early and mid post contained 0 horsenettle stems/sample. The stem density of horsenettle in the late post treatments was not significantly different from that in the untreated checks (>20 stems). Horsenettle control fell to between 40 and 70% in all plots of both studies by June of the year following application. Horsenettle density was significantly lower in Grazon P+D®application plots than in the untreated plots in May of the year following application. Both Red and Ladino clover survival was significantly lower in the treatment plots than in the untreated plots.

Though the second year of data is still being collected, Grazon P+D® provided good horsenettle control in the year application, exhibits some residual control and appears to be a valuable tool for forage producers.

JIGGS BERMUDAGRASS RESPONSE TO PLATEAU. J.D. Nerada and W.J. Grichar; Texas Agricultural Experiment Station, Yoakum, TX.

ABSTRACT

Plateau (imazapic), a new pasture herbicide, was evaluated on Jiggs bermudagrass [*cynodon dactylan* (L.) Pers.] "Jiggs" at the Texas Agricultural Experiment Station in Yoakum, Texas. Multiple rates of Plateau (2,4,6,and 8 oz/A) were sprayed on April 23, 2002. Plant height measurements and percent stunt were recorded at 14 and 28 Days After Treatment (DAT). Yield was recorded at 36 and 87 DAT. In relation to the untreated check, Jiggs plant height decreased as the rate of Plateau increased on both observation dates. Percent stunting increased as the application rate increased, again on both dates. Yield decreased as the rate of Plateau increased at the first (36 DAT) harvest, but yield increased with the second harvest (87 DAT) . The 8oz. Treatment was the only treatment that did not surpass the untreated check in yield (87 DAT). Rainfall was recorded for the duration of the study to compare with Jiggs recovery from the initial stunting. All Jiggs plots grew out of the stunting and no plant death was recorded (87+ DAT).

EARLY SEASON AND PREHARVEST HERBICIDES FOR TRUMPETCREEPER (*CAMPSIS RADICANS*) CONTROL IN GLYPHOSATE-RESISTANT SOYBEANS. M.W. Marshall and J.D. Green; Department of Agronomy, University of Kentucky, Lexington.

ABSTRACT

The advent of glyphosate-resistant technology has allowed producers to more effectively target and manage difficult summer annual weeds, including giant ragweed (*Ambrosia trifida*), morningglories (*Ipomoea spp*.), and broadleaf signalgrass (*Brachiaria platyphylla*), with in-season glyphosate treatments. Yet, perennial dicots, such as honeyvine milkweed (*Ampelamus albidus*), trumpetcreeper, and common pokeweed (*Phytolacca americana*), remain difficult to manage in-season with normal in-crop rates of glyphosate mainly due to lack of herbicide movement to underground root tissue. Delaying herbicide treatment of these perennial dicots to the late summer/fall (either preharvest or after crop removal) would potentially result in more herbicide translocated into the underground root tissue. The objectives of this study were to evaluate trumpetcreeper control with early in-season herbicide treatments and to evaluate trumpetcreeper control and population changes the following season after various combinations of early in-season and preharvest herbicide treatments. Field experiments were conducted at cooperator sites in Taylor and Hardin Counties in central Kentucky. Experimental design was a split-plot with the main plot being in-season herbicide treatments and the subplot being with or without a preharvest herbicide treatment. In-season treatments applied in 2001 were Roundup UltraMAX at 32 and 48 oz/A, Flexstar at 1.5 pt/A, and Ultra Blazer at 1.5 pt/A when soybeans were at the 2 to 3 trifoliate stage and trumpetcreeper vine length was approximately 8 to 12 inches. A preharvest treatment of Roundup UltraMAX at 52 oz/A (2 lb ae/A) was sprayed after pods were mature and brown on August 30, 2001 in Taylor County and October 4, 2001 in Hardin County. Visual control ratings 8 weeks after treatment (8 WAT) in 2001 were pooled across preharvest treatments due to non-significant interaction term. The efficacy of in-season treatments 8 WAT at Taylor and Hardin County were ranked as Roundup UltraMAX (48 oz/A) = Roundup UltraMAX (32 oz/A) > Ultra Blazer = Flexstar. Percent control ratings and density counts were also assessed 1 year after in-season treatments (1 YAT). At Taylor County, Roundup UltraMAX (52 oz/A) applied preharvest, with or without an in-season herbicide treatment, provided >90% control 1 YAT. Roundup UltraMAX (48 oz/A) in-season was equally effective at Taylor County as Roundup UltraMAX preharvest treatment without an in-season herbicide treatment (ie untreated control). Whereas at Hardin County, an in-season herbicide treatment followed by Roundup UltraMAX applied preharvest was required to provide $\geq$ 90% visual control 1 YAT. Trumpetcreeper populations 1 YAT were reduced with all in-season herbicide treatments followed by a preharvest treatment of Roundup UltraMAX at 52 oz/A. In-season treatments of Roundup UltraMAX at 32 and 48 oz/A, without a preharvest treatment, also reduced trumpetcreeper populations. Differences among herbicide treatments were not significant with respect to soybean yield in 2001. In summary, these results indicated that applications of glyphosate containing products, such as Roundup UltraMAX, provided excellent in-season percent visual control in 2001 with preharvest treatments providing the greatest reduction in trumpetcreeper population at both locations.

WEED CONTROL STRATEGIES FOR SHORT-SEASON CORN IN A TRIPLE CROP ROTATION. C.E. Brewer and L.R. Oliver; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville.

ABSTRACT

A crop rotation of short-season corn, early-maturing soybean, and winter wheat was developed to better utilize rainfall and diversify the producer's income. This intense cropping system increases the need for maximum weed control with minimum herbicide carryover. Experiments were conducted at the Main Experiment Station in Fayetteville, AR, on a Taloka silt loam soil. The test area was conventionally tilled and overseeded with velvetleaf (*Abutilon theophrasti*), pitted morningglory (*Ipomoea lacunosa*), and broadleaf signalgrass (*Brachiaria platyphylla*) prior to the last tillage operation before planting corn. Indigenous common lambsquarters (*Chenopodium album*) was also present in the test area. Pioneer 39M27 RR/BT corn (75 day crop relative maturity) was planted on 20-inch rows at 75,000 seed/acre during the third week of April in 2001 and 2002. Immediately after planting, the following herbicides were applied preemergence (PRE): flufenacet (0.51 lb ai /A) + metribuzin (0.12 lb ai /A), metolachlor (1.27 lb ai /A) alone and in combination with atrazine (0.5, 0.75, 1.0 lb ai /A) or flumetsulam (0.0625 lb ai /A). PRE herbicides were followed by (fb) 2,4-D (0.5 lb ai /A) at 5 weeks after emergence (WAE), atrazine (0.75 lb ai /A), or a tank mixture of bentazon (1.0 lb ai /A) + metribuzin (0.09 lb ai /A) postemergence (POST) at 8 WAE. Following corn harvest, Asgrow 2201 RR soybeans (maturity group 2.2) were no-till drilled into the corn stubble on 7-inch rows at 350,000 seed /A during the fourth week of July in 2001 and the first week of August in 2002. Pioneer 2684 wheat was planted the first week of November in 2001 and the second week in November in 2002 following soybean harvest. Wheat was planted on 7-inch rows at 90 lb/A. Treatments were arranged in a randomized complete block with four replications in 2001 and three replications in 2002. Visual ratings of weed control and corn injury were made 4 weeks after PRE application (WAA) and 12 WAE. Soybean stand counts and visual injury ratings were taken at 4 WAE

Metolachlor + atrazine (0.5, 0.75, 1.0 lb/A) PRE controlled >90% of velvetleaf and pitted morningglory at 4 WAA in 2001 and 2002. Metolachlor + flumetsulam PRE controlled velvetleaf >95% in both years. In 2001 metolachlor + flumetsulam PRE controlled pitted morningglory 76% at 4 WAA, but control of pitted morningglory was 95% in 2002. Flufenacet + metribuzin PRE controlled all species >90% at 4 WAA both years. Metolachlor + atrazine (0.5 and 1.0 lb/A) PRE fb 2,4-D POST controlled velvetleaf, pitted morningglory, and common lambsquarters >95% at 12 WAE in 2001 and 2002. Metolachlor + atrazine (0.75 lb/A) PRE fb atrazine (0.75 lb/A) at 2-leaf corn fb 2,4-D at 5 WAE controlled pitted morningglory, velvetleaf, common lambsquarters, and broadleaf signalgrass >90% at 12 WAE in 2002. This treatment was not included in 2001. Metolachlor + atrazine (1.0 lb/A) PRE fb bentazon + metribuzin POST, metolachlor + flumetsulam PRE fb 2,4-D POST, and flufenacet + metribuzin PRE fb 2,4-D controlled 95% of all species at 12 WAE in both years.

No significant corn, soybean, or wheat injury due to herbicide application or carryover was noted in 2002. However, in 2001, 2,4-D was applied after the corn was 12-inches tall. Corn injury was >50% and the yields were reduced. There were no significant differences in soybean yield due to herbicide application in either year. However, the average yield was 41.5 bu/A in 2001 and only 10.4 bu/A in 2002. This difference was probably due to decreased light intensity caused by cool and cloudy weather, which prevented node elongation. Wheat yields from 2001 were not significantly different among treatments.

These data show that metolachlor (1.27 lb/A) + atrazine (0.5, 0.75, 1.0 lb/A) PRE provided excellent control to 4 WAA. The addition of 2,4-D or bentazon + metribuzin POST controlled the selected species up to 12 WAE. Metolachlor + flumetsulam PRE fb 2,4-D POST provided similar control, as did flufenacet + metribuzin fb 2,4-D POST, and these herbicide programs are the most reasonable choice for short-season corn weed control in a triple-crop rotation.

ANNUAL BROADLEAF WEED CONTROL IN CLEARFIELD AND ROUNDUP READY CORN SYSTEMS. W.T. Willian, Department of Agriculture, Western Kentucky University, Bowling Green.

ABSTRACT

A field experiment was established in 2001 at Bowling Green to evaluate various field corn (*Zea mays* L.) weed management systems with respect to weed control, grain yield and return on investment (ROI). Four field corn hybrids were planted on May 24 into adjacent conventionally tilled (CT) and no-till (NT) silt loam soils having a pH of 6.5 and an organic matter content of 1.7%. Field corn consisted of: (1) a Roundup Ready (RR) hybrid with high yield potential, (2) a stress-tolerant RR hybrid, (3) a Clearfield (CL) hybrid with high yield potential, and (4) a stress-tolerant CL hybrid. A split-split plot design was utilized with tillage serving as the main plots and hybrid and herbicide treatment as the subplots. Plot size was four 30" rows wide by 25' long and all hybrids were established at a population of 28,500 seeds/acre.

Herbicide treatments were replicated four times in each tillage regime. Preemergence (PRE) and postemergence (POST) herbicides were applied to selected hybrids on May 28 and June 12, respectively, utilizing a CO_2-backpack sprayer delivering 15 gallons per acre. Two herbicide programs were applied to RR hybrids only: Degree Xtra at 1.5 qt/A followed by (f.b.) Roundup Ultra Max at 20 fl. oz./A, and ReadyMaster ATZ at 2 qt/A. Atrazine at 1 qt/A f.b. Lightning + Atrazine (1.28 oz/A + 1 qt/A) was applied to CL hybrids only. Harness Xtra at 2.4 qt/A f.b. 4 oz/A Yukon, as well as Bicep II Magnum at 2.1 qt/A f.b.1 oz/A Exceed were the two herbicide programs applied to both RR and CL hybrids. Crop response and weed control were visually evaluated and grain yield was collected at crop maturity. An economic analysis was performed utilizing the formula: Return = [yield (bu/A) * $ 2.50/bu] – production costs. Production cost assumptions included: herbicide cost, application cost, seed cost (including technology fees for RR hybrids) as well as costs associated with planting, tillage, fertilizer, and harvest. The economic analysis did not include costs associated with land rental/payments, insecticide and/or fungicide application, or grain transport/drying.

Corn injury was < 5% from all treatments. All treatments controlled common cocklebur (*Xanthium strumarium*), smooth pigweed (*Amaranthus hybridus*) and ivyleaf morningglory (*Ipomoea hederacea*) > 94% 4 weeks after treatment (WAT) in CT plots. Harness Xtra f.b. Yukon provided greater control of ivyleaf morningglory 4 WAT than did Bicep II Magnum f.b. Exceed. Control of all weeds species in CT plots was > 88% 12 WAT. In NT plots, smooth pigweed, goosegrass (*Eleusine indica*) and prickly sida (*Sida spinosa*) were controlled > 90% 4 WAT by all treatments. ReadyMaster ATZ provided less prickly sida and goosegrass control 4 WAT than other treatments.

Statistical analyses indicated no interactions among herbicide treatment, tillage, or hybrid for either grain yield or ROI. Grain yield ranged from 111.5 bu/A to 130.8 bu/A among treatment. Degree Xtra f.b. Roundup Ultra Max treated plots had higher yields and ROI than plots treated with either Harness Xtra f.b. Yukon or Atrazine f.b. Lightning + Atrazine. Both tillage and hybrid had a significant influence on grain yield and ROI ($P < 0.05$). When averaged across treatment and hybrid, NT plots produced greater yield and higher ROI than did CT plots. Below average rainfall during the 2002 growing season at this location may have had a greater detrimental effect upon corn growing in CT soils. The stress-tolerant RR hybrid provided an 8.5 bu/A yield advantage and a $ 21.33 advantage in ROI when compared to the RR hybrid with a high yield potential. Likewise, the stress-tolerant CL hybrid provided greater yield and ROI than the CL hybrid with a high yield potential. Inadequate moisture conditions and corn borer feeding likely influenced hybrid performance to favor stress-tolerant hybrids.

BROADLEAF SIGNALGRASS CONTROL IN ROUNDUP READY NO-TILLAGE CORN. M.W. Shankle and T.F. Garrett; Mississippi State University, Pontotoc Ridge-Flatwoods Experiment Station, Pontotoc, MS 38863.

ABSTRACT

Broadleaf signalgrass (*Brachiaria platyphylla*) was ranked as the most common and most troublesome weed in Mississippi corn production in year 2000. This summer annual grass has relatively short and wide leaves (widest near base, tapering near apex), a round basally prostrate stem that is distinctly bent at nodes, and often rooting at lower nodes. Special identifying characteristics are a decumbent habit, leaf constriction near leaf tip, and distinctive spikelets that are ovate, smooth, and transversely wrinkled near apex. Research was conducted to evaluate herbicide systems for broadleaf signalgrass control in no-tillage corn. The experimental design was a randomized complete block with 4 replications. Plot size was 20 x 50 ft with eight 30-in rows. The soil type was a Falkner silt loam (fine-silty, siliceous, thermic Typic Hapludults). Fertilizer and lime were applied in the spring according to soil test recommendations. A preplant burndown application of 26 oz/ac Roundup Ultramax 5 SL was applied to the entire trial area 2 weeks before planting. Corn hybrids Dekalb 6410RR and Pioneer 3223 were planted on April 15. An application of 8.7 lb/ac Lorsban 15G was T-banded at planting. A side-dress application of 150 lb N/ac (32% UAN solution) was applied 6-in from row and 2-in deep at the 6 to 8 leaf stage. Herbicide treatment application timings were PRE, 21 DAP, 31 DAP, and 46 DAP. All treatments were applied with a tractor-mounted CO_2 sprayer. Weed control ratings were conducted at 21, 38, 52, and 65 DAP. Herbicide systems included a tank-mixture of Bicep II Magnum 5.5EC + Aatrex 4L at 1.8 and 0.5 qt/ac PRE; Bicep II Magnum + Aatrex at 0.9 and 0.25 qt/ac PRE fb 20 oz/ac Roundup Ultramax POST (2 inch weeds, 11 inch corn); a tank-mixture of Aatrex + Roundup Ultramax at 1.5 qt and 26 oz/ac POST (3 inch weeds, 8 inch corn); a tank-mixture of Aatrex + Roundup Ultramax at 1.5 qt and 26 oz/ac POST (3 inch weeds, 8 inch corn) fb 26 oz/ac Roundup Ultramax POST (weeds sprouting, 11 inch corn); 26 oz/ac Roundup Ultramax POST (3-8 inch weeds, 11 inch corn); and 26 oz/ac Roundup Ultramax POST (3-8 inch weeds, 11 inch corn) fb 20 oz/ac Roundup Ultramax POST (2 inch weeds, 26 inch corn). The two center rows of each plot were mechanically harvested on August 27. Corn grain from each plot was weighed and seed moisture was determined using a MT3 Farmex grain moisture tester. Yield was adjusted to 15.5% moisture. Analysis of variance was conducted and means were separated using Fisher's protected LSD (α=0.05).

The PRE treatment of Bicep II Magnum + Aatrex at 1.8 and 0.5 qt/ac PRE was included to represent a one-pass soil applied residual herbicide system approach. This PRE system was applied to Dekalb 6410RR and Pioneer 3233 to compare crop performance of a Roundup Ready hybrid to a conventional hybrid. Each hybrid received the same treatments and weed control was not different throughout the growing season. At 38 DAP, all treatments had been applied for at least 7 days, except a sequential Roundup Ultramax application to be applied at 46 DAP. At this time, all systems that included a POST application of Roundup Ultramax controlled broadleaf signalgrass at least 99%, which was greater than systems that included only PRE treatments. At 52 DAP, a sequential application of 26 fb 20 oz/ac Roundup Ultramax controlled broadleaf signalgrass 100% and was greater than all other treatments. Treatments that included a residual herbicide plus Roundup Ultramax or Roundup Ultramax alone were not different in the degree of weed control, but were greater than PRE alone systems.

Grain yield ranged from 144.8 to 197.3 bu/ac for all herbicide treatments and was greater than 123 bu/A for the untreated check. The highest yield was 197.3 bu/ac with a sequential application of 26 fb 20 oz/ac Roundup Ultramax applied to Dekalb 6410RR. This yield was greater than all treatments except for the PRE alone system of Bicep II Magnum + Aatrex at 1.8 and 0.5 qt/ac applied to Pioneer 3223. This would suggest that Pioneer 3223 could have greater yield potential than Dekalb 6410RR, since weed control was less effective for the PRE alone compared to the sequential Roundup Ultramax system. However, grain yield was not different for PRE alone systems applied to Pioneer 3223 and Dekalb 6410RR. Grain yield was 160.5

bu/ac with a single application of 26 oz/ac Roundup Ultra and the addition of a residual herbicide did not improve yield. Therefore, preliminary research indicates that grain yield with a one-pass PRE herbicide system in conventional corn hybrid production can be equivalent to a sequential POST herbicide system for Roundup Ready corn hybrid production in a no-tillage environment.

EFFECT OF NEWPATH RATE AND TIMING ON WEED CONTROL IN RICE. B.J. Williams, D.B. Copes, and A.B. Burns; Northeast Research Station, St. Joseph, La., Louisiana State University Agricultural Center, Baton Rouge, La. 70803.

ABSTRACT

The effect of Newpath (imazethapyr) rate and timing on barnyardgrass control in Clearfield rice was evaluated in 2002 at the Northeast Research Station near St. Joseph, La. on a Sharkey clay soil. Newpath was applied at 2, 4, 6, 8, and 16 oz/A to 1-2, 2-3, 3-4, and 4-5 leaf barnyardgrass, applications were also made to barnyardgrass with 1 and 2 tillers. To prevent additional barnyardgrass flushes 1 lb ai/A pendimethalin was applied 3 days after each Newpath application. The 2-3 leaf applications were made eight days after the 1-2 leaf applications. The 2-3 leaf applications were followed by the 3-4 leaf applications one day later, and the 4-5 leaf applications were made the next day. The one tiller applications were made four days after the 4-5 leaf applications. The 2 tiller applications were made eight days after the 1 tiller applications. Clearfield rice 'CL 161' at 110 lb/A was drill seeded in rows 7.5 inches apart. Permanent floods were established 4 to 5 weeks after planting. Nitrogen, in the form of prilled Urea, was applied at 126 kg/ha just before permanent flood. Herbicide treatments were applied, in water using a CO_2 pressurized backpack sprayer calibrated to deliver 15 GPA to plots measuring 7 by 15 feet. The experimental design was a randomized complete block with a factorial treatment arrangement. Barnyardgrass control ratings were subjected to analysis of variance. Means were separated using Fisher's Protected LSD at the 5% level. Newpath application timing affected barnyardgrass control more than application rate. Overall, barnyardgrass control was best when Newpath applications were made at or before the 2-3 leaf stage. Control, especially at 6 and 9 WAT, declined rapidly as Newpath applications were made to increasingly larger barnyardgrass. Barnyardgrass control was 90% or better when Newpath was applied at the 1-2 leaf stage, regardless of Newpath rate. When Newpath applications were made at the 2-3 leaf stage at least 4 oz/A of Newpath was required for 85% or better control. At 3 WAT, barnyardgrass control was similar when 2 to 4 oz/A Newpath were applied at the 3-4 and 4-5 leaf stages. Increasing Newpath rates to 6 oz/A improved barnyardgrass control 10 to 20% when applications were made at the 4 to 5 leaf stage. Barnyardgrass control 6 WAT generally increased as Newpath rate increased up to 6 oz/A. At least 8 oz/A was required for 80% barnyardgrass control 6 WAT when applied at the 4 to 5 leaf stage. After tillering, not even 16 oz/A Newpath resulted in better than 80% barnyardgrass control 3 WAT or 60 to 70% control 6 WAT. This research indicates that barnyardgrass control with Newpath is strongly influenced by application timing and applications should be made at or before 3-4 leaf stage.

CORN RESPONSE TO PREPLANT APPLICATIONS OF VALOR. A.B. Burns, B.J. Williams and D.B. Copes; Northeast Research Station, St. Joseph, La., Louisiana State University Agricultural Center, Baton Rouge, La. 70803.

ABSTRACT

Corn tolerance to preplant applications of 1 and 2 oz/A Valor (flumioxazin) applied 30, 21, 14 and 7 days before planting (DBP) was evaluated under weed free conditions on a Commerce silt loam at the Northeast Research Station near St. Joseph, La in 2001 and 2002. In 2002, the same study was conducted on a Commerce silt loam but weeds were not removed before applying Valor. In this study Valor was applied with glyphosate. Also in 2002, corn tolerance to 1 and 2 oz/A Valor applied 21, 14, and 7 DBP was evaluated in a third study under weed free conditions on a Sharkey clay. In the weed free studies plots were kept weed free with glyphosate plus 2,4-D before planting. All trials were treated with metolachlor plus atrazine after planting. A non-treated check was included in each trial. Herbicide treatments were applied using a CO_2 pressurized backpack sprayer calibrated to deliver 15 GPA. The experimental design for each trial was an RCB with a factorial treatment arrangement. All data were subjected to analysis of variance. Means were separated using Fisher's Protected LSD at the 5% level. Corn injury was closely associated with rainfall, with the most injury occurring 3 to 8 days after a heavy rain. Visual injury was generally short lived. Under weed free conditions 1 oz/A Valor caused less than 10% injury in 2001 and 2002 when applied 30, 21, and 14 DBP. In 2001 and 2002, corn injury as high as 19% was observed from 1 oz/A Valor applied 7 DBP. Corn injury from 2 oz/A Valor was generally 10 to 20% more than that observed from 1 oz/A. The presence of dead or dying vegetation did not appear to reduce the potential for corn injury from Valor compared with Valor applied under weed free conditions. Corn yield was not affected in 2001. In 2002, corn yield was not affected by 1 oz/A Valor applied at any time under weed free conditions. Corn yields were reduced 22 and 52 bu/A when 2 oz/A Valor was applied 14 and 7 DBP, respectively. When weeds were not removed before applying Valor the best corn yields observed were from 1 oz/A Valor applied 21 DPP or 2 oz/A Valor applied 30 DPP. In this study, corn yields were 22 and 36 bu/A lower when 2 oz/A Valor was applied 14 and 7 DBP compared to Valor applications made 30 and 21 DBP. Though, not as severe as 2 oz/A, corn yields were lower even from 1 oz/A Valor applied 14 and 7 DBP. Corn injury from Valor was generally higher, as high as 40%, on the Sharkey clay than on the Commerce silt loam. Corn yield was not taken in this trial. These data suggest that Valor at 1.0 oz/A could potentially be used in corn 21 days before planting to improve preplant weed control systems. However, considering the differences in Valor affect on corn yield in 2001 and 2002 more research is needed to identify appropriate rates and timings, especially on clay soils.

ECONOMIC IMPACT OF PERENNIAL WEEDS IN NO-TILL ROW CROPS OF KENTUCKY. C.L. Brommer and W.W. Witt; Department of Agronomy, University of Kentucky, Lexington, KY 40546.

ABSTRACT

Crop yield reductions from the presence of perennial weeds are a central issue for producers. Three trumpetcreeper plants per square meter, soybean yield loss was in the 10-15 % range for the Shelby Co. but, between no loss and 6% reduction for the Calloway site. Across locations in Calloway and Shelby Co., trumpetcreeper did not reduce yield unless three plants per square meter were present. Canada thistle reduced yield of corn and soybean with one plant per square meter. One or two hemp dogbane plants per square meter did not measurably reduce soybean yield. Corn yield reduction from hemp dogbane was monitored at Shelby, Calloway, and Woodford Co. One or two honeyvine milkweed plants per square meter reduced corn yield 16 percent and 24 percent, respectively. Corn yield reductions from field bindweed were not high enough to be measured at either one or two plants per square meter. There is not a strong economic basis for using herbicides to control these perennial weeds, post harvest, unless densities are greater then 3 plants per square meter.

WEED CONTROL AND CROP INJURY IN GRAIN SORGHUM WITH POSTEMERGENCE PICLORAM APPLICATION. B.W. Bean, M.W. Rowland, and B.L. Porter; Texas Cooperative Extension and Texas Agricultural Experiment Station, Amarillo, Texas 79106.

ABSTRACT

Experiments were conducted in 2000, 2001, and 2002 at Bushland, Texas to investigate the usefulness of picloram in grain sorghum on the Texas High Plains. Picloram, formulated as Tordon 22K, was applied postemergence to actively growing grain sorghum (*Sorghum bicolor* L. Meunch) (Pioneer 8699), Palmer amaranth (*Amaranthus palmeri*), velvetleaf (*Abutilon theophrasti*), ivyleaf morningglory (*Ipomoea hedeacea*), and common lambsquarters (*Chenopodium album*). Rates investigated were 0.0625, 0.125, and 0.25 pounds active ingredient (picloram) per acre. Also investigated was 0.0625 pounds picloram + 0.25 pounds 2,4-D. Applications were made using a tractor mounted compressed air sprayer that delivered 10 gallons per acre at 24 psi. All applications were made when Palmer amaranth was less than 5 in tall. In 2000, grain sorghum was 6 in tall when applications were made, in 2001, 12 in, and in 2002, 20 in. Crop injury and weed control were recorded 2 and 4 weeks after treatment (WAT), and yield data was collected at harvest. Data was subjected to an analysis of variance with partitioning appropriate for a randomized block design, and pooled over years when appropriate. Means were separated using Fisher's Protected LSD at $\alpha = 0.05$. Studies were conducted on a Pullman clay loam soil with a pH of 7.4.

Grain sorghum was not visibly injured by any picloram rate investigated, nor was yield significantly changed from the untreated. Yield across all three years averaged 5,662 pounds per acre. Palmer amaranth control 2 WAT in 2000 was dissimilar to control observed in 2001 and 2002. In 2000, 0.0625 lbs and 0.125 lbs picloram only provided 57% and 53% control, respectively, of Palmer amaranth. Control was improved to 78% with 0.25 lbs picloram, and 87% with 0.0625 lbs picloram + 0.25 lbs 2,4-D. In the pooled data from 2001 and 2002, no differences were detected, and the range of observed weed control was smaller, changing from 66% control with 0.0625 lbs picloram to 80% control with both 0.025 lbs picloram and the tank mix. Palmer amaranth control 4 WAT in 2000 and 2001 was different from 2002. In 2002, Palmer amaranth control 4 WAT was at least 88% regardless of treatment. In years 2000 and 2001, in contrast, 0.25 lbs picloram and the tank mix only provided 77-78% control. Control from 0.0625 lbs and 0.125 lbs picloram was significantly less (55%). Velvetleaf, ivyleaf morningglory, and common lambsquarters control was evaluated in 2002. Velvetleaf control 2 WAT was 72% when picloram was applied at 0.0625 lbs/A, but improved to at least 82% for the higher rates of picloram alone and the tank mix. By 4 WAT, velvetleaf control with all treatment was between 85 and 92%. The addition of 2,4-D to the lowest rate of picloram improved ivyleaf morningglory control from 73% to 93% 2 WAT, while 0.125 lbs and 0.25 lbs picloram controlled 85-88% of the plants. At 4 WAT, the effect of the additional 2,4-D was still noticeable, improving ivyleaf morningglory control from 85% to 95%. Common lambsquarters control 2 WAT was comparable across treatments, and ranged from 82 to 92%. All treatments provided 90% or greater control 4 WAT.

GRAIN SORGHUM TOLERANCE AND WEED CONTROL USING VALOR AT DIFFERENT APPLICATION TIMINGS AND RATES. B.A. Besler, W.J. Grichar, K.D. Brewer and J.C. Braun. Texas Agricultural Experiment Station, Yoakum, TX 77995 and Valent USA Corporation, Richardson, TX 75080.

ABSTRACT

Valor (flumioxazin) is cleared for use in peanut and soybean and provides control of competitive broadleaf weeds such as Florida beggarweed, tropic croton, and eclipta. Valor allows rotation flexibility with crops such as alfalfa, corn, grain sorghum and wheat. The scope of this study was to evaluate grain sorghum (*Sorghum bicolor)* response to preemergence (PRE) applications of Valor 50 WP when applied at 2.0 and 3.0 oz/A at various timings prior to planting beginning 30 days before planting (DBP). Valor was applied 30, 21, 14 and 7 (DBP) and at-plant. Parameters measured included percent reduction in emergence (5 days after planting, DAP), weed control (11, 35, and 61 DAP), percent grain sorghum-stunting (35 DAP), number of grain sorghum plants per 10 ft of row (36 DAP), percent head emergence (61 DAP) and yield. The experimental design was a randomized complete block with factorial treatment arrangement and 4 replications.

Grain sorghum plant emergence was not affected at any timing application with the 2.0 and 3.0 oz/A rate of Valor. Tumble pigweed (*Amaranthus albus)* control 11 DAP was ≥ 95% with both Valor rates when applied at timings 30, 21, 14, and 7 DBP. The at-planting application controlled tumble pigweed 84 and 89% with the 2.0 and 3.0 oz/A rates, respectively. Control of tumble pigweed 35 DAP was good to excellent (≥ 88%) with all application timings and rates of Valor except at planting where tumble pigweed control was reduced to < 80%. Also at 35 DAP, stunting was not observed with any timing application with both rates of Valor. Weed control continued 61 DAP with the 30, 21, 14 and 7 days before planting Valor applications. Valor applied at planting resulted in tumble pigweed control < 75%. No differences were seen in percent seed head emergence with all application timings. Untreated plots had % seed head emergence ≤ 45%. Yields were consistent among all application timings and rates with the exception of the 14 DBP application of Valor at 3.0 oz/A which yielded 3242 lbs/A. The untreated check, due to excessive weed competition, yielded lower than all other treatments.

Results from this study indicate that Valor is safe on grain sorghum at all application timings and rates of Valor. Rainfall of 2.3 in occurred 4 days after the 14 DBP application and resulted in no observed injury with the 2.0 and 3.0 oz/A of Valor. Significant rainfall did not occur after any other application timings. Excellent tumble pigweed control also resulted with the 30 and 21 DBP applications of Valor when rated 61 DAP indicating that growers have a wide window in which to make applications prior to planting.

SORGHUM RESPONSE TO SIMULATED DRIFT RATES OF GLYPHOSATE. L.L. Lyon, J.W. Keeling, B.W. Bean, M.W. Rowland, and P.A. Dotray; Texas Agricultural Experiment Station, Lubbock and Texas Cooperative Extension, Bushland.

ABSTRACT

The Texas High and Low Plains accounted for approximately 4.6 million of the 6 million acres of upland cotton planted in Texas in 2001, and 3.3 million of the 3.5 million acres of sorghum. Approximately 60% of Texas cotton is glyphosate-tolerant. Sorghum is often planted as a primary crop or in a crop failure situation, often adjacent to cotton fields, in regions where cotton is the predominant crop. Wet or windy conditions occasionally cause the postemergence-topical application window for glyphosate-tolerant cotton to narrow, and in an attempt to cover large acreages, applications are made aerially, or under less than ideal conditions suggested on the herbicide label. Therefore the objective of this study was to determine the effects of low rates of glyphosate (similar to drift) on sorghum.

Experiments were conducted at Lubbock, TX and Bushland, TX in 2002. At the Lubbock location, DK 44 was planted and Pioneer 8699 was planted at Bushland. Glyphosate (Roundup UltraMax) was applied at 0.38 lb ae/A, 0.19 lb ae/A, 0.094 lb ae/A, 0.047 lb ae/A, and 0.023 lb ae/A (1/2X, 1/4X, 1/8X, 1/16X, and 1/32X of 0.75 lb ae/A, respectively) postemergence-topical to sorghum at the 4-inch, 12-inch, boot, and bloom growth stages. Sorghum visual injury ratings were taken at 14 and 28 days after treatment (DAT) and grain yields were determined.

At Lubbock, glyphosate applied early season (4- and 12-inch growth stages) injured sorghum 5 to 100% 14 DAT. By 28 DAT, rates $\geq$ 0.05 lb ae/A caused 30 to 100% injury. Rates $\geq$ 0.09 lb ae/A applied later in the season (boot and bloom growth stages) injured sorghum 12 to 100% 14 DAT. By 28 DAT, rates $\geq$ 0.05 lb ae/A applied at boot injured sorghum 5 to 100%, but only 0.19 and 0.38 lb ae/A applied at bloom showed injury (20 to 90%). Glyphosate applied at 0.05 lb ae/A at 4-inches reduced yield approximately 30%, while no yield was produced when rates $\geq$ 0.09 lb ae/A were applied. Yield was reduced 25% from 0.02 lb ae/A applied at 12-inches, while rates of 0.05, 0.09, and 0.19 lb ae/A at 12-inches stunted and delayed plant maturity, so harvest was not possible. Rates $\geq$ 0.05 lb ae/A at boot caused blasted heads, which reduced sorghum yield. Only 0.19 and 0.38 lb ae/A applied at bloom reduced yield, primarily due to blasted heads and plant lodging.

At Bushland, glyphosate at $\geq$ 0.09 lb ae/A on 4-inch sorghum caused injury 20 to 100% 14 DAT, and this injury did not change by 28 DAT. Injury ranged from 10 to 100% from rates $\geq$ 0.05 lb ae/A applied on 12-inch sorghum, with similar injury observed at 28 DAT. Glyphosate $\geq$ 0.09 lb ae/A applied at boot injured sorghum 15 to 80%; however, only the 0.19 and 0.38 lb ae/A rates applied at bloom caused injury (3 to 5%). Similar injury was observed at both application timings at 28 DAT. Glyphosate at 0.09 lb ae/A applied early season reduced yield 20 to 25%, while higher rates caused > 85% yield reduction. Yield was reduced from boot applications of glyphosate $\geq$ 0.05 lb ae/A (31 to 100%), while only 0.38 lb ae/A applied at bloom reduced yield (51%).

At both locations, increasing glyphosate rate increased sorghum injury, especially early season. Young sorghum was more susceptible to lower rates of glyphosate than older sorghum, although higher glyphosate rates on older sorghum interfered with grain production. Glyphosate rates as low as 1/16X of 0.75 lb ae/A reduced sorghum yield at the 4-inch, 12-inch, and boot stages, while sorghum tolerated rates up to 1/4X at bloom. Sorghum injury and recovery varied by location and may be dependent on the growing season and crop conditions.

ECONOMICS OF PREHARVEST DESICCANTS IN MATURITY GROUP III SOYBEAN. R.M. Griffin, D.H. Poston, D.R. Shaw, and M.C. Smith; Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS; and Delta Research and Extension Center, Stoneville, MS.

ABSTRACT

Field studies were conducted in 2000 and 2001 at the Delta Research and Extension Center, Stoneville, MS. The soil type was a Sharkey clay (very-fine, smectitic, thermic Chromic Epiaquert) with a pH of 6.9 and 2.9% organic matter. 'Dekalb CX 367 cRR' soybean was planted in 19-cm rows on May 2, 2000, and April 30, 2001. All tests were planted with a grain drill using a seeding rate of approximately 430,000 seed/ha following conventional tillage with a disc-harrow and/or a field cultivator. Fifteen herbicide treatments were evaluated. Paraquat at 0.28 kg ai/ha + sodium chlorate at 3.4 kg ai/ha + nonionic surfactant (0.25% v/v) served as the preharvest desiccant, and was applied 5 to 7 days prior to harvest.

Harvestability was determined visually at time of harvest based on a rating scale of 0 to 5, where 0 = unharvestable and 5 = very easy to harvest with no green weeds or matter present in the plot. Soybean yield was determined by harvesting the five (19 cm) center rows with a small-plot combine with a conventional rotor and separator, cleaning, and weighing plot samples. Yields were adjusted for trash percent and moisture. Net returns were calculated using herbicide costs from the Mississippi State University soybean planning budgets and using market prices or loan rates for soybean at harvest for each year.

A fifteen by two split-plot factorial arrangement of treatments in a randomized complete block design was utilized. Main plot factor was herbicide treatment and subplot factor was with and without a preharvest desiccant. Main plots were 6 m by 12 m and sub plots were 3 m by 12 m. The experimental design both years was a randomized complete block design with four replications. Preharvest desiccant data was analyzed as a split plot. Data were analyzed using analysis of variance with sums of squared partitioned to reflect split-plot design. Tests for treatment by year interactions were conducted and data were pooled across years when appropriate. Means were separated using Fisher's Protected LSD test conducted at the alpha = 0.05 level.

Soybean yields were similar for 11 of 15 herbicide programs evaluated suggesting that a wide variety of herbicide programs can be used successfully with this production system. In 2000, soybean yield was not influenced by the use of a preharvest desiccant. However, soybean yield averaged across herbicide treatments increased from 2540 to 2890 kg/ha as a result of using a desiccant. In 2001, however, heavy August rains caused heavy pitted morningglory and barnyardgrass pressure to develop after the crop had begun to senesce. Thus, use of the preharvest desiccants in 2001 resulted in higher harvestable yields and net returns.

In 2000, net returns were similar except for PRE followed by chlorimuron or chlorimuron + dimethenamid. Soybean yields with this herbicide program were similar to the highest yielding treatments, but high yields were offset by the expense of the herbicides used in the program resulting in low net returns. In 2001, two and three applications of glyphosate with and without a tank-mix, PRE followed by glyphosate, and MSU-HERB recommendations used with and without dimethenamid had net returns above weed control costs of 440 to 540 $/ha. Main effects of net returns with the use of the preharvest desiccant were a loss of 30 $/ha in 2000 and a gain of 30 $/ha in 2001.

The use of the preharvest desiccant generally increased harvestability in both years. In 2001, heavy August rainfall caused a resurgence of barnyardgrass and pitted morningglory that emerged through the senescing soybean. Harvestability was greatest overall with the use of the preharvest desiccant in seven of the ten highest harvestabilty ratings in 2000 and seven of the eight highest harvestabilty ratings in 2001. Even though the increase in harvestability generally

did not increase yields, the decreased costs associated with machinery wear and labor may warrant an application of a preharvest desiccant.

SOYBEAN ROW SPACING AND SEEDING RATE INFLUENCE ON CANOPY CLOSURE AND SICKLEPOD CONTROL. R.R. Dobbs, N.W. Buehring, and M.P. Harrison; Mississippi State University, Verona, MS 38879.

ABSTRACT

Narrow row soybean production has been widely adopted in North Mississippi. Vacuum seed technology with equidistant seed spacing, (equal distance between seed in the row) which has been available in wide row production for some time, has recently become available in narrow row production. A field study in 2000 and 2001 was conducted on a Catalpa silty clay loam soil to determine the effect Roundup (glyphosate) weed management systems, seeding rates and planting methods in narrow rows have on canopy closure and late season sicklepod control. Roundup Ultra Max [(glyphosate) at 1.0 lb ai/A] weed management systems were; low weed management [one application in 2000 (applied 6/07/00) and two applications in 2001 (applied 5/30/01 and 6/19/01)] and high weed management [two applications in 2000 (applied 6/07/00 and 7/06/00) and three applications in 2001 (applied 5/30/01, 6/19/01 and 6/26/01)]. Planter treatments were: an air planter, used to plant 140,000 seed/A (1X) and 210,000 seed/A (1.5X) in 7.5 and 15 inch rows; a vacuum planter treatment at seed rates of 0.75X (105,000 seed/A), 1X and 1.5X in 9.5 and 19 inch rows; and a standard wide row vacuum planter treatment in 28.5 inch rows with a 1X seed rate.

Roundup weed management systems showed no early or mid-season canopy closure differences, and there was no Roundup management by year or year by Roundup management by planter treatment interaction. However, there was a planter treatment by year interaction. Comparing years, the 19 inch row vacuum planter at the 0.75X seed rate, the 7.5 and 15 inch row air planter at the 1X seed rate, and the wide row standard treatment were the only treatments which showed lower early season canopy closure in 2000 than 2001. All treatments had greater canopy closure than the standard treatment in 2000. Both years the 9.5 inch row vacuum planter at the 0.75X seed rate showed 63 to 73% canopy closure which was equal or greater than all planter treatments at the 1X seed rate, and the 19 inch row vacuum and 15 inch row air planter treatments at the 1.5X seed rate. In 2000, the 7.5 inch row air planter and the 9.5 inch row vacuum planter at 1.5X seeding rate showed 76 to 86% canopy closure. These were the only treatments which had more canopy closure than 9.5 inch vacuum planter with 0.75X seed rate. In 2001, the 9.5 inch row vacuum planter at the 0.75X seed rate had 73% canopy closure and was equal or higher than all other planter treatments.

Comparing years, the 7.5 inch row air planter treatment at the 1X seed rate and the wide row standard were the only treatment which had lower mid-season canopy closure in 2001 than 2000. In 2000, the wide row standard showed 80% canopy closure and was equal to all planter treatments with 0.75X and 1X seed rates, except the 9.5 inch row vacuum planter treatment at the 1X seed rate. The 9.5 inch row vacuum planter treatment at both 1X and 1.5X seed rates, and the 7.5 and 15 inch row air planter treatments at the 1.5X seed rate produced equal canopy closure (88 to 95%).

The 9.5 inch row vacuum planter with the 0.75X seed rate had 85% to 87% canopy closure both years, and was equal to or greater than all planter treatments, except the 7.5 inch row air planter and the 9.5 inch row vacuum planter treatments at the 1.5X seed rates in 2000 which showed 93 to 95% canopy closure.

There was a year by planter treatment interaction and a Roundup management by planter treatment interaction for late season sicklepod control. The year by planter treatment interaction data were pooled over Roundup weed management systems . Except for the wide row standard and the vacuum planter in 19 inch rows at 0.75X seed rate in 2001, all treatments provided 79% or greater late season sicklepod control both years. The 9.5 inch row vacuum planter treatment at the 0.75X seed rate provided 90 and 81% sicklepod control in 2000 and 2001, respectively; and was only lower than the vacuum planter in 9.5 inch rows at the 1.5X seed rate in 2001 which

showed 90% sicklepod control. The data for the Roundup management by planter treatment interaction were pooled over years. All Roundup high management treatments had greater late season sicklepod control than low Roundup management. With high Roundup management, the vacuum planter in 9.5 inch rows at the 0.75X seed rate provided 98% sicklepod control, which was equal to all planter treatments and was greater than the wide row standard (86% control). With low Roundup management, the 9.5 inch row vacuum planter at the 0.75X seed rate provided 73% sicklepod control, which was equal or greater than all treatments, except the 7.5 inch row air planter and 9.5 inch row vacuum planter treatments at the 1.5X seed rates and the 9.5 inch vacuum planter at the 1X seed rate. These treatments showed 81 to 87% sicklepod control. The results indicate that with good weed management and narrow rows (19 inches or less), vacuum planters offer growers the opportunity to reduce seeding rates and maintain adequate canopy closure and late season sicklepod control.

CONTROLLING VOLUNTEER GLYPHOSATE-TOLERANT CORN IN ROUNDUP READY SOYBEANS. M.A. Thompson and R.M. Hayes, Department of Plant Sciences and Landscape Systems, University of Tennessee West Tennessee Experiment Station, Jackson; J.A. Kendig, Department of Agronomy, University of Missouri Delta Research Center, Portageville.

ABSTRACT

Field trials were conducted at the West Tennessee Agricultural Experiment Station in Jackson, and at the University of Missouri Delta Research Center in Portageville in 2002. The purpose of these trials was to evaluate tank mixtures of graminicides with Roundup WeatherMax for crop safety and volunteer corn control, and to determine the effect of untreated volunteer corn on soybean yield.

At Jackson, corn was inter-planted no-till at densities of 12,000 to 21,000 plants per acre, along with soybeans planted in the same row at a population of 150,000 seed per acre. Roundup WeatherMax was applied both with and without graminicides as a single application to V3-V4 soybeans or in the second application of a sequential treatment to R1-R2 soybeans. Graminicides were tank mixed at labeled rates and included Assure II, Select, Fusilade DX, or Fusion. Treatments were arranged in a randomized complete block design with three replications. At Portageville, soybeans were planted at 140,000 seed per acre in a conventional till plot area that had been broadcast seeded with corn at a population of 217,000 plants per acre. Graminicides were tank mixed with Roundup WeatherMax or Roundup UltraMax and applied only to R1-R2 soybeans. Assure II, Select, Fusilade DX or Fusion were included at labeled rates. Treatments were arranged in a factorial design with four replications. Volunteer corn control and crop safety were evaluated. Soybean yields were corrected to 13% moisture at harvest. Data were subjected to an analysis of variance and means were separated with the Student-Newman-Keuls (P=0.05) procedure.

At both locations, volunteer corn was controlled with Select, Fusilade DX and Fusion tank mixtures. Assure II was 28 to 33% less effective in controlling volunteer corn than Select, Fusilade DX or Fusion at the Jackson location. Slight (<15%) soybean injury was observed with all graminicide tank mixtures with Roundup WeatherMax at the Jackson location two weeks after application to R1 soybeans. At Jackson, soybean yield was significantly reduced in plots that did not receive an early application of a graminicide. At Portageville, soybeans could not be harvested in plots that received no graminicide due to severe competition effects from volunteer corn.

UTILIZING TRIFLOXYSULFURON IN WEED CONTROL SYSTEMS FOR FLORIDA SUGARCANE. A.C. Bennett; Everglades Research and Education Center, University of Florida, Belle Glade.

ABSTRACT

Two studies were conducted at the Everglades Research and Education Center outside Belle Glade, FL to evaluate trifloxysulfuron for weed control in sugarcane. Both studies were conducted on first ratoon sugarcane fields. One study was designed to evaluate trifloxysulfuron + asulam tank-mixtures. Treatments included trifloxysulfuron at 15.8 g ai/ha, asulam at 3700, 1850, and 925 g ai/ha, trifloxysulfuron at 15.8 g ai/ha + 1850 or 925 g ai/ha asulam, trifloxysulfuron at 15.8 g ai/ha + 140 g ai/ha ametryn, and 4484 g ai/ha atrazine. All treatments were applied with a non-ionic surfactant at 0.25% v/v except atrazine, which was applied with crop oil concentrate at 1% v/v. All applications were made early post (EPOST) on April 12, 2002 to 10-12 inch sugarcane and 2-4 inch weeds. Weeds included nutsedge (*Cyperus* spp.), alligatorweed (*Alternanthera philoxeroides*), and goosegrass (*Elusine indica*). A second trial evaluated trifloxysulfuron with a range of tank-mix partners. Treatments included 2242 g ai/ha atrazine applied preemergence (PRE) followed by (fb) 15.8 g ai/ha trifloxysulfuron with a range of tank-mix partners including 2242 g ai/ha atrazine, 70 g ai/ha ametryn, and 1850 g ai/ha asulam. Comparisons included 2242 and 4484 g ai/ha atrazine applied PRE, and 2242 g ai/ha atrazine applied PRE followed by 1121 g ai/ha ametryn or 1850 g ai/ha asulam. PRE applications were made on March 19, 2002 to spiking sugarcane, and EPOST applications were made on April 21, 2002 to 10-12 inch sugarcane and 2-4 inch weeds. All EPOST applications included 0.25% v/v non-ionic surfactant. Weeds evaluated included spiny amaranth (*Amaranthus spinosus*), fall panicum (*Panicum dichotomiflorum*), and giant bristlegrass (*Setaria magna*).

The trifloxysulfuron + asulam trial was evaluated 8 weeks after treatment (WAT). Nutsedge was controlled less than 30% by asulam alone at any rate or atrazine. Trifloxysulfuron alone or in tank-mixture with any rate of asulam or ametryn controlled nutsedge at least 90%. Alligatorweed control was less than 40% with any rate of asulam. Control of alligatorweed with atrazine was 85%. Trifloxysulfuron alone or in tank-mixture with any rate of asulam controlled alligatorweed at least 95%, but trifloxysulfuron in tank-mixture with 140 g ai/ha ametryn only controlled alligatorweed 55%. The very low rate of ametryn was included in this tank-mixture because it had been shown to minimize sugarcane injury in some instances. Goosegrass control was greater than 90% for all trifloxysulfuron + asulam tank-mixtures or asulam applied alone, but control with trifloxysulfuron alone or trifloxysulfuron + ametryn was less than 50%.

The trifloxysulfuron tank-mixture trial was evaluated 7 WAT. Giant bristlegrass control was above 95% for atrazine PRE fb trifloxysulfuron + asulam, asulam, or ametryn EPOST. Atrazine PRE at 2242 g ai/ha only controlled giant bristlegrass 24%. Atrazine PRE fb trifloxysulfuron EPOST controlled giant bristlegrass 70%. The atrazine PRE fb trifloxysulfuron + ametryn tank-mixture EPOST provided 83% control. Fall panicum control was less than 70% for all treatments except atrazine PRE fb trifloxysulfuron + asulam, asulam, or ametryn EPOST. Control with atrazine PRE fb trifloxysulfuron EPOST was 68%. Spiny amaranth control was greater than 70% for all treatments. Atrazine PRE fb trifloxysulfuron + atrazine, trifloxysulfuron + ametryn, trifloxysulfuron + asulam, or ametryn EPOST provided greater than 90% control of spiny amaranth.

Trifloxysulfuron alone provided good control of alligatorweed and nutsedge. Low rates of ametryn in tank mixture with trifloxysulfuron reduced control of alligatorweed. Trifloxysulfuron + atrazine tank-mixtures did not increase grass control compared to trifloxysulfuron alone. The addition of asulam increased grass control without reducing control of other weed species. Future research will continue evaluation of trifloxysulfuron tank-mixtures with asulam to increase the grass control spectrum.

EFFICACY OF TRIFLOXYSULFURON-SODIUM (ENVOKE™) IN BXN™ AND ROUNDUP READY™ COTTON SYSTEMS. J.L. Alford and R.M. Hayes; University of Tennessee, Knoxville.

ABSTRACT

Two experiments were conducted in Jackson, TN testing the efficacy of Envoke™ in Roundup Ready™ and BXN™ cotton systems. 'PM 1218 B/R' and 'Stoneville BXN 49B' cotton were planted April 29, 2002 and May 7, 2002, respectively. PRE and POST treatments were applied using a tractor-mounted CO_2 boom sprayer and post-directed (PD) treatments were applied using a four-row CO_2 layby sprayer. Plots for the test were 3 m wide and 7.6 m long. Treatments were replicated four times in a randomized complete block design. An untreated plot was included in the test for rating comparisons. Treatments for Roundup Ready™ cotton included sequential POST Touchdown IQ (glyphosate diammonium salt) applications, Touchdown IQ POST followed by Envoke at 0.1 oz/A POST to 5-6 LF cotton and Envoke at 0.2 oz/A PD to 7-8 LF cotton, Prowl (pendimethalin) PRE followed by previous treatments, and combinations of Touchdown IQ POST followed by Suprend (prometryn plus trifloxysulfuron-sodium). Treatments for BXN™ cotton included Caparol (prometryn) PRE and Caparol and Prowl PRE followed by Envoke at 0.1 and 0.15 oz/A, Suprend at 16 oz/A, and Staple (pyrithiobac) at 1.2 oz/A. A separate weed-free test was conducted evaluating cotton injury. The test evaluated Envoke at 0.1, 0.15, 0.2, and 0.25 oz; Envoke 0.1 oz and Staple 0.3, 0.6, and 1.2 oz; and Staple 1.2 oz. Cotton was treated at 2-3 LF, 5-6 LF, 5-6 LF PD, 8-9 LF, and 8-9 LF PD.

Visual evaluations of cotton injury and control of Palmer amaranth (*Amaranthus palmeri*), pitted morningglory (*Ipomoea lacunosa*), and common cocklebur (*Xanthium strumarium*) were recorded at the 4-LF stage, 10 days after the PD treatment, the 17-LF stage, and prior to harvest. Cotton yield was determined by spindle picking, ginning a grab sample, and calculating lint yield. Data was subjected to analysis of variance and means were separated using Fischer's Protected LSD test at the 0.05 level of probability.

Since season-long weed control is the primary emphasis, discussion will focus on the end-of-season evaluations. In the Roundup Ready system, Touchdown IQ POST with no soil residual activity did not provide season-long weed control, but when the overtop treatments were followed by a layby, control of both IPOLA and AMAPA was about 80%. However, where Touchdown IQ was followed by Envoke layby, AMAPA was not controlled, and IPOLA was improved to 89%. When Touchdown IQ was followed by Suprend at 20 ounces per acre, AMAPA control increased to 83% and IPOLA was controlled 87%.

In the BXN system, Caparol or Caparol + Prowl pre followed by Envoke POST did not control AMAPA (58%), only controlled IPOLA 75%, but controlled XANST 93%. However, when these treatments were followed by Suprend layby, IPOLA control increased to 88 to 91%, however AMAPA was not controlled (<62%). In similar treatments where Staple replaced Envoke, IPOLA control was <42% and XANST control was <77%, and AMAPA was <54%. When Direx + MSMA layby was added to this treatment control was 66, 73, and 75% for AMAPA, IPOLA, and XANST, respectively. Neither Caparol nor Caparol plus Prowl preemergence will provide season long control of AMAPA, IPOLA, or XANST. Both Envoke and Staple failed to provide season long control of AMAPA. Envoke was more effective than Staple on IPOLA and XANST. The most effective systems included a layby application of either Suprend or Direx plus MSMA.

Younger, smaller cotton was injured more by Envoke than older, taller cotton. Higher Envoke rates caused greater injury. When Envoke was post-directed to avoid contact with the cotton plant, injury was greatly reduced compared with POST overtop application. Staple was less injurious than Envoke to cotton. The combination of Staple and Envoke POST was more injurious than either product applied alone. Lint yield was reduced by Envoke POST at the 2 to 3 LF stage and at the higher Envoke rates. Early season applications likely had higher levels of

injury than expected due to cool temperatures at the time of application. The cooler temperatures would increase the level of stress on cotton, which would make the crop more susceptible to injury.

Envoke provides >89% control of IPOLA and XANST. IPOLA was controlled more effectively with Envoke (>89%) than Staple (<42%). Injury did occur with Envoke 2-3 LF POST applications and caused significant yield reduction. Also, yields were reduced at some of the higher rates.

COMPARISON OF GLYPHOSATE FORMULATIONS IN ROUNDUP READY CROPS.
R.G. Parker and A.C. York, Department of Crop Science, North Carolina State University, Raleigh; A.S. Culpepper, University of Georgia, Tifton.

ABSTRACT

Transgenic crops resistant to glyphosate have been widely accepted throughout the Southeast. Growers rapidly adopted this technology because of broad-spectrum weed control, good crop tolerance, reduced weed management costs, and convenience. A number of glyphosate products are commercially available. Most are formulated as isopropylamine salts, although Touchdown is a diammonium salt. Roundup Weathermax, which was not included in our experiments, is a potassium salt. It is generally assumed that all glyphosate products perform similarly when applied according to label directions. However, in the fall of 2001, we observed severe injury to Roundup Ready cotton in greenhouse studies with Clearout 41 Plus, an imported isopropylamine salt of glyphosate. That led us to conduct field experiments to compare ClearOut 41 Plus and seven other glyphosate products.

In 2002, glyphosate-resistant corn 'DK 687 RR' and cotton 'ST 4893 BR' were planted in 91-cm rows in conventionally tilled seedbeds at three locations for each crop. Treatments were replicated four times in a randomized complete block design. Treatments consisted of eight brands of glyphosate (ClearOut 41 Plus, Glyphomax, Glyfos, Glyphos X-TRA, Glystar Original, Roundup Original, Roundup UltraMAX, and Touchdown IQ) each applied at 0.6 and 1.7 kg ae/ha and a non-treated check. Non-ionic surfactant at 0.5% (v/v) was included with Glyphomax, Glyphos, Glystar, and Roundup Original. Treatments were applied postemergence (POST) to five-leaf corn and then postemergence-directed (PDIR) to 10-leaf corn, or POST to 2-leaf and 4-leaf cotton and PDIR to 10- to 12-leaf cotton. All applications were at 140 L/ha and 160 kPa. Treatments were precisely PDIR to the base of cotton plants. Crop injury was estimated visually 7 and 14 d after each application; weed control was estimated 14 and 21 d after each application. Late-season evaluations were made 6 wk after PDIR application in both crops. Yield was determined in both crops, and cotton fiber quality was determined via HVI analysis. Data were subjected to ANOVA with partitioning for the factorial arrangement of two application rates by eight glyphosate products; non-treated checks were excluded from the analysis. Means were separated using Fisher's Protected LSD test at $P = 0.05$.

No injury was observed on either cotton or corn from any of the glyphosate products, even when applied at 1.7 kg/ha. No differences among glyphosate products were noted for yield of either cotton or corn, and no differences were noted for cotton fiber quality. Treated corn plots yielded approximately twice as much as non-treated plots. Check plots in cotton were too weedy to be harvested.

Each glyphosate product at 0.6 kg/ha controlled all weed species encountered very well. Annual grass species, including broadleaf signalgrass [*Brachiaria platyphylla* (Griseb.) Nash], fall panicum (Panicum dichotomiflorum Michx.), and goosegrass [Eleusine indica (L.) Gaertn.], and Palmer amaranth (*Amaranthus palmeri* S.Wats.) and sicklepod [*Senna obtusifolia* (L.) Irwin and Barneby] were controlled 100% 14 days after the second application in both crops. Common lambsquarters (*Chenopodium album* L.) and morningglory species (*Ipomoea* spp. L.) were controlled 96 to 100% and 94 to 99%, respectively, in both crops. All species were controlled at least 93% late in the season.

Results from these experiments agree with previous findings by a number of researchers indicating that weed control and tolerance of Roundup Ready crops are similar with the various glyphosate products commercially available. These experiments will be repeated in 2003, and Roundup Weathermax, a potassium salt formulation, will be included.

CONTROL OF ROUNDUP-READY VOLUNTEER COTTON. J.C. Reed, T.A. Baughman, J.W. Keeling, and P.A. Dotray; Texas A&M Research and Extension Center and Texas Tech University, Vernon and Lubbock, TX.

ABSTRACT

Producers in the High and Rolling Plains of Texas have readily adopted the use of Roundup-Ready cotton (>60% of the acreage). Since adopting the use of Roundup-Ready cotton, many producers have reduced the amount of tillage, especially in-season cultivation. With the reduction in tillage and a series of mild winters, problems with in-crop volunteer cotton have arisen. This has lead to many questions and concerns on how to best control these volunteer plants. Experiments were conducted at three locations: Childress, Lockett, and Lubbock, TX to investigate both preplant and postemergence herbicide options for controlling volunteer Roundup-Ready cotton. Experiments were conducted on cotton planted on 40-inch rows at both Childress and Lockett. At Childress, the volunteer cotton growth stage was 1 to 7 leaf, and at Lockett 6 to 15 leaf. At Lubbock, cottonseed was planted with a small grains drill prior to planting of cotton in traditional 40-inch rows. With the preplant study, volunteer cotton was sprayed 14 days prior to planting when volunteer cotton was in the cotyledon to 1 leaf stage. POST treatments were applied with a hooded sprayer 6 weeks after planting when volunteer cotton was in the 5 to 6 leaf stage.

Cyclone Max (24 fl oz pr/A) was the only preplant treatment that controlled volunteer cotton greater than 50% at Childress (57%). The only POST treatments that controlled volunteer cotton at least 60% were Cyclone Max at 20 fl oz pr/A (73%) and Buctril at 8 fl oz pr/A (60%). No treatment control volunteer cotton greater than 25% at Lockett. Cotton injury of greater than 25% was observed at Lubbock when 2,4-D (0.8 lb ai/A) and Clarity (8 fl oz pr/A) were applied 14 day prior to planting. The only preplant treatment that controlled volunteer cotton at least 90% 4 WAT were Cyclone Max (13 fl oz pr/A), Valor (2.5 oz pr/A), 2,4-D (0.8 lb ai/A), and a preplant tillage operation. Cyclone Max (10 fl oz pr/A), Buctril (4 fl oz pr/A), and a cultivation at the 4-leaf cotton followed by Roundup Ultra (26 fl oz pr/A) + Direx (16 fl oz pr/A) were the only POST treatments that controlled volunteer cotton 4 WAT at least 90% at Lubbock. The lower volunteer Roundup-Ready volunteer cotton control at Childress and Lockett compared to Lubbock was mostly likely due to the later application timings. Therefore, herbicide application timing to small volunteer cotton is critical for effective control.

EVALUATION OF LIBERTY FOR CONTROL OF COMMON LOUISIANA COTTON WEEDS. T.B. McKnight[1], S.T. Kelly[1], D.K. Miller[2] and P.R. Vidrine[3]; LSU AgCenter, Winnsboro[1], St. Joseph[2] and Alexandria[3], LA.

ABSTRACT

Two experiments were conducted to evaluate Liberty for control of common cotton weeds in Louisiana. Experiment one evaluated control of small (1-2 inches) weeds and experiment two evaluated control of large (4-12 inches) weeds when Liberty was applied at various rates or tank-mixed with other herbicides. Both experiments were conducted at the Sweet Potato Research Station near Chase, LA on a silt loam soil. Experimental design was a randomized complete block. Treatments were replicated three times. Plot were 10 feet wide by 15 feet long. Weed seed were drill-seeded on June 19, 2002 in rows 12 inches on center.

Weed species in experiment one included: morningglory *(Ipomoea spp.)*, Pennsylvania smartweed *(Polygonum pennsylvanicum)*, redroot pigweed *(Amaranthus retroflexus)*, prickly sida *(Sida spinosa)*, barnyardgrass *(Echinochloa crus-galli)*, sicklepod *(Senna obtusifolia)*, johnsongrass *(Sorghum halepense)*, Palmer amaranth *(Amaranthus palmeri)*, hemp sesbania *(Sesbania exaltata)*, common waterhemp *(Amaranthus rudis)*, carpetweed *(Mollugo verticillata)*, crabgrass *(Digitaria spp.)*, and purple nutsedge *(Cyperus rotundus)*. All weeds in experiment one were present in experiment two with the exception of carpetweed, Pennsylvania smartweed and prickly sida. In experiment two a natural infestation of groundcherry *(Physalis heterophylla)* was present. Weed control was evaluated at seven and 14 days after treatment (DAT), and five and 19 DAT for experiments one and two, respectively. Treatments were applied with a backpack sprayer calibrated to deliver 20 gallons per acre (gpa). Application date for experiment one was July 5, 2002 and July 17, 2002 for experiment two. Treatments included Liberty alone (24, 28, 32 or 40 oz/A), or in combination with Staple (1.2 oz/A), Roundup UltraMax alone (26 oz/A), or in combination with Staple, and CGA-362-222 (3.0 g/A).

Liberty and Liberty tank-mixes controlled morningglory, sicklepod, johnsongrass, Palmer amaranth, hemp sesbania and common waterhemp (large and small) at least 90%. Small weeds controlled by Liberty and Liberty tank-mixes at least 90% were Pennsylvania smartweed, prickly sida and crabgrass. Liberty applied at less than 32 oz/A controlled small barnyardgrass 80% or less. Roundup UltraMax alone (26 oz/A) controlled small hemp sesbania 37% and CGA-362-622 (0.5 g/A) only 77%. Liberty alone controlled large or small purple nutsedge less than 25%, but with the addition of Staple controlled small and large purple nutsedge at least 83%. Roundup UltraMax alone or tank-mixed with Staple provided at least 90% control of small purple nutsedge. Large barnyardgrass was controlled less than 83% with Liberty alone, and 50% with CGA362-622; however Liberty tank-mixed with Staple controlled large barnyardgrass 87% or less. Liberty alone (any rate) controlled large groundcherry 80% or less, but when tank-mixed with Staple provided 90% control, while Roundup UltraMax alone or tank-mixed with Staple provided 90% control. CGA-362-622 3.0 g/A provided 30% groundcherry control.

EFFECT OF OVER-THE-TOP AND POSTEMERGENCE DIRECTED APPLICATIONS OF ENVOKE ON COTTON GROWTH AND YIELD. D.K. Miller, P.R. Vidrine, S.T. Kelly, and D.R. Lee; LSU AgCenter, Baton Rouge, LA.

ABSTRACT

Field studies were conducted in 2001 at the Dean Lee Research Station near Alexandria, La and at the Northeast Research Station near St. Joseph, La in 2002 to evaluate cotton tolerance to over-the-top and postemergence directed applications of Envoke (trifloxysulfuron sodium). In 2001, treatments evaluated included Envoke applied EPOST (4lf) at 0.1, 0.15, or 0.25 oz/A; LPOST (10lf) or LPD (12lf) at 0.15 or 0.25 oz/A; sequentially at 0.1 or 0.25 oz/A EPOST followed by 0.15 or 0.25 oz/A, respectively; and EPOST at 0.15 oz/A in combination with Touchdown IQ (glyphosate) at 32 oz/A. Comparison treatments included Staple (pyrithiobac) EPOST at 1.2 or 2.4 oz/A, Dual II Magnum (metolachlor) plus Touchdown IQ at 16 plus 32 oz/A, and a nontreated control. Experimental design was a randomized complete block with three replications. Treatments were applied at 15 GPA over-the-top and 7.5 GPA postemergence directed to each four row, 12’ x 40’ plot. Crop assessment included visual injury at 12, 21, 28, and 55 d after EPOST application and seedcotton yield. At St. Joseph in 2002, treatments evaluated included Envoke applied EPOST (2-3lf) at 0.1 or 0.15 oz/A; MPOST (5-6lf) at 0.1, 0.15, or 0.2 oz/A; PD (5-6lf) at 0.15 or 0.2 oz/A; LPOST or LPD (8-9lf) at 0.15, 0.2, or 0.25 oz/A; EPOST at 0.15 oz/A in combination with Caparol (prometryn) at 0.016 or 0.064 oz/A; and MPOST at 0.1 oz/A in combination with Staple at 0.3, 0.6, or 1.2 oz/A. Comparison treatments included Staple MPOST at 1.2 oz/A and a nontreated control. Experimental design was a randomized complete block with four replications. Treatments were applied at 15 GPA to each two row, 6.67’ x 30’ plot. Crop assessment included plant height 3, 14, and 142 d after LPOST treatment, node above white flower (NAWF) 42 d after LPOST, total nodes 142 d after LPOST, yield, and fiber quality. In both studies, nonionic surfactant at 0.25% was included with all treatments except tankmixtures with Touchdown IQ.

At Alexandria in 2001, Envoke resulted in no greater than 6% visual injury from 12 to 55 d after EPOST treatment. Seedcotton yield was equivalent for all treatments and the nontreated control and ranged from 1766 to 2661 lb/A. At St. Joseph in 2002, no significant differences in plant height, NAWF, or number of total nodes were observed for herbicide treatments and the nontreated control. Differences in seedcotton yield, lint fraction, or fiber micronaire, strength, or length were observed. In this research, cotton was very tolerant to both over-the-top and postemergence directed applications of Envoke.

EVALUATION OF SUPREND FOR WEED CONTROL IN COTTON. D.R. Lee, D.K. Miller, P.R. Vidrine, and S.T. Kelly, LSU AgCenter, Baton Rouge, LA.

ABSTRACT

Field studies were conducted at the Dean Lee Research Station near Alexandria, La and at the Northeast Research Station near St. Joseph, La to evaluate weed control in cotton with Suprend (trifloxysulfuron sodium + prometryn). Experimental design was a randomized complete block with three replications in Alexandria and four replications in St. Joseph. Treatments consisted of a 2x4x2 factorial arrangement of EPOST application (Touchdown IQ (glyphosate) alone at 24 oz/A or in combination with Dual Magnum (metolachlor) at 16 oz/A); Suprend rate (12, 16, 20, or 24 oz/A); and Suprend application timing (postemergence directed (PD) or layby (LYBY)). All Suprend treatments included a nonionic surfactant at 0.25%. Treatments were applied at 15 GPA over-the-top and 7.5 GPA postemergence directed at Alexandria to each four row, 10' x 40' plot. EPOST, PD, and LYBY timings corresponded to 5, 10, and 16-inch cotton, respectively. Weeds evaluated included prickly sida (*Sida spinosa*), hemp sesbania (*Sesbania exaltata*), barnyardgrass (*Echinochloa crus-galli*), hophornbeam copperleaf (*Acalypha ostryaefolia)*), smellmelon (*Cucumis melo*), Palmer amaranth (*Amaranthus palmeri*), and johnsongrass (*Sorghum halepense*). Weed control was visually rated 34 d after EPOST treatment and seedcotton yield was determined. At St. Joseph, treatments were applied at 15 GPA to each four row, 13.33' x 40' plot. EPOST, PD, and LYBY timings corresponded to 3, 6-8, and 10-12 inch cotton, respectively. Weeds evaluated included pitted morningglory (*Ipomoea lacunosa*), entireleaf morningglory (*Ipomoea hederacea*), hemp sesbania, barnyardgrass, redroot pigweed (*Amaranthus retroflexus*), sicklepod (*Senna obtusifolia*), and broadleaf signalgrass (*Brachiaria platyphylla*). Weed control was visually estimated 27 d after LYBY application and seedcotton yield was determined.

At Alexandria, slight differences within main factors or interactions with main factors were noted for all weeds evaluated, however, control was good to excellent in all cases (89 to 98%). Differences in seedcotton yield were only noted for the EPOST main factor, with yield greater with addition of Dual Magnum to Touchdown IQ compared to Touchdown IQ applied alone (2641 vs 3066 lb/A). At St. Joseph, slight differences within main factors or interactions with main factors were noted for morningglory, hemp sesbania, and barnyardgrass. In most cases, however, control was good to excellent (>89%). Control of redroot pigweed (89 to 95%), sicklepod (92 to 95%), and broadleaf signalgrass (83 to 95%) was equivalent for all treatments as was seedcotton yield.

In the current research, although slight differences were noted between Suprend rates and application timings for several weeds, programs including Suprend as a PD or LYBY treatment resulted in good to excellent control of grass and broadleaf weeds evaluated.

BROADLEAF WEED AND THRIPS CONTROL WITH ENVOKE/INSECTICIDE COMBINATIONS. D.K. Miller, R.G. Downer, J.W. Wilcut, E. Burris, R.W. Costello, D.R. Lee, and K. Sanders, LSU AgCenter, Baton Rouge, LA and North Carolina State University, Raleigh, NC.

ABSTRACT

Field studies were conducted at the Northeast Research Station near St. Joseph, La in 2002 to evaluate broadleaf weed and thrips (*Frankliniella spp.*) control with tankmix combinations of Envoke (trifloxysulfuron-sodium) and various insecticides. Experimental design for all studies was a randomized complete block with four replications in weed control studies and six replications in insect control studies. In repeated weed control studies, Envoke was applied at 0.1 oz/A alone or in combination with the following insecticides: Orthene (acephate) at 5.9 oz/A; Vydate (oxamyl) at 11.2 oz/A; Karate (*lamda*-cyhalothrin) at 1.9 oz/A; Intruder (acetamiprid) at 0.9 oz/A; Centric (thiamethoxam) at 2.6 oz/A; Phaser (endosulfan) at 14 oz/A; Steward (indoxacarb) at 11.3 oz/A; Denim (emamecpin benzoate) at 1 oz/A; Intrepid (methoxyfenozide) at 3.8 oz/A; Tracer (spinosad) at 2.1 oz/A; and S-1812 at 3.2 oz/A. Application was to a natural population of hemp sesbania (*Sesbania exaltata*), sicklepod (*Senna obtusifolia*), and redroot pigweed (*Amaranthus retroflexus*) ranging from 10 to 12 inches in height and nursery grown pitted morningglory (*Ipomoea lacunosa*) ranging from six to eight inches in height. A nonionic surfactant at 0.25% was included with all treatments. Treatments were applied at 15 GPA to each two row, 6.67' x 10' naturally infested plot and each 10 inch diameter nursery container. Visual weed control was determined 14 and 28 DAT and above ground dry weight was recorded 28 DAT from 10 randomly selected field plants or each nursery grown plant. Dry weight data was converted to a percent reduction from a nontreated control prior to analysis. In repeated thrips control studies, previously listed insecticide treatments were applied either alone or in combination with Envoke at 0.15 oz/A to cotton when thrips economic threshold was reached. Nonionic surfactant was included at 0.25% with all treatments. Treatments were applied at 10 GPA to each four row, 13.33' x 45' plot. Larvae and adult thrips number was determined five DAT after collection of five randomly selected cotton terminals and counting with a binocular microscope. Data were converted to a percent reduction from a nontreated control prior to contrast analysis.

Averaged across experiments, hemp sesbania, sicklepod, and redroot pigweed control 14 DAT with Envoke was reduced with addition of Karate (75 vs 69%), Intrepid (77 vs 46%), and both Intrepid (75 vs 51%) and Tracer (75 vs 61%), respectively. Pitted morningglory control was not reduced by addition of any insecticide. Averaged across experiments, control of hemp sesbania and sicklepod 28 DAT with Envoke was reduced with addition of Vydate (83 vs 69%) and both Intrepid (78 vs 41%) and S-1812 (78 vs 27%), respectively. Pitted morningglory control was unaffected by insecticide addition (73 vs 55 to 80%). Redroot pigweed control with Envoke 28 DAT was reduced with addition of insecticides Orthene (85 vs 68%), Centric (85 vs 69%), Intrepid (85 vs 48%), and Tracer (85 vs 61%) in experiment one. In the second experiment, control was reduced only with addition of S-1812 (74 vs 30%). Dry weight reduction of sicklepod and pitted morningglory 28 DAT, averaged across experiments, was lower for Envoke tankmixed with S-1812 (86 vs 36%) and Steward (89 vs 74%), respectively, compared with herbicide applied alone. Dry weight reduction for hemp sesbania, averaged across experiments (89 vs 84 to 93%), and redroot pigweed in experiment one (95 vs 81 to 95%), was unaffected by insecticide addition compared to reduction with Envoke alone. In experiment two, redroot pigweed dry weight reduction was affected only with addition of S-1812 (96 vs 44%).

In experiment one, adult thrips number reduction from a nontreated control for each insecticide was lowered with addition of Envoke for only the insecticide Steward (61 vs 23%). Adult thrips number reduction in experiment two and thrips larvae reduction averaged across both experiments was unaffected by Envoke addition when compared to each insecticide applied alone.

Pitted morningglory was the only broadleaf weed that showed no negative effect from tankmixture of Envoke and insecticides based on both visual control and dry weight reduction with application made to larger weeds. Steward/Envoke combination resulted in lower adult thrips reduction in one of two experiments. Negative effects were not observed with any insecticide/herbicide combination with respect to reduction in adult thrips numbers in the second experiment and for reduction in thrips larvae numbers.

EVALUATION OF GRAMOXONE MAX TANKMIX COMBINATIONS FOR MARESTAIL CONTROL IN NORTHEAST LOUISIANA. D.R. Lee, D.K. Miller, and S.T. Kelly, LSU AgCenter, Baton Rouge, LA.

ABSTRACT

A field study was conducted at the Northeast Research Station near St. Joseph, La in 2002 to evaluate marestail (*Conyza Canadensis*) control with tankmix combinations including Gramoxone Max (paraquat). Experimental design was a randomized complete block with four replications. Treatments included Gramoxone Max at 26 oz/A applied alone or in combination with the following herbicides: Caparol (prometryn) at 16 or 32 oz/A; 2,4-D Ester at 13 oz/A alone or plus Caparol at 32 oz/A; Clarity (dicamba) at 8 oz/A alone or plus Caparol at 32 oz/A; Direx (diuron) at 16 or 32 oz/A; and Valor (flumioxazin) at 1 or 1.5 oz/A. Comparison treatments included Touchdown IQ (glyphosate) at 32 oz/A alone or in combination with 2,4-D Ester at 13 oz/A and a nontreated control. Treatments were applied at 15 GPA to each two row, 6.67' x 35' plot. Weed size at time of application ranged from three to six inches. Visual control was estimated at 14, 28, and 40 d after treatment.

At 14 DAT, Touchdown IQ alone or in combination with 2,4-D Ester resulted in equivalent marestail control of 95 and 91%, respectively. Gramoxone Max tankmixed with 2,4-D Ester or Clarity alone or with Caparol controlled marestail 79 to 80%. All other Gramoxone Max combinations resulted in no greater than 58% control, which was equal to that for Gramoxone Max alone (55%). At 28 DAT, marestail control was maximized with treatments including Touchdown IQ (98%). Control with Gramoxone Max was greatest when applied in combination with 2,4-D Ester or Clarity (66 to 78%). Other Gramoxone Max treatments provided no greater than 34% control. By 40 DAT, the most effective Gramoxone Max tankmix treatments were those including Clarity (75 and 78%). Control with all other Gramoxone Max programs ranged from 35 to 55%. Similar to earlier ratings, Gramoxone Max tankmix combinations were not equal to treatments including Touchdown IQ.

In the current research, marestail control with Gramoxone Max applied in combination with various burndown herbicides was inferior to that with Touchdown IQ. Through 28 DAT, maximum control with Gramoxone Max was achieved in combination with 2,4-D Ester or Clarity. By 40 DAT, however, only combinations including Clarity maintained this level of control.

ANNUAL WEED CONTROL SYSTEMS USING STAPLE/GLYPHOSATE COMBINATIONS. J.D. Everitt, J.W. Keeling, L.L. Lyon, and P.A. Dotray; Texas Agricultural Experiment Station, Lubbock, TX.

ABSTRACT

Cotton producers on the Texas Southern High Plains have used in-season glyphosate applications to effectively control many annual and perennial weeds in Roundup Ready cotton. Palmer amaranth (*Amaranthus palmeri*), devil's-claw (*Proboscidea louisianica*), and lanceleaf sage (*Salvia reflexa*) continue to be problems. Staple can improve preemergence and postemergence control of these weeds; however, the efficacy of Staple in Roundup Ready systems has not been clearly defined. The objectives of these studies were: 1) to compare Staple applied preemergence (PRE), postemergence-topical (POST), or POST in combination with glyphosate; 2) to evaluate Staple PRE/POST programs without a preplant incorporated (PPI) dinitroaniline herbicide; and 3) to evaluate Staple-glyphosate combinations applied at different rates and timings.

Excellent season-long devil's-claw control was achieved with glyphosate POST followed by (fb) glyphosate postemergence-directed (PDIR). Similar control was achieved with Staple and Karmex PRE fb Staple POST and sequential Staple Plus treatments (early POST and POST). These treatments were more effective than a single application of a glyphosate-Staple combination (glyphosate at 0.56 lb ae/A and Staple at 0.031 lb ai/A or glyphosate at 0.75 lb ae/A and Staple at 0.063 lb ai/A) applied POST only. Treflan alone controlled Palmer amaranth 76%, while all Staple or Staple-glyphosate combinations improved Palmer amaranth control (93 to 100%). Staple applied early POST (EPOST) alone provided similar Palmer amaranth and devil's-claw control achieved from Staple-glyphosate combinations applied at the same timing. Devil's-claw control was improved with an EPOST application of Staple compared to a POST application. Without Treflan PPI, all Staple combinations controlled Palmer amaranth, devil's-claw, and lanceleaf sage greater than 88% season-long. Glyphosate alone was less effective on lanceleaf sage by late season (70%) compared to any combination of Staple and glyphosate. Staple or Staple PRE combinations improved lanceleaf sage control over a single Staple-glyphosate POST combination.

USING EPOST COTTON HERBICIDES TO CONTROL VOLUNTEER PEANUTS. W.J. Grichar, T.A. Baughman, J.W. Wilcut, B.A. Besler, and K.D. Brewer. Texas Agricultural Experiment Station, Yoakum; Texas Cooperative Extension, Vernon; North Carolina State University, Raleigh.

ABSTRACT

Field studies were conducted during the 2001-2002 growing seasons in Texas and North Carolina to evaluate the effects of early postemergence (EPOST) cotton (*Gossypium hirsutum* L.) herbicides on volunteer peanut (*Arachis hypogaea* L.). The experiments were conducted in conventionally planted peanut. It was assumed that the response of planted peanut to POST herbicides would be similar to the response of volunteer peanut. Treatments included the non-selective herbicides glyphosate(Roundup UltraMax) at 1.9 L/ha, bromoxynil (Buctril) at 1.2 L/ha, and glufosinate (Liberty) at 2.0 L/ha. Selective herbicides included CGA 362622 at 4.9 g/ha, MSMA at 1.6 L/ha, and pyrithiobac (Staple) at 84 g/ha. These herbicides were applied alone and in various combinations at 140 to 187 L/ha when peanut were 6 to 12 cm in diameter. Ammoniun sulfate at 3.8 kg/ha was added to all glyphosate and glufosinate treatments while a non-ionic surfactant at 0.25%v/v was added to all bromoxynil, CGA 362622, and pyrithiobac treatments.

At all locations, Liberty and Roundup increased volunteer peanut control over the selective herbicides applied alone. Buctril alone or in combination with CGA 362622, MSMA, or Staple controlled peanut less than 70% except at one location in North Carolina. At the North Carolina location, Buctril in combination with CGA 362622 controlled peanut 100% while Buctril in combination with MSMA or Staple controlled peanut less than 50%. Buctril alone controlled peanut less than 10%. At two locations, the addition of MSMA or Staple to Liberty increased control when compared to Liberty alone. At three locations, the addition of a selective herbicide to Roundup did not increase peanut control compared to Roundup alone.

WEED CONTROL AND SPECIES SHIFT IN ROUNDUP READY AND BXN COTTON ROTATION SYSTEMS. K.N. Reddy, USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS 38776.

ABSTRACT

Bromoxynil-resistant (BR) and glyphosate-resistant (GR) cotton weed management systems have advantages and limitations. Because both herbicides lack residual activity, preemergence (PRE) herbicides are usually necessary and the need for PRE herbicides is greater in BR than GR cotton. Over-reliance on either BR or GR cotton weed control systems could lead to problems such as weed species shifts and evolution of herbicide-resistant weeds. BR and GR cotton offers growers the advantages of different modes of action to use against herbicide resistance. Weed species shifts can be prevented or delayed from occurring with a rotation of BR and GR cotton. This study examines weed control, weed densities and shifts, and cotton yield response in BR and GR cotton rotation systems involving bromoxynil and glyphosate POST applications either alone or following PRE herbicides under narrow and wide row spacing.

A 3-yr field experiment was conducted in 1999, 2000, and 2001 on a Dundee silt loam at Stoneville, MS. Cotton (BXN 47 and DP 436 RR) was planted in late April to early May at 312,000 seeds/ha in 25-cm (narrow) rows and 111,000 seeds/ha in 102-cm (wide) rows. Three year rotations included continuous BR, continuous GR, BR-GR-BR, and GR-BR-GR. Herbicide programs consisted of POST only, PRE + POST, and a no herbicide treatment. The POST only treatment included two applications of either bromoxynil at 0.56 kg ai/ha in BR cotton or glyphosate at 1.12 kg ai/ha in GR cotton. The PRE + POST treatment included fluometuron at 1.12 kg ai/ha plus pendimethalin at 1.12 kg ai/ha PRE followed by two POST applications of bromoxynil or glyphosate. First POST and second POST treatments were applied at 1- to 2-leaf cotton (≈3 wk after planting) and 4- to 5-leaf cotton (≈5 wk after planting), respectively. Sethoxydim at 0.31 kg ai/ha was applied over the entire BR cotton area 5 d after first POST to control grass weeds. The experiment was conducted in a split-split plot arrangement of treatments in a randomized complete block design with row spacing as the main plot, rotation systems as the sub-plot, and herbicide programs as the sub-subplot with four replications. Each sub-subplot consisted of sixteen rows spaced 25-cm apart and four rows spaced 102-cm apart that were 13.7 m long.

Control of hemp sesbania, pitted morningglory, prickly sida, and hyssop spurge was ≥97%, regardless of row width, rotation, and herbicide program. Control of common purslane, sicklepod, and smooth pigweed was higher with glyphosate POST in GR cotton than bromoxynil POST in BR cotton. Broadleaf and yellow nutsedge weed biomass were higher with bromoxynil POST in BR cotton than glyphosate POST in GR cotton. Continuous BR cotton system resulted in higher densities of common purslane, sicklepod, and yellow nutsedge (15.3, 1.5, and 373 plants/m^2, respectively) compared to continuous GR cotton (0.7, 0.1, and 1.0 plant/m^2, respectively). Seed cotton yield was consistently higher in wide row compared to narrow row cotton regardless of year. Seed cotton yield was lower in continuous BR cotton compared to other three rotation systems and yields greatly improved when BR cotton was rotated with GR cotton. Over a 3-yr period, seed cotton yields with glyphosate POST only (4,000 to 4,890 kg/ha) or following PRE herbicides (4,480 to 4,860 kg/ha) were similar in GR cotton, whereas, in BR cotton, bromoxynil POST only (1,390 to 4,280 kg/ha) resulted in lower yield compared to bromoxynil POST following PRE herbicides (2,550 to 4,480 kg/ha). These results indicated that a shift in the spectrum of weeds towards more tolerant species and yield drag in continuous BR cotton can be prevented by rotating BR with GR cotton.

WEED MANAGEMENT PROGRAMS WITH TRIFLOXYSULFURON (ENVOKE) IN COTTON. M.R. McClelland, J.L. Barrentine, and O.C. Sparks; Department of Crop, Soil, and Environmental Sciences, Fayetteville

ABSTRACT

Trifloxysulfuron (formerly CGA-362622), or Envoke™, is a sulfonylurea herbicide developed for postemergence over-the-top or post-directed applications in cotton. Experiments were conducted in 2002 in Arkansas to determine the best fit for trifloxysulfuron in Roundup Ready and conventional cotton. Experiments were conducted at Marianna and Fayetteville, AR, on silt loam soil to evaluate trifloxysulfuron in conventional and Roundup Ready (glyphosate-tolerant) cotton herbicide systems and to compare efficacy of trifloxysulfuron and pyrithiobac (Staple). Each experiment was an RCB design with four replications. Plots were 13 by 40 ft at Marianna and 3.3 by 27 ft at Fayetteville, except for the trifloxysulfuron/pyrithiobac comparison at Fayetteville, which was a multispecies experiment with 12 species planted across 6.5-ft-wide plots. Treatments in conventional cotton were prometryn + pendimethalin (1 + 0.75 lb ai/A) PRE or metolachlor, 0.95 lb ai/A + fluazifop-P, 0.125 lb ai/A over-the-top (OT) applied to 1- to 2-leaf cotton (EOT) followed by (fb) trifloxysulfuron, 0.0071 lb ai/A OT to 5- to 6-leaf cotton, alone or fb prometryn + trifloxysulfuron (A12474), 0.8 lb ai/A at layby. In Roundup Ready cotton, glyphosate (Touchdown), 0.75 lb ae/A or glyphosate + metolachlor, 0.95 lb/A was applied OT to 1- to 2-leaf cotton fb trifloxysulfuron, 0.0071 lb/A OT or 0.0094 lb/A post-directed (DIR) to 7- to 8-leaf cotton. In trifloxysulfuron/pyrithiobac comparison experiments, trifloxysulfuron was applied OT at 0.0071 lb/A to 2-leaf cotton and 0.0094 lb/A to 4-leaf cotton, pyrithiobac at 0.063 OT to 2- and 4-leaf cotton, and trifloxysulfuron, 0.0047 lb/A or pyrithiobac, 0.063 lb/A + glyphosate, 0.75 lb ai/A to 2- and 4-leaf cotton.

Glyphosate programs were more effective than conventional programs that used metolachlor + fluazifop-P EOT as a prior treatment for trifloxysulfuron because the metolachlor programs failed to control *Amaranthus* species early in the season. At Fayetteville, all broadleaf species in plots with EOT treatments were uncontrolled, and trifloxysulfuron was not effective on large weeds. Metolachlor should be applied before weeds emerge or after cultivation to be effective. Trifloxysulfuron following a PRE treatment and fb A12474 at layby controlled pitted morningglory (*Ipomoea lacunosa*), velvetleaf (*Abutilon theophrasti*), and prickly sida (*Sida spinosa*) 88 to 99%. In the Roundup Ready experiment, two applications of glyphosate controlled Palmer amaranth (*Amaranthus palmeri*) better than glyphosate fb trifloxysulfuron at Marianna (91% vs 60% with OT application and 70% with DIR application). For control of annual grasses, a follow-up glyphosate application or metolachlor with the 1- to 2-leaf glyphosate application was needed. A12474 was also effective for late-season Palmer amaranth and grass control (>90%). Control of pitted morningglory (83 to 100%), velvetleaf (95 to 100%), sicklepod (*Senna obtusifolia*) (88 to 95%), and prickly sida (75 to 100%) did not differ among treatments. In the trifloxysulfuron/pyrithiobac comparison experiment, trifloxysulfuron and pyrithiobac controlled *Amaranthus* species, pitted morningglory, and velvetleaf equally at Marianna. At Fayetteville, control of Palmer amaranth and velvetleaf was better with pyrithiobac treatments than with trifloxysulfuron. Pitted morningglory was controlled better with trifloxysulfuron (83% averaged over treatments) than pyrithiobac (58% average), a difference more pronounced at the 4-leaf than 2-leaf cotton stage. Control of barnyardgrass (*Echinochloa crus-galli*), seedling johnsongrass (*Sorghum halepense*), and sicklepod was better with trifloxysulfuron than with pyrithiobac, but prickly sida control was better with pyrithiobac treatments.

Cotton injury is a concern with trifloxysulfuron applied over-the-top. In the conventional tests, injury was 5 to 20% 1 wk after trifloxysulfuron application to 5- to 6-lf cotton but was <3% by 2 WAT. Injury in the trifloxysulfuron/pyrithiobac comparison tests was 18 to 30% 1 wk after 4-lf treatments. After 3 wk, injury was 13 to 18% at Marianna and 0 to 15% at Fayetteville, with the higher injury from trifloxysulfuron + glyphosate. Injury from trifloxysulfuron DIR was <11% 1 WAT, while injury from OT applications was as high as 39% in tank mixture with glyphosate.

Pyrithiobac injury was not as severe as trifloxysulfuron injury in most experiments, and cotton recovered from visual symptoms from both herbicides.

In summary, PRE applications were needed for effective control with trifloxysulfuron in conventional cotton; metolachlor EOT was ineffective as a prior treatment for trifloxysulfuron because weeds were emerged. *Amaranthus* species were a late-season problem in conventional cotton programs. Glyphosate + metolachlor applied EOT followed by trifloxysulfuron gave good broad-spectrum control in Roundup Ready cotton. Barnyardgrass, seedling johnsongrass, and sicklepod were controlled better with trifloxysulfuron than with pyrithiobac. Visual cotton injury from trifloxysulfuron OT is a concern, and trifloxysulfuron should probably not be applied in tank mixture with glyphosate for over-the-top applications. More specifics are needed about conditions under which moderate to severe cotton injury can occur.

ROUNDUP VERSUS PRE PLUS POST HERBICIDE WEED CONTROL IN RR/BT COTTON. M.P. Harrison, N.W. Buehring, R.R. Dobbs and G. Stapleton. Northeast Branch Experiment Station; North Mississippi Research and Extension Center; Mississippi State University; Verona, MS 38879; BASF Corporation, Dyersburg, Tennessee.

ABSTRACT

A study was conducted during the 2002 growing season evaluating weed management systems for Roundup Ready cotton on a Leeper silty clay loam soil. Broadleaf weeds [pitted morningglory (*Impomoea lacunosa*), sicklepod (*Senna obtusifolia*)] and annual grasses [broadleaf signalgrass (*Brachiaria platyphylla*), barnyardgrass (*Echinochloa crusgalli*), and crabgrass (*Digitaria sanguinalis*)] infestations were light to moderate.

The experimental design was a randomized complete block with 4 replications. Plot size was 4 rows (38-inch) x 50 ft long. Except for herbicide application treatments, good agronomic production practices were applied to the entire study. Sure-Grow SG501BR cotton cultivar at 4 seed/ft of row was planted in mid-May on a fall prepared seedbed.

Burndown herbicide applications were used as needed to maintain winter vegetation control and all treatments received an application of Gramoxone Max (paraquat) + surfactant at 1.0 lb ai/ac + 0.4 pt/ac before planting. Preemergence (PRE) and post emergence over the top (POT) herbicide applications at 4 leaf cotton were made at 15 gpa and with 8002VS nozzles. The post-directed broadcast (PD) applications at 8 to 12 leaf cotton were made with a post-direct fender slide applicator at 25 gpa spray volume. The center 2 rows of each 4-row plot were harvested with a spindle picker modified for plot harvest. Seed cotton was weighed and grab samples were taken from each plot. The grab samples were ginned with a sample gin to determine percent lint turnout and calculate lint yield.

The results indicated, that except for the check and Prowl (pendimethalin) alone at 0.83 lb ai/A applied PRE, treatments of Roundup (glyphosate) alone at 0.75 lb ai/A applied POT at 4 leaf cotton and repeated PD at 8 to 12 leaf cotton or in combination with a PRE herbicide [Prowl at 0.83 or 1.24 lb ai/A, Outlook (dimethamid-P) at 0.75 lb ai/A, Meturon (flometuron) at 1.0 lb ai/A, or Dual II Magnum (S-metolachlor/benoxacor) at 1.24 lb ai/A] showed excellent season long grass and broadleaf weed control (> 90%), and were equivalent to 3 applications (1 leaf, 4 leaf and 8 to 12 leaf cotton) of Roundup at 0.75 lb ai/A. Prowl at 1 lb ai/A applied PRE followed by Roundup at 0.75 lb ai/A applied POT at 4 leaf cotton followed by Valor (flumioxazin) + MSMA (monosodium acid methanearsonate) applied PD at 8 to 12 leaf cotton also had > 90% grass and broadleaf weed control.

Lint yields ranged from 842 lb/A for the check (no herbicide) to 1351 lb/A for Prowl at 1.00 lb ai/A applied PRE followed by Roundup at 0.75 lb ai/A applied POT to 4 leaf cotton followed by Valor + MSMA 0.06 + 2 lb ai/A applied PD at 8 to12 leaf cotton. All treatments showed no difference in lint yield but were higher than the check or Prowl applied alone. In summary, under good early season growing conditions and light to moderate weed infestation PRE herbicides in combination with Roundup did not increase weed control or yield.

WEED MANAGEMENT WITH DUAL MAGNUM AND GLYPHOSATE COMBINATIONS IN COTTON. S.B. Clewis and J.W. Wilcut; Department of Crop Science, North Carolina State University, Raleigh, NC.

ABSTRACT

Experiments were conducted at Clayton, Rocky Mount, and Lewiston-Woodville, NC in 2001 and 2002 to evaluate weed management, crop tolerance, and yield of cotton treated with two glyphosate formulations (Roundup UltraMax and Touchdown 3AE) alone and in combination with Dual Magnum. The objectives were to evaluate glyphosate alone versus glyphosate plus Dual Magnum with or without a late postemergence-directed (LAYBY) for cotton tolerance and yield, and weed control. Cotton varieties tested were Stoneville 4892 BG/RR, Paymaster 1218 BG/RR, Deltapine 5415 RR, Deltapine 451 BG/RR, and Fibermax 989 RR. Herbicide treatments included an untreated check, Roundup UltraMax alone, Roundup UltraMax followed by (fb) a LAYBY of Caparol plus MSMA and NIS, Dual Magnum plus Roundup UltraMax alone, and Dual Magnum plus Roundup UltraMax fb a LAYBY. The herbicide treatments were included with Touchdown 3AE instead of Roundup UltraMax. Herbicide rates were Roundup UltraMax at 1.0 lb ai/A early postemergence (EPOST), Touchdown 3AE at 0.75 lb ai/A EPOST, Dual Magnum at 1.0 lb ai/A EPOST, Caparol at 1.0 lb ai/A LAYBY, MSMA at 2.0 lb ai/A LAYBY, and Induce at 0.25% v/v LAYBY. Both glyphosate systems were used in strip- and conventional-tillage cotton production systems. The experimental design was a split-block with a complete factorial treatment arrangement with 3 replications. Where year, location, tillage, and glyphosate formulation were not significant, data were pooled. All data were subjected to analysis of variance and means were separated using Fisher's Protected LSD at a P=0.05.

Early season cotton injury was minimal with the addition of Dual Magnum to either glyphosate formulation. Weed control and cotton yields were similar for both glyphosate formulations, thus data were averaged over glyphosate formulations. Annual grass control was significantly increased 25-56 percentage points with the addition of Dual Magnum to either glyphosate formulation. Dual Magnum was not beneficial for late season yellow nutsedge control. The addition of Dual Magnum to either glyphosate formulation significantly increased control (10-50 percentage points) of common ragweed, velvetleaf, common lambsquarters, smooth pigweed, and Palmer amaranth. However, Dual Magnum was not beneficial for jimsonweed and morningglory species control. The addition of a LAYBY application significantly increased control (>96%) of all weed species regardless of treatment. Cotton lint yield also significantly increased with the addition of Dual Magnum to either glyphosate formulation alone (105 lb/A) and with a LAYBY (80 lb/A).

Dual Magnum provided residual control to fill a window between the last glyphosate application (4-leaf post over the top) and the LAYBY (12-14 leaf). Dual Magnum allowed for a more effective LAYBY application on small weed seedlings instead of possible larger and harder to control weeds.

TWO-YEAR ASSESSMENT OF 2,4-D PREPLANT INTERVALS IN COTTON. P.R. Vidrine, S.T. Kelly, D.K. Miller, E.P. Millhollon, A.M. Stewart, LSU Agricultural Center, Baton Rouge; P.A. Dotray, J.W. Keeling, W.J. Grichar, Texas Tech Univ. and Texas Agricultural Experiment Station, Lubbock; C.B. Guy, G&H Associates, Tillar, AR; R.M. Hayes, Univ. of Tennessee, Jackson; J.A. Kendig, Univ. of Missouri, Portageville; C.E. Snipes, D.B Reynolds, Mississippi State Univ., Stoneville and Starkville; C.H. Tingle, Univ. of Arkansas, Keiser; A.C. York, J.W. Wilcut, North Carolina State Univ., Raleigh; B.J. Brecke, Univ. of Florida, Milton; D.S. Murray, J.C. Banks, Oklahoma State Univ., Stillwater; E.C. Murdock, Clemson Univ., Florence, SC; J.M. Chandler, Texas Agricultural Experiment Station, College Station; K.L. Smith, Univ. of Arkansas, Monticello; M.G. Patterson, Auburn Univ., Auburn Univ., AL; A.S. Culpepper, Univ. of Georgia, Tifton and Athens; and M.M. Kenty and J. Thomas, Helena Chemical Company, Collierville and Memphis, TN

ABSTRACT

The objective of this study was to determine if the preplant period prior to planting cotton could be safely shortened when two formulations of 2,4-D were applied at 2 rates and at 3 timings.

Acreage devoted to reduced tillage systems is increasing across the Southeast. The use of burndown herbicides to remove cover crops and/or winter weeds is necessary in a preplant management program (York et al., 2001). The use of 2,4-D formulations in the past required at least a 30 day preplant interval from some manufacturers while other companies were vague in planting after applications. To safely shorten the interval of time when applying herbicides prior to planting cotton could save time and allow decision to be made closer to planting time, especially if managing multiple crops. The use of 2,4-D in a short preplant interval to burn down broadleaf weeds would provide an economical and effective component in a stale seedbed management program.

Field studies were conducted in 2001 and 2002 at 24 locations in the Southeast and Southwest (See authors and locations). Treatments consisted of HM9625-B (an ester of 2,4-D) and HM9720 (an amine of 2,4-D). HM9625 was applied at 13 and 26 oz/a whereas HM9720 was applied at 12 and 24 oz/a. Both herbicides were applied at 21, 14, and 7 days prior to planting (DPP) in 2001 and 28, 21, and 14 DPP in 2002. Data recorded include the node of the first fruiting branch, total bolls on the first four fruiting branches, injury, and yield. Data of 21, 14, and 0 DPP across years were analyzed as a factorial using SAS Proc GLM procedures. Partial results from the ANOVA for the full factorial analysis were performed. A square root transformation of means was performed, but showed no differences from the original means in the analyses. Therefore, analyses and means reflect non-transformed data. Where interactions prevented pooling of data, simple effect means were reported by location. Mean separation was achieved using the Waller-Duncan k-ratio test at the 0.05 level of probability.

Results were analyzed from combined location ANOVA for NAFB, bolls plant-1, plant stand, injury and seedcotton yield. The only interactions that occurred were from injury. Cotton injury evaluations were collected at approximately 3 to 4 weeks after planting. The Missouri location showed as much as 86% early-season cotton injury. Later ratings at most locations indicated cotton had recovered from the early-season injury. Pooled data of seedcotton yield showed no significant differences on yield data collected. Cotton recovery was similar to research conducted by York et al., 2001. Rainfall at the various locations did not pinpoint reasons for early-season cotton injury. No differences in yield data indicated the cotton overcame any injury sustained from the 2,4-D applications, regardless of formulations, rates, and timings.

COMMON RAGWEED, MORNINGGLORY, AND PEANUT RESPONSE TO STRONGARM RATES AT DIFFERENT POST TIMINGS. W.J. Everman, S.B. Clewis, J.W. Wilcut; Department of Crop Science, North Carolina State University, Raleigh, NC.

ABSTRACT

Weed Control and Weed-free Peanut Response to Strongarm POST Rates and Timing Studies. Two experiments were conducted at the Upper Coastal Plain Research Station near Rocky Mount in 2001 and 2002 (Four trials total). The objectives were to evaluate peanut response to various rates and application timings for weed control and yield and to evaluate the weed-free peanut response to the aforementioned Strongarm variables. The peanut variety VA-98 R was planted conventionally in raised beds with Temik in-furrow at 7 lb product/A for early season insect control. The weed management options included an non-treated check, Dual Magnum, and Strongarm at various rates and timings. Herbicide rates for weed control study were Dual Magnum at 1.25 lb ai/A preemergence (PRE) for all treatments and Strongarm at 0.004, 0.008, 0.012, or 0.024 lb ai/A postemergence (POST). The herbicide rates for weed-free peanut response study were Dual Magnum at 1.25 lb ai/A PRE + Strongarm at 0.012 lb ai/A PRE for all treatments, and Strongarm at 0.008, 0.012, 0.024, or 0.048 lb ai/A POST. All Strongarm treatments included a NIS at 0.25% (v/v). Herbicide timings for these studies were 21, 28, 35, and 42 days after planting (DAP). The experimental design was a RCBD with a factorial treatment arrangement of four Strongarm POST rates and four application timings with 3 replications. All data were subjected to Analysis of Variance and means were separated using Fisher's Protected LSD at P=0.05. Peanut injury was less than 15% and injury was transitory by late season [~35 days after treatment (DAT)]. Strongarm at all rates was effective for late season common ragweed control when applied within 35 days after planting (DAP). Timely application of Strongarm early in the season at reduced rates is essential for common ragweed control. However, late flushes of common ragweed can be controlled with high rates of Strongarm. Strongarm at all rates was effective for late season entireleaf morningglory control when applied within 28 DAP. Timely application of Strongarm early in the season is essential for entireleaf morningglory control. Common lambsquarters was not responsive to rate of Strongarm POST. Strongarm soil-applied is effective for common lambsquarters control. Peanut yield was reduced as the application time interval was increased. Peanut yields are reduced by competition with weeds. Therefore, timely weed control (early season) is essential for maximizing peanut yields. Strongarm at all rates did not affect weed-free peanut yields when applied POST. Peanut yield was not affected by time of application in a weed-free environment.

Peanut Cultivar Response to Strongarm POST Rate Study. Experiments were conducted at the Upper Coastal Plain Research Station near Rocky Mount and at the Peanut Border Belt Research Station near Lewiston-Woodville in 2002 (two trials total). The objective was to evaluate peanut cultivar response to Strongarm applied POST. The peanut varieties NCV-11, Gregory, and Perry were planted conventionally in raised beds with Temik in-furrow at 7 lb product/A for early season insect control. The herbicide rates for peanut cultivar response study were Dual Magnum at 1.5 lb ai/A PRE, Dual Magnum PRE + Strongarm at 0.012 lb ai/A PRE (for all treatments with POST option), and Strongarm at 0.008, 0.016, 0.024, 0.031, 0.046, or 0.063 lb ai/A POST. All Strongarm treatments included a NIS at 0.25% (v/v). The experimental design was a RCBD with a factorial treatment arrangement of three peanut cultivars and seven Strongarm POST rates with 3 replications. All data were subjected to Analysis of Variance and means were separated using Fisher's Protected LSD at P=0.05. Early season injury at 7-10 DAT was minimal with Strongarm at all rates up to 0.0464 lb ai/A. Peanut injury was transitory and was less than 5% within 30 DAT and was not visually detectable late in the season. There was no peanut variety by herbicide effect, thus data are pooled over variety. Peanut yields were similar for all rates of Strongarm and the non-treated checks in a weed-free environment. Similar results were reported with Strongarm soil-applied.

Strongarm is effective on entireleaf morningglory only when applied within 28 DAP. Reduced rates of Strongarm are only effective on common ragweed when applied within 35 DAP,

however, Strongarm can be utilized later in the season at higher rates. Strongarm rates and application timings did not affect peanut yield. Therefore, Strongarm has a wide window of rate application and flexibility in respect to peanut tolerance, creating the opportunity for Strongarm to be used as a late season salvage treatment. However, crop rotation restrictions must be taken into consideration with a late season Strongarm application.

EFFICACY OF FOUR-WAY TANK MIXTURES APPLIED TO PEANUT (*ARACHIS HYPOGAEA* L.). S.R. Hans, D.L. Jordan, J.E. Lanier, A.C. York, and J.W. Wilcut. Department of Crop Science, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

Peanut producers apply a wide range of agrichemicals throughout the growing season to control pests and to optimize crop growth and development. Timing of application of agrichemicals often coincides, and growers prefer to apply agrichemicals simultaneously when possible. In most instances, sufficient information is available concerning tank mixtures that contain two agrichemicals. However, little information is available for growers who apply three or more agrichemicals in one tank mixture. Defining the compatibility of agrichemical mixtures is important when developing pest management strategies.

Field experiments were conducted to evaluate the efficacy of clethodim, and 24-DB applied alone or in a factorial arrangement of treatments consisting of five levels of fungicide (no fungicide, azoxystrobin, chorothalonil, tebuconazole, or BAS 500), two levels of insecticide (no insecticide or lambda-cyhalothrin), and three levels of foliar fertilizer/plant growth regulator (none, boron, or prohexadione calcium). Clethodim was applied to large crabgrass [*Digitaria sanguanilis* (L.) Scop.] (6 to 10 cm in height) and 2,4-DB was applied to tall morningglory (*Ipomea purpurea*) (20 to 30 cm runners) and sicklepod [*Senna obtusifolia* (L.) Irwin and Barneby] (20 to 40 cm in height). A crop oil concentrate was included with clethodim. Nitrogen solution was included with all treatments containing prohexadione calcium. Visual estimates of percent weed control were recorded approximately 3 weeks after application on a scale of 0 (no control) to 100% (complete control). The experimental design was a randomized complete block with treatments replicated 3 or 4 times. Experiments for large crabgrass were conducted three times, while experiments for sicklepod and tall morningglory work conducted twice each. Data were subjected to analysis of variance appropriate for the factorial treatment arrangement. Means of significant main affects and interactions were separated using Fisher's Protected LSD at $p \leq 0.05$.

Large crabgrass control by clethodim was reduced by the addition of tebuconazole in one trial, chlorothalonil and BAS 500 in two trials, and azoxystrobin in three trials . However, the addition of prohexadione calcium increased control by clethodim plus chlorothalonil or azoxystrobin in two experiments. Boron also increased large crabgrass control by clethodim plus azoxystrobin one experiment. Sicklepod control by 2,4-DB was reduced by the addition of tebuconazole in one experiment. Sicklepod control by 2,4-DB plus azoxystrobin was increased by the addition of boron or prohexadione calcium. The addition of boron also increased sicklepod control by 2,4-DB plus chlorothalonil. Prohexadione calcium decreased sicklepod control by 2,4-DB plus tebuconczole. Tall morningglory control by 2,4-DB was not affected by the addition of other agrichemicals. Lambda-cyhalothrin did not affect the efficacy of clethodim or 2-4-DB.

GEORGIA PEANUT (*ARACHIS HYPOGAEA*) RESPONSE TO FLUMIOXAZIN TIMING, RATE AND FORMULATION. T.L. Grey*, E.P. Prostko*, W.K. Vencill**, and W.C. Johnson, III***. College of Agriculture and Environmental Sciences, University of Georgia, Tifton* and Athens**, and USDA/ARS***, Tifton, GA.

ABSTRACT

Flumioxazin (Valor) applied preemergence (PRE) controls many broadleaf weed species in peanut. The initial peanut registration label of 2001 stressed the importance of timely PRE application and that flumioxazin treatments made to at-crack or to emerged peanut could be very injurious. Previous research had noted some early season injury from flumioxazin applied PRE but these reports indicated that injury was transient and not observed later in the season. With the first year of on farm use of flumioxazin in 2001, came reports of significant peanut injury from Georgia, Oklahoma, and North Carolina. This injury was noted in many grower fields and university research trials. Specifically, emerged peanut exhibited swollen stems, black spots on the stems, cotyledons and leaves, drooped leaves, and poor early season growth. Issues of formulation were first questioned in that the marketed flumioxazin was a 50WG where previous research was conducted with a 51WP. The peanut use rates of 0.07 and 0.10 kg ai/ha was set as a result of years of field research, were also questioned. PRE application timing was considered an issue as a 2 day window is all that was allowed on the label. If applied after that 2 day window, the potential for peanut injury would increase.

The registration of flumioxazin for peanut provided a tool that has an alternative mode of action for weed control (PPO inhibitor), offers excellent Florida beggarweed and other weed species control, and has a low carryover potential that makes it an excellent herbicide for peanut producers that rotate to fall vegetables, and gives greater flexibility in corn and cotton rotational schemes. However, injury concerns in 2001 associated with PRE application were unexpected and undefined. Research was initiated to address these injury issues; specifically in the areas of formulation, timing, and rate. To better understand crop tolerance and address injury concerns, a series of field experiments were initiated by several University of Georgia researchers.

Six field experiments were conducted (one in 2001 and five in 2002) to determine dose, formulation, and timing response to flumioxazin on Georgia green peanut. Flumioxazin timing studies determined the affect of flumioxazin PRE applied out to 10 days after planting (DAP), and up to 5 days before and 6 DAP, while flumioxazin formulation, rate, and method of application studies investigated the effects on peanut tolerance and yield.

There was an increase in injury from flumioxazin as a result of timing and rate for all trials. Specifically, injury from delayed applications of flumioxazin increased with DAP, and was greatest at 10 and 6 DAP flumioxazin application. Injury from these delayed applications was evident through early season (36-51 DAP) and late season ratings (118 DAP). Peanut width was reflective of injury, with narrowing of peanut canopy as injury increased. For one study, peanut width was similar to the non-treated check for all treatments by 63 DAP. Early season necrosis and chlorosis was evident at 17 DAP for flumioxazin applied at 0.07, 0.1, 0.21, and 0.42 kg/ha on the day of planting. This and other injury symptoms, including stunting, was evident at 28 and 39 DAP. These rates correspond to 2, 3, 6, and 12 oz/ac of Valor, respectively. However, by the end of the season, peanut injury was only evident at the 6 and 12 oz rates. These data indicate that peanut can tolerate flumioxazin concentrations up to 2x the recommended rate without affecting yield if applied on the day of planting. Injury was not related to the WP or DG formulations. Timing of application is critical in that increased injury can occur with applications made later that 2 DAP. Therefore, following label registration directions is critical when applying Valor in peanut.

POTENTIAL SAFENERS FOR COMMAND IN WATER-SEEDED RICE. C.R. Mudge, E.P. Webster, W. Zhang, and C.T. Leon Department of Agronomy, Louisiana State University AgCenter, Baton Rouge.

ABSTACT

In 2001, several Louisiana rice producing parishes received a supplemental label for Command impregnated on fertilizer to be used in water seeded rice. This Command/fertilizer mixture is applied to pegging (PEG) rice. PEG refers to the growth stage at which the primary root penetrates the soil surface, usually occurring 4 to 7 d after planting.

A field study was conducted at the Rice Research Station near Crowley, Louisiana to evaluate the potential safening effects of Londax and Permit when impregnated with Command on urea in water seeded rice. 'Cocodrie' rice was water seeded on April 25, 2002 at 150 lbs/A. A randomized complete block design was used with four replications. Treatments included 1.1 pt/A Command plus Londax or Permit at 0.25 and 1.0 oz/A impregnated on urea fertilizer (46-0-0) and applied at 150 lb/A on pegging (PEG) rice. Command impregnated on urea followed by a postemergence (POST) application of 1.0 oz/A Londax or Permit on three to four leaf rice, and no POST were added as comparisons. POST treatments were applied 14 d after PEG (DAPEG) with a CO_2 backpack sprayer calibrated to deliver 15 GPA.

Bleaching of rice foliage and control of barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.] and rice flatsedge (*Cyperus iria* L.) were evaluated at 14 DAPEG and 7 and 14 DAPOST. Rice stand was evaluated 7 DAPOST and plant height at 7 and 14 DAPEG. Rice was harvested for yield with a small plot combine and grain moisture was adjusted to 12%. Data were analyzed using ANOVA and means separated using Fisher's protected LSD at 0.05 probability.

Bleaching of rice foliage with single applications of Command PEG was 30 to 38% 14 DAPEG. However, Command plus the addition of 1.0 oz/A Londax or both rates of Permit impregnated on 150 lb/A urea at the PEG timing reduced bleaching to 16 to 20%, indicating a safening effect. At 7 DAPOST, the safening strengthened with Command plus Londax or Permit at 1.0 oz/A PEG as the bleaching was reduced to 6% compared with 31% for Command alone.

Barnyardgrass control was 89 to 98% for all treatments at all rating dates. A single application of Command did not control rice flatsedge. However, all treatments containing Command plus Londax or Permit controlled rice flatsedge at least 75%.

Rice stand and height were less affected by any herbicide combination compared with a single application of Command. There were no differences in rice yield between any treatments containing Command.

Results suggest that combinations of Command plus Londax or Permit impregnated on urea can safen rice from bleaching caused by Command without a reduction in weed control. Such combinations help broaden weed control spectrum and reduce number of applications, variable cost, and off-site Command movement.

WEED SUPPRESSION POTENTIAL IN INDICA RICE LINES FOR THE SOUTHERN U.S. D.R. Gealy, H.L. Black, W. Yan, and J.N. Rutger. Dale Bumpers National Rice Research Center, USDA-ARS, Stuttgart, AR

ABSTRACT

Weed control is one of the key challenges to sustainable rice production systems in the southern U.S. Rice cultivars that naturally suppress weeds have been the topic of numerous recent research efforts worldwide. Several indica rice lines from the Philippines, including ‘PI 312777’, have consistently been suppressive to barnyardgrass in drill-seeded rice in Arkansas and show promise as economically viable components of reduced herbicide systems. Other indica rice cultivars recently imported from China have yielded substantially more than the highest-yielding U.S. tropical japonica commercial cultivars. In a two-year field study at Stuttgart, AR, we compared the barnyardgrass-suppression and yielding abilities of eleven indica cultivars and improved indica lines, and the commercial hybrid rice ‘XL8’ with the southern U.S. commercial tropical japonica cultivars, ‘Drew’ and ‘Bengal’. In 2001 when no grass herbicide was applied, heavy barnyardgrass infestations resulted in poor weed suppression and low yields for all rice entries. In 2002, the reduced rate of 1 kg/ha propanil was applied at the three-leaf stage to supplement barnyardgrass suppression. XL8 provided 72% visual control of barnyardgrass, while ‘PI 312777’ and the indica x indica crosses, ‘8004’ and ‘8010’ provided 55 to 60% control. By comparison, ‘Drew’ and ‘Bengal’ provided 48 and 40% control, respectively. Visual control levels were usually negatively correlated with mid-season barnyardgrass biomass levels. Although numerous indica cultivars have yielded more than U.S. commercial cultivars in previous studies at Stuttgart, only ‘4593’ from China out-yielded ‘Drew’ and none out-yielded ‘Bengal’ in our studies. Heavy rainfall between rice planting and emergence probably reduced the overall suppression of barnyardgrass in both years. Many of the indica lines lodged before harvest in both years (especially 2001). This led to difficulties in harvest operations and loss of seed, and may account for the relatively few yield differences among cultivars.

EFFECT OF NEWPATH RATE AND TIMING ON WEED CONTROL IN RICE. B.J. Williams, D.B. Copes, and A.B. Burns; Northeast Research Station, St. Joseph, La., Louisiana State University Agricultural Center, Baton Rouge, La. 70803.

ABSTRACT

The effect of Newpath (imazethapyr) rate and timing on barnyardgrass control in Clearfield rice was evaluated in 2002 at the Northeast Research Station near St. Joseph, La. on a Sharkey clay soil. Newpath was applied at 2, 4, 6, 8, and 16 oz/A to 1-2, 2-3, 3-4, and 4-5 leaf barnyardgrass, applications were also made to barnyardgrass with 1 and 2 tillers. To prevent additional barnyardgrass flushes 1 lb ai/A pendimethalin was applied 3 days after each Newpath application. The 2-3 leaf applications were made eight days after the 1-2 leaf applications. The 2-3 leaf applications were followed by the 3-4 leaf applications one day later, and the 4-5 leaf applications were made the next day. The one tiller applications were made four days after the 4-5 leaf applications. The 2 tiller applications were made eight days after the 1 tiller applications. Clearfield rice 'CL 161' at 110 lb/A was drill seeded in rows 7.5 inches apart. Permanent floods were established 4 to 5 weeks after planting. Nitrogen, in the form of prilled Urea, was applied at 126 kg/ha just before permanent flood. Herbicide treatments were applied, in water using a CO_2 pressurized backpack sprayer calibrated to deliver 15 GPA to plots measuring 7 by 15 feet. The experimental design was a randomized complete block with a factorial treatment arrangement. Barnyardgrass control ratings were subjected to analysis of variance. Means were separated using Fisher's Protected LSD at the 5% level. Newpath application timing affected barnyardgrass control more than application rate. Overall, barnyardgrass control was best when Newpath applications were made at or before the 2-3 leaf stage. Control, especially at 6 and 9 WAT, declined rapidly as Newpath applications were made to increasingly larger barnyardgrass. Barnyardgrass control was 90% or better when Newpath was applied at the 1-2 leaf stage, regardless of Newpath rate. When Newpath applications were made at the 2-3 leaf stage at least 4 oz/A of Newpath was required for 85% or better control. At 3 WAT, barnyardgrass control was similar when 2 to 4 oz/A Newpath were applied at the 3-4 and 4-5 leaf stages. Increasing Newpath rates to 6 oz/A improved barnyardgrass control 10 to 20% when applications were made at the 4 to 5 leaf stage. Barnyardgrass control 6 WAT generally increased as Newpath rate increased up to 6 oz/A. At least 8 oz/A was required for 80% barnyardgrass control 6 WAT when applied at the 4 to 5 leaf stage. After tillering, not even 16 oz/A Newpath resulted in better than 80% barnyardgrass control 3 WAT or 60 to 70% control 6 WAT. This research indicates that barnyardgrass control with Newpath is strongly influenced by application timing and applications should be made at or before 3-4 leaf stage.

MESOTRIONE AND FLUMIOXAZIN IN RICE. B.A. Hinklin, J.A. Kendig, R.M. Cobill and P.M. Ezell, University of Missouri Delta Center, Portageville, MO 63873

ABSTRACT

Mesotrione (Callisto) and flumioxazin (Valor) are two newer herbicides currently registered for corn (*Zea mays L.*) and soybeans (*Glycine Max L.*). In preliminary research, rice appeared to be tolerant and several common rice weeds were controlled.

To further evaluate the weed control potential, mesotrione and flumioxazin were evaluated in several rice weed control experiments.

Mesotrione and flumioxazin were applied preemergence (PRE), postemergence (POST), PRE-tank mixed with clomazone (Command) and POST following command. Rates were 0.16 and 0.09 lb ai/A for PRE and POST mesotrione, respectively, 0.064 lb ai/A for flumioxazin and 0.5 lb ai/A for clomazone. These were the currently labeled rates of mesotrione and flumioxazin for corn and soybean respectively. Postemergence treatments were applied with either crop oil concentrate at 1.25% v/v or nonionic surfactant at 0.25% v/v.

Selected treatments were included in seven experiments conducted in 2002 on a Portageville clay at the University of Missouri Delta Center at Portageville and on a Crowley silt loam at the Missouri Rice farm at Glennonville, Missouri. Treatments were applied with a CO_2 backpack sprayers at a 20 gpa application volume, with Tee Jet AI10015 tips at approximately 40 psi. Plots were heavily infested with barnyardgrass (*Echinochloa crus-galli*) and hemp sesbania (*Sesbania exaltata*). The rice variety was Cocodrie. Visual ratings were taken shortly before permanent flood and approximately two weeks after permanent flood. Experiments were randomized complete blocks with four replications.

Mesotrione caused 25 to 50% rice injury in preliminary multispecies studies. Some rice bleaching was observed in these studies; however, rice had fully recovered by the time of preflood ratings. Mesotrione and flumioxazin provided poor barnyardgrass control, and are used primarily for broadleaf weed control in registered crops. Clomazone treatments were inconsistent and provided 0 to 96% barnyardgrass control. Mesotrione provided 55 to100% hemp sesbania control with a mean of 90% control. Flumioxazin provided 75 to 100% hemp sesbania control with a mean of 91% control.

Mesotrione and flumioxazin may have the potential to control broadleaf weeds in rice. Further research is needed to determine if mesotrione has adequate crop safety. Also, at current prices, mesotrione and flumioxazin are more expensive than several existing broadleaf herbicides in rice.

EFFECTS OF BARNYARDGRASS DENSITY ON RICE YIELDS. K.V. Tindall, B.J. Williams, E.P. Webster and M.J. Stout. LSU Ag. Center, Baton Rouge, LA 70803.

ABSTRACT

Barnyardgrass, *Echinochloa crus-galli* Beauv., is a world-wide problem in numerous agroecosystems. Barnyardgrass is the second most troublesome graminaceous weed pest in rice production systems in the United States. One barnyardgrass plant/m^2 has been shown to reduce yield by 65 kg/ha; 10 plants/m^2 reduced yields by 10% and 57 plants/m^2 reduced yields by 50%. Studies in other crop systems have investigated yield components to determine which components contribute to yield reductions. However, research examining yield components has not been conducted in rice. The purpose of these experiments is to determine from where rice yield losses originate by examining yield components in response to varying densities of barnyardgrass.

Experiments were conducted in north Louisiana at two Louisiana Agricultural Experiment Stations: Northeast Research Station and Macon Ridge Branch Station in 2002. Experimental design was a randomized block design with three replications. Rice (var. 'Cocodrie') was drill-seeded at 100 lb seed/A. Plots were 2.03 m X 4.57 m. Herbicide applications were made to achieve varying levels of weed pressure. Herbicide treatments were: 0.2 lb ai/A Command (clomazone) applied preemergence (PRE), 0.4 lb ai/A Command applied PRE, 0.6 lb ai/A Command applied PRE, 0.4 lb ai/A Command applied PRE followed by 0.19 lb ai/A Clincher (cyhalofop) at the 4-5 leaf rice stage, 0.6 lb ai/A Command applied PRE followed by 0.19 lb ai/A Clincher at the 4-5 leaf rice stage, and no herbicide applied. Vegetation was removed from two 1ft^2 areas of each plot one to two days prior to flooding. Plants were grouped by plant species and counted. Yield data was collected. Additionally, one week prior to harvest, 10 rice plants were removed from each plot. Each plant was used to collect the following data to assess the impact of weed on yield components: rice biomass (dry weight), weight of 100 seeds, and number of tillers, panicles, and seeds per panicle. Data gathered from these treatments were analyzed in SAS using regression analysis.

Increasing densities of barnyardgrass caused an increased reduction in all yield components with the exception of seed weight. One barnyardgrass plant/m^2 reduced overall yield by 71.04 kg/ha and 30 barnyardgrass plants/ m^2 reduced yields by 50%. Biomass of rice was reduced by 0.1686 g/plant by one barnyardgrass plant/m^2. Twenty-five barnyardgrass plants/m^2 reduced biomass by 50%. A reduction of one tiller and panicle was caused by the presence of 12 and 18 plants/m^2, respectively. A 50% reduction in number of tillers and panicles was caused by 22 and 28 barnyardgrass plants/m^2, respectively. Two barnyardgrass plants were required to reduce seed/panicles by one. Fifty-six barnyardgrass plants/m^2 reduced number of seeds/panicle by 50%.

Yield reductions seen in these experiments were similar to those found previously. Biomass of rice and numbers of tillers, panicles, and seeds per panicle were reduced as density of barnyardgrass increased. Therefore, all yield components, with the exception of seed weight contributed to overall yield loss. At low barnyardgrass densities, percent reduction was greatest for seeds per panicle. However, as density of barnyardgrass increased, biomass was the yield component most affected, indicating stand reductions occurred at higher densities. Similarly, experiments with spring wheat showed that wheat stands, spikes/m row, and seeds per spike decreased in response to increasing densities of thistles, whereas seed weight had little impact on overall yield. Although, reductions in other yield components contribute to overall yield loss, studies in soybeans and wheat showed that biomass of the crop plants were most affected by increasing weed pressure.

ITALIAN RYEGRASS (*LOLIUM MULTIFLORUM*) CONTROL WITH WHEAT HERBICIDES. J.R. Martin, D.L. Call, and J. James; Department of Agronomy, University of Kentucky, Princeton.

ABSTRACT

Current herbicide options used for managing Italian ryegrass in wheat are somewhat costly, inflexible in regards to application timing, and have antagonism problems when tank mixed with certain other herbicides. Also, repeated use of some options such as diclofop-methyl or tralkoxydim may increase the risk of developing populations that are resistant to Accase inhibiting herbicides.

Studies were conducted at UKREC in Princeton, KY during the last three years to compare and evaluate certain postemergence herbicides recently registered for ryegrass control as well as experimental products being developed for controlling weedy grasses in wheat. Studies were designed to evaluate the impact of the stage of growth of Italian ryegrass and tank mixing with other herbicides.

The first study evaluated Italian ryegrass control with tralkoxydim at 0.18 and 0.24 lb ai/A; premix of flufenacet at 0.34 lb ai/A plus metribuzin at 0.09 lb ai/A; clodinafop-propargyl at 0.063 lb ai/A; flucarbazone at 0.027 lb ai/A; diclofop-methyl at 0.5, 0.75, and 1 lb ai/A; and AE F13006000 at 0.014 lb ai/A (proposed name mesosulfuron-methyl) plus a safener (AE F10789200) in Pioneer 2552 wheat. The second study evaluated ryegrass control with imazamox at 0.031, 0.039, and 0.047 lb ai/A in an experimental Clearfield wheat that is tolerant to imidazolinone herbicides. The third study evaluated the potential antagonism of the premix of thifensulfuron at 0.016 lb ai/A plus tribenuron at 0.008 lb ai/A on postemergence control of Italian ryegrass in a fallow area with tralkoxydim at 0.18 lb ai/A, imazamox at 0.039 lb ai/A, clodinafop-propargyl at 0.05 lb ai/A, flucarbazone at 0.027 lb ai/A, diclofop-methyl at 0.75 lb ai/A, and AE F13006000 at 0.014 lb ai/A. Adjuvants were included, when required, according to manufacture' s recommendations. Diclofop-methyl, tralkoxydim, and flucarbazone are currently registered and available for controlling Italian ryegrass; whereas, flufenacet plus metribuzin premix, clodinafop-propargyl, and imazamox (for Clearfield wheat only) are not registered for use in wheat in Kentucky.

A randomized complete block design with 3 replications was used in all studies. Treatments were applied with a hand-held CO_2 pressurized sprayer in a 20 GPA spray volume.

Clodinafop-propargyl and diclofop-methyl provided equal or better control relative to tralkoxydim, flufenacet plus metribuzin premix, or flucarbazone. Diclofop-methyl applied to 2 to 4 leaf Italian ryegrass at 0.5 lb ai/A provided at least 87% Italian ryegrass control and was similar to that observed with diclof0.75 lb ai/A and 1 lb ai/A; however, the 0.5 lb ai/A rate was less consistent relative to the higher rates when the treatment was applied to 2 to 3 tillered weeds. Control of 2 to 3 leaf and 2 to 3 tillered Italian ryegrass with tralkoxydim, flufenacet plus metribuzin premix, and flucarbazone was more consistent, and in some instances significantly greater, compared with the same herbicides applied to fully tillered plants. AE F13006000 was equally effective relative to clodinafop-propargyl and diclofop-methyl for small Italian ryegrass plants, but efficacy for AE F13006000 on larger Italian ryegrass is needed.

Imazamox at 0.039 lb ai/A or 0.047 lb ai/A provided at least 90 % control of 2 to 3 leaf and 2 to 3 tillered Italian ryegrass, but was usually less effective on controlling fully tillered plants. Italian ryegrass control with imazamox at 0.031 lb ai/A tended to be more erratic when compared with that observed with 0.039 lb ai/A and 0.047 lb ai/A rates. Italian ryegrass control was often reduced when the premix of thifensulfuron plus tribenuron was used as a tank mix partner. This antagonism was significant in one experiment with tralkoxydim, clodinafop-propargyl, and diclofop-methyl. In another experiment, the premix of thifensulfuron plus tribenuron or dicamba caused antagonism to imazamox at 0.031 lb ai/A when they were applied

as tank mix partners to fully tillered Italian ryegrass, but they did not limit control of ryegrass plants that were in the 4 to 5 leaf stage.

Most of the herbicides in these studies are capable of providing effective control of Italian ryegrass in the 2 to 4 leaf stage. Delaying applications until plants have 2 to 3 tillers may occasionally reduce control. However, delaying the applications until ryegrass plants are fully tillered, results in a strong trend for poor control with such herbicides as tralkoxydim, flufenacet plus metribuzin premix, and flucarbazone. Clodinafop-propargyl and diclofop-methyl are equal or superior options for controlling Italian ryegrass relative to tralkoxydim, flufenacet plus metribuzin premix, or flucarbazone. Although AE F13006000 effectively manages small Italian ryegrass plants, information on its potential to control large ryegrass is needed. Thifensulfuron plus tribenuron can limit the control of Italian ryegrass when tank mixed with tralkoxydim, imazamox, clodinafop-propargyl, and diclofop-methyl.

EVALUATION OF NEW WEED MANAGEMENT OPTIONS IN WHEAT. G.N. Rhodes, Jr. and G.K. Breeden; University of Tennessee.

ABSTRACT

Wheat (*Triticum aestivum*) is important for uses other than flour milling. In Tennessee, cattle producers use it for hay, silage, or winter forage in a rotational grazing system. The straw from wheat can be used as bedding for livestock and other animals. Straw is also used by homeowners and construction companies to aid in grass establishment and to help prevent erosion. Any of the end users want a product as weed free as possible. Ryegrass (*Lolium multiflorum*) continues to be a costly problem in wheat as well as in other crops. This cool season grass competes with wheat for nitrogen and, thereby, reduces yields dramatically. Current management inputs for annual ryegrass include crop rotation, use of nonselective herbicides or tillage in fallow fields, and in-crop applications of Hoelon or Achieve.

Field studies were conducted at Milan (Hoelon-resistant population) and Spring Hill (Hoelon-sensitive population), TN during 2001-02 to evaluate new herbicides for ryegrass control, winter annual broadleaf control and crop tolerance. All experiments were replicated 4 times in a randomized complete block design. New herbicides included in the research were Axiom, Domain and Everest. Hoelon and Achieve were included as standard treatments. Axiom was applied at 10 or 12 oz./A early postemergence (EPOST). Domain was applied at 4 oz./A EPOST. Everest was applied at 0.61 oz./A mid postemergence (MPOST) by itself and as a follow up to Axiom 10 oz./A EPOST and Domain 4 oz./A EPOST. All applications of Everest included Activator-90 at 0.25%. Achieve was applied at 9.6 oz./A EPOST. Applications of Achieve included Supercharge at 0.5%. Hoelon was applied at 1.33 pts./A EPOST. All applications were made with a CO_2 pressurized backpack sprayer at 15 gpa. Plots were visually rated using a 0-99% scale. The center section of each plot was harvested for yield.

At Milan at 19 weeks after planting (WAP), all treatments provided excellent (90% or greater) control of Hoelon resistant ryegrass with the exception of Achieve, Domain and Hoelon. At 24 WAP Achieve, Domain, Everest alone and Hoelon were the only treatments that did not provide 92% or greater control. No wheat injury was observed, and applications of Axiom 10 oz./A, Everest alone and Domain followed by Everest increased yields when compared to a weedy check.

At Spring Hill at 22 WAP, all treatments provided good control (85% or greater) of Hoelon sensitive ryegrass except Domain alone. At 26 WAP Axiom at 10 and 12 oz./A was providing fair control (83 and 84%, respectively). All other treatments provided excellent control (88% or greater) except Domain and Everest. At this location there were two broadleaf weeds, mouseear chickweed (*Cerastium vulgatum*) and ivyleaf speedwell (*Veronica hederaefolia*). Achieve, Everest and Hoelon were the only treatments that did not provide excellent control (92% or greater) of these two weeds. No treatment exhibited more than 5% crop injury and all increased yield when compared to a weedy check.

Our research indicates that both Axiom and Everest are promising for ryegrass (both Hoelon resistant and sensitive) control in wheat. Control tended to increase when Axiom was applied EPOST followed by a MPOST application of Everest. Axiom would also provide another option to control some winter annual broadleaf weeds.

USING GLOBAL POSITIONING SYSTEMS TO DETECT COGONGRASS (IMPERATA CYLINDRICA L.) IN CONJUNCTION WITH MISSISSIPPI'S ERADICATION PROGRAM. R.S. Wright, J.D. Byrd, Jr., L.M. Bruce, and K.D. Burnell; Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Cogongrass has become problematic in forests, pastures, turf, and along highways, railroads, and utility rights-of-way in Mississippi. Cogongrass has primarily been documented in the southeastern part of the state; however, after surveying MDOT (Mississippi Department of Transportation) maintained highways and interstates, cogongrass has spread north and west through Mississippi. Efforts have been made to establish a Noxious Weed or Invasive Weed law that will focus on education and control options for cogongrass. A pilot eradication program for this aggressive weed could help minimize spread in less infested areas. Frequent mowing and highway construction have greatly increased MDOT interest in problems that cogongrass poses for private land near highways. Assistance provided through this survey, helped familiarize MDOT personnel with cogongrass identification and levels of infestation across Mississippi. Vehicle-mounted GPS (global positioning systems) were used to accurately and efficiently document colonies of cogongrass. All visible populations along MDOT rights-of-way as well as populations documented by herbarium specimens and written documentations mapped have been or will be documented using GPS. Terrain Navigator topographic software ® was used to combine all data. In Mississippi, 44 of 82 counties have at least one documented population of cogongrass. The data from this survey will help determine the feasibility of the proposed eradication program, and boundaries can be established accordingly. Also, in conjunction with satellite imagery these data will assist with determining the feasibility for population detection.

ENVIRONMENTAL APPLICATIONS OF REMOTE SENSING: DETERMINATION OF CROP RESIDUES ON SOIL SURFACES USING HYPERSPECTRAL REFLECTANCE.
W.G. Powell, J.H. Massey, M.S. Cox, L.M. Bruce, D.L. Evans, M.L. Tagert and D.R. Shaw, Department of Plant & Soil Sciences, Mississippi State University, Starkville 39762.

ABSTRACT

With more than one-third of the cropland in the United States classified as highly erodible, minimizing water quality impacts of herbicides and sediment carried by non-point source runoff is a concern of agricultural and environmental communities. The amount of crop residue present on the soil surface plays an important role in reducing runoff losses and improving water quality. By leaving more crop residue on the soil surface, no-till or reduced-tillage practices increase water infiltration and minimize soil erosion, thereby reducing herbicide and sediment loads in surrounding water bodies. As a result, the percentage of a soil's surface that is covered by crop residue is an important factor used to assess the non-point source (NPS) contamination potential of a water body. Current methods used to determine percent residue cover are time consuming and subjective. For example the line transect method, currently the method of choice for the USDA NRCS, must be repeated many times to provide an accurate estimate of percent residue cover; the repetition necessary for accurate residue determinations becomes impractical on large scales. Improved methods are needed to better quantify crop residue coverage on watershed scales. This laboratory study was designed to determine the feasibility of using hyperspectral reflectance to detect and quantify crop residues on soil surfaces. To do this, the best spectral reflectance bands for differentiating crop residues from soil were to be determined as well as the effect of natural residue decomposition and moisture content on our ability to detect/quantify crop residues on soils. Determining the extent of such abilities is a necessary step towards developing a more practical method of assessing crop residue coverage. Hyperspectral reflectance data were acquired using a hand-held spectroradiometer for four mature crop residues (corn, cotton, wheat, and soybean) at varying stages of decomposition and four Mississippi soils at five moisture levels. The data were processed using receiver operating characteristics to determine the prime spectral bands and Fisher's linear discriminate analysis to group the bands based on their level of utility to determine the best wavelengths to distinguish between the various soil-crop residue combinations. Our ability to differentiate between soil and crop residue for the different soil-crop residue pairs approached 100% and was found to be independent of residue age (decomposition) and moisture content when using the automated classification system. Twenty reflectance wavelengths between 1280 and 1300 nm were identified as the best spectral bands for differentiating between crop residues and soils. Discriminant analyses were next performed using combinations of these twenty best spectral bands. Soil-crop residue discrimination accuracies ranging from 83 to 97% were achieved using three or more of the identified spectral bands. As expected, as the number of bands included in the discriminant analyses increased, so did our overall ability to differentiate between the crop residue and a given soil. Having isolated the twenty best crop residue-specific reflectance bands that result in high classification accuracies in the laboratory, the next step is to determine if this technique is accurate in the field. The ability to use remote sensing to estimate crop residue coverage on soil surfaces would improve the accuracy and timeliness of NPS runoff estimations at the watershed scale.

ASSESSMENT OF SAMPLING TECHNIQUES FOR GENERATION OF SITE-SPECIFIC SPRAY MAPS IN SOYBEAN. J.W. Easley, D.R. Shaw, and M.L. Tagert; Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Producers are attempting to reduce input costs while maintaining productivity by integrating new technologies as they are developed. One technology producers are evaluating to assist in attaining this goal is site-specific pesticide application, including herbicides. In order to generate a site-specific spray map, weed distributions must be accurately mapped across a field. This is generally a labor-intensive process, since some type of grid sampling system must be implemented. This is a very time consuming process if done on a scale fine enough to accurately estimate weed distributions.

This research was conducted on multiple soybean fields located in eastern Mississippi in 2002. Data were collected from these fields using several methods. The first scouting technique employed overlaying fields with 0.25-ha grids, and then sampling at the center of each grid. At each sample location, weed counts were taken of all weeds present within a 10-m^2 area. In addition, weed size, crop size, field conditions, and time involved in sampling were also recorded. The second method of scouting these fields involved tracing the perimeters of weed patches with a GPS unit based on visual estimates of above-threshold populations. In addition to the two methods of physically scouting the fields, 0.5-m multispectral imagery was collected within 5 days of scouting the fields. This imagery was another attempt to locate weeds within each field, for use in generating site-specific maps. ERDAS Imagine was used to classify the multispectral images for weed patches in each field. Supervised and unsupervised classifications were performed on the fields to try to differentiate weed-free from weedy areas of the field. ArcView 3.2 was then used to generate true weed distribution maps of the fields from the weed count data. These maps were then used to compare with the weed tracing maps.

Perimeter tracing showed general weed distributions, and patches of high weed density; however some patches were missed. Weedy and weed-free areas were effectively differentiated with high classification accuracies from the images. The perimeter tracing method and the use of imagery for scouting both show promise for use in weed detection for the generation of site-specific spray maps. Physically counting weeds on a grid system gives detailed weed maps, but is too time-consuming to be practical for production agriculture.

UTILIZING SPECTRAL REFLECTANCE DATA TO MONITOR MATURITY OF AGRONOMIC CROPS. M.T. Kirkpatrick, J.C. Sanders, L.T. Barber, N.W. Buehring, D.G. Wilson, and D.B. Reynolds, Mississippi State University, Mississippi State, MS.

ABSTRACT

Successful and efficient harvesting of agronomic crops is often dependant on determining physiological maturity of the crop . Once the crop reaches maturity, a potential decline in yield and quality resulting in decreased net return for the producer can occur if the crop is not harvested in a timely manner. Typically, crop maturity is assessed by visual inspection; however, remote sensing can potentially be utilized to predict and determine crop maturity. Remote sensing may be a tactical approach to crop management because it can monitor crop responses throughout the season, and may ultimately assess crop maturity of the entire field rather than a small sample which may or may not represent the majority of the crop population. This study was designed to assess the use of remotely sensed crop data to predict physiological growth stages in corn (*Zea mays*), soybean (*Glycine max*), cotton (*Gossypium hirsutum*), peanut (*Arachis hypogaea*), and sweet potato (*Ipomoea batatas*). The objective of this research was to compare hyperspectral reflectance data with physiological growth stages in corn, soybean, cotton, peanut, and sweet potato. This study was conducted at the Plant Science Research Center in Starkville, MS, and the reflectance data were collected using a handheld spectroradiometer at wavelengths from 350 to 2500nm. The reflectance data were utilized to calculate a Normalized Difference Vegetation Index (NDVI).

The NDVI value of all crops used in this study increased to ~0.8 forty days after planting, which corresponded with the vegetative growth of each plant. Once the NDVI value reached greater than 0.8, the value remained constant representing reproductive growth of each crop. However, corn and soybean, which are determinant crops, decreased in NDVI value to ~0.4 as the crop matured. Cotton, which is an indeterminant crop, also showed a decrease in NDVI value as it matured, but only decreased slightly. Peanut and sweet potato NDVI values remained constant above 0.8 as maturity was approached due to their indeterminant growth habit. Physiological growth stages and crop maturity can be correlated to NDVI values for corn, soybean, cotton, peanut, and sweet potato. From these data, it appears that plant growth habit of these crops greatly influences spectral reflectance values throughout the growing season. Future research may more clearly delineate discrete NDVI values, or slope characteristics of the curve, which correspond to some crop species; however, these preliminary data are inconclusive for peanut and sweet potato.

THE USE OF A POINT-INJECTION SPRAYER IN SITE-SPECIFIC MANAGEMENT PROGRAMS. L.T. Barber, J.C. Sanders, N.W. Buehring and D.B. Reynolds, Mississippi State University, Mississippi State.

ABSTRACT

Cotton (*Gossypium hirsutum*) production requires the use of many agricultural chemicals such as herbicides, insecticides, plant growth regulators, and defoliants. Weed management in cotton production is typically achieved with numerous blanket applications of herbicides before and after crop emergence. Current herbicide applications do not account for the spatial variability in soils, weed populations or species. This results in unnecessary herbicide applications, where no weeds are present, and also decreased control in some areas of the field that may contain higher weed populations or more difficult to control species. Defoliation applications are also applied at a single rate across the entire field, regardless of spatial variation in crop maturity, weeds present, boll count or percent open bolls. These types of applications may result in excessive chemical use, increased production costs and poor efficacy. In a time when commodity prices are low and production costs are high, a more reasonable approach would be to account for the spatial variability of weed populations and of cotton maturity. The purpose of this study was to evaluate a point-injection, site-specific pesticide applicator to determine if herbicides and defoliants can be applied on a site-specific and variable rate basis depending upon the spatial variability present in a cotton field.

Research was conducted in 2002 at the Blackbelt Research Station near Brooksville, MS on a 10 hectare cotton field. Deltapine variety 451BR was planted on 96.5 cm rows on May 6, 2002. The field was divided into 0.2 ha grids. Weed species and densities were recorded at the center of each grid as well as maturity data such as percent open bolls and nodes above cracked boll. The two main weed species were pitted morningglory (*Ipomoea lacunosa*) and horsenettle (*Solanum carolinense*). Species composition and densities for each grid were subjected to a herbicide application decision support system (MSU-HADSS) to determine the most economical herbicide application for each grid. Weed species, density, distribution, and resulting herbicide recommendations were interpolated over the entire field, utilizing an inverse distance weighted function in the SSToolbox software package. The interpolated herbicide recommendation map was transferred to a PCMCIA card (spray card) for use in a point-injection sprayer. Defoliation data consisting of nodes above cracked boll and percient open bolls were also interpolated and variable rate treatments of ethephon + cyclanilide (Finish) and thidiazuron (Dropp) were applied with the point-injection sprayer depending on percent open bolls and nodes above cracked boll in the grid areas. With all site-specific applications, the field was divided in half, where one half was applied site-specifically and the other half was applied conventional broadcast, with a single rate of both herbicide and defoliant treatments. The data that were recorded for herbicide applications consisted of herbicide efficacy (percent control) and weed density reductions 12 and 24 days after treatment (DAT). Defoliation data were recorded as percent defoliation and number of open bolls present before and 8 days after defoliants were applied. Data from within each grid cell were subjected to analysis of variance and separated at the 0.05 percent level of significance to determine if site-specific applications of these compounds were different than conventional broadcast applications.

Site-specific and variable-rate herbicide and defoliant applications were successfully applied with the point-injection sprayer. Herbicides recommended by the MSU-HADSS program included glyphosate (Roundup Ultramax) at both 1.4 and 1.9 L/ha product and pyrithiobac (Staple) at 35 g/ha product. These products and rates were compared to the conventional broadcast application of glyphosate (Roundup Ultramax) at 1.9 L/ha. There were no differences in weed control between the site-specific and broadcast applications. Both application methods controlled pitted morningglory and horsenettle 82 to 85% by 24 DAT. The weed densities were also equally reduced in both application systems. One grid cell of pitted morningglory; however, was only controlled 70% in the site-specific application area. This decreased control can be attributed to the high pitted morningglory density and because no pyrithiobac was

recommended for this site. There was also no difference in percent open bolls or percent defoliation when comparing the variable rates of Finish and Dropp to the conventional broadcasted rates. Both application methods resulted in 85 to 95% of the field being defoliated and 80 to 90% of all bolls were open 8 DAT. These results show that site-specific and variable rate herbicide and defoliation treatments can be applied with a site-specific sprayer and are capable of producing equivalent results to broadcast single rates of these chemicals. Furthermore, this technology allows for decreased rates and product used which in turn will result in decreased chemical and application costs.

SPRAY DROPLET COMPARISONS FOR GLYPHOSATE FORMULATIONS. J.E. Hanks, USDA-ARS, Stoneville, MS; G.D. Wills and E.J. Jones, Delta Research and Extension Center, Stoneville, MS and J.A. Mills, Monsanto, Collierville, TN.

ABSTRACT

Preliminary studies were conducted to evaluate the effects of three glyphosate formulations on spray droplet size. A Malvern laser droplet analyzer was used to determine spray droplet size for three glyphosate formulations; Roundup Original®, UltraMax®, and WeatherMax®. Each glyphosate formulation contains surfactant, but additional surfactant is recommended with Roundup Original®. Two surfactants, SurfAid® and Activate Plus® were evaluated with Roundup Original® at the recommended rate of 0.5% (v/v). Spray solutions were mixed to provide 0.8 kg a.e./ha (0.75 lb a.e./A) in a 94 l/ha (10 gpa) spray volume. All evaluations were conducted using a Spraying Systems Turbo TeeJet® 11003vp nozzle. Volume median diameter and the percentage of spray volume in droplets less than 144 microns were determined with the Malvern laser droplet analyzer, over a range of pressures from 138 to 550 kPa (20-60 psi). Volume median diameter was slightly smaller for all glyphosate formulations compared to water, but there were no significant difference among glyphosate formulations. The percent spray volume in droplets less than 144 microns ranged from 5% to 27% and volume median diameter ranged from 244 to 474 microns over the range of pressures. The addition of Activate Plus® slightly decreased the percent of spray volume in droplets less than 144 microns, whereas the addition of SurfAid® caused a slight increase.

IMPROVED EFFICACY OF GLYPHOSATE WITH ADJUVANTS. M. Singh and S. Singh, University of Florida-IFAS, Citrus Research and Education Center, Lake Alfred, FL 33850

ABSTRACT

The efficacy of a foliar applied herbicide is greatly influenced by adjuvants. Glyphosate is the most commonly used non-selective POST herbicide used under diverse conditions. Lower activity of glyphosate has been observed against some broadleaf and grass weeds. Non-ionic surfactants have been commonly used to improve glyphosate activity; however, not all are synergistic. Recently there is increased interest in using fertilizer, particularly ammonium based adjuvants to increase glyphosate activity. In the present study non-ionic surfactants, Improve and Blaze and an ammonium sulfate based conditioning agent, Condition from GarrCo Products Inc., Converse, IN were compared with Induce, another non-ionic surfactant.

Green house experiments were conducted using two grass and broadleaf weeds to evaluate glyphosate (Rodeo, with no added surfactant) efficacy by tank mixing with 0.5% of Blaze, Condition, Improve and Induce. Seeds of *Echinochola crus-galli* L (barnyardgrass), *Panicum maximum* Jacq. (Guineagrass), *Bidens bipinnata* L. (Spanishnedles) and *Abutilon theophrasti* Medik. (Velvetleaf) were planted in 12 cm plastic pots using Metromix media. Thinning was done a week after emergence and 5 plants per pot were maintained for spraying. Glyphosate at 0, 0.14, 0.28 and 0.56 kg ae ha^{-1} alone and mixed with four surfactants was sprayed at the 4 leaf stage of weeds. Spraying was done with an air pressure chamber track sprayer fitted with a Teejet 8002 flat fan spray nozzle delivering 189 L ha^{-1} volume at 138 kPa pressure. There were 4 replicate pots for each treatment arranged in a completely block design in the green house maintained at 25/16^{O}C day/night temperature. Experiment was repeated under similar conditions. Visual mortality data was recorded at weekly intervals for 4 weeks till herbicide effect was stabilized. Fresh and dry weights were recorded at harvest. Mortality data was arcsin transformed for ANOVA using SPSS software.

All the four surfactants increased the activity of glyphosate by 4 to 16% compared to glyphosate alone. Among the weed species higher mortality was observed in *P. maximum* and *B. bipinnata* followed by *E. crus-galli* and lowest in *A. theophrasti*. Significant differences were observed on the tank mixing of various surfactants on their efficacy against grass and broadleaf weed species. Significantly higher mortality was recorded with tank mixing of Blaze, Condition and Improve over glyphosate alone and Induce for all the weed species. Improve surfactant was more effective on grasses than broadleaf weeds; whereas reverse was true for Condition. Among surfactants lowest mortality on *E. crus-galli* was observed when glyphosate was tank mixed with Condition. Activity of Induce + glyphosate was significantly less at 0.14 and 0.28 kg ae ha^{-1} compared to other surfactants. Induce was more effective on grasses than broadleaf weeds. Blaze was equally effective against both grasses and broadleaf weeds. Statistically both Improve and Condition were at par when mortality was averaged among weed species, but better than Condition and Induce.

EFFECTS OF ADJUVANTS AND SPRAY DROPLET SIZE ON VELVETLEAF CONTROL. J.A. Garr, II, GARRCO Products, Inc., Converse, IN; J.E. Hanks, USDA-ARS, Stoneville, MS; G.D. Wills and E.J. Jones, 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®. Spraying Systems Turbo TeeJet®, 110015vp nozzles were used and calibrated to apply 94 L/ha at 7.4 km/hr. Array®, Spray Start® and Control® were commercially available adjuvants and GP D1 an experimental product evaluated. 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. A Malvern laser particle analyzer was used to determine the volume median diameter and percent spray volume in droplets less than 144 microns. 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. 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.

EFFECT OF DRIFT CONTROL ADJUVANTS ON GLYPHOSATE APPLIED WITH AIR INDUCTION SPRAY NOZZLES. G.D. Wills[1], J.E. Hanks[2], E.J. Jones[1], and R.E. Mack[3], Miss. Agric. And Forest. Exp. Stn.[1], USDA-ARS[2], Stoneville, MS, and Helena Chemical Co., Memphis, TN[3]

ABSTRACT

Research has shown that herbicide application is influenced by the pattern of spray delivery and by the size of spray droplets wherein the smaller droplets result in the greater drift from the target area. Both laboratory and field studies were conducted to determine the effect of six drift reducing adjuvants on the spray pattern, droplet size and efficacy of glyphosate herbicide applied both with and without surfactant using TeeJet® Air Induction 110015VS spray tips. The drift reducing adjuvants and the rates applied are shown in Table 1. Glyphosate was applied at 0.4 lb ai in 10 gallons per acre both with surfactant as Roundup Ultra Max® and without surfactant as either Rodeo® or Roundup D-Pak®. This rate of glyphosate, which was less than the recommended rate of 1 lb ai per acre, was used to detect any increase or decrease in efficacy due to the addition of the drift control adjuvants.

In the laboratory studies, the spray droplet size was determined using an Insitec Measurement Systems® laser particle analyzer in an enclosed chamber with the nozzle installed on a mechanical traversing system. The nozzle was positioned at a height above the laser beam that allowed the entire width of the spray pattern to be traversed through the laser beam. Droplet analyses were repeated three times at 60 psi. Droplet size was determined both as the volume median diameter in microns (Dv. 5) which is the droplet size where half the spray volume is composed of smaller droplets and half of larger droplets and as the percentage of the spray volume resulting in fine droplets less than 144 microns (<144 μ) in diameter.

Spray patterns were determined by using a single nozzle in a stationary position at 13 inches above a slanted sheet of corrugated metal. Spray mixtures were applied in 600-ml volumes at 43 psi to the sheet of corrugated metal with troughs spaced 2.5 inches apart and the discharge was collected in 100-ml graduated cylinders. The values for the average milliliter volumes of three replications as collected at each position from left to right were reversed right to left, added together, and averaged again to show a symmetrical spray pattern for each mixture.

In the field study, mixtures of glyphosate both with and without surfactant were applied with each drift control adjuvant using a tractor-mounted sprayer at 37 psi with eight nozzles spaced 19 inches apart along the boom. Field applications were over-the-top to four rows each of three-trifoliolate-stage non-Roundup Ready® soybean (*Glycine max* L. Merr.) 'Pioneer 9594' spaced 38 inches apart, 40 feet long and interspaced with 4- to 6-inch-tall barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.], 6- to 8-inch-tall pitted morningglory (*Ipomoea lacunosa* Lag.), 2- to 4-inch-tall smooth pigweed (*Amaranthus hybridus* L.), and 6- to 10-inch-tall velvetleaf (*Abutilon theophrasti* Medik.) replicated four times in a randomized complete block design. Efficacy was determined by visual ratings 2 weeks after treatment (WAT), whereby 0 = no control and 100% = complete kill of shoots. Data were subjected to analysis of variance. Means were separated using Fisher's Protected Least Significant Difference (LSD) at P=0.05.

The percent volume of the spray droplets which were below 144 microns in diameter (< 144 μ) with glyphosate applied with and without surfactant respectively; with no drift control adjuvants was 5.7 and 8.2%, with HM 9911 was 8.3 and 7.1%, with HM 2052 was 4.5 and 4.0%, with HM 2005B was 3.3 and 3.6%, with HM 2007 was 3.8 and 3.5%, with HM 2006 was 3.6 and 3.9%, and with HM 9752 was 3.1 and 2.2%.

The volume mean diameter (Dv. 5) in microns with glyphosate applied with and without surfactant respectively; with no drift control adjuvant was 422 and 451 μ, with HM 9911 was 426 and 414 μ, with HM 2052 was 474 and 468 μ, with HM 2005B was 484 and 492 μ, with

HM 2007 was 466 and 462 μ, with HM 2006 was 449 and 462 μ, and with HM 9752 was 585 and 677 μ.

The width of the spray patterns with glyphosate applied with and without surfactant respectively; with no drift control adjuvant was 35 and 35 inches, with HM 9911 was 35 and 35 inches, with HM 2052 was 35 and 40 inches, with HM 2005B was 30 and 30 inches, with HM 2007 was 35 and 35 inches, with HM 2006 was 35 and 40 inches, and with HM 9752 was 20 and 20 inches. Efficacy of glyphosate over all the plant species in the field study at 2 WAT where glyphosate was applied with and without surfactant respectively; with no drift control adjuvants was 68 to 89% and 65 to 76%, with HM 9911 was 70 to 94% and 89 to 100%, with HM 2052 was 74 to 93% and 76 to 95%, with HM 2005B was 86 to 100% and 83 to 95%, with HM 2007 was 84 to 95% and 81 to 98%, with HM 2006 was 89 to 100% and 86 to 100%, and with HM 9752 was 84 to 98% and 89 to 100%.

Each of the drift control adjuvants in this study was effective in reducing the percent of fine driftable spray droplets and increasing the percent weed control of glyphosate both with and without surfactant. However, HM 9911 was the least effective and HM 9752 was the most effective in reducing the volume of fine, < 144 μ droplets and while both were among the most effective for increasing the percent weed control as compared to glyphosate with no drift control adjuvant. The spray pattern for each glyphosate mixture was adequate to provide uniform applications with the spray nozzles positioned 19 inches apart along the boom.

Table 1. Drift control adjuvants and rates applied.

HM 9752	Proprietary blend of polymeric viscosity modifiers and ammonium sulfate (9 lb/100 gal)
HM 9911	Proprietary blend of ammonia salts, potassium phosphate, surfactants, polyacrylamide polymers, and formulation aids (1.0% v/v)
HM 2005B	Proprietary blend of plant nutrients and water soluble organic polymers (7 lb/100 gal)
HM 2006	Proprietary blend of nonionic water soluble organic polymers and ammonium salts (9 lb/100 gal)
HM 2007	Proprietary blend of nonionic water soluble organic polymers and ammonium salts (9 lb/100 gal)
HM 2052	Distillates (petroleum), hydrotreated light paraffinic (0.25% v/v)

EFFECT OF DRIFT CONTROL ADJUVANTS ON GLYPHOSATE APPLIED WITH EXTENDED RANGE SPRAY NOZZLES. E.J. Jones[1], J.E. Hanks[2], G.D. Wills[1], and R.E. Mack[3], Miss. Agric. And Forest. Exp. Stn.[1], USDA-ARS[2], Stoneville, MS, and Helena Chemical Co., Memphis, TN[3]

ABSTRACT

Research has shown that herbicide application is influenced by the pattern of spray delivery and by the size of spray droplets wherein the smaller droplets result in greater drift from the target area. Both laboratory and field studies were conducted to determine the effect of six drift reducing adjuvants on spray pattern, droplet size and efficacy of glyphosate herbicide applied both with and without surfactant using TeeJet® Extended Range 110015VS spray nozzles. The drift reducing adjuvants and the rates applied are shown in Table 1. Glyphosate was applied at 0.4 lb ai in 10 gallons per acre both with surfactant as Roundup Ultra Max® and without surfactant as either Rodeo® or Roundup D-Pak®. This rate of glyphosate, which was less than the recommended rate of 1 lb ai per acre, was used to detect any increase or decrease in efficacy due to the addition of the drift control adjuvants.

In laboratory studies, spray droplet size was determined using an Insitec Measurement Systems® laser particle analyzer in an enclosed chamber with the nozzle installed on a mechanical traversing system. The nozzle was positioned at a height above the laser beam that allowed the entire width of the spray pattern to be traversed through the laser beam. Droplet analyses were repeated three times at 40 psi. Droplet size was determined both as the volume median diameter in microns (Dv. 5) which is the droplet size where half the spray volume is composed of smaller droplets and half of larger droplets and as the percentage of the spray volume resulting in fine droplets less than 144 microns (<144 μ) in diameter.

Spray patterns were determined by using a single nozzle in a stationary position at 13 inches above a slanted sheet of corrugated metal. Spray mixtures were applied in 600-ml volumes at 43 psi to the sheet of corrugated metal with troughs spaced 2.5 inches apart and the discharge was collected in 100-ml graduated cylinders. The values for the average milliliter volumes of three replications as collected at each position from left to right were reversed right to left, added together, and averaged again to show a symmetrical spray pattern for each mixture.

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The percent volume of the spray droplets which were below 144 microns in diameter (<144 μ) with glyphosate applied with and without surfactant respectively, with no drift control adjuvants was 58 and 55%. The addition of each drift adjuvant reduced the percentage of fine droplets to 52 and 53% with HM 9911, to 51 and 49% with HM 2052, to 49 and 47% with HM 2005B, to 48 and 45% with HM 2007, to 47 and 51% with HM 2006, and to 28 and 33% with HM 9752.

The volume median diameter (Dv. 5) in microns with glyphosate applied with and without surfactant respectively, with no drift control adjuvant was 127 and 134 μ. Droplet size increased with the addition of drift adjuvants HM 9911 to 140 and 138 μ, with HM 2052 to 142 and 148 μ,

with HM 2005B to 147 and 152 μ, with HM 2007 to 149 and 156 μ, with HM 2006 to 152 and 143 μ, and with HM 9752 to 234 and 205 μ.

The width of the spray patterns with glyphosate applied with and without surfactant respectively; with no drift control adjuvants and with HM 9911 was 45 inches for each, with HM 2052 was 45 and 50 inches, with HM 2005B was 45 and 40 inches with HM 2007 was 50 inches for both, with HM 2006 was 50 and 45 inches, and with HM 9752 was 30 and 35 inches.

At 2 WAT, smooth pigweed was controlled at a higher level than were the other plant species in this study. With glyphosate applied with and without surfactant, respectively; with no drift control adjuvant, smooth pigweed was controlled 88 and 73% and with each of the drift control adjuvants control was 94 to 100% and 90 to 100% except for 80% control with HM 2052 with glyphosate and no surfactant. Control of the remaining four species with glyphosate applied with and without surfactant respectively; with no drift control adjuvant was 64 to 85% and 65 to 79%, with HM 9911 was 83 to 90% (except for 70% control with velvetleaf) and 84 to 88%, with 2052 was 78 to 88% and 75 to 81%, with 2005B was 86 to 97% and 81 to 86%, with HM 2007 was 86 to 96% and 84 to 90%, with HM 2006 was 89 to 94% and 83 to 91%, and with 9752 was 90 to 98% and 89 to 96%.

Each of the drift control adjuvants in this study was effective in reducing the percent of fine driftable spray droplets and increasing the percent weed control of glyphosate both with and without surfactant. However, HM 9752 was the most effective in reducing the volume of fine, <144 μ droplets and among the most effective for increasing the percent weed control as compared to glyphosate with no drift control adjuvant. The spray pattern for each glyphosate mixture was adequate to provide uniform applications with the spray nozzles positioned 19 inches apart along the boom.

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HM 2052	Distillates (petroleum), hydrotreated light paraffinic (0.25% v/v)

THE EFFECT OF SUBLETHAL RATES OF GLYPHOSATE ON SHIKIMATE ACCUMULATION IN CORN (*ZEA MAYS)*. N.W. Buehring, J. H. Massey, and D.B. Reynolds. Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

The increased acceptance of transgenic crops and the subsequent increase of glyphosate use throughout the growing season has increased problems with glyphosate drift in corn. After a spray drift event in corn, producers are often left with a difficult decision on whether to terminate the crop and replant; or keep the crop in production. Previous research has indicated that visual injury estimates and plant height reductions do not strongly correlate to potential yield losses from sublethal applications of glyphosate in corn. Therefore, other methods for assessing potential yield losses from glyphosate drift events in corn are needed. Glyphosate inhibits 5-enolpyruvylshikimate-3-phosphate (EPSP) synthase in the shikimate pathway which results in the accumulation of high levels of shikimic acid (shikimate). The objectives of this study were to determine the optimum time to sample for shikimic acid accumulation following sublethal applications of glyphosate and to assess the ability of shikimic acid accumulation to predict yield reductions in corn from sublethal glyphosate applications. This experiment was conducted at the Plant Science Research Center in Starkville, MS. The experimental design was a randomized complete block. Corn 'Pioneer 3167' was planted into 7.72 by 12.2 m plots. Glyphosate rates are as follows: 0.041(1/2X), 0.20(1/4X), 0.05(1/16X), 0.01(1/64X), and 0.00 kg ai/ha. A glyphosate formulation which did not contain surfactant was used. Thus, Induce surfactant was added to all treatments at 1% v/v and treatments were applied at a delivery volume of 48 L/ha. Two corn whorls were randomly collected from each plot at 0, 1, 3, 5, 7, and 14 days after application (DAA). Data were collected for shikimic acid concentration and visual injury at each collection time. Each corn whorl was individually analyzed for shikimic acid concentration. The corn whorl was ground using a food processor. To extract the shikimic acid, 25 ml of 1.0 N HCl was added to 5 g of plant tissue and allowed to digest for 24 hr. The extract was diluted at 2:3 ratio with acetonitrile. The diluted extract (1 ml) was used for analysis with high pressure liquid chromatography using a wavelength of 215 nm. Shikimic acid concentration was reported on an oven-dry weight basis (µg shikimic acid/g dry plant tissue).

Shikimic acid accumulation, as a result of glyphosate at 0.41 and 0.20 kg ai/ha, were transient over the collection times. Glyphosate at 0.41 kg ai/ha resulted in the highest shikimic acid accumulation at 5 DAA. Also, shikimic acid accumulated at higher levels (above the untreated control) at 3, 5, and 7 DAA with glyphosate at 0.41 and 0.20 kg ai/ha. Visual injury symptoms were detected with glyphosate at 0.41 and 0.20 kg ai/ha at 5 DAA and increased through 14 DAA. High correlations between percent yield reduction and shikimic acid accumulation were observed 3, 5, and 7 DAA (r=0.96 to 0.98). When data were combined from 3 to 7 DAA, a high correlation was also observed (r=0.96).

Shikimic acid accumulation could serve as a potential method to assess yield losses from a glyphosate drift event. However, plant tissue samples would need to be collected between 3 and 7 days after a drift event occurred. If a glyphosate drift event occurred in corn without prior knowledge, shikimic acid accumulation may not serve as an effective method because visual injury symptoms were most evident at 14 DAA for glyphosate at 0.41 and 0.20 kg ai/ha. By 14 DAA, shikimic acid decreased to background levels equivalent to that found in the untreated control.

YIELD AND PHYSIOLOGICAL RESPONSE OF FLUE-CURED TOBACCO TO GLYPHOSATE DRIFT. I.C. Burke, W.E. Thomas, B.L. Robinson, L.R. Fisher, W.D. Smith, and J.W. Wilcut, Department of Crop Science, North Carolina State University, Raleigh, NC.

ABSTRACT

The increase in glyphosate-tolerant cotton and soybean acreage has introduced potential problems for growers. Approximately 70-80% of the cotton and soybean acreage is planted to Roundup Ready varieties in North Carolina. Tobacco is often grown in areas that are situated near soybean and cotton fields, and is sensitive to glyphosate drift. Accumulation of shikimic acid in nontransgenic crops may be used to determine glyphosate drift. Field trials were conducted in 2001 and 2002 at the Tobacco Research Station at Oxford, NC, and the Upper Coastal Plains Research Station in Kinston, NC, respectively, to determine yield, injury and shikimic acid accumulation. Glyphosate (Roundup UltraMax) was applied EPOST at 0.0078, 0.0156, 0.03125, 0.0625, 0.125, 0.25, 0.5, and 1.0 lb ai/ac to tobacco (variety ‘K326’) 4-6 inches in height. Injury in the form of overall injury, crop stunting, discoloration and stand reduction were visually rated 7, 14, and 35 d after the EPOST treatment. Samples for shikimic acid accumulation were taken 7 d after glyphosate treatments. Yield and quality measurements were taken according to extension recommended guidelines. Shikimic acid accumulation was determined by the methods developed by Singh and Shaner (1998).

Shikimic acid accumulation was found to be an effective diagnostic tool to determine glyphosate drift in tobacco at 7 DAT. Shikimic acid accumulation increased as glyphosate rates increased, and increases in visual injury symptoms were similar to increases in shikimic acid accumulation. Glyphosate rates of 0.125, 0.25, 0.5 and 1.0 lb ai/acre resulted in significant crop injury and reduced tobacco yield. Shikimic acid accumulation was inversely related to tobacco yield - tobacco yields decreased as shikimic acid accumulation increased. Glyphosate rates of 0.125, 0.25, 0.5 and 1.0 lb ai/acre decreased the quality index for each tobacco harvest interval. The most profitable tobacco yield components are the later harvests, and as glyphosate rates increased, these later harvests were reduced or not present. Shikimic acid analysis could provided additional evidence for growers who suspect glyphosate drift.

GLYPHOSATE/MICRONUTRIENT INTERACTIONS IN NORMAL AND GLYPHOSATE-RESISTANT SOYBEAN. D.M. Dodds[1], D.M. Huber[2], M.V. Hickman[2], and D.R. Shaw[1]. [1]Department of Plant and Soil Sciences, Mississippi State University, Mississippi State. [2]Department of Botany and Plant Pathology, Purdue University, West Lafayette.

ABSTRACT

Foliar chlorosis following postemergence applications of glyphosate to glyphosate-resistant soybean is becoming more common. Previous research on a single cultivar has suggested that the presence of the glyphosate-resistance gene complex appears to exacerbate manganese deficiency. Research was conducted on several glyphosate-resistant and conventional soybean cultivars to determine the impact of the glyphosate-resistance gene complex and postemergence glyphosate application on micronutrient uptake and utilization. Experiments were conducted on a nutrient-sufficient Chalmers silt loam soil (Fine-silty, mixed, mesic Typic Hapludoll) at the Purdue Agronomy Research Center (ARC) near West Lafayette, IN and on a low-manganese Sebewa loam soil (Fine-loamy over sandy or sandy skeletal, mixed, mesic Typic Argiaquoll) at the Pinney Purdue Agricultural Center (PPAC) near Wanatah, IN. Glyphosate was applied at 1.12 kg ai ha^{-1} at the second trifoliolate to the glyphosate-resistant cultivars. Samples of the youngest fully-expanded trifoliolate were taken from both cultivars, four weeks after application. Samples were air-dried, ground through a 1 mm stainless steel screen, and analyzed by inductively coupled plasma – atomic absorption for micronutrient content. Data were analyzed and means were separated by Fischer's Protected LSD.

Tissue manganese concentrations did not reflect the level of observed deficiency at PPAC, possibly due to temporary immobilization of micronutrients. The level of manganese deficiency also appeared to be cultivar- specific. Uptake and utilization of nutrients appeared to be environment and cultivar-specific.

SURFACTANTS AFFECT THE EFFICACY OF THE POTENTIAL MYCOHERBICIDE *PHOMOPSIS AMARANTHICOLA* TO SUPPRESS *AMARANTHUS LIVIDUS* IN BELL PEPPER. J.P. Morales-Payan[1,2], R. Charudattan[2], W.M. Stall[1], and J.T. DeValerio[2]. [1]Horticultural Sciences Department and [2]Department of Plant Pathology. University of Florida, Gainesville. FL 32611-0690.

ABSTRACT

A study was conducted in Citra, FL, to determine the effect of various surfactants on the efficacy of the potential mycoherbicide *Phomopsis amaranthicola* to control *Amaranthus lividus* in bell pepper. *A. lividus* emerged (4 plants/m^2) alongside the crop 6 days after transplanting the pepper, and allowed to interfere season-long. *P. amaranthicola* was applied ($1x10^6$ conidia/ml) on the crop-weed canopy 10 and 20 days after weed emergence, with the surfactants Metamucil® (hygroscopic derivative of *Plantago psyllium*) 0.5%, Natrosol® (hydroethylcellulose) 0.5%, Ivod® (nonylphenol ethoxylate) 0.03%, the experimental petroleum derivatives PCC 588 and PCC 1026 (2%), and Metamucil® (0.5%) + PCC 588 (2%). Relative humidity after applications was <70%, below optimal for the progress *P. amaranthicola* epidemics. Uncontrolled *A. lividus* interference reduced pepper yield by nearly 70% as compared to weed-free pepper. When *P. amaranthicola* was applied with Metamucil®, disease severity was 80%, *A. lividus* mortality was 12%, and Fancy and US1 pepper yield loss was about 10% as compared to the weed-free crop. When *P. amaranthicola* was applied with Natrosol®, disease severity was 54%, and the yield loss of Fancy and US1 fruit was 50 and 70%, respectively. Application of *P. amaranthicola* with the other surfactants did not result in sufficient disease severity to prevent pepper yield loss. Under the conditions of this study, Metamucil® and Natrosol® provided the best results in terms of pepper yield, disease severity and shoot suppression in A. lividus.

ULTRASTRUCTURAL STUDIES OF THE BIOHERBICIDAL FUNGUS *MYROTHECIUM VERRUCARIA* ON KUDZU (*PUERARIA LOBATA*). K.C. Vaughn and C.D. Boyette*, USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS.

ABSTRACT

Kudzu [*Pueraria lobata* (Willd.) Ohwi] is a perennial leguminous vine native to eastern Asia. Kudzu was introduced into the U. S. in the late 1800's, and presently occurs from Florida to New York, westward to central Oklahoma and Texas, with the heaviest infestations in Alabama, Georgia, and Mississippi. It was listed in a report by Congress in 1993 as one of the most harmful nonindigenous plant species in the U. S., and was listed as a noxious weed in 1998.

An isolate of the fungus *Myrothecium verrucaria* (Alb. & Schwein.) (MV) originally isolated from diseased sicklepod (*Senna obtusifolia* L.) exhibited biocontrol potential against leguminous weed species, such as sicklepod (*Senna obtusifolia* L.), and hemp sesbania (*Sesbania exaltata* Rydb. ex A.W. Hill). In greenhouse tests, we found MV to be highly virulent against kudzu when fungal spores were formulated in 0.2% Silwet L-77 surfactant (SW). Disease symptomatology was characterized by necrotic flecking which occurred within 2 h following treatment at incubation temperatures of 30-40ºC with slower disease development at lower temperatures. Disease symptoms progressed from inoculated cotyledons and leaves to produce stem lesions within 48 h.

Ultrastructural investigations revealed that there is a rapid (within 1 h of treatment) detachment of the protoplast from the cell wall. Plasmodesmata appear to be snapped off and left in the wall. These ultrastructural symptoms occurred well in advance of the appearance of any fungal structures. Some fungal growth was observed after severe tissue degeneration (24-48 h after treatment), but even then occurring primarily extracellularly. Treatment with any portion of the complete biocontrol reagent were similar to the controls, indicating that a phytotoxic substance(s) from the fungal filtrate, facilitated in its movement by the SW, is involved in the rapid degeneration of the kudzu tissue.

COMPETITION STUDIES TO EVALUATE SUPPRESSION OF SMOOTH AMARANTH (*AMARANTHUS HYBRIDUS)* AND YELLOW NUTSEDGE *(CYPERUS ESCULENTUS)* BY THREE LEGUMINOUS COVER CROPS. A.S. Collins, C.A. Chase, W.M. Stall, and C.M. Hutchinson. University of Florida, Gainesville, Fl 32611**

ABSTRACT

Cover crops are important to sustainable agriculture. They preserve productivity of the soil, have the potential to enhance the sustainability of vegetable cropping systems, improve soil structure and suppress weeds during the fallow period. The main objective of this study is to determine the best population of cover crop for the suppression of smooth amaranth *(Amaranthus hybridus)* in additive field experiments and to determine the competitive ability of the cover crops with yellow nutsedge *(Cyperus esculentus)* using replacement series in the greenhouse. The three leguminous cover crops that are known to be nematode suppressive were cowpea *(Vigna unguiculata* cv. Iron and Clay), sunn hemp (*Crotalaria juncea*), and velvetbean (*Macuna deeringiana*). A replacement series experiment was performed in the greenhouse using a randomized complete block design with four replications. These were performed using the following proportions of crop: weed of 100:0, 75:25, 50:50, 25:75, 0:100. Plants were grown for 8 weeks and then shoots were harvested and leaf area and dry weights of each species were determined. Relative yield was calculated from the dry weights. The relative yields showed that intraspecific competition and interspecific competition were not significantly different at the 50:50 level for cowpea and sunn hemp. The relative yield of velvetbean was significantly greater at the 50:50 level indicating greater interspecific competition. An additive field study was also performed in a randomized complete block design with four replications. Six densities of cover crops were planted by varying the row spacing within the plot. Plants were harvested after 10 weeks and dry weight was determined. All three cover crops suppressed amaranth at the lowest density of cover crop and increasing density beyond the initial density did not increase the suppression of smooth amaranth. Sunn hemp suppressed the amaranth at the lowest population with a decrease in dry matter in the dry matter when the density was increased.

SEED GERMINATION CHARACTERISTICS OF TROPICAL SIGNALGRASS (*Urochloa subquadripara*). T.C. Teuton, B.J. Brecke, J.B. Unruh, G.E. MacDonald, G.L. Miller, and J.T. Ducar; Department of Agronomy, University of Florida, Gainesville, FL 32611; West Florida Research and Education Center, Jay, FL 32565; Department of Animal and Horticultural Sciences, Berry College, Mt. Berry, GA 30149.

ABSTRACT

Tropical signalgrass (Urochloa subquadripara (Trin.) R. D. Webster) has become one of the dominant weeds in the southeastern turfgrass industry. Presence of this weed results in increased production costs and lower turfgrass quality. This is especially true for the St. Augustinegrass sod industry, which has struggled with tropical signalgrass control methods.

Tropical signalgrass seed were collected from greenhouse grown plants at the University of Florida. The plants were established from 3 locations from Florida; Duda Sod Farm in Ft. Lonesome, H&H Sod Farm in St. Cloud, and the University of Florida in Gainesville. Little is known about the germination characteristics of tropical signalgrass seed, therefore the objectives for this research were to determine the effects of light, temperature, pH, water stress, and planting depth on tropical signalgrass seed germination.

Tropical signalgrass seed were separated into petri dishes and placed in either complete darkness or in continuous light (200 μmol m^{-2} s^{-1} PPFD) in a growth chamber at 25 C. There were no differences in tropical signalgrass germination between dark and light treatments. Seeds were placed in growth chambers with constant light and temperatures of 15, 20, 25, 30, 35, and 40 C. Tropical signalgrass germination was highest (≥ 65%) at the 25 C. Seeds were exposed to buffer solutions of hydrogen phthalate (pH 4), 2(4-orpholino)ethanesulfonic acid (MES) (pH 5), N-2(2-hydroxyethyl)-piperazine-N'-2-ethanesulfonic acid (HEPES) (pH 6 and 7), tris(hydroxymethyl)-aminomethane (TRIS) (pH 8), or glycine (pH 10) and placed in a growth chamber with constant light at 25 C for 2 wks. Germination was > 60% in the pH ranges of 5 and 6 while all other treatments showed < 30% germination. Tropical signalgrass seed were exposed polyethylene glycol solutions with water potentials of 0, -0.2, -0.4, -0.6,-0.8, and -1.0 MPa and placed in a growth chamber with constant light at 25 C for 2 wks. Tropical signalgrass germination was greatest (> 30%) at the 0 and -0.2 water potentials; all other treatments had < 5% germination. Tropical signalgrass seed were planted in a United States Golf Association greens mix (85% peat and 15% sand) at 0, 0.5, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10 cm and placed in a growth chamber set for a 14 hr day at 25 C and a 10 hr night at 20 C. Pots were watered daily and emerged seedlings were counted once a wk for 6 wk. Maximum emergence occurred within the first 3 wks with little emergence after that. Maximum emergence also occurred from seed placed on the soil surface and no emergence below the 6 cm soil depth.

ALLELOPATHIC POTENTIAL OF CENTIPEDEGRASS. T.W. Gannon and F.H. Yelverton; Department of Crop Science, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

Allelopathic cover crops have proven beneficial, especially in no-till agricultural systems, by reducing weed populations. Tall fescue (*Festuca arundinacea*) and red fescue (*Festuca rubra*) have been reported to possess allelopathic properties. Weed scientists in the southeastern US have observed the lack of weed populations in established stands of centipedegrass (*Eremochloa ophiuroides*) possibly indicating an interference mechanism; however, no research is available evaluating the allelopathic potential of centipedegrass.

Weed control in centipedegrass poses a unique situation. In many cases, once centipedegrass is established, no weed control practices are needed due to minimal weed infestations; however, registered herbicides options are available for grass and broadleaf weed control in established centipedegrass. However, no registered herbicide option exists during the establishment of seeded centipedegrass.

Experiments were initiated to evaluate the effect of centipedegrass leaf debris and aqueous leaf extracts on germination and growth of indicator species. For the leaf debris experiment, debris (0, 3, 6, or 9 mg debris/g soil medium) was incorporated into the soil before surface seeding three radish (*Raphanus sativa*) or lettuce (*Lactuca sativa*) seeds. Large crabgrass (*Digitaria sanguinalis*), radish, or lettuce germination and growth were monitored in aqueous leaf extracts of centipedegrass.

Incorporated centipedegrass leaf debris did not reduce indicator species germination; however, radish shoot and root dry weights were reduced with increasing rates of leaf debris. Six and 9 mg debris/g soil reduced radish shoot dry weight by 49 and 64%, respectively. Aqueous leaf extracts of centipedegrass did not affect large crabgrass or radish germination, hypocotyl length, or radicle length, while lettuce germination was reduced compared to the control.

Although established centipedegrass frequently exhibits fewer weeds, centipedegrass did not inhibit selected indicator species germination. However, significant reductions in radish shoot weight with increasing amounts of centipedegrass leaf debris demonstrates a pattern of inhibition.

IMPACT OF POSTEMERGENCE METOLACHLOR APPLICATIONS, TILLAGE, AND ROW SPACING ON LATE-SEASON ANNUAL GRASS INFESTATIONS. D.H. Poston, T.H. Koger, and R.M. Griffin. Delta Research and Extension Center, Stoneville, MS 38776 and USDA-ARS Southern Weed Science Research Unit, Stoneville, MS 38776

ABSTRACT

Widespread adoption of the Early Soybean Production System (ESPS) has occurred in Mississippi. With the ESPS, MG IV and V soybeans are planted in April in an effort to avoid seasonal drought and maximize yields. Early-planted soybeans emerge before most summer annual weeds and therefore have a competitive advantage over weeds that emerge several weeks after planting. However, many early-planted soybeans are harvested in August when there is a risk of weed resurgence during the period of soybean senescence, especially during periods of ample rainfall. Resurgence can be the result of newly germinating weeds or the recovery of weeds that have been suppressed by the soybean canopy. In many early-planted glyphosate-resistant soybean fields throughout the Mississippi delta, annual grasses have become especially problematic and appear to have become the predominant weed species indicating a potential weed shift from once problematic broadleaf weeds to annual grasses. Glyphosate provides excellent control of most annual grasses but offers no residual activity to control grasses that emerge later in the growing season.

Field studies were conducted in 2002 and the Delta Research and Extension Center in Stoneville, MS on a Dundee silt loam soil to evaluate the impact of postemergence metolachlor, tillage, and row spacing on late-season annual grass infestations in early-maturing soybeans grown in the Mississippi delta. The test area was naturally infested with barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.] and browntop millet [*Brachiaria ramosa* (L.) Stapaf] and was also seeded with broadleaf signalgrass [*Brachiaria platyphylla* (Griseb.) Nash] and barnyardgrass seed to ensure uniformity across plots and to add one additional grass species. Plots were3 x 12 m and arranged in a randomized complete block experimental design with a split-split plot treatment arrangement (herbicide treatment x tillage treatment x row spacing). Tilled and non-tilled plots were established in the test area. Row spacings were 38 and 76 cm. Tilled plots were disked once and field cultivated and non-tilled plots were treated with 1.12 kg/ha glyphosate prior to planting. DK3961RR soybean was planted April 25, 2002 and all plots were treated postemergence (POST) with 1.12 kg/ha glyphosate May 14, 2002. Annual grass density determined prior to this application was approximately 63 plants m^{-2}. Follow-up POST herbicide treatments applied June 3, 2002 were: 1) no sequential glyphosate application, 2) 0.84 kg/ha glyphosate, 3) 0.84 kg/ha glyphosate + 1.8 kg/ha *s*-metolachlor, 4) 0.84 kg/ha glyphosate + 1.3 kg/ha *s*-metolachlor, 5) 0.84 kg/ha glyphosate + 0.9 kg/ha *s*-metolachlor, and 6) 0.84 kg/ha glyphosate + 0.4 kg/ha *s*-metolachlor. Annual grass density at the time of follow-up treatments was approximately 19 plants m^{-2}. All POST treatments were applied with a tractor-mounted compressed air sprayer delivering 140 L/ha at 221 kPa. Annual grass biomass m^{-2} was determined in each plot August 21, 2002 and soybeans harvested August 23,2002.

Annual grass biomass at harvest was statically similar with all herbicide treatments according to Fisher's Protected LSD conducted at the alpha = 0.05 level (Figure 1). However, annual grass biomass was 31 to 38% lower in plots treated with 0.84 kg/ha glyphosate + 1.8 or 1.3 kg/ha *s*-metolachlor compared to plots treated with glyphosate alone. These reductions were not statistically different, but suggest a potential benefit of incorporating a residual grass herbicide into glyphosate only weed control programs to manage increasing annual grass populations in early-maturing glyphosate-resistant soybeans. In addition, the impact of residual grass herbicides over time may become significant and needs to be assessed. Adding 0.9 or 0.4 kg/ha *s*-metolachlor to postemergence glyphosate applications did not reduce biomass compared to plots receiving glyphosate alone. Therefore, at least 1.3 kg/ha *s*-metolachlor may need to be added to postemergence glyphosate applications on medium-textured soils to achieve season-long annual grass control. Annual grass populations were too high to accurately count in many plots at harvest, but it appeared that grass populations were lower in plots treated with *s*-metolachlor

than in plots treated with glyphosate alone. As this study progresses, attempts will be made to determine plants populations as well as weed biomass. Annual grass biomass at harvest was not influenced by tillage (Figure 2). In contrast, row spacing had a tremendous impact on the annual grass biomass at harvest. There was 51% less grass biomass in 38 cm rows than in 76 cm rows. Soybean yields ranged from 2200 to 2800 kg/ha and were statistically similar (data not presented). Herbicide program, tillage, or row spacing did not influence yields (data not presented).

Incorporating residual grass herbicides into glyphosate-only weed control programs may be helpful in managing increasing annual grass populations in early-maturing soybean in the Mississippi delta, but further research is needed to confirm this hypothesis. Initial results from this study indicate that the most immediate and effective strategy for producers to implement to combat late-season annual grass control problems in glyphosate-resistant soybeans is to use narrow row spacings.

WEED EMERGENCE PATTERNS IN THE COASTAL PLAIN. T.M. Webster, CPMRU, USDA-ARS, Tifton, GA 31794.

ABSTRACT

The ability of a weed to interfere with crop growth is a function of the competitive ability of the weed and its emergence time relative to the crop. Knowledge of weed emergence patterns may help optimize crop production and weed management systems. Seeds of coffee senna (*Cassia occidentalis*), Florida beggarweed (*Desmodium tortuosum*), morningglory species (*Ipomoea* spp.), sicklepod (*Senna obtusifolia*), and smallflower morningglory (*Jaquemontia tamnifolia*) were spread in Spring 1999, 2000, 2001, and 2002. Each plot was replicated 4 times in a RCBD, and no crop was planted. Weed emergence was counted at least every 10 days, after which vegetation was removed using paraquat. Base temperatures were crudely estimated from previous germination studies: 10 C for smallflower morningglory, 15 C for sicklepod and coffee senna, 16 C for *Ipomoea* morningglory species, and 18 C for Florida beggarweed. Emergence data were fit to growing degree days using a Gompertz function with the following form: cumulative relative seedling emergence = 100 exp{-a exp(-b*GDD)}. *Ipomoea* morningglory spp. were among the earliest emerging weed species, with an estimated median emergence data (ED_{50}) for each year before 1 May. In three of four years, the estimated ED_{50} for sicklepod ranked it as the second latest species to emerge in this grouping of weeds. Smallflower morningglory was the latest emerging weed species evaluated, with ED_{50} ranging from the middle of May to the end of June. Measurements of soil growing degree days (at 5 cm depth) are not adequate to accurately predict emergence. Future studies should evaluate the utility of bio-indicators (e.g. using the phenology of native flora) to indicate when critical environmental requirements have been satisfied.

VERIFICATION OF RESISTANCE TO ALS-INHIBITORS IN A NORTH CAROLINA COCKLEBUR (XANTHIUM STRUMARIUM). R.B. Batts, A.C. York, and R.G. Parker, North Carolina State University, Raleigh

ABSTRACT

Greenhouse experiments were conducted to verify the presence of herbicide resistance in a cocklebur biotype in Warren County, North Carolina. Field history and preliminary screening suggested that the biotype was resistant to ALS-inhibiting herbicides. Burs from this biotype and burs from a known susceptible biotype, from Alamance County, North Carolina, were collected and grown in six-inch diameter pots for comparison of responses to several ALS-inhibiting herbicides. These herbicides were applied postemergence to 4-leaf, 6-7 inch cocklebur at rates ranging from 1/32 of the 1X rate to 32 times the 1X rate. These herbicides included representatives from all ALS-inhibiting families as well as the major field crops labeled for the use of ALS-inhibitors. At 17 days after application, control of each biotype was estimated visually on a 0-100 scale. Plants were then clipped at the soil surface and growth inhibition was calculated on a percentage basis versus the weight of nontreated plants. This experiment was conducted twice.

Herbicides included:

Trade Name	Common Name	Family	1X Rate (oz/a)
Beacon	Primisulfuron	Sulfonylurea	0.76
Classic	Chlorimuron	Sulfonylurea	0.6
Firstrate	Cloransulam	Triazolopyrimidine	0.3
Pursuit	Imazethapyr	Imidazolinone	1.44
Staple	Pyrithiobac	Pyrimidinylthiobenzoate	1.2

The Warren County ®) biotype displayed high levels of resistance to all herbicides used, while the Alamance county (S) biotype was controlled. At 17 days after treatment, visual estimates of control of the S biotype ranged from 67-79 percent at the 1X rate of all herbicides. At the 32X rate, control ranged from 78-90 percent. Visual control of the R biotype was zero for all herbicides when applied at the 1X rate. However, the 32X rate of Classic and Firstrate did give slight chlorosis and stunting. This injury was 10% or less.

Growth inhibition followed the trend of visual control. At 1X, inhibition of the S biotype ranged from 67-76%, while inhibition of the R biotype was 10-23%. At 32X, 78-88% inhibition was seen with the S biotype, while growth of the R biotype was inhibited 9-13%. The symptoms shown from the 32X rate of Classic and Firstrate on the R biotype did not result in higher inhibition from these products. In fact, Classic at 32X had the lowest inhibition of the R biotype.

In a single run of another trial, both biotypes performed similarly when exposed to a rate range of products with different mechanisms of action. These products were chosen to represent the major herbicide families and most of the major crops. Herbicides included Basagran (bentazon), Blazer (acifluorfen), Roundup (glyphosate), Clarity (dicamba), Weedar (2,4-D), Buctril (bromoxynil), Liberty (glufosinate), Bueno (MSMA), Lexone (metribuzin), Meturon (fluometuron), Aatrex (atrazine), Gramoxone Extra (paraquat), Tough (pyridate), and Resource (flumiclorac). These results indicate that there is not resistance to these other families and that the use of products with different mechanisms of action will be means of controlling the R biotype. This trial is being conducted again.

SEED HYDRATION-DEHYDRATION IN AN ALLELOCHEMCIAL AFFECTS SEED GERMINATION AND SEEDLING GROWTH. L.K. Peal, R.D. Williams and P.W. Bartholomew, USDA-ARS, Langston University, Langston, OK.

ABSTRACT

Coumarin is an allelochemical widely distributed throughout the plant kingdom. Several researchers have reported that, depending on the concentration, this plant compound inhibits or delays germination, and will inhibit or stunt radicle elongation. However, the seed germination and seedling growth studies were done with the seeds or seedlings placed in direct contact with the test solutions. Seed in the soil can go through several hydration-dehydration cycles before germination occurs. This study was conducted to evaluate the effect of hydration-dehydration of radish seed in coumarin on subsequent germination and seedling growth. Radish seed were placed in petri dishes or in seed pouches containing water (control) or coumarin solutions of 10^{-5}, 10^{-4} or 10^{-3} M. At all concentrations coumarin inhibited or reduced seed germination and radicle growth. The greatest inhibitory effect was observed with 10^{-3} M. Concentrations of 10^{-5} and 10^{-4} M initially inhibited germination and radicle elongation, but after 72 h values approached those observed in the control. After 24 h germination percentages were 92%, 85%, 50% and 1% for the control, 10^{-5}, 10^{-4}, and 10^{-3} M, respectively. After 48 h the there was not significant difference among the treatments except for the 10^{-3} M coumarin treatment. Radicle length showed similar results. At 48 h radicle lengths were 18, 14 and 4 mm for the control, 10^{-5}, and 10^{-3} M coumarin, respectively; while at 72 h radicle lengths were 46 mm, 49 mm and 12 mm, respectively. Seed hydrated in coumarin solutions for up to 5 hours and then transferred to water, or coumarin solutions showed results similar to those reported above. When the seed were hydrated and dehydrated several times in coumarin, only the 10^{-3} M treatment seem to have an accumulative affect. Hydration and dehydration of seed in the soil in the presence of allelochemicals may provide further insight as to allelopathic interactions among plants.

DIVERSITY OF RHIZOBACTERIA FROM SELECTED WEEDS. D.T. Gooden, H.D. Skipper, J.H. Kim, K. Xiong, V. Demarque, and T.L. Lalande. Department of Crop & Soil Environmental Science, Clemson University, Pee Dee REC, Florence, SC 29506.

ABSTRACT

A critical research need in agroecosystems is to understand the bacterial interactions in the rhizosphere of crops and associated weeds. We are developing a database on rhizobacteria from roots of selected weed species. Over 3 years and 2 sampling dates per year, 40 isolates were randomly selected on TSBA for each weed species at each date in Norfolk soil and were identified by GC/FAME analyses. Numerical populations of rhizobacteria were similar between plant species. Isolates identified from the non-rhizosphere soil were dominated by *Bacillus* and *Arthrobacter* genera. Rhizobacteria, root bacteria, from yellow nutsedge (*Cyperus esculentus* L.), Palmer amaranth (*Amaranthus palmeri* S. Wats.), large crabgrass [*Digitaria sanguinalis* (L.) Scop.], common ragweed (*Ambrosia artemisiifolia* L.), and tropic croton (*Croton glandulosus* var. *septentrionalis* Muell.-Arg.) will be presented. *Bacillus*, *Burkholderia*, and *Chryseobacterium* were major genera across the weeds. Dynamic ecological shifts in rhizobacteria were noted for several weed species over a 30-day period. The dominant genera and diversity of rhizobacteria varied by weed species.

CONTROL OF ARKANSAS PALMER AMARANTH ACCESSIONS. J.A. Bond and L.R. Oliver; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville.

ABSTRACT

Palmer amaranth [*Amaranthus palmeri* (S.) Wats.] is a tremendous hindrance to crop production in the southern United States. Because reports on control levels with different herbicides are often conflicting, better control strategies to minimize the competitive effects of Palmer amaranth need to be developed. An experiment was conducted in 2001 and 2002 to determine whether Palmer amaranth accessions from different regions of Arkansas vary in response to glyphosate, fomesafen, and pyrithiobac. Seeds were collected from female Palmer amaranth plants across Arkansas. The experimental design was a strip-plot with four replications. Vertical treatments included glyphosate (0.84 kg ae/ha), fomesafen (0.42 kg ai/ha), pyrithiobac (0.07 kg ai/ha), and a non-treated check. Horizontal treatments consisted of Palmer amaranth accessions randomized within vertical treatments. Spray applications were made with a CO_2-propelled backpack sprayer and hand-held boom. Fomesafen, pyrithiobac, and glyphosate were applied to 60-cm weeds in 2001 in an effort to detect variable herbicide response among accessions. In 2002, fomesafen and pyrithiobac were applied to 15-cm tall Palmer amaranth with 12 to 15 leaves, but glyphosate application was delayed until weeds reached 60 cm. Check rows received no herbicide and functioned as a comparison for treated rows. Data collected included visual control ratings at 7, 14, and 21 days after treatment (DAT) and plant biomass following the last visual rating. Data were analyzed across years and accessions were grouped by sampling region within Arkansas including northwest, northeast, southwest, and southeast.

Palmer amaranth control for glyphosate was 100% 21 DAT for all accessions in both years. Biomass was reduced at least 99% for all accessions following treatment with glyphosate compared with non-treated controls for the respective accessions. Control with fomesafen was equal for the four regions in 2001, but control was less than 14% 21 DAT due to weed size at application. Fomesafen controlled all accessions at least 95% 21 DAT in 2002, and biomass was reduced 95% for all accessions. Pyrithiobac controlled Palmer amaranth accessions from southwest Arkansas better than those from other regions of the state in 2001 and 2002. Because plants were large at application in 2001, accessions from southwest Arkansas were controlled only 30% 21 DAT in 2001, but control was 83% 21 DAT in 2002. Regardless of plant size at application, control of southwest Arkansas accessions was higher than northeast accessions, while control of northwest and southeast accessions was lower than northeast accessions in both years.

Variation in control of Palmer amaranth accessions from Arkansas was observed for pyrithiobac, but not glyphosate or fomesafen, based on visual weed control and dry weight reductions. Palmer amaranth accessions responded differently to pyrithiobac, but differences could not be credited to accession origin or production practices in the different regions of Arkansas. Weed size at application influenced control by pyrithiobac and fomesafen in 2001, but only pyrithiobac in 2002.

RED MORNINGGLORY (*IPOMOEA COCCINEA*) EMERGENCE AND RESPONSE TO SHADE AND TILLAGE. C.A. Jones, J.L. Griffin, and J.D. Siebert. Louisiana State University AgCenter, Baton Rouge, LA 70803.

ABSTRACT

In 2001 and 2002, field studies were conducted in West Baton Rouge Parish, LA, to evaluate red morningglory (*Ipomoea coccinea* L.) emergence and growth in response to shade and tillage. In both studies, plots were tilled with a rotary tiller to a 4-inch depth in May, June, July, and August of each year. Data were collected 20 to 41 days after each tillage operation. In the shade study, shade boxes, a randomized complete block design with 4 replication was used and treatments included 0, 30, 50, 70, or 90% shade. Weed emergence, leaf area, and plant height data were collected just prior to each tillage operation. In the red morningglory tillage study, tilled and non-tilled treatments were included and initial and final seed population in soil for each treatment were determined each year. Additionally weed emergence 20 to 41 days after each tillage operation was determined. In non-tilled plots Liberty at 0.5 lbs ai/A was used to control weeds in lieu of tillage.

A response in red morningglory emergence to shade was observed in 2001 only for the June sampling date . As shade level increased red morningglory emergence decreased linearly. Under no shade (full sunlight) red morningglory emergence was 13.5 plants/ft^2 and under 90% shade 9.8 plants/ft^2 emerged. At the July, August, and September sampling dates in 2001 shade did not influence weed emergence and emergence ranged from 1.6 to 3.8 plants/ft^2. In full sunlight 3.8, 3.3, 1.8 plants/ft^2 emerged at the July, August, and September sampling dates, respectively.

In 2002, shade influenced red morningglory emergence at the June and July sampling dates. In June, red morningglory emergence under full sunlight was 4.7 plants/ft^2 while increasing shade to 90% decreased emergence by 2 plants/ft^2. In July, red morningglory emergence was reduced from 1.9 for full sunlight to 0.4 plants/ft^2 for 90% shade. At the August and September sampling dates, red morningglory emergence was not influenced by shade and weed emergence ranged from 1.4 to 0.5 plants/ft^2. As noted for the previous year, red morningglory emergence decreased as the season progressed.

Even though red morningglory emergence decreased for some of the sampling dates in response to shading, plant growth (leaf area and height) for individual dates both years was equivalent regardless of shade. The differences in red morningglory growth among sampling dates for the individual shade levels is probably a reflection of soil moisture. Data also indicate that environmental conditions were more conducive to red morningglory growth and development in 2002.

Soil samples collected at a 4-inch depth prior to initiation of the study contained between 100 and 450 red morningglory seeds/ft^2. On the July sampling date red morningglory emergence was equal whether soil was tilled or not tilled around 4 weeks earlier and emergence averaged 9.7 plants/ft^2. In August, weed emergence was 45% greater when plots had been tilled around 4 weeks earlier as compared with plots that had not been tilled (9.3 vs 6.4 plants/ft^2). On the September sampling date only 2.1 plants/ft^2 emerged in the non-tilled plots compared with 8.0 plants/ft^2 where plots were tilled. The decrease in red morningglory emergence as the season progressed and the greater separation between tillage treatments for the August and September sampling dates is probably due to seed bank depletion. Soil samples taken in October clearly showed a decrease in the seed bank from the initial sampling, but no differences in seed population were noted between tilled and non-tilled treatments. This indicates that tillage redistributed seed in the soil profile and that soil aeration enhanced germination.

COMPETITIVENESS OF VOLUNTEER ROUNDUP READY CROPS. C.H. Tingle and A. Beach; University of Arkansas Agricultural Experiment Station, Keiser, AR 72351

ABSTRACT

Since the introduction of Roundup Ready crops, weed control strategies have drastically changed. Despite efforts from weed scientist, producers are oftentimes relying solely on glyphosate products for weed control in crops including cotton, soybean, and corn. While these practices will eventually lead to weed species becoming resistant to glyphosate, volunteer crops may pose a quicker problem. Many recent studies have addressed control measures, but currently there is no data pertaining to specific yield losses.

Field experiments were established at the Northeast Research and Extension Center, Keiser, AR to determine the critical density and critical period of competition for volunteer Roundup Ready soybean in Roundup Ready cotton and volunteer Roundup Ready cotton in Roundup Ready Soybean. Cultivars evaluated included Asgrow AG4902RR and Paymaster 1218 BR. The experimental design was a randomized complete block with 4 replications. Plot size for each of the experiments was 4 (1 m rows) by 12 m long. Volunteer densities for each experiment consisted of 0, 2, 3, 5, and 10 plants per 10 m of row. Densities of 10 plants per 10 m of row were used in the critical period of control experiments. Introduction periods included –2, 0, 2, 4, 6, and 8 weeks after planting (WAP) and removal times were 0, 2, 4, 6, 8, 10 WAP.

When volunteer soybean densities were allowed to compete with cotton, only minimal yield differences were observed. Untreated plots yielded 50 bu/A while 10 volunteer cotton plants per 10 m only reduced soybean yields to 47 bu/A. Volunteer soybean proved to be more competitive. Untreated cotton plots yielded 1051 lb/A while 5 or 10 volunteer soybean plants per 10 m reduced cotton yields to less 975 lb/A.

The duration of competition also varied among species. Volunteer soybean had to compete with cotton for at least 8 WAP before yield losses were observed and volunteer soybean introduced after 2 WAP did not cause any yield loss. When volunteer soybean plants were introduced 2 weeks prior to planting, cotton yield values were reduced from 1050 lb/A to 647. Volunteer cotton had to compete with soybean the entire season before yield losses were observed and, as before, losses were minimal. However, when volunteer cotton was introduced 2 weeks prior to soybean planting yield losses were reduced from 50 to 42 bu/A.

DIFFERENTIATION OF KUDZU (*Pueraria montana*) AND FOREST VEGETATION USING HYPERESPECTRAL REFLECTANCE DATA. K.D. Burnell, J.D. Byrd, Jr., and L.M.. Bruce; Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

During 2001 and 2002, hyperspectral reflectance data were collected for kudzu (*Pueraria montana*) and various forest vegetation in an attempt to determine the utility of using remote sensing as a survey tool. In addition to kudzu, data were collected for several species of oaks (*Auercus alba, stellata, falcate, velutina,* and *nigra*), and pines (*Pinus taeda* and *echinata*), along with *Vitis rotundifolia*, *Ligustrum* spp., *Baccharaus halimifolia*, *Diospyros virginiana*, *Rubus cuneifolius*, *Liquidambar styraciflua*, and *Juniperus virginiana*. For each species, 5 to 10 readings were taken monthly from March until October with a Field Spec Pro FR portable spectroradiometer ASD FR (analytical spectral device – full range) equipped with a 23° field of view optical. Data were separated by spring, summer, or fall growing seasons and pooled over years. Data were analyzed using customized software, which performed a feature extraction technique using Receiver Operating Characteristics (ROC) Best Spectral Bands Combination (unbiased), that classified weed species using spectral bands chosen by nearest mean. Best band reflectance data was then analyzed using the PROC DISCRIMM function (or redistribution) in SAS, which determined classification accuracies for each desired class by cross-validation and redistribution/leave one out methods. Cross-validation data were used to generate data reported.

Overall, classification in a 2-class system (all other species combined vs. kudzu) was 81%, but when compared to all others, classification accuracy increased to 91%, with 12 to 15 bands being used. When evaluated by season, the best time (based on detection vs. all others), was spring with 70% accuracy for detecting kudzu and 97% accuracy for detection of kudzu compared to all others using ~15 bands (934-952nm). The next best time was fall with 93% accuracy for detecting kudzu and 89% accuracy for detection of kudzu compared to all others using ~12 bands (375-378, 384-388, 393, 396, 400, 401, and 406nm). Finally, summer readings revealed 77% accuracy for detecting kudzu and 86% accuracy for detection of kudzu compared to all others using ~12 bands (456-468, 483, and 492nm). These data indicated remote sensing as a tool can be used to identify kudzu populations in forest environments.

EFFECT OF COGONGRASS (*IMPERATA CYLINDRICA*) RESIDUES ON BERMUDAGRASS (*CYNODON DACTYLON*) AND ITALIAN RYEGRASS (*LOLIUM MULTIFLORUM*). C.H. Koger* and C.T. Bryson, USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS 38776; J.D. Byrd Jr., Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Cogongrass is a rhizomatous, perennial plant that is among the most troublesome weeds worldwide. It was introduced into the southern U.S. in the late 19th and early 20th centuries, and today, is an invasive weed in many coastal states of the southeastern United States. Cogongrass competes with other plant species for nutrients, light, water, and physical space in infrequently cultivated areas, roadways, forests, pastures, mining areas, pine plantations, parks, and other natural and recreational areas. Extensive research has been conducted on biological properties of cogongrass such as temperature and shade tolerance, reproductive characterization and capabilities, and growth potential. However, information on potential inhibitory effects of cogongrass residues on other plant species is lacking.

The effects of foliage and root residues of cogongrass on germination and shoot and root growth of bermudagrass (BM) and Italian ryegrass (RG), two desirable grasses commonly found in similar areas as cogongrass, were investigated in greenhouse experiments. Ground residues of cogongrass foliage and roots were mixed separately at concentrations of 0, 0.25, 0.5, 1, 2, 4, and 8% (w/w) with 500 grams of sterilized sand in sterilized pots. Twenty-five seeds of common bermudagrass (BM) or Italian ryegrass (RG) were spread on top of cogongrass residue:sand mix in four pots for each residue concentration. Greenhouses were maintained at 30/21 C with 14-h photoperiod for BM and 22/15 C with 12-h photoperiod for RG. Pots were sub-irrigated as needed. Experimental design was a split-split plot in a randomized complete block with plant species as the main-plot, type of cogongrass residue as sub-plots, and residue concentration as sub-subplots with four replications. Experiments were repeated. Germinated seeds were counted 10 d after planting and plants were thinned to 3 plants/pot. Shoot and root biomass of BM and RG was recorded at 35 DAP. Germination and dry weight of shoot and root biomass data are presented as a percent of the untreated check. Data were subjected to polynomial regression and pseudo R^2 values were calculated to determine the goodness-of-fit for individual loglinear regression lines.

Both types of cogongrass residues reduced germination of BM and RG, however BM was impacted more than RG. Germination of both species was reduced at the lowest concentrations (0.25%) of cogongrass foliage and root residues, and was as low as 3% of the untreated check for BM and 40% for RG at the 8% concentration of cogongrass root residues. Shoot and root biomass of BM and RG were reduced by foliage and root residue of cogongrass at similar levels, with little difference in the type of cogongrass residue. Shoot and root biomass of BM was as low as 6% and RG as low as 17 to 24% at the 8% concentration of cogongrass root residue. Both foliage and root residues of cogongrass may contain an allelopathic substance that elicits a competitive advantage for cogongrass by suppressing germination and seedling growth of desirable grasses.

EVALUATION OF PLANT GROWTH REGULATORS FOR COGONGRASS [*Imperata cylindrica* (L.) Beauv.] SEED DEVELOPEMENT AND CONTROL. K.D. Burnell, J.D. Byrd, Jr., and P.D. Meints; Mississippi State University, MS 39762.

ABSTRACT

Field studies were conducted during 2002 at two locations near Morgan (south) or Preston (central), in Mississippi to evaluate efficacy of plants growth regulators (PGR) for reducing seedhead production, seed germination, and/or viability. Treatments were arranged in RCB with three replications and plots size was 1.8- by 9.14 m. Initial application was made March 13, 2002 to foliage 75 to 100 cm tall and 20 % green (visual estimate), using a CO_2 pressurized backpack 4-nozzle boom sprayer delivering 187 L/ha at 138 kPA. Treatments included Primo 1EC (trinexapac-ethyl) at 3.2 L/ha, Oust 75DG (sulfometuron methyl) at 0.070 kg/ha, Plateau 2AS (ammonium salt of imazapic) at 0.22 L/ha + 0.25% V/V (NIS), TGR Turf Enhancer (paclobutrazol) 2L at 3.5 L/ha, Select 2EC (clethodim) at 0.60 L/ha + 1% V/V COC, Roundup Pro 4L (isopropylamine salt) at 0.74 L/ha, Cutless 50WP (flurprimidol) at 0.28 L/ha, and an untreated check. Seedhead reduction was based on 0-100% scale, with 0 representing no seedhead reduction and 100 representing total seedhead reduction or no seedheads produced. In addition, seed germination and viability were tested by means of standard germination, accelerated aging for 48 and 72 hours, field emergence, viability test (biomass production 30 DAP), and weight per 100 seed as affected by these treatments. Seedheads were collected 43 days after initial treatment (DAIT) at Morgan, while no seeds were present in seedheads at Preston. Naked seeds were used for all experimental purposes and seedheads were stored in a refrigerator at until tested. Data for all tests were subjected to ANOVA using PROC GLM, with means separated using Fisher's Protected LSD at a significance level of 0.05.

Results indicated that seedhead production was reduced by Oust, Select, and Roundup Pro 88% and with Primo and Plateau by 61 and 66%, respectively. Germination for untreated and PGR treated plants 9 days after planting (DAP) was above 95%. Accelerated aging (AA) for 48 and 72 hours reduced germination compared to optimal germination of treated seeds, with a reduction of 23% from optimal conditions for the 72 hour AA treated seeds, by Primo and Plateau. Plateau, Select, and Roundup Pro had the highest percent reduction in germination after being adjusted for the decrease in the check, with 28, 23, and 23%, respectively. Dried aboveground biomass production 30 DAP (viability) indicated Plateau, Select, and Cutless reduced biomass production 67% as compared to the check and Roundup Pro decreased biomass production by 59% of the check. Seed weights per 100 seeds were unaffected by PGR treatments. Overall, Plateau, Select, and Roundup Pro gave more consistent results. These data suggest that Plateau, Select, and Roundup Pro are effective in reducing seedhead production, seed germination, and viability of cogongrass and will be further evaluated.

EFFICACY OF METHYL BROMIDE IN ELIMINATING THE SOIL SEEDBANK OF TROPICAL SPIDERWORT AND SICKLEPOD. M.G. Burton, J.F. Spears and A.C. York; Department of Crop Science, NC State University, Raleigh.

ABSTRACT

The federal noxious weed tropical spiderwort (*Commelina benghalensis*) was recently discovered near Goldsboro, NC. Tropical spiderwort is particularly troublesome due to its tolerance of many herbicides. Soil fumigation with methyl bromide (MeBr) was considered as a treatment option because (1) this was the only known infestation in NC and eradication seemed possible, and (2) the infestation was believed to be constrained to an area of less than 3 ha. Dormancy characteristics are known to differ among the four seed types (large and small seeds are produced from aerial and subterranean flowers) produced by tropical spiderwort. Previous reports indicate that sicklepod (*Senna obtusifolia*), which was also present in the affected area, is not well controlled by soil fumigation. This study was conducted to determine the efficacy of the soil fumigant methyl bromide in eradicating the soil seedbank of tropical spiderwort. Crop seed and sicklepod seed were included for comparison.

The experiment was conducted on two soil types in mid-June 2002. Both soils were tilled to an average depth of 15 cm with a tractor-mounted rotary tiller. Soil A averaged 11% volumetric moisture content and 1.3 Mg m^{-3} bulk density after tillage. Soil B had been lightly irrigated one day before the experiment and averaged 15% volumetric moisture content and 1.1 Mg m^{-3} after tillage.

Seeds from each of the four tropical spiderwort seed types and sicklepod were enclosed in separate compartments of nylon rumen bags using a thermal seem sealer. For small and large aerial seeds of tropical spiderwort and sicklepod, 25 seeds were enclosed in each bag. Because our supply of subterranean seeds was limited, fewer subterranean seeds were used in some cases. Weed seeds were buried on location for two days to allow seed to equilibrate to soil moisture levels. Rumen bags containing crop seed were not buried in advance to reduce the risk of bag breakage due to early germination. Two seed sources were used in each of three plots in each soil type.

Seed bags were buried at a depth of 7.5 cm immediately after tillage. Each 90 cm (3 ft) square plot was covered by transparent 2 mil plastic. To simulate knife width on tractor-mounted soil fumigation devices, methyl bromide was manually injected at 15 cm (0.5 ft) depth at the corners of a 30 cm (1 ft) square overlaying the center of the plot. The holes in the plastic resulting from injection were sealed with tape. Total methyl bromide delivered to each plot was approximately 380 Kg ai ha^{-1}. One plot was covered with plastic only (no MeBr applied) to test for a solarization effect. All plots remained covered for 72 h.

After recovery, seeds were subjected to a germination test. After 14 d, ungerminated seeds were subjected to a tetrazolium chloride test to assess viability. Unstained seeds or seeds with critical structures unstained were deemed non-viable (i.e. "dead" for the purposes of this experiment).

Average initial viability (germination + tetrazolium chloride viability) of crop and weed seed was at least 95%. Methyl bromide was highly efficacious against buried seeds of tropical spiderwort. All (100%) tropical spiderwort seeds were killed by the fumigant irrespective of seed type. All crop seed was also killed by the methyl bromide treatment. No differences were observed between seed sources. Sicklepod, as expected, was not acceptably controlled by methyl bromide. Only 81% (+/- 9%) and 73% (+/- 16%) of seeds were killed by the soil fumigant in soil A and B, respectively.

Solarization alone had insignificant effects on the tropical spiderwort seedbank compared to untreated seed. Although response was variable, solarization resulted in 32% (+/- 18%) dead sicklepod seeds compared to the 4% dead seeds observed in untreated sicklepod. Greater caution

should be exercised in applying the solarization results reported here because only one plot was used (although three subsamples were present in that plot).

Our results indicate that methyl bromide offers a highly effective means of eliminating the soil seedbank of tropical spiderwort where shallow tillage has been used. Additional applications might be necessary where the tropical spiderwort seedbank is likely more greatly vertically distributed. For example, in soils with high shrink/swell capacity (i.e. forms deep cracks when dry) or where deep tillage practices (e.g. moldboard or subsoil tillage) have been used, multiple applications of methyl bromide or other additional practices might be required.

TEMPERATURE OPTIMA FOR GROWTH OF TROPICAL SPIDERWORT. M.G. Burton, S. Sermons, and T.W. Rufty; Department of Crop Science, North Carolina State University, Raleigh, NC 27695-7620.

ABSTRACT

Commelina benghalensis L., known as tropical spiderwort or benghal dayflower, is native to tropical Asia, Africa, and the Pacific Islands (Faden 2000). It was introduced and established in Florida by the 1930s . It now occurs in Georgia and Louisiana, and was introduced separately to California (Faden 1993). Recently, it has been identified in one location in North Carolina (Krings et al. 2002).

C. benghalensis has aerial chasmogamous flowers, which generally produce one large and four small seeds, and subterranean cleistogamous flowers, which generally produce one large and two small seeds (Maheshwari & Maheshwari 1955). Aboveground and belowground flowers are borne in protective structures known as spathes. In the field, plants can produce up to 12,000 seeds per m^2 (Walker and Evenson 1985). They also may be propagated vegetatively; stem cuttings with 3 to 4 nodes can produce new plants if not buried deeply (Budd et al. 1979).

In Australia, tropical spiderwort has been reported as a pest in peanuts, beans, sorghum, and maize, where it not only competes with crops, but also interferes with harvesting (Walker and Evenson 1985). In the US, it is listed as a Federal Noxious Weed (Plant Protection and Quarantine 2000) due to its tolerance of many herbicides.

This study explored the effect of temperature on growth and floral initiation of *C. benghalensis*. This information may be relevant in predicting its potential growth in new habitats.

Growth chambers in the Southeastern Plant Environment Laboratory were set at 12 hour light/ 12 hour dark cycles with a night interruption and at constant temperatures of 20, 25, 30, 35, and 40 C.

Large and small aerial and subterranean seeds of *C. benghalensis* were sown 1.5 cm deep in sand in each chamber. When five seedlings from one seed type were 2 to 3 cm in height, one was transplanted into each temperature treatment into an 8.5-inch diameter pot containing equal parts of fine sand and coarse gravel. Plants were watered with a complete nutrient solution once daily and with distilled water once daily. Sufficient seeds germinated to replicate the experiment five times for large aerial (LgAer) and large subterranean (LgSub) seeds; poor germination of small seeds resulted in one replicate for small subterranean (SmSub) seedlings and none from small aerial seeds.

Plants were harvested 28 days after transplant. Plant material was divided into the following categories: aboveground vegetative, aboveground reproductive, roots, rhizomes, and belowground reproductive. Material was dried at 70 C to constant weight. Spathes were counted and all parts were weighed.

Temperature response of the plants produced from all types of seeds was strong, with all measured aspects showing a similar response. Appearances of LgSub and LgAer plants were similar, with browning of leaves in the 40 C treatment.

Vegetative mass and root mass were greatest at 30 and 35 C. Root mass was slightly greater for LgSub plants than LgAer plants at 25 and 30 C.

Aboveground spathe number and spathe mass demonstrated a very sharp temperature response, with the highest output at 30 C. LgSub plants had more spathes than LgAer at 25 and 30 C. Belowground spathe number, spathe mass, and rhizome mass were highest at 30 and 35 C.

C. benghalensis responds strongly to temperature, with highest growth and floral initiation (spathe number and mass) at 30 to 35 C. Our data suggest that summer temperatures throughout the southeastern US are optimal for growth and reproduction of this noxious weed.

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ISOLATION AND STUDY OF ARYLACYLAMIDASE ACTIVITY FROM PROPANIL-RESISTANT BARNYARDGRASS [ECHINOCHLOA CRUS-GALLI (L.) BEAUV.]. R.E. Hoagland and K. Hirase; USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS 38776 and Mitsui Chemicals, Inc., Chiba, Japan.

ABSTRACT

Long-term use of propanil in rice (Oryza sativa L.) production has resulted in the development of a propanil-resistant barnyardgrass [Echinochloa crus-galli (L.) Beauv.] biotype in Arkansas which was reported in the early 1990's. Several years latter, the mechanism of resistance of this propanil-resistant biotype was shown to be elevated levels of the enzyme, arylacylamidase that metabolically detoxifies propanil via conversion to 3,4-dichloroaniline and propionic acid. However, no reports have been published on the isolation, or characterization of this enzyme from this resistant weed. We have recently succeeded in the isolation, and partial characterization of this enzyme in propanil-sensitive and -resistant barnyardgrass with respect to kinetic parameters, effects of inhibitors, and levels of activity in dark- and light-grown tissues.

Generally, enzyme preparations were prepared by homogenizing leaf tissue with phosphate buffer (pH 7.5), dithiothreitol (1 mM), and polyvinylpyrrolidone (0.2%), followed by centrifugation. The supernatants from these preparations were used in standard assays containing enzyme, propanil (1mM), and phosphate buffer (pH 7.5). Reactions were incubated at 30 ^{0}C and terminated with 20% trichloroacetic acid, followed by centrifugation. The 3,4-dichloroaniline produced was quantitated by adding *p*-dimethylaminocinnamaldehyde to terminated assay aliquots, and measuring the optical density (A_{540}) of the colored product formed after 15 min. The level of extracted enzyme activity in the resistant tissue preparation increased linearly with time over a 5 hr time course, but activity in the sensitive tissue preparation was 2- to 3-fold lower, and the activity tended to decrease at later time points. Apparent K_m values were 62 mM and 3 mM for the enzyme activity in sensitive and resistant tissue preparations, respectively. The relatively low enzyme K_m value of the resistant- compared to the sensitive-biotype also demonstrates the greater efficiency of enzymatic conversion of propanil to non-phytotoxic products in propanil-resistant barnyardgrass. Two herbicides (anilofos and piperophos), previously shown in field and laboratory tests to synergize propanil injury against the resistant biotype, were demonstrated to be potent inhibitors of the *in vitro* arylacylamidase activity in preparations from both sensitive and resistant biotypes. These results are important with regard to understanding basic biochemical differences in these susceptible and resistant barnyardgrass biotypes, and in developing chemical synergists with propanil to control the propanil-resistant weed.

THE EFFECT OF TITANIUM DIOXIDE ALUMINA BEADS ON THE PHOTOCATALYTIC DEGRADATION OF PICLORAM IN WATER. D.J. Lee and S.C. Jung, Sunchon National University, Suncheon, Jeonnam 540-742, Korea; S.A. Senseman, A.S. Sciumbato, and L.J. Krutz, Texas Agricultural Experiment Station, Texas A&M University, Dept. of Soil and Crop Sciences, College Station, TX 77843-2474.

ABSTRACT

Photocatalytic degradation of pesticides with titanium dioxide (TiO_2) and other catalysts has shown promise as a potential water remediation method. Titanium-based powders have been used in photocatalytic degradation studies but have limitations. The objective of this study was to determine picloram degradation in water using various UV light sources and low pressure metal organic chemical vapor deposition (LPMOCVD) titanium dioxide alumina beads (TDABs) as a catalyst. A triple-annular, flow-through photoreactor was used as a degradation chamber. A picloram test solution of 50 µg/mL was introduced to the photoreactor inlet and recycled for 10 h at a flow rate of 50 mL/min. Three ultraviolet light sources were compared for their photocatalytic capacity (UV-A, UV-B, and UV-C) both with and without TDABs. TDABs were added to the photoreactor at 1.8 g/cm^3. Dark treatments with and without TDABs were included to quantify hydrolysis or adsorption. A 500-µL aliquot was taken from the test solution 14 times during the 10-h recycling period. Sampling times ranged from 0 to 600 min (10 h). These aliquots were placed in a vial and analyzed by high performance liquid chromatography (HPLC) equipped with a photodiode array (PDA) detector. Picloram was not significantly hydrolyzed or adsorbed to TDABs during the experiment. The picloram degradation rate with UV-A and TDABs ($t_{1/2}$ = 119.5 min) was greater than the degradation rate of UV-A alone ($t_{1/2}$=2288 min). Picloram degradation was not enhanced by the presence of TDABs with either UV-B or UV-C. This may be attributed to inadequate TDAB densities and/or poor light penetration in the photoreactor. Rapid picloram degradation occurred with both UV-B and UV-C regardless of the presence of TDABs with mean half-lives ranging from 7 to 18 min. These rates were 8 to 16 times faster than picloram degradation using UV-A with TDABs. TDABs greatest photocatalytic effect was with the lowest energy light source (UV-A). However, picloram degradation was not enhanced when TDABs were combined with more powerful, shorter wavelength light.

TRIFLOXYSULFURON: SOIL BEHAVIOR AND FOLIAR VERSUS ROOT ABSORPTION BY TORPEDOGRASS. R.H. Walker, W.A. Williams and G.R. Wehtje. Alabama Agric. Exp. Stn., Auburn University, Auburn University, AL 36849-5412.

ABSTRACT

Root and/or foliar absorption. CGA 362622 (trifloxysulfuron proposed) rates (0.02, 0.035, 0.05, 0.065 lb ai/A) and herbicide placements (foliar+soil, foliar-only, soil-only) were evaluated under greenhouse conditions for the control of torpedograss. Foliar+soil and soil-only applications were more effective than foliar-only in suppressing re-growth at 7 WAT. Re-growth reduction relative to a non-treated progressed from 73 to 84% as herbicide rate increased from 0.02 to 0.065 lb ai/A.

Foliar/root absorption and translocation. Foliar and root absorption and subsequent translocation were determined in torpedograss with radio-tracer techniques. After 72 h, 29% of the foliar-applied CGA 362622 had been absorbed, and 2 and 5% of the amount applied had accumulated in developing rhizomes and roots, respectively. Root absorption and translocation were determined with plants in a solution spiked with CGA 362622 at 190 ppb (hydroponics). After 6 h, whole plant concentration was 134 *n*g/plant. Only 56% of amount absorbed remained in the roots; the remainder having been translocated to other tissues. The youngest leaf and the immature rhizomes accumulated 3 and 15%, respectively.

Soil adsorption. Soil adsorption as affected by CGA 362622 concentration (0.019, 0.19, 1.9 mg/kg) and soil pH (5.7, 6.7) was researched using a soil solution technique and radio-labeled CGA 362622. The 0.19 concentration was based upon the 0.02 lb ai/A rate. Averaged over pH, percent recovered in soil solution increased from 20 to 23% as concentration increased from 0.019 to 1.9 ppm. Percent CGA 362622 in soil solution averaged over concentrations was 15 and 27% for pH 5.7 and 6.7, respectively.

Soil mobility. Soil mobility of CGA 362622 was researched using a soil chromatography technique and radio-labeled CGA 362622 at pH 5.7 and 6.7 values. Soil mobility was pH dependent. At pH 5.7, highest concentrations were detected in the 5th and 6th increments. Only a trace amount was detected in the increment that included the wetting front. At pH 6.7, highest concentrations were detected in the 7th and 8th increments, and 18% was detected in the increment that included the wetting front.

ADSORPTION OF FLUMIOXAZIN TO SEVEN SOUTHERN SOILS. J.A. Ferrell, T.L. Grey, W.K. Vencill. Department of Crop and Soil Sciences, University of Georgia, Athens, Georgia, 30602, and Tifton, Georgia, 31794.

ABSTRACT

The adsorption and desorption of flumioxazin was tested on seven commonly occurring soils throughout the southern United States. Adsorption isotherms for all soils had K_d values that ranged from 2.1 to 0.9. These low K_d values indicated that flumioxazin does not form strong associations with sorbent. As clay content increased for soils in this experiment, flumioxazin adsorption also increased. However, organic matter percentage of the soil was not statistically correlated with adsorption. Adsorption kinetics experiments showed that 72% of total herbicide was absorbed after 1 hour of continuous shaking and continued to increase to 78% after 72 hours. Desorption isotherms exhibited a slight hysteretic effect. These results denote that desorption was only marginally slower than adsorption. Therefore, flumioxazin can become readily available in soil solution with the addition of increased soil water content.

PLANT AVAILABLE IMAZETHAPYR IN SOIL SOLUTION AND RED RICE (*ORYZA SATIVA* L.) EFFICACY AS INFLUENCED BY HERBICIDE RATE AND SOIL MOISTURE. A.S. Sciumbato, L.J. Krutz, G.L. Steele and S.A. Senseman, Texas Agricultural Experiment Station, College Station, D.J. Lee, Sunchon National University, Suncheon, Jeonnam, South Korea and B.V. Ottis, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville.

ABSTRACT

Soil moisture content affects herbicide efficacy by influencing the amount of plant-available product in soil solution. Unfavorable moisture conditions could result in the herbicide not being available in sufficient levels to provide adequate weed control. Lab studies were conducted to evaluate the plant-available imazethapyr at different soil moisture contents (-10 kPa, -33 kPa, -100 kPa and -200 kPa) and herbicide rates (0.016 $\mu g\ g^{-1}$, 0.032 $\mu g\ g^{-1}$ and 0.064 $\mu g\ g^{-1}$). Plant available ^{14}C-imazethapyr in soil solution was extracted from soils of varying moisture content by centrifugal force and quantified using liquid scintillation. Soil moisture was held constant for each treatment throughout the study period. There was no moisture by rate interaction. Application rate had no effect on plant-available imazethapyr. However, application rates affected the amounts of imazethapyr that was adsorbed to the soil. Imazethapyr became more plant-available as soil moisture increased. Of all factors evaluated, soil moisture was the most influential in determining the amount of imazethapyr available for plant uptake.

IDENTIFICATION, HISTORY, AND CONTROL OF COGONGRASS [*IMPERATA CYLINDRICA* (L.) BEAUV.] K.D. Burnell, J.D. Byrd, Jr., C.T. Bryson, T.H. Koger, and D.N. Ivy; Mississippi State University, MS 39762.

ABSTRACT

As public awareness of invasive weeds increases, so does the need for clientele education. Numerous educational venues exist, including, public service announcements, newspaper and newsletter articles, Extension leaflets and publications, videos, internet, and traditional Extension meetings and workshops. Prices and availability of electronic tools in the 21st century, such as digital cameras, computers, software and printers have greatly increased our ability to produce educational pieces with appeal and pertinent information. In meetings and workshops, multiple sources can often be used to reemphasize important facts.

Cogongrass is an invasive weed in Mississippi that is expanding populations north and westward. Identification, history, and control of cogongrass has become a topic for public awareness. A poster was designed that could be displayed at various functions to help educate clientele on this aggressive, invasive weed. The poster contains images of cogongrass in a variety of environments, including highway and utility rights-of-way, forests, and natural areas. Also displayed are images of the various growth phases of cogongrass, including dormancy, spring bloom, and summer growth as well as morphological features, such as rhizome, ligule, and leaf collar.

Several other perennial grasses may be mid-identified as cogongrass by those not familiar with this weed. These include bahiagrass (*Paspalum notatum*), broomsedge (*Andropogon virginicus*), johnsongrass (*Sorghum halepense*), eastern gamagrass (*Tripsacum dactyloides*), and silver beardgrass (*Andropogon saccharoides*). Images and text focus on the differences that are important to correctly identify cogongrass and not mis-identify the others as cogongrass. Lastly, control information, such as effective herbicides, rates and application timing is presented.

MOWING AND CULTURAL TACTICS FOR COGONGRASS [*Imperata cylindrica* (L.) Beauv.]. K.D. Burnell, J.D. Byrd. Jr., G. Ervin, P.D. Meints, J.W. Barnett, Jr., and D.B. Mask. Mississippi State University, MS 39762.

ABSTRACT

Field studies were conducted during 2002 in southern and central Mississippi to evaluate the influence of various mowing and cultural tactics for cogongrass control. The objectives were to determine if 1) compare mowing frequencies for cogongrass control and 2) determine influence of mowing frequencies on fertilized and natural cogongrass populations. For objectives 1 and 2, mowing treatments included mowing frequencies of none, weekly, bi-weekly, monthly, and bi-monthly. A Husquvarna gas powered string trimmer was used to mow cogongrass at ground level in plots sized 10 ft by 10 ft. Both objectives were arranged in a randomized compete block, but the design for objective 2 was a split plot with whole plot factors of mowing and subplot factors being fertilization.

Fertilized plots were initially limed with 2 tons per A, along with 62 lbs N per A of 13-13-13 as warranted by soil test for bermudagrass (*Cynodon dactylon*) hay. Thereafter 50 lbs/A N was applied monthly from April through September. Vegetation analysis was done almost monthly from May 2002, analysis included identifying of species present and percentage of plot infested with that particular species, from these data, diversity (dominance of a species) and richness (number of species per plot) calculated. In addition, biomass was collected, dried, and weighed 10 to 14 days after all plots were mowed during the bi-monthly mowing treatment. ANOVA was performed on all data and means separated by Fisher's Protected LSD at alpha of 0.05.

Data indicated that when combined over locations, initial density counts of 86 plants/ft^2 in 1999 were reduced to between 13 to 68 plants/ft^2 by 2002 with frequent mowing. Plant populations declined as mowing frequency increased. Density counts fell to 13 plants/ft^2 in plots mowed weekly and 41 plants/ft^2 in plots mowed every other week by dormancy of 2002. Plots mowed once a month or every other month had densities of 62 and 68 plants/ft^2, respectively, at final count in 2002. Data for objective for suggested that diversity, richness, and biomass production were all increased by mowing and fertilization treatments. Biomass production was doubled when mowed plots were fertilized compared to non-fertilized plots, with the monthly and bi-monthly mowing having the highest increase. Diversity was increased compared to the check until late season (late October). Richness was similar to diversity of and showed increased richness compared to the check October. Increased mowing (weekly or biweekly) increased richness 2 to 3 times that of the check and by October weekly, bi-weekly, and monthly mowings increased richness 3 to 4 times compared to the check. Frequent mowing can reduce cogongrass populations significantly. In addition, to mowing fertilization will promote new species to invade previously cogongrass dominated areas. All data suggest positive results in the battle to control cogongrass.

COGONGRASS [*IMPERATA CYLINDRICA* (L.) BEAUV.] CAN BE DETECTED USING HYPERSPECTRAL REFLECTANCE DATA. J.W. Barnett, Jr., J.D. Byrd, Jr., L.M. Bruce, J. Li, D.B. Mask, A. Mathur, and K.D. Burnell; Department of Plant and Soil Sciences. Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

In an attempt to correctly differentiate cogongrass from other grassy weeds, cogongrass reflectance data was compared to other perennial grasses, which included, bahiagrass (*Paspalum notatum*), bermudagrass (*Cynodon dactylon*), broadleaf signalgrass (*Brachiaria platyphylla*), broomsedge (*Andropogon virginicus*), centipedegrass (*Eremochloa ophiuroides*), dallisgrass (*Paspalum dilatatum)*, johnsongrass (*Sorghum halepense*), knotroot foxtail (*Setaria geniculata*), and vaseygrass (*Paspalum urvillei*). Starting October of 1999, four to five hyperspectral reflectance readings were recorded monthly using a Field Spec Pro FR portable spectroradiometer at each location. These hyperspectral reflectance curves are comprised of over 2150 spectral bands ranging between 350 to 2500 nm at 1.4 nm increments. Various techniques, like one-dimensional discrete wavelet transform (DWT) and Fisher's discriminant method, and Haar mother wavelet were used to differentiate the assorted grassy weeds from cogongrass.

For every month evaluated, results were positive. Using the Haar mother wavelet on the October data, both species (cogongrass and all other grassy weeds) were detected with 100% accuracy. Also, using the same method for analyzing February data, cogongrass was correctly classified with 96% accuracy and the other grassy weeds were correctly classified with 100% accuracy. Classification accuracies declined in April (during cogongrass flowering), with 83% accuracy detecting cogongrass and 75% accuracy for the other species. Other classification methods, such as the principal component analysis applied to the same data set, correctly identified cogongrass from the other grassy weeds 48, 86, 69, and 93% during October, February, April and July, respectively. Classification accuracy ranged from 48 to 100%, depending on the method of analysis and classification for cogongrass and other gassy weeds. These results indicate hyperspectral reflectance data can be used to detect and classify cogongrass in areas in which cogongrass as well as additional grassy weeds species coexist.

SYMPOSIUM.

GLYPHOSATE RESISTANCE/TOLERANCE IN *Conysa canadensis*

CONTROL OF MARESTAIL (*CONYZA CANADENSIS*) WITH GLYPHOSATE. R.F. Montgomery, T.E. Dutt, G.P. Murphy, T.S. Willard, and G.A. Elmore; Monsanto Company, St. Louis MO 63167.

ABSTRACT

Marestail (*Conyza canadensis*) surviving applications of glyphosate was reported in Delaware by Van Gessel in 2000. Fields were identified in 2001 in Delaware, New Jersey and Maryland in which glyphosate treated marestail was stunted but produced green meristems following herbicide applications. In 2001, Hayes reported similar results in West Tennessee where field results indicated no difference among glyphosate formations, herbicide carrier volumes or surfactant levels ranging from .25 to 2% v/v. Marestail from Tennessee exhibited a 6X level of resistance to glyphosate when resistant ®) and susceptible (S) biotypes were compared. Control ratings for the R biotype were greater for small (2 in) marestail rosettes when compared to larger (3 in) rosettes.

Studies by Chen in 2001 and Heck 2002 conclude that dominant, nuclear-encoded glyphosate resistance is present in some C*onyza canadensis* populations. Glyphosate application to F2 progeny of RxS biotypes suggests that resistance is controlled by a single dominant gene. Resistance does not appear to be based on lack of glyphosate uptake, glyphosate metabolism, EPSPS gene expression or EPSPS gene amplification. Currently, 3 distinct EPSPS genes have been cloned from horseweed. Given the distribution of the different EPSPS genes within the horseweed populations and the difference in glyphosate translocation levels between R and S biotypes, it appears that a non-target (i.e. non-EPSPS) difference is a key component of resistance.

Historical effectiveness of glyphosate on marestail used as a single spring burndown application in 230 experiments at 4 rates including 82 glyphosate formations ranged from a low of 63% in 1993 to a high of 91% control in 1978. The years in which control exceeded 90 % included 1978, 1984, and 1991. Years where marestail control averaged < 70% were 1982, 1987, and 1993. These data suggest that average glyphosate performance in a given year can vary as much as of 45% due to the effects of environmental conditions that exist.. This fact alone can make resistance issues difficult to detect with field studies.

Glyphosate rates ≤ 0.38 , 0.56 , 0.75 and > 0.75 pounds acid equivalent per acre (lbs. ae/a) controlled horseweed of all heights an average of 73, 88, 91 and 94 %, respectively. Control of either < 6 inch or 6 to 12 inch tall marestail was equivalent averaging 91 and 92 % respectively, however control ratings for marestail > 12 inches declined to 77 % across all rates.

Marestail control decreased as weed height increased at glyphosate rates ≤ 0.38 ae/a. Marestail control for all other rates tested was greatest for weeds within the 6-12 inch growth stage, lowest for tall weeds (> 12 in) and intermediate for small (< 6 in) marestail.

A subset of this data was selected for experiments that had side-by-side comparisons of Roundup and Roundup + 2,4-D at 0.5 lbs. ai/a. Data available for this comparison were made up of 949 observations from 6 years and 36 experiments. Marestail control improved from 69 to 77 % with the addition of 0.5 lbs. ai/a 2,4-D to Roundup when averaged across all Roundup rates. Control ranged from 52-88% for Roundup only and 64-94% for Roundup + 2,4-D. Control differences between treatments with and without 2,4-D were greater at Roundup rates was limited to 0.5 lbs. ae/a or less. Differences in marestail control among treatments comparing

Roundup only and Roundup 2,4-D declined to 4.0 % when Roundup rates increased to the range of 0.56 and 1.5 lbs ae/a.

Monsanto presently recommends Roundup Weathermax® @ 0.75 lbs ae/a plus 2,4-D applied preplant (PP) for control of marestail in soybean and corn and Roundup Weathermax @ 0.75 lb ae/A plus dicamba applied 21-35 days PP to cotton. PP applications should be made prior to horseweed reaching 6 inches in height. Cloransulam plus glyphosate @ 0.75 lbs ae/a is recommended for in-crop applications in Roundup Ready® soybean where marestail escapes PP control. MSMA plus diuron is recommended as an in-crop post-directed treatment for horseweed escapes in cotton. Dicamba or 2,4-D is effective on marestail postemergence to corn.

GLYPHOSATE-RESISTANT HORSEWEED *(CONYZA CANADENSIS*) DISTRIBUTION AND CONTROL IN TENNESSEE. R.M. Hayes, TC. Mueller, and C.C. Craig, University of Tennessee, Jackson, TN 38301

ABSTRACT

Glyphosate-resistant horseweed was found on upwards of half million acres of cropland in western Tennessee in 2002. The represents quite an enormous spread from the initial reports in 2000 by a producer in Lauderdale County.
Similar spread occurred in the Delmarva area after the initial report by Van Gessel. The rapid spread in not unexpected since horseweed achenes are readily windblown. There are also report of possible resistant fields in Kentucky, Missouri, and North Mississippi.

Horseweed, thought to emerge in the fall and early spring emerged throughout the growing season in West Tennessee during 2002. On farm visits confirmed newly emerged plants throughout the summer.

Several experiments were conducted during 2001-2002 to determine the most effective strategies for horseweed management, particularly in cotton and soybean production systems. All herbicide and applications were made at labeled rates and in accordance with application instructions. All treatment were replicated three or four times in a RCB design and data were subjected to ANOV and means were separated using Fisher's protected LSD at P=0.05.

Neither glyphosate nor paraquat controlled resistant horseweed, but admixtures of glyphosate or with 2,4-D or dicamba controlled horseweed >95%. Glufosinate plus 2,4-D was equally effective. Flumioxazin or paraquat plus diuron applied in late November provide control through early April the following year. The former did not control annual bluegrass, while the latter control all vegetation, leaving the soil exposed to erode. Flumioxazin applied 1 April did not control 5 to 10 cm horseweed.

Paraquat plus metribuzin and glyphosate plus a package package mixture of sulfentrazone:chloransulam-methyl, and glufosinate plus chloransulam-methyl applied 30 days before planting soybeans controlled horseweed an other summer dicot weeds throughout the season and prevented yield loss to weeds.

MSMA plus diuron posted directed in cotton controlled 3 to 5 cm horseweed >95%. Trifloxysulfuron-sodium killed the apical meristem of horseweed, but did released axillary buds, failing to provide complete control.

Crop rotation and associated herbicide mode of action rotation appears to be of little value in preventing problems with glyphosate resistant horseweed unless practiced over a large area because of the potential for infestation from windblown seed. Therefore, the best management practice for glyphosate resistant horseweed appears to be through the use of mixture of herbicides with modes of action other than an EPSP synthase inhibitior. Producers should also be cautious of relying on ALS inhibitor herbicides (e.g. chloransulam-methy) since weed are know to develop resistance to ALS inhibitiors. Specific recommendations for horseweed management can be obtained at http://www.ut.extension.utk.edu/weedcontrol/weedcontrol.html

RESPONSE OF GLYPHOSATE TOLERANT AND SUSCEPTIBLE BIOTYPES OF HORSEWEED (*CONYZA CANADENSIS*) TO FOLIAR APPLIED HERBICIDES. J.R. Martin and W.W. Witt, Department of Agronomy, University of Kentucky, Princeton, KY 42445-0469.

ABSTRACT

There were isolated cases where multiple applications of glyphosate failed to provide complete control of horseweed in Kentucky during 2001. Due to these unique circumstances, studies were conducted in 2002 at a farm site in Trigg County and at two sites on the UKREC near Princeton to evaluate strategies for horseweed control and to determine if glyphosate tolerant biotypes existed in Kentucky. Although crops were not planted in these studies, the timing of treatments were done to simulate burndown or in-season applications for Roundup Ready soybeans. In addition to the field studies, horseweed seed were collected from various fields and used for a greenhouse experiment to help confirm glyphosate tolerance.

The Trigg County site was chosen because it had problems with escapes following multiple applications of glyphosate in 2001. Results of the Trigg County field study in 2002 indicated this population had a high level of tolerance to glyphosate. Applying glyphosate at 0.75 lb ae/A to four-inch tall plants on April 25, resulted in only 60% control by June 6. These plants continued to survive when treated again on June 6 with an in-season application of glyphosate at 0.75 lb ae/A. The overall control rating, which accounted for burndown control of treated plants and residual control of newly emerging plants, was only 10% for this treatment on July 8. Using a similar approach, but increasing the rate of the in-season application of glyphosate to 1.125 lb ae/A, resulted in only 66% overall horseweed control on July 8. The addition of 2,4-D ester at 0.5 lb ae/A or cloransulam at 0.016 lb ai/A with glyphosate, tended to improve burndown control of treated plants, but control of late emerging plants was variable. However, the overall control on July 8 was at least 91% when both 2,4-D and cloransulam were mixed with glyphosate in the April 25 early preplant burndown treatment, or when the combination of 2,4-D plus glyphosate was applied as an April burndown spray followed by an in-season application of cloransulam plus glyphosate. The use of paraquat at 0.75 lb ai/A as a tank mix partner with cloransulam or with cloransulam plus 2,4-D as early preplant treatments followed by an in-season application of glyphosate, provided 100% overall control on July 8. The in-season application of cloransulam plus glyphosate tended to improve control of plants previously treated with an early preplant application of glyphosate alone, but overall control was still only 63% by July 8. Greenhouse studies of plants collected from the Trigg County site confirmed this population was highly tolerant to glyphosate.

The two experiments at UKREC dealt with populations of horseweed that were more susceptible to glyphosate compared with the population in Trigg County. Treatments in the first UKREC study were applied on May 16 when horseweed was approximately 10 inches in height. The level of burndown control of horseweed in this study was 98% with glyphosate at 0.75 lb ae/A, 53% with cloransulam at 0.016 lb ai/A, 67% with 2,4-D at 0.5 lb ae/A, and 100% with glyphosate at 0.75 lb ae/A plus 2,4-D at 0.5 lb ae/A. In the second UKREC experiment, horseweed plants were mowed to an average height of five inches and treated on May 31. Glyphosate applied at 0.56, 0.75, 1.125, and 1.5 lb ae/A resulted in 77, 86, 93, and 100% burndown control of horseweed, respectively. The use of tank mix partners such as 2,4-D at 0.5 lb ae/A, cloransulam at 0.016 lb ai/A, or the premix of chlorimuron plus sulfentrazone at 0.14 lb ai/A tended to improve burndown control with glyphosate at the low rate of 0.56 lb ae/A. However carfentrazone at 0.008 lb ai/A or flumioxazin at 0.064 lb ai/A did not improve horseweed control when combined with glyphosate.

The horseweed seed that were collected from various fields were planted in styrofoam cups. Plants were grown in the greenhouse and treated when they reached approximately 2 to 3 inches in diameter. Results indicated that 7 of the 11 samples were tolerant to glyphosate at 1.5 lb ae/A. The samples were collected from 7 counties in central and western Kentucky. Although

surviving plants were stunted and had burned leaves, they were able to initiate new growth by 16 days after treatment.

Results of these experiments indicate that glyphosate - tolerant biotypes of horseweed are present in Kentucky, and that herbicides with other sites of action are needed to provide effective burndown and residual control of this weed. The fact that glyphosate-tolerant and ALS-resistant biotypes have been observed in neighboring states, makes it critical to develop strategies with alternative modes of action and to monitor fields for regrowth.

GLYPHOSATE RESISTANCE IN HORSEWEED (*CONYZA CANADENSIS)* FROM A WESTERN KENTUCKY FARM. C.B. Rogers. Department of Agricultural and Human Sciences, Morehead State University, Morehead, KY 40351.

ABSTRACT

Horseweeds suspected of being resistant to glyphosate were first noted in a farm field in Logan County, Kentucky during the summer of 2000. The farmer brought these horseweeds to my attention when he was not getting proper kill after application of 1 quart/A of glyphosate (Roundup Ultra ®). Subsequently the farmer applied another 2 quarts/A. of glyphosate and still did not get control. At this time, I suspected resistance and soon thereafter began seeing VanGessel's reports of resistance in Delaware. In the summer of 2001 spots of horseweed that did not respond to glyphosate were found in adjacent fields on the same farm. Four horseweed plants (coded RS1 – RS4) were selected at random from one of these spots and transferred to pots in the greenhouse at Morehead State University. These plants were allowed to flower and seed were collected from these plants. The seed from each plant were kept separate. Seeds were also collected from plants native to the Morehead, KY area and which were known not to have been exposed to glyphosate and were not suspected of glyphosate resistance (one composite sample, coded NS).

During late winter of 2002 seeds from the suspected resistant selections and from the non-suspect plants were germinated in ½ inch square plugs of potting media in plug flats in the greenhouse mist room. When the plants were at approximately the 4-leaf stage they were transplanted into 2 inch x 2 inch disposable pots. By mid-April the plants were 2 to 3 inches in diameter and were ready for treatment. Three pots of each selection (NS, RS1, RS2, RS3, RS4) were placed in open-bottomed flats and sprayed with glyphosate (Roundup Ultra Max ®; 5lb. ai./gal.) using a CO_2-pressurized backpack sprayer to deliver 20 GPA spray volume. The herbicide rates used were 0, 1, 2, 4, 8, and 16 quarts/A. The plants were then returned to the greenhouse for observation and data collection. Data was collected over a period of 3 months and then selected plants were transferred to larger pots and allowed to continue growth.

There was little, if any, injury noted at 3 days after treatment (DAT) for all herbicide rates except 16 quarts/A where some of the horseweed plants exhibited symptoms similar to surfactant burn. It was most pronounced on the NS plants. At 7 DAT there were prominent injury symptoms on NS plants at all glyphosate rates other than the check (0) rate with the 16-quart rate showing severe leaf desiccation. There were some minor changes visible on the RS plants. By 10 DAT there were obvious injury symptoms present on the plants suspected of resistance with the severity of injury increasing with increasing herbicide rates. At 17 DAT NS plants were dead at all rates above 1 quart and nearly dead at the 1 quart/A rate. RS plants treated at 2 and 4 quart/A rates appeared to stabilize, and most plants in the 8 and 16-quart treatments were dead or nearly dead. Observations at 21 DAT showed all non-resistant type plants were dead except in the check (0) flat and all plants appeared dead in the 8 and 16-quart flats. At 25 DAT the resistant horseweed plants were beginning to show regrowth at the 1, 2, and 4-quart rates with progressively smaller regrowth at the higher rates. At 32 DAT one RS type plant in the 8-quart/A treatment began showing regrowth (had previously been thought to be dead). Regrowth soon began to look like normal plant growth but was slower at higher treatment rates. At 73 DAT representative plants were selected from each type and rate surviving and transplanted to larger pots. There were no detectable differences in any of the 4 selections of resistant type plants. All plants (including the 8-quart/A survivor) had flowered by early November and produced seed.

Glyphosate did cause some degree of injury to all treated plants. A few of the Suspected Resistant plants were killed at rates below 8 quarts/A but most of them recovered and produced seed. The 16-quart rate of glyphosate killed all plants. These horseweeds appear to be resistant to glyphosate at rates well above normal use rates but extreme rates killed them.

SYMPOSIUM. RICE

NEW AND POTENTIAL WEED PROBLEMS IN RICE. R.E. Strahan; Louisiana State University AgCenter, Baton Rouge, LA

ABSTRACT

Selection pressures cause shifts in the weed community from one species to another by eliminating susceptible weed species and allowing the tolerant species to flourish. In southwest Louisiana rice fields, cultural practices associated with water-seeding rice, crawfish/rice rotations, and the control of the most susceptible weeds has caused a weed species shift over the past 10 years. Perennial grasses such as knotgrass (*Paspalum distichum*), brook paspalum (*Paspalum acuminatum*), water paspalum (*Paspalum hydrophylum*), and perennial barnyardgrass (*Echincochloa polystachya*), collectively called "water bermudas" by growers, may infest as much as 200,000 rice acres in southwest Louisiana. Although seed production does occur, the perennial grasses appear to reproduce vegetatively by cut stolons and rhizomes. The distribution of the weeds and their rapid spread in water-seeded rice can probably be attributed to tillage practices and movement of contaminated equipment from field to field. Due to their tremendous reproductive capacity and lack of sufficient control methods, populations can reach levels that severely limit rice production. The "water bermudas" now rank as the second most troublesome weeds in water-seeded rice.

Giant salvinia (*Salvinia molesta*) is an aquatic floating fern native to Brazil. This extremely invasive weed reproduces by vegetative fragments and populations can double within ten days. The weed is dispersed by wind, boats, and flowing water. Giant salvinia produces dense mats of vegetation, which cover lakes, ponds, and canals thereby reducing oxygen levels and lowering water quality. The weed can clog irrigation systems and may compete directly with the rice crop if introduced into rice fields. LSU AgCenter scientists are currently monitoring a heavy giant salvinia infestation near the town of Cameron in southwest Louisiana. This infestation threatens the drainage and irrigation systems with the potential for devastating rice production in the region.

CHANGES IN RICE CULTURAL PRACTICES. P.K. Bollich; Louisiana State University AgCenter, Rice Research Station, Crowley, LA.

ABSTRACT

Clearfield rice technology provides an opportunity to control red rice in commercial rice by taking advantage of herbicide-tolerant varieties and in-season use of the herbicide Newpath. Until the development of this technology, cultural practices were relied upon for red rice suppression. Water seeding, and more specifically water seeding with pinpoint flood water management, has been the primary cultural method used in Louisiana to suppress red rice. Water seeding usually includes a tillage practice referred to as "mudding in." The majority of seedbed tillage is performed under flooded conditions with various field implements designed for this purpose. The intent is to destroy any existing red rice prior to planting and reduce the germination potential of buried red rice seed. This cultural system can be very effective in suppressing red rice but is not environmentally sound due to sediment-laden rice field discharges.

The Clearfield system is a cultural practice change in itself since it represents the first time that herbicide-tolerant rice can be used to control red rice. Southwest Louisiana usually water seeds approximately 80% of its rice acreage while 65% is water seeded on a statewide basis. It is expected that a shift toward drill seeding will occur as the Clearfield system becomes more popular. When comparing water seeding with drill seeding, there are differences in many aspects of each system. Extensive educational activities are currently underway to familiarize rice producers who have historically water planted with these differences and to assist them in making this change.

The first labelled use of Clearfield allowed for drill seeding only. The label was recently amended to include dry broadcasting, all tillage systems, and water seeding. The water seeding label is restricted to clear water planting only. In this system tillage is conducted under dry soil conditions followed by flood establishment and aerial seeding. Clear water planting has long been a water-seeded option available to producers, but it has been less effective in suppressing red rice than the traditional mudding in system.

From the producer perspective, changing from water seeding to dry planting may not seem to be a complicated process. But, it is not only the planting operation that changes. The approach to nutrient and water management, stand establishment, and weed control in these systems can be quite different, depending on which cultural systems are compared. The timing of fertilizer nitrogen (N) in a clear water, pinpoint flood system is drastically different from that in a drill-seeded system. In this water-seeded system, most of the N is applied preplant and preferably incorporated; whereas in a drill-seeded system the bulk of the N is applied just prior to permanent flood establishment at the 3- to 4-leaf growth stage. Fertilizer N management in a mudding in system also differs from drill seeding since most of the N is applied either to saturated soil or into the floodwater because of the water management required to suppress red rice. Water and N management are closely linked to each other, regardless of whether red rice is a concern. Water management in a water- or drill-seeded system with Clearfield rice will be very similar to that with conventional rice varieties. Once again, the change in cultural practices is primarily a change from water seeding to drill seeding since the Clearfield system allows for red rice control when drill seeding. Stand establishment between water and drill seeding is quite different because of the placement of the rice seed. With water seeding the seedling develops on the soil surface and thrives with saturated conditions or frequent flushing during stand establishment. With drill seeding, the rice seed is buried, and while adequate moisture is necessary for germination and seedling development, saturated conditions can reduce stands or delay plant development. Aeration is necessary for proper root development in this system. This aspect of water management will be an important change facing the water-seeding producer when switching to a drill-seeded management. Herbicide programs will also change to a certain extent because of the water management scheme.

It is expected that rice culture in Louisiana will gradually shift from predominantly water seeding to more drill seeding or dry broadcast if the Clearfield system provides the expected benefits with respect to red rice control. There is also tremendous potential within both drill- and water-seeded systems to incorporate more reduced tillage practices to complement the Clearfield system in order to realize of the advantages of conservation tillage techniques.

CHANGES IN WATER-SEEDED RICE WEED MANAGEMENT. E.P. Webster; Department of Agronomy, Louisiana State University AgCenter, Baton Rouge.

ABSTRACT

Herbicide options for rice weed control have changed in the past five years. Herbicides Aim, Clincher, Command, Newpath, Regiment, and Ricestar received federal labels between 1998 and 2002. Theses new herbicides have given producers new alternatives for weed control in rice other than the standard rice herbicides Stam, Arrosolo, and Facet.

In Louisiana, 75% of the total rice acreage is planted in a water-seeded system. In south Louisiana, approximately 90% of the acreage is water-seeded. Historically, rice producers who employ a water-seeded system have fewer herbicide options. The development of the new herbicides has given water-seeded rice producers choices for herbicide applications that have only been available for drill-seeded rice.

Command was first labeled for use in drill-seeded rice. However, in 2001 rice producers in several parishes in Louisiana were allowed to apply Command in water-seeded rice. Command has given producers the option to use an economical herbicide with residual activity on many problem grasses. In order to apply Command on water-seeded rice, the herbicide must be impregnated on fertilizer. The impregnated fertilizer must be applied at a minimum of 150 lb/A. This treatment is usually applied after rice is planted and the seeding flood is removed to allow for seedling establishment. The application occurs once the root of the rice plant begins to protrude into the soil, often referred to as the pegging stage. This occurs approximately four to seven days after planting. When applying Command in this manner the field should not be surface irrigated for approximately 24 to 48 hours after application. This will allow time for the herbicide to release from the fertilizer granule and bind to soil particles.

Clearfield rice is tolerant to the imidazolinone herbicide family. This tolerant rice will allow producers to apply Newpath to control red rice in Clearfield rice. In 2002, Clearfield rice could only be grown in a drill-seeded system. ‘CL 161’ rice is a new Clearfield line with enhanced-tolerance to imazethapyr and it will be available in 2003. In south Louisiana spring weather patterns are often wet and producers do not have the option of drill-seeding rice. CL 161 is approved for water seeding and this will allow the application of Newpath when growing Clearfield rice in this production system. This will give producers in Louisiana more flexibility with Clearfield rice. Newpath can now be applied as two postemergence applications at 4 oz/A for a total of 8 oz/A. The first application should be applied on pegging rice and followed by an application 10 to 14 days later to obtain acceptable control of red rice and other troublesome rice weeds.

All of the previously mentioned herbicides are labeled for use in water-seeded rice. These new herbicides will allow producers to have more options when determining weed control programs.

RICE WEED CONTROL: AN AGENTS PERSPECTIVE. C.E. Eskew; LSU AgCenter Jefferson Davis Parish, Louisiana State University AgCenter, Jennings.

ABSTRACT

Weed control is a major input cost in rice production. Education is an important tool in developing sound management strategies. Areas of concern include weed identification, what will work, the herbicide label, sources of information, producer involvement, and producer expectations.

Identification is the key to a good weed management program. A history of the field is invaluable in planning ahead and anticipating problems. Producers also need to realize the economic impact between species and target those that cause the greatest loss in yield and quality grade. The producer also needs to improve his knowledge of herbicides. Familiarity helps make better management decisions in regards to water management, application restrictions and reduced rates.

The herbicide label is the law. The fine print, herbicide interactions, and tank mixtures are things producers expect extension agents and crop advisors to know and caution them about when making recommendations. Sources of information include university and private research scientists, result demonstrations, and follow up visits to the fields to confirm control and fine tune application recommendations.

Communication technology has greatly improved a producer's ability to make accurate and timely applications. Cell phones, distance diagnostic laboratories and electronic mail enables all aspects of the industry to stay in constant touch and make critical decisions on the spot. Also, by providing producers with opportunities to attend field days, grower meetings and advisory committees we can improve their ability to know and understand the latest recommendations.

As we continue to loose producers due to tight economic times, we will be left with a group that demands the cutting edge technology and we must be able to deliver it in a professional and timely manner.

MANAGING HERBICIDE DRIFT WITH NEW TECHNOLOGIES IN SPRAY EQUIPMENT. J.L. Griffin. Louisiana State University AgCenter, Baton Rouge, LA.

ABSTRACT

Roundup was initially evaluated in the South for preplant weed control in reduced tillage systems, but the role has expanded with the development of herbicide-resistant crops. In 2002, around 80% of the soybean and 85% of the cotton acreage in Louisiana were planted with Roundup Ready varieties. Because of the diversity of cropping systems in the South, it is not uncommon for Roundup-Ready crops to be planted near susceptible crops. Consequently, the potential for herbicide drift is of great concern. Most agricultural chemicals used to control pests are applied into the atmosphere as liquid spray droplets. Conversion of a liquid into spray droplets and the ultimate fate of the droplets depend on nozzle type, spray pressure, droplet size, and environmental conditions. Drift is especially prevalent when herbicides are applied under windy conditions or when temperature inversions exist. Research has shown that off-target movement of herbicide can be somewhere between 1/10 and 1/100 of the applied rate. Even though these herbicide rates would be considered sub-lethal, response can be quite severe for susceptible crops.

Research in Louisiana in the area of drift management initially concentrated on quantifying the effect of glyphosate on rice, corn, wheat, soybeans, and cotton, and was expanded to evaluate the effect of nozzle selection on drift and efficacy of Roundup Ultra. When drift was simulated by varying herbicide rate with application in a constant spray volume, Roundup Ultra reduced yield 83 and 15% when applied to 2 to 3 leaf rice at 4 and 2 oz product/A, respectively. Application at the same rates to 2 to 3 tiller rice reduced yield 42 and 32%, respectively. Corn yield was reduced 78, 43, and 22% following a 6-leaf application of 4, 2, and 1 oz/A of Roundup Ultra, respectively. Yields of soybeans and cotton were not affected when treated with 4 oz/A. In the field, drift occurring from aerial or ground equipment would decrease with movement downwind from the point of application. As water in the spray solution evaporates, the remaining spray droplets would become more concentrated with herbicide and the surfactant. The degree of water evaporation would depend on several variables to include atmospheric relative humidity and temperature. In subsequent research, drift rate represented 12.5 and 6.3% of the use rate of 32 oz/A Roundup Ultra (4 and 2 oz/A, respectively). Herbicide was applied in a constant spray volume of 25 gallons/A (GPA) and in proportional spray volumes of 3.1 GPA for the 12.5% rate and 1.6 GPA for the 6.3% rate. Roundup Ultra at 4 oz/A reduced corn yield 64% when the spray volume was 25 GPA but yield was reduced 96% when spray volume was 3.1 GPA. At 2 oz/A of Roundup Ultra corn yield was reduced 88% when the spray volume was 1.6 GPA but 21% when the spray volume was 25 GPA. This same response was observed with wheat treated with Roundup Ultra at first node and at heading. The differences in response to spray volume were attributed to spray droplet number and herbicide/surfactant concentration in individual spray droplets.

To reduce drift potential herbicide should not be applied when conditions are conducive to off-target movement. However, this is easier said than done particularly when farm management operations are large and timely herbicide application is critical to weed control. Nozzle selection, however, can play an important role in drift management. In research to evaluate drift reduction, larger spray droplets and spray coverage were detected on water-sensitive cards where the venturi-type (air-induction) nozzles (Greenleaf TurboDrop, Greenleaf TurboDrop XL, Greenleaf AirMix, and AI TeeJet) were used compared with a standard XR TeeJet nozzle. Application of Roundup Ultra using the drift-reducing nozzles (air induction nozzles along with DG TeeJet and Turbo TeeJet nozzles) in a spray volume of 10 GPA provided weed control equal to that of the standard XR TeeJet nozzle. The Turbo TeeJet and Greenleaf AirMix nozzles were equally effective in controlling weeds using Roundup Ultra in spray volumes of either 3 or 8 GPA, and control was no less than that obtained with the XR TeeJet nozzle at 10 GPA. There were, however, significant reductions in weed control when the spray volume, regardless of spray nozzle, was reduced below 3 GPA.

There is no substitution for use of common sense when applying glyphosate products around sensitive crops. Regardless of whether or not a drift-reduction nozzle is used, application under windy conditions or during a temperature inversion will increase the odds of off-target movement of glyphosate and the likelihood of damage to sensitive crops. Of concern based on our research and from observations in the field is that visual injury to corn, rice, and wheat caused by glyphosate drift may be minimal but the negative effect on yield can be significant.

SYMPOSIUM. INVASIVE SPECIES

MULTIPURPOSE MONITORING OF NON-NATIVE INVASIVE SPECIES: PERSPECTIVES FROM REGIONAL FOREST RESOURCE INVENTORIES. V.A. Rudis, USDA Forest Service, Southern Research Station, Forest Inventory and Analysis Unit, Starkville, Mississippi

ABSTRACT

Managers often note the occurrence of non-native invasive plant species (NNIS) to estimate the infestation and size of the management task, but what they and scientists may also want is to predict the area and amount likely to be present and their environmental associations. Such information helps in management planning, assessing economic impacts, and increasing public awareness about needed efforts. Over a large area, sample-based inventories provide such estimates with a stated degree of confidence, ground-based measures for calibrating remote sensors, and if permanent, field locations for monitoring change over time. An Operational Inventory (OI) of nonnative invasive plant species (NNIS) estimates populations within a given management area so that effective treatments can be accomplished. A Strategic Inventory (SI) of NNIS estimates populations to make an efficient allocation of management activities. A Strategic Multipurpose Resource Inventory (SMRI) estimates two or more objects, and the two that this presentation focuses on are forest resources and NNIS that potentially affect forest resources.

All such inventories reference the area sampled, with SIs providing precise estimates at regional scales, and OIs at local scales. Due to their larger area coverage and broader array of measurements, systematic sample-based SMRIs serve as bases for testing significance of associations among NNIS and resource measures to generate conceptual models and plausible hypotheses. The data provide the means to (1) evaluate associations between NNIS and the resource of interest, including potential costs and benefits within definable environmental conditions; (2) estimate the range and density of species occurrence for further study; (3) model invasion risk and effectiveness of suitable treatments; and (4) describe invasion hot spots. The presentation references one SMRI that assesses nonnative invasive species as part of an ongoing forest resource inventory, but SMRIs of pastureland and other nonforest land are needed as well to provide comprehensive NNIS population estimates. OIs of test locations in smaller areas also are needed to provide definitive causal inferences and knowledge of effective management activities.

Example SMRI results reference Chinese tallow (*Triadica sebifera*), Kudzu (*Pueraria montana*), Japanese honeysuckle (*Lonicera japonica*), *Melaleuca quinquenerva*, Multiflora rose (*Rosa multiflora*), Privet (*Ligustrum* spp.), Royal Paulownia (*Paulownia tomentosa*) and Tree-of-Heaven (*Ailanthus altissima*)—species of widespread concern on forest land—identified as part of the USDA Forest Service, Forest Inventory and Analysis (FIA) surveys. Procedures and maps presented primarily refer to 1984-1997 surveys of southeastern U.S. forests (Rudis and Jacobs, manuscript in review). The current FIA survey includes a four-season identification guidebook for 32 taxa, and additional species for Florida. See the FIA "Southern Research Station Field Guide" at "http://www.srs.fs.fed.us/fia/manual/p2manual.htm" for the guidebook, detailed sampling protocols, quality assurance procedures, and an array of other attribute measures. Lists of added species since 2001, monitoring progress, and contacts for further information are available from the author.

Many specialized NNIS monitoring efforts are provincially applicable but may be poorly coordinated regionally. Wider public acceptance of the NNIS problem and needed control requires orchestration of public demand for economic, social, or biological justice regarding plant invasion impacts, as in a comprehensive assessment report. Having consistent monitoring information in one place makes it easier to engage in dialogue about potential costs and benefits

with potential stakeholders, e.g., those in the agricultural, timber, and landscape nursery trades, highway maintenance crews, even landowners. Repeating the assessment process with a re-inventory at some fixed future date will permit opportunities for refining data collection and reporting procedures, involvement of stakeholders, and may engender additional support.

A logical NNIS management strategy includes a socioeconomic impact evaluation and public education, both of which benefit from having strategic inventory information. With SMRI studies involving FIA surveys, Rudis (In press. Comprehensive regional resource assessments and multipurpose uses of Forest Inventory and Analysis data, 1976-2001. General Technical Report. Asheville, NC: USDA Forest Service, Southern Research Station) found such data most used when they shared certain traits. Lessons for NNIS inventories suggest the data obtained will be most useful when they: (1) are collected consistently across spatial and temporal scales important to the geographic region and questions being addressed, (2) are well-documented, stored in a form suited to common analytical techniques (3) lend themselves to accommodating changing information needs, (4) can be reassembled without bias to suit other disciplinary assumptions, and (5) have logical spatial and temporal associations with other data important to a more comprehensive monitoring strategy.

DEEPROOTED SEDGE (*CYPERUS ENTRERIANUS*). C.T. Bryson*, USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS 38776; R. Carter, Valdosta State University, Valdosta, GA 31698; and D.J. Rosen, US Fish and Wildlife Service, Houston, TX 77058.

ABSTRACT

Deeprooted sedge (*Cyperus entrerianus* Boeck.) is a non-native invasive weed that has spread rapidly in the coastal plain of the southern United States. First reported from the United States in 1990, it was apparently introduced from temperate regions of South America. Currently in the United States, deeprooted sedge is a troublesome weed in 43 counties of Alabama, Florida, Georgia, Louisiana, Mississippi, and Texas. Deeprooted sedge can be distinguished from related species by its robust growth form, deeply set thick rhizomes, dark purplish black leaf bases, and glossy leaves. Flooding, construction equipment, mowing, heavy traffic, and soil moving activities, especially along highways, spread its tiny seeds, resulting in infestations in new areas, particularly in disturbed habitats. Deeprooted sedge is displacing native vegetation even in undisturbed habitats. Without widespread control, deeprooted sedge will likely continue to spread rapidly, infesting agricultural, forested, riparian and urban areas. In the southern United States, this perennial species reproduces by copious seed production and vegetative growth from short, woody rhizomes. Plants survive (>95%) winters as far north as Stoneville, MS, and, in a single growing season, plants grown from seeds weighed 1 to 1.8 kg/plant by frost. In field studies, biweekly mowing prevented inflorescence production but did not control vegetative re-growth. Clipping at 15 cm above soil prevented inflorescence formation and seed maturation. Number of seed per inflorescence ranges from 1,000 to > 20,000 depending on the size and maturity of deeprooted sedge, and mature plants (≥ 1 year old) produced from 10 to over 100 inflorescences per year. Deeprooted sedge re-growth was rapid and seed production was only temporarily suppressed (< one month) following a single tillage operation (disking). Repeated tillage controlled established plants, but seedlings rapidly replaced them following rainfall with no additional tillage. Of herbicide treatments tested in field trials, the most effective for deeprooted sedge control were glyphosate at 2.2 kg/ha (98%) or 1.1 kg/ha followed by 1.1 kg/ha (10 days apart) (95%), hexazinone at 0.28 kg/ha (92%), MSMA at 2.2 kg/ha (85%), glyphosate at 1.1 kg/ha (84%), halosulfuron-methyl at 0.07 kg/ha (80%), 2,4-D at 0.8 kg/ha + dicamba at 0.27 kg/ha (78 %), and 2,4-D at 2.2 kg/ha + picloram at 0.07 kg/ha (70%). Additional spread of deeprooted sedge can be prevented by (1) cleaning machinery, vehicles, equipment, clothing and other personal items after use in infested areas to avoid spread; (2) suppressing seed production by repeated mowing at 2 to 4 weeks intervals; and (3) applying herbicides and/or repeated tillage operations where and when possible. Because deeprooted sedge continues to spread at an alarming rate threatening agricultural and natural areas and preliminary studies suggest that populations will potentially spread northward into Arkansas, North Carolina, South Carolina, Tennessee, and Virginia, additional research is needed to determine more effective methods of prevention and control.

SERICEA LESPEDEZA (*LESPEDEZA CUNEATA*). C.H. Koger*,USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS 38776; J.F. Stritzke, Department of Plant and Soil Sciences, Oklahoma State University, Stillwater, OK 74078.

ABSTRACT

Sericea lespedeza (*Lespedeza cuneata* [Dum.Cours] G. Don) is a long-lived, warm-season, herbaceous, –fixing, perennial legume. Mature plants form a crown of numerous erect stems that reach lengths of up to 75 cm, and that often persist into the next growing season. It was introduced into the southeastern United States in the late 1800's from Asia as a potential forage species. In the early 1900's, and continuing for most of the century, sericea was planted on many sites in southeastern U.S. for forage production and soil conservation. Sericea will tolerate and grow on acidic and low fertility soils. However, it thrives on clay and loam soils that are deep and fertile. In the early 1980's, some severe infestations of sericea were reported in pastures of Oklahoma and Kansas. This lead to our involvement in numerous studies and research efforts on controlling sericea lespedeza. Solid canopy cover of sericea have been documented in unfertilized bermudagrass, grazed tallgrass prairie, woodland, and ungrazed sites. No infestations of sericea have been documented in fertilized bermudagrass grazed pastures or hay fields.

Sericea competes strongly with native vegetation in tallgrass prairies. Stems of sericea grow upright quickly as single stems upon emergence and then profusely branch in early summer. In addition, there is limited grazing of sericea in this ecosystem because the young stems are protected by "woody-like" stems from previous seasons growth, and high tannin levels. Within several years of introduction into a tallgrass prairie or unfertilized, heavily grazed bermudagrass pasture, sericea can become the dominant species. Sericea is a prolific seed producer, producing in upwards of 6 million seed per hectare. Seeds often germinate in March, April, or early May, and survival of seedlings is often dependant upon summer environmental conditions, with 0% survival in dry hot summers to over 90% in cool wet summers.

Sericea is not killed by herbicides commonly used to control undesirable species in pastures (2,4-D, dicamba + 2,4-D, picloram + 2,4-D). Triclopyr and fluroxypyr resulted in the best long-term control of established sericea. Triclopyr (0.56 to 0.84 kg/ha) applied to nongrazed, actively growing mature plants in late June to mid-July resulted in 95 to 99% stem reduction of established plants 2 years after treatment (YAT). Triclopyr or fluroxypry applied in May or September were not as effective. Spring burning before June/July applications of triclopyr or fluroxypyr had no negative effects on control of established plants. However, a combination of spring burning plus early double stocking of livestock before spraying resulted in only 65% control 2 YAT. Deferring grazing before spraying resulted in 85% control 2 YAT. Late summer applications of metsulfuron resulted in good control (95 to 99%) of sericea 1 YAT, however stem densities by 3 YAT were similar to untreated areas. An integrated strategy using triclopyr followed by spring burning and grazing can be utilized to manage sericea lespedeza in tallgrass prairies. We have documented that some sericea lespedeza can be tolerated in tallgrass ecosystem before yields of desirable grasses are reduced and that sericea will be utilized by cattle if the site is spring-burned and double stocked at initiation of sericea growth in April.

WHAT TO DO WITH AN UNKNOWN SPECIMEN: PREPARATION AND STORAGE OF VOUCHERS. R. Carter, Biology Department, Valdosta State University, Valdosta, GA 31698-0015.

ABSTRACT

Properly prepared voucher specimens are fundamentally essential in documenting occurrences and distributions of plant species. The specimen itself is permanent, verifiable, and tangible evidence, and its label provides geographical, ecological and other kinds of data. Voucher specimens should be deposited in an officially recognized public herbarium, where they will provide a permanent record and will be available to other researchers. The steps involved in taking the voucher specimen from field to herbarium will be discussed, with special emphasis on the collection of specimens and data and the proper handling, storage, and shipment of specimens.

SYMPOSIUM.

GLYPHOSATE RESISTANCE/TOLERANCE IN *Conysa canadensis*

CONTROL OF MARESTAIL (*CONYZA CANADENSIS*) WITH GLYPHOSATE. R.F. Montgomery, T.E. Dutt, G.P. Murphy, T.S. Willard, and G.A. Elmore; Monsanto Company, St. Louis MO 63167.

ABSTRACT

Marestail (*Conyza canadensis*) surviving applications of glyphosate was reported in Delaware by Van Gessel in 2000. Fields were identified in 2001 in Delaware, New Jersey and Maryland in which glyphosate treated marestail was stunted but produced green meristems following herbicide applications. In 2001, Hayes reported similar results in West Tennessee where field results indicated no difference among glyphosate formations, herbicide carrier volumes or surfactant levels ranging from .25 to 2% v/v. Marestail from Tennessee exhibited a 6X level of resistance to glyphosate when resistant ®) and susceptible (S) biotypes were compared. Control ratings for the R biotype were greater for small (2 in) marestail rosettes when compared to larger (3 in) rosettes.

Studies by Chen in 2001 and Heck 2002 conclude that dominant, nuclear-encoded glyphosate resistance is present in some C*onyza canadensis* populations. Glyphosate application to F2 progeny of RxS biotypes suggests that resistance is controlled by a single dominant gene. Resistance does not appear to be based on lack of glyphosate uptake, glyphosate metabolism, EPSPS gene expression or EPSPS gene amplification. Currently, 3 distinct EPSPS genes have been cloned from horseweed. Given the distribution of the different EPSPS genes within the horseweed populations and the difference in glyphosate translocation levels between R and S biotypes, it appears that a non-target (i.e. non-EPSPS) difference is a key component of resistance.

Historical effectiveness of glyphosate on marestail used as a single spring burndown application in 230 experiments at 4 rates including 82 glyphosate formations ranged from a low of 63% in 1993 to a high of 91% control in 1978. The years in which control exceeded 90 % included 1978, 1984, and 1991. Years where marestail control averaged < 70% were 1982, 1987, and 1993. These data suggest that average glyphosate performance in a given year can vary as much as of 45% due to the effects of environmental conditions that exist.. This fact alone can make resistance issues difficult to detect with field studies.

Glyphosate rates ≤ 0.38 , 0.56 , 0.75 and > 0.75 pounds acid equivalent per acre (lbs. ae/a) controlled horseweed of all heights an average of 73, 88, 91 and 94 %, respectively. Control of either < 6 inch or 6 to 12 inch tall marestail was equivalent averaging 91 and 92 % respectively, however control ratings for marestail > 12 inches declined to 77 % across all rates.

Marestail control decreased as weed height increased at glyphosate rates ≤ 0.38 ae/a. Marestail control for all other rates tested was greatest for weeds within the 6-12 inch growth stage, lowest for tall weeds (> 12 in) and intermediate for small (< 6 in) marestail.

A subset of this data was selected for experiments that had side-by-side comparisons of Roundup and Roundup + 2,4-D at 0.5 lbs. ai/a. Data available for this comparison were made up of 949 observations from 6 years and 36 experiments. Marestail control improved from 69 to 77 % with the addition of 0.5 lbs. ai/a 2,4-D to Roundup when averaged across all Roundup rates. Control ranged from 52-88% for Roundup only and 64-94% for Roundup + 2,4-D. Control differences between treatments with and without 2,4-D were greater at Roundup rates was limited to 0.5 lbs. ae/a or less. Differences in marestail control among treatments comparing

Roundup only and Roundup 2,4-D declined to 4.0 % when Roundup rates increased to the range of 0.56 and 1.5 lbs ae/a.

Monsanto presently recommends Roundup Weathermax® @ 0.75 lbs ae/a plus 2,4-D applied preplant (PP) for control of marestail in soybean and corn and Roundup Weathermax @ 0.75 lb ae/A plus dicamba applied 21-35 days PP to cotton. PP applications should be made prior to horseweed reaching 6 inches in height. Cloransulam plus glyphosate @ 0.75 lbs ae/a is recommended for in-crop applications in Roundup Ready® soybean where marestail escapes PP control. MSMA plus diuron is recommended as an in-crop post-directed treatment for horseweed escapes in cotton. Dicamba or 2,4-D is effective on marestail postemergence to corn.

GLYPHOSATE-RESISTANT HORSEWEED *(CONYZA CANADENSIS)* DISTRIBUTION AND CONTROL IN TENNESSEE. R.M. Hayes, TC. Mueller, and C.C. Craig, University of Tennessee, Jackson, TN 38301

ABSTRACT

Glyphosate-resistant horseweed was found on upwards of half million acres of cropland in western Tennessee in 2002. The represents quite an enormous spread from the initial reports in 2000 by a producer in Lauderdale County.
Similar spread occurred in the Delmarva area after the initial report by Van Gessel. The rapid spread in not unexpected since horseweed achenes are readily windblown. There are also report of possible resistant fields in Kentucky, Missouri, and North Mississippi.

Horseweed, thought to emerge in the fall and early spring emerged throughout the growing season in West Tennessee during 2002. On farm visits confirmed newly emerged plants throughout the summer.

Several experiments were conducted during 2001-2002 to determine the most effective strategies for horseweed management, particularly in cotton and soybean production systems. All herbicide and applications were made at labeled rates and in accordance with application instructions. All treatment were replicated three or four times in a RCB design and data were subjected to ANOV and means were separated using Fisher's protected LSD at P=0.05.

Neither glyphosate nor paraquat controlled resistant horseweed, but admixtures of glyphosate or with 2,4-D or dicamba controlled horseweed >95%. Glufosinate plus 2,4-D was equally effective. Flumioxazin or paraquat plus diuron applied in late November provide control through early April the following year. The former did not control annual bluegrass, while the latter control all vegetation, leaving the soil exposed to erode. Flumioxazin applied 1 April did not control 5 to 10 cm horseweed.

Paraquat plus metribuzin and glyphosate plus a package package mixture of sulfentrazone:chloransulam-methyl, and glufosinate plus chloransulam-methyl applied 30 days before planting soybeans controlled horseweed an other summer dicot weeds throughout the season and prevented yield loss to weeds.

MSMA plus diuron posted directed in cotton controlled 3 to 5 cm horseweed >95%. Trifloxysulfuron-sodium killed the apical meristem of horseweed, but did released axillary buds, failing to provide complete control.

Crop rotation and associated herbicide mode of action rotation appears to be of little value in preventing problems with glyphosate resistant horseweed unless practiced over a large area because of the potential for infestation from windblown seed. Therefore, the best management practice for glyphosate resistant horseweed appears to be through the use of mixture of herbicides with modes of action other than an EPSP synthase inhibitior. Producers should also be cautious of relying on ALS inhibitor herbicides (e.g. chloransulam-methy) since weed are know to develop resistance to ALS inhibitiors. Specific recommendations for horseweed management can be obtained at http://www.ut.extension.utk.edu/weedcontrol/weedcontrol.html

RESPONSE OF GLYPHOSATE TOLERANT AND SUSCEPTIBLE BIOTYPES OF HORSEWEED (*CONYZA CANADENSIS*) TO FOLIAR APPLIED HERBICIDES. J.R. Martin and W.W. Witt, Department of Agronomy, University of Kentucky, Princeton, KY 42445-0469.

ABSTRACT

There were isolated cases where multiple applications of glyphosate failed to provide complete control of horseweed in Kentucky during 2001. Due to these unique circumstances, studies were conducted in 2002 at a farm site in Trigg County and at two sites on the UKREC near Princeton to evaluate strategies for horseweed control and to determine if glyphosate tolerant biotypes existed in Kentucky. Although crops were not planted in these studies, the timing of treatments were done to simulate burndown or in-season applications for Roundup Ready soybeans. In addition to the field studies, horseweed seed were collected from various fields and used for a greenhouse experiment to help confirm glyphosate tolerance.

The Trigg County site was chosen because it had problems with escapes following multiple applications of glyphosate in 2001. Results of the Trigg County field study in 2002 indicated this population had a high level of tolerance to glyphosate. Applying glyphosate at 0.75 lb ae/A to four-inch tall plants on April 25, resulted in only 60% control by June 6. These plants continued to survive when treated again on June 6 with an in-season application of glyphosate at 0.75 lb ae/A. The overall control rating, which accounted for burndown control of treated plants and residual control of newly emerging plants, was only 10% for this treatment on July 8. Using a similar approach, but increasing the rate of the in-season application of glyphosate to 1.125 lb ae/A, resulted in only 66% overall horseweed control on July 8. The addition of 2,4-D ester at 0.5 lb ae/A or cloransulam at 0.016 lb ai/A with glyphosate, tended to improve burndown control of treated plants, but control of late emerging plants was variable. However, the overall control on July 8 was at least 91% when both 2,4-D and cloransulam were mixed with glyphosate in the April 25 early preplant burndown treatment, or when the combination of 2,4-D plus glyphosate was applied as an April burndown spray followed by an in-season application of cloransulam plus glyphosate. The use of paraquat at 0.75 lb ai/A as a tank mix partner with cloransulam or with cloransulam plus 2,4-D as early preplant treatments followed by an in-season application of glyphosate, provided 100% overall control on July 8. The in-season application of cloransulam plus glyphosate tended to improve control of plants previously treated with an early preplant application of glyphosate alone, but overall control was still only 63% by July 8. Greenhouse studies of plants collected from the Trigg County site confirmed this population was highly tolerant to glyphosate.

The two experiments at UKREC dealt with populations of horseweed that were more susceptible to glyphosate compared with the population in Trigg County. Treatments in the first UKREC study were applied on May 16 when horseweed was approximately 10 inches in height. The level of burndown control of horseweed in this study was 98% with glyphosate at 0.75 lb ae/A, 53% with cloransulam at 0.016 lb ai/A, 67% with 2,4-D at 0.5 lb ae/A, and 100% with glyphosate at 0.75 lb ae/A plus 2,4-D at 0.5 lb ae/A. In the second UKREC experiment, horseweed plants were mowed to an average height of five inches and treated on May 31. Glyphosate applied at 0.56, 0.75, 1.125, and 1.5 lb ae/A resulted in 77, 86, 93, and 100% burndown control of horseweed, respectively. The use of tank mix partners such as 2,4-D at 0.5 lb ae/A, cloransulam at 0.016 lb ai/A, or the premix of chlorimuron plus sulfentrazone at 0.14 lb ai/A tended to improve burndown control with glyphosate at the low rate of 0.56 lb ae/A. However carfentrazone at 0.008 lb ai/A or flumioxazin at 0.064 lb ai/A did not improve horseweed control when combined with glyphosate.

The horseweed seed that were collected from various fields were planted in styrofoam cups. Plants were grown in the greenhouse and treated when they reached approximately 2 to 3 inches in diameter. Results indicated that 7 of the 11 samples were tolerant to glyphosate at 1.5 lb ae/A. The samples were collected from 7 counties in central and western Kentucky. Although

surviving plants were stunted and had burned leaves, they were able to initiate new growth by 16 days after treatment.

Results of these experiments indicate that glyphosate - tolerant biotypes of horseweed are present in Kentucky, and that herbicides with other sites of action are needed to provide effective burndown and residual control of this weed. The fact that glyphosate-tolerant and ALS-resistant biotypes have been observed in neighboring states, makes it critical to develop strategies with alternative modes of action and to monitor fields for regrowth.

GLYPHOSATE RESISTANCE IN HORSEWEED (*CONYZA CANADENSIS)* FROM A WESTERN KENTUCKY FARM. C.B. Rogers. Department of Agricultural and Human Sciences, Morehead State University, Morehead, KY 40351.

ABSTRACT

Horseweeds suspected of being resistant to glyphosate were first noted in a farm field in Logan County, Kentucky during the summer of 2000. The farmer brought these horseweeds to my attention when he was not getting proper kill after application of 1 quart/A of glyphosate (Roundup Ultra ®). Subsequently the farmer applied another 2 quarts/A. of glyphosate and still did not get control. At this time, I suspected resistance and soon thereafter began seeing VanGessel's reports of resistance in Delaware. In the summer of 2001 spots of horseweed that did not respond to glyphosate were found in adjacent fields on the same farm. Four horseweed plants (coded RS1 – RS4) were selected at random from one of these spots and transferred to pots in the greenhouse at Morehead State University. These plants were allowed to flower and seed were collected from these plants. The seed from each plant were kept separate. Seeds were also collected from plants native to the Morehead, KY area and which were known not to have been exposed to glyphosate and were not suspected of glyphosate resistance (one composite sample, coded NS).

During late winter of 2002 seeds from the suspected resistant selections and from the non-suspect plants were germinated in ½ inch square plugs of potting media in plug flats in the greenhouse mist room. When the plants were at approximately the 4-leaf stage they were transplanted into 2 inch x 2 inch disposable pots. By mid-April the plants were 2 to 3 inches in diameter and were ready for treatment. Three pots of each selection (NS, RS1, RS2, RS3, RS4) were placed in open-bottomed flats and sprayed with glyphosate (Roundup Ultra Max ®; 5lb. ai./gal.) using a CO_2-pressurized backpack sprayer to deliver 20 GPA spray volume. The herbicide rates used were 0, 1, 2, 4, 8, and 16 quarts/A. The plants were then returned to the greenhouse for observation and data collection. Data was collected over a period of 3 months and then selected plants were transferred to larger pots and allowed to continue growth.

There was little, if any, injury noted at 3 days after treatment (DAT) for all herbicide rates except 16 quarts/A where some of the horseweed plants exhibited symptoms similar to surfactant burn. It was most pronounced on the NS plants. At 7 DAT there were prominent injury symptoms on NS plants at all glyphosate rates other than the check (0) rate with the 16-quart rate showing severe leaf desiccation. There were some minor changes visible on the RS plants. By 10 DAT there were obvious injury symptoms present on the plants suspected of resistance with the severity of injury increasing with increasing herbicide rates. At 17 DAT NS plants were dead at all rates above 1 quart and nearly dead at the 1 quart/A rate. RS plants treated at 2 and 4 quart/A rates appeared to stabilize, and most plants in the 8 and 16-quart treatments were dead or nearly dead. Observations at 21 DAT showed all non-resistant type plants were dead except in the check (0) flat and all plants appeared dead in the 8 and 16-quart flats. At 25 DAT the resistant horseweed plants were beginning to show regrowth at the 1, 2, and 4-quart rates with progressively smaller regrowth at the higher rates. At 32 DAT one RS type plant in the 8-quart/A treatment began showing regrowth (had previously been thought to be dead). Regrowth soon began to look like normal plant growth but was slower at higher treatment rates. At 73 DAT representative plants were selected from each type and rate surviving and transplanted to larger pots. There were no detectable differences in any of the 4 selections of resistant type plants. All plants (including the 8-quart/A survivor) had flowered by early November and produced seed.

Glyphosate did cause some degree of injury to all treated plants. A few of the Suspected Resistant plants were killed at rates below 8 quarts/A but most of them recovered and produced seed. The 16-quart rate of glyphosate killed all plants. These horseweeds appear to be resistant to glyphosate at rates well above normal use rates but extreme rates killed them.

SYMPOSIUM. RICE

NEW AND POTENTIAL WEED PROBLEMS IN RICE.

R.E. Strahan; Louisiana State University AgCenter, Baton Rouge, LA

ABSTRACT

Selection pressures cause shifts in the weed community from one species to another by eliminating susceptible weed species and allowing the tolerant species to flourish. In southwest Louisiana rice fields, cultural practices associated with water-seeding rice, crawfish/rice rotations, and the control of the most susceptible weeds has caused a weed species shift over the past 10 years. Perennial grasses such as knotgrass (*Paspalum distichum*), brook paspalum (*Paspalum acuminatum*), water paspalum (*Paspalum hydrophylum*), and perennial barnyardgrass (*Echincochloa polystachya*), collectively called “water bermudas” by growers, may infest as much as 200,000 rice acres in southwest Louisiana. Although seed production does occur, the perennial grasses appear to reproduce vegetatively by cut stolons and rhizomes. The distribution of the weeds and their rapid spread in water-seeded rice can probably be attributed to tillage practices and movement of contaminated equipment from field to field. Due to their tremendous reproductive capacity and lack of sufficient control methods, populations can reach levels that severely limit rice production. The “water bermudas” now rank as the second most troublesome weeds in water-seeded rice.

Giant salvinia (*Salvinia molesta*) is an aquatic floating fern native to Brazil. This extremely invasive weed reproduces by vegetative fragments and populations can double within ten days. The weed is dispersed by wind, boats, and flowing water. Giant salvinia produces dense mats of vegetation, which cover lakes, ponds, and canals thereby reducing oxygen levels and lowering water quality. The weed can clog irrigation systems and may compete directly with the rice crop if introduced into rice fields. LSU AgCenter scientists are currently monitoring a heavy giant salvinia infestation near the town of Cameron in southwest Louisiana. This infestation threatens the drainage and irrigation systems with the potential for devastating rice production in the region.

CHANGES IN RICE CULTURAL PRACTICES. P.K. Bollich; Louisiana State University AgCenter, Rice Research Station, Crowley, LA.

ABSTRACT

Clearfield rice technology provides an opportunity to control red rice in commercial rice by taking advantage of herbicide-tolerant varieties and in-season use of the herbicide Newpath. Until the development of this technology, cultural practices were relied upon for red rice suppression. Water seeding, and more specifically water seeding with pinpoint flood water management, has been the primary cultural method used in Louisiana to suppress red rice. Water seeding usually includes a tillage practice referred to as "mudding in." The majority of seedbed tillage is performed under flooded conditions with various field implements designed for this purpose. The intent is to destroy any existing red rice prior to planting and reduce the germination potential of buried red rice seed. This cultural system can be very effective in suppressing red rice but is not environmentally sound due to sediment-laden rice field discharges.

The Clearfield system is a cultural practice change in itself since it represents the first time that herbicide-tolerant rice can be used to control red rice. Southwest Louisiana usually water seeds approximately 80% of its rice acreage while 65% is water seeded on a statewide basis. It is expected that a shift toward drill seeding will occur as the Clearfield system becomes more popular. When comparing water seeding with drill seeding, there are differences in many aspects of each system. Extensive educational activities are currently underway to familiarize rice producers who have historically water planted with these differences and to assist them in making this change.

The first labelled use of Clearfield allowed for drill seeding only. The label was recently amended to include dry broadcasting, all tillage systems, and water seeding. The water seeding label is restricted to clear water planting only. In this system tillage is conducted under dry soil conditions followed by flood establishment and aerial seeding. Clear water planting has long been a water-seeded option available to producers, but it has been less effective in suppressing red rice than the traditional mudding in system.

From the producer perspective, changing from water seeding to dry planting may not seem to be a complicated process. But, it is not only the planting operation that changes. The approach to nutrient and water management, stand establishment, and weed control in these systems can be quite different, depending on which cultural systems are compared. The timing of fertilizer nitrogen (N) in a clear water, pinpoint flood system is drastically different from that in a drill-seeded system. In this water-seeded system, most of the N is applied preplant and preferably incorporated; whereas in a drill-seeded system the bulk of the N is applied just prior to permanent flood establishment at the 3- to 4-leaf growth stage. Fertilizer N management in a mudding in system also differs from drill seeding since most of the N is applied either to saturated soil or into the floodwater because of the water management required to suppress red rice. Water and N management are closely linked to each other, regardless of whether red rice is a concern. Water management in a water- or drill-seeded system with Clearfield rice will be very similar to that with conventional rice varieties. Once again, the change in cultural practices is primarily a change from water seeding to drill seeding since the Clearfield system allows for red rice control when drill seeding. Stand establishment between water and drill seeding is quite different because of the placement of the rice seed. With water seeding the seedling develops on the soil surface and thrives with saturated conditions or frequent flushing during stand establishment. With drill seeding, the rice seed is buried, and while adequate moisture is necessary for germination and seedling development, saturated conditions can reduce stands or delay plant development. Aeration is necessary for proper root development in this system. This aspect of water management will be an important change facing the water-seeding producer when switching to a drill-seeded management. Herbicide programs will also change to a certain extent because of the water management scheme.

It is expected that rice culture in Louisiana will gradually shift from predominantly water seeding to more drill seeding or dry broadcast if the Clearfield system provides the expected benefits with respect to red rice control. There is also tremendous potential within both drill- and water-seeded systems to incorporate more reduced tillage practices to complement the Clearfield system in order to realize of the advantages of conservation tillage techniques.

CHANGES IN WATER-SEEDED RICE WEED MANAGEMENT. E.P. Webster; Department of Agronomy, Louisiana State University AgCenter, Baton Rouge.

ABSTRACT

Herbicide options for rice weed control have changed in the past five years. Herbicides Aim, Clincher, Command, Newpath, Regiment, and Ricestar received federal labels between 1998 and 2002. Theses new herbicides have given producers new alternatives for weed control in rice other than the standard rice herbicides Stam, Arrosolo, and Facet.

In Louisiana, 75% of the total rice acreage is planted in a water-seeded system. In south Louisiana, approximately 90% of the acreage is water-seeded. Historically, rice producers who employ a water-seeded system have fewer herbicide options. The development of the new herbicides has given water-seeded rice producers choices for herbicide applications that have only been available for drill-seeded rice.

Command was first labeled for use in drill-seeded rice. However, in 2001 rice producers in several parishes in Louisiana were allowed to apply Command in water-seeded rice. Command has given producers the option to use an economical herbicide with residual activity on many problem grasses. In order to apply Command on water-seeded rice, the herbicide must be impregnated on fertilizer. The impregnated fertilizer must be applied at a minimum of 150 lb/A. This treatment is usually applied after rice is planted and the seeding flood is removed to allow for seedling establishment. The application occurs once the root of the rice plant begins to protrude into the soil, often referred to as the pegging stage. This occurs approximately four to seven days after planting. When applying Command in this manner the field should not be surface irrigated for approximately 24 to 48 hours after application. This will allow time for the herbicide to release from the fertilizer granule and bind to soil particles.

Clearfield rice is tolerant to the imidazolinone herbicide family. This tolerant rice will allow producers to apply Newpath to control red rice in Clearfield rice. In 2002, Clearfield rice could only be grown in a drill-seeded system. ‘CL 161’ rice is a new Clearfield line with enhanced-tolerance to imazethapyr and it will be available in 2003. In south Louisiana spring weather patterns are often wet and producers do not have the option of drill-seeding rice. CL 161 is approved for water seeding and this will allow the application of Newpath when growing Clearfield rice in this production system. This will give producers in Louisiana more flexibility with Clearfield rice. Newpath can now be applied as two postemergence applications at 4 oz/A for a total of 8 oz/A. The first application should be applied on pegging rice and followed by an application 10 to 14 days later to obtain acceptable control of red rice and other troublesome rice weeds.

All of the previously mentioned herbicides are labeled for use in water-seeded rice. These new herbicides will allow producers to have more options when determining weed control programs.

RICE WEED CONTROL: AN AGENTS PERSPECTIVE. C.E. Eskew; LSU AgCenter Jefferson Davis Parish, Louisiana State University AgCenter, Jennings.

ABSTRACT

Weed control is a major input cost in rice production. Education is an important tool in developing sound management strategies. Areas of concern include weed identification, what will work, the herbicide label, sources of information, producer involvement, and producer expectations.

Identification is the key to a good weed management program. A history of the field is invaluable in planning ahead and anticipating problems. Producers also need to realize the economic impact between species and target those that cause the greatest loss in yield and quality grade. The producer also needs to improve his knowledge of herbicides. Familiarity helps make better management decisions in regards to water management, application restrictions and reduced rates.

The herbicide label is the law. The fine print, herbicide interactions, and tank mixtures are things producers expect extension agents and crop advisors to know and caution them about when making recommendations. Sources of information include university and private research scientists, result demonstrations, and follow up visits to the fields to confirm control and fine tune application recommendations.

Communication technology has greatly improved a producer's ability to make accurate and timely applications. Cell phones, distance diagnostic laboratories and electronic mail enables all aspects of the industry to stay in constant touch and make critical decisions on the spot. Also, by providing producers with opportunities to attend field days, grower meetings and advisory committees we can improve their ability to know and understand the latest recommendations.

As we continue to loose producers due to tight economic times, we will be left with a group that demands the cutting edge technology and we must be able to deliver it in a professional and timely manner.

MANAGING HERBICIDE DRIFT WITH NEW TECHNOLOGIES IN SPRAY EQUIPMENT. J.L. Griffin. Louisiana State University AgCenter, Baton Rouge, LA.

ABSTRACT

Roundup was initially evaluated in the South for preplant weed control in reduced tillage systems, but the role has expanded with the development of herbicide-resistant crops. In 2002, around 80% of the soybean and 85% of the cotton acreage in Louisiana were planted with Roundup Ready varieties. Because of the diversity of cropping systems in the South, it is not uncommon for Roundup-Ready crops to be planted near susceptible crops. Consequently, the potential for herbicide drift is of great concern. Most agricultural chemicals used to control pests are applied into the atmosphere as liquid spray droplets. Conversion of a liquid into spray droplets and the ultimate fate of the droplets depend on nozzle type, spray pressure, droplet size, and environmental conditions. Drift is especially prevalent when herbicides are applied under windy conditions or when temperature inversions exist. Research has shown that off-target movement of herbicide can be somewhere between 1/10 and 1/100 of the applied rate. Even though these herbicide rates would be considered sub-lethal, response can be quite severe for susceptible crops.

Research in Louisiana in the area of drift management initially concentrated on quantifying the effect of glyphosate on rice, corn, wheat, soybeans, and cotton, and was expanded to evaluate the effect of nozzle selection on drift and efficacy of Roundup Ultra. When drift was simulated by varying herbicide rate with application in a constant spray volume, Roundup Ultra reduced yield 83 and 15% when applied to 2 to 3 leaf rice at 4 and 2 oz product/A, respectively. Application at the same rates to 2 to 3 tiller rice reduced yield 42 and 32%, respectively. Corn yield was reduced 78, 43, and 22% following a 6-leaf application of 4, 2, and 1 oz/A of Roundup Ultra, respectively. Yields of soybeans and cotton were not affected when treated with 4 oz/A. In the field, drift occurring from aerial or ground equipment would decrease with movement downwind from the point of application. As water in the spray solution evaporates, the remaining spray droplets would become more concentrated with herbicide and the surfactant. The degree of water evaporation would depend on several variables to include atmospheric relative humidity and temperature. In subsequent research, drift rate represented 12.5 and 6.3% of the use rate of 32 oz/A Roundup Ultra (4 and 2 oz/A, respectively). Herbicide was applied in a constant spray volume of 25 gallons/A (GPA) and in proportional spray volumes of 3.1 GPA for the 12.5% rate and 1.6 GPA for the 6.3% rate. Roundup Ultra at 4 oz/A reduced corn yield 64% when the spray volume was 25 GPA but yield was reduced 96% when spray volume was 3.1 GPA. At 2 oz/A of Roundup Ultra corn yield was reduced 88% when the spray volume was 1.6 GPA but 21% when the spray volume was 25 GPA. This same response was observed with wheat treated with Roundup Ultra at first node and at heading. The differences in response to spray volume were attributed to spray droplet number and herbicide/surfactant concentration in individual spray droplets.

To reduce drift potential herbicide should not be applied when conditions are conducive to off-target movement. However, this is easier said than done particularly when farm management operations are large and timely herbicide application is critical to weed control. Nozzle selection, however, can play an important role in drift management. In research to evaluate drift reduction, larger spray droplets and spray coverage were detected on water-sensitive cards where the venturi-type (air-induction) nozzles (Greenleaf TurboDrop, Greenleaf TurboDrop XL, Greenleaf AirMix, and AI TeeJet) were used compared with a standard XR TeeJet nozzle. Application of Roundup Ultra using the drift-reducing nozzles (air induction nozzles along with DG TeeJet and Turbo TeeJet nozzles) in a spray volume of 10 GPA provided weed control equal to that of the standard XR TeeJet nozzle. The Turbo TeeJet and Greenleaf AirMix nozzles were equally effective in controlling weeds using Roundup Ultra in spray volumes of either 3 or 8 GPA, and control was no less than that obtained with the XR TeeJet nozzle at 10 GPA. There were, however, significant reductions in weed control when the spray volume, regardless of spray nozzle, was reduced below 3 GPA.

There is no substitution for use of common sense when applying glyphosate products around sensitive crops. Regardless of whether or not a drift-reduction nozzle is used, application under windy conditions or during a temperature inversion will increase the odds of off-target movement of glyphosate and the likelihood of damage to sensitive crops. Of concern based on our research and from observations in the field is that visual injury to corn, rice, and wheat caused by glyphosate drift may be minimal but the negative effect on yield can be significant.

SYMPOSIUM. INVASIVE SPECIES

MULTIPURPOSE MONITORING OF NON-NATIVE INVASIVE SPECIES: PERSPECTIVES FROM REGIONAL FOREST RESOURCE INVENTORIES. V.A. Rudis, USDA Forest Service, Southern Research Station, Forest Inventory and Analysis Unit, Starkville, Mississippi

ABSTRACT

Managers often note the occurrence of non-native invasive plant species (NNIS) to estimate the infestation and size of the management task, but what they and scientists may also want is to predict the area and amount likely to be present and their environmental associations. Such information helps in management planning, assessing economic impacts, and increasing public awareness about needed efforts. Over a large area, sample-based inventories provide such estimates with a stated degree of confidence, ground-based measures for calibrating remote sensors, and if permanent, field locations for monitoring change over time. An Operational Inventory (OI) of nonnative invasive plant species (NNIS) estimates populations within a given management area so that effective treatments can be accomplished. A Strategic Inventory (SI) of NNIS estimates populations to make an efficient allocation of management activities. A Strategic Multipurpose Resource Inventory (SMRI) estimates two or more objects, and the two that this presentation focuses on are forest resources and NNIS that potentially affect forest resources.

All such inventories reference the area sampled, with SIs providing precise estimates at regional scales, and OIs at local scales. Due to their larger area coverage and broader array of measurements, systematic sample-based SMRIs serve as bases for testing significance of associations among NNIS and resource measures to generate conceptual models and plausible hypotheses. The data provide the means to (1) evaluate associations between NNIS and the resource of interest, including potential costs and benefits within definable environmental conditions; (2) estimate the range and density of species occurrence for further study; (3) model invasion risk and effectiveness of suitable treatments; and (4) describe invasion hot spots. The presentation references one SMRI that assesses nonnative invasive species as part of an ongoing forest resource inventory, but SMRIs of pastureland and other nonforest land are needed as well to provide comprehensive NNIS population estimates. OIs of test locations in smaller areas also are needed to provide definitive causal inferences and knowledge of effective management activities.

Example SMRI results reference Chinese tallow (*Triadica sebifera*), Kudzu (*Pueraria montana*), Japanese honeysuckle (*Lonicera japonica*), *Melaleuca quinquenerva*, Multiflora rose (*Rosa multiflora*), Privet (*Ligustrum* spp.), Royal Paulownia (*Paulownia tomentosa*) and Tree-of-Heaven (*Ailanthus altissima*)—species of widespread concern on forest land—identified as part of the USDA Forest Service, Forest Inventory and Analysis (FIA) surveys. Procedures and maps presented primarily refer to 1984-1997 surveys of southeastern U.S. forests (Rudis and Jacobs, manuscript in review). The current FIA survey includes a four-season identification guidebook for 32 taxa, and additional species for Florida. See the FIA "Southern Research Station Field Guide" at "http://www.srs.fs.fed.us/fia/manual/p2manual.htm" for the guidebook, detailed sampling protocols, quality assurance procedures, and an array of other attribute measures. Lists of added species since 2001, monitoring progress, and contacts for further information are available from the author.

Many specialized NNIS monitoring efforts are provincially applicable but may be poorly coordinated regionally. Wider public acceptance of the NNIS problem and needed control requires orchestration of public demand for economic, social, or biological justice regarding plant invasion impacts, as in a comprehensive assessment report. Having consistent monitoring information in one place makes it easier to engage in dialogue about potential costs and benefits

with potential stakeholders, e.g., those in the agricultural, timber, and landscape nursery trades, highway maintenance crews, even landowners. Repeating the assessment process with a re-inventory at some fixed future date will permit opportunities for refining data collection and reporting procedures, involvement of stakeholders, and may engender additional support.

A logical NNIS management strategy includes a socioeconomic impact evaluation and public education, both of which benefit from having strategic inventory information. With SMRI studies involving FIA surveys, Rudis (In press. Comprehensive regional resource assessments and multipurpose uses of Forest Inventory and Analysis data, 1976-2001. General Technical Report. Asheville, NC: USDA Forest Service, Southern Research Station) found such data most used when they shared certain traits. Lessons for NNIS inventories suggest the data obtained will be most useful when they: (1) are collected consistently across spatial and temporal scales important to the geographic region and questions being addressed, (2) are well-documented, stored in a form suited to common analytical techniques (3) lend themselves to accommodating changing information needs, (4) can be reassembled without bias to suit other disciplinary assumptions, and (5) have logical spatial and temporal associations with other data important to a more comprehensive monitoring strategy.

DEEPROOTED SEDGE (*CYPERUS ENTRERIANUS*). C.T. Bryson*, USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS 38776; R. Carter, Valdosta State University, Valdosta, GA 31698; and D.J. Rosen, US Fish and Wildlife Service, Houston, TX 77058.

ABSTRACT

Deeprooted sedge (*Cyperus entrerianus* Boeck.) is a non-native invasive weed that has spread rapidly in the coastal plain of the southern United States. First reported from the United States in 1990, it was apparently introduced from temperate regions of South America. Currently in the United States, deeprooted sedge is a troublesome weed in 43 counties of Alabama, Florida, Georgia, Louisiana, Mississippi, and Texas. Deeprooted sedge can be distinguished from related species by its robust growth form, deeply set thick rhizomes, dark purplish black leaf bases, and glossy leaves. Flooding, construction equipment, mowing, heavy traffic, and soil moving activities, especially along highways, spread its tiny seeds, resulting in infestations in new areas, particularly in disturbed habitats. Deeprooted sedge is displacing native vegetation even in undisturbed habitats. Without widespread control, deeprooted sedge will likely continue to spread rapidly, infesting agricultural, forested, riparian and urban areas. In the southern United States, this perennial species reproduces by copious seed production and vegetative growth from short, woody rhizomes. Plants survive (>95%) winters as far north as Stoneville, MS, and, in a single growing season, plants grown from seeds weighed 1 to 1.8 kg/plant by frost. In field studies, biweekly mowing prevented inflorescence production but did not control vegetative re-growth. Clipping at 15 cm above soil prevented inflorescence formation and seed maturation. Number of seed per inflorescence ranges from 1,000 to > 20,000 depending on the size and maturity of deeprooted sedge, and mature plants (≥ 1 year old) produced from 10 to over 100 inflorescences per year. Deeprooted sedge re-growth was rapid and seed production was only temporarily suppressed (< one month) following a single tillage operation (disking). Repeated tillage controlled established plants, but seedlings rapidly replaced them following rainfall with no additional tillage. Of herbicide treatments tested in field trials, the most effective for deeprooted sedge control were glyphosate at 2.2 kg/ha (98%) or 1.1 kg/ha followed by 1.1 kg/ha (10 days apart) (95%), hexazinone at 0.28 kg/ha (92%), MSMA at 2.2 kg/ha (85%), glyphosate at 1.1 kg/ha (84%), halosulfuron-methyl at 0.07 kg/ha (80%), 2,4-D at 0.8 kg/ha + dicamba at 0.27 kg/ha (78 %), and 2,4-D at 2.2 kg/ha + picloram at 0.07 kg/ha (70%). Additional spread of deeprooted sedge can be prevented by (1) cleaning machinery, vehicles, equipment, clothing and other personal items after use in infested areas to avoid spread; (2) suppressing seed production by repeated mowing at 2 to 4 weeks intervals; and (3) applying herbicides and/or repeated tillage operations where and when possible. Because deeprooted sedge continues to spread at an alarming rate threatening agricultural and natural areas and preliminary studies suggest that populations will potentially spread northward into Arkansas, North Carolina, South Carolina, Tennessee, and Virginia, additional research is needed to determine more effective methods of prevention and control.

SERICEA LESPEDEZA (*LESPEDEZA CUNEATA*). C.H. Koger*,USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS 38776; J.F. Stritzke, Department of Plant and Soil Sciences, Oklahoma State University, Stillwater, OK 74078.

ABSTRACT

Sericea lespedeza (*Lespedeza cuneata* [Dum.Cours] G. Don) is a long-lived, warm-season, herbaceous, –fixing, perennial legume. Mature plants form a crown of numerous erect stems that reach lengths of up to 75 cm, and that often persist into the next growing season. It was introduced into the southeastern United States in the late 1800's from Asia as a potential forage species. In the early 1900's, and continuing for most of the century, sericea was planted on many sites in southeastern U.S. for forage production and soil conservation. Sericea will tolerate and grow on acidic and low fertility soils. However, it thrives on clay and loam soils that are deep and fertile. In the early 1980's, some severe infestations of sericea were reported in pastures of Oklahoma and Kansas. This lead to our involvement in numerous studies and research efforts on controlling sericea lespedeza. Solid canopy cover of sericea have been documented in unfertilized bermudagrass, grazed tallgrass prairie, woodland, and ungrazed sites. No infestations of sericea have been documented in fertilized bermudagrass grazed pastures or hay fields.

Sericea competes strongly with native vegetation in tallgrass prairies. Stems of sericea grow upright quickly as single stems upon emergence and then profusely branch in early summer. In addition, there is limited grazing of sericea in this ecosystem because the young stems are protected by "woody-like" stems from previous seasons growth, and high tannin levels. Within several years of introduction into a tallgrass prairie or unfertilized, heavily grazed bermudagrass pasture, sericea can become the dominant species. Sericea is a prolific seed producer, producing in upwards of 6 million seed per hectare. Seeds often germinate in March, April, or early May, and survival of seedlings is often dependant upon summer environmental conditions, with 0% survival in dry hot summers to over 90% in cool wet summers.

Sericea is not killed by herbicides commonly used to control undesirable species in pastures (2,4-D, dicamba + 2,4-D, picloram + 2,4-D). Triclopyr and fluroxypyr resulted in the best long-term control of established sericea. Triclopyr (0.56 to 0.84 kg/ha) applied to nongrazed, actively growing mature plants in late June to mid-July resulted in 95 to 99% stem reduction of established plants 2 years after treatment (YAT). Triclopyr or fluroxypry applied in May or September were not as effective. Spring burning before June/July applications of triclopyr or fluroxypyr had no negative effects on control of established plants. However, a combination of spring burning plus early double stocking of livestock before spraying resulted in only 65% control 2 YAT. Deferring grazing before spraying resulted in 85% control 2 YAT. Late summer applications of metsulfuron resulted in good control (95 to 99%) of sericea 1 YAT, however stem densities by 3 YAT were similar to untreated areas. An integrated strategy using triclopyr followed by spring burning and grazing can be utilized to manage sericea lespedeza in tallgrass prairies. We have documented that some sericea lespedeza can be tolerated in tallgrass ecosystem before yields of desirable grasses are reduced and that sericea will be utilized by cattle if the site is spring-burned and double stocked at initiation of sericea growth in April.

WHAT TO DO WITH AN UNKNOWN SPECIMEN: PREPARATION AND STORAGE OF VOUCHERS. R. Carter, Biology Department, Valdosta State University, Valdosta, GA 31698-0015.

ABSTRACT

Properly prepared voucher specimens are fundamentally essential in documenting occurrences and distributions of plant species. The specimen itself is permanent, verifiable, and tangible evidence, and its label provides geographical, ecological and other kinds of data. Voucher specimens should be deposited in an officially recognized public herbarium, where they will provide a permanent record and will be available to other researchers. The steps involved in taking the voucher specimen from field to herbarium will be discussed, with special emphasis on the collection of specimens and data and the proper handling, storage, and shipment of specimens.

STATE EXTENSION WEED CONTROL PUBLICATIONS

J. D. Byrd, Jr., Section Chairman

Extension weed identification and control publications for all commodities are listed by state. Publication numbers, titles and ordering sources are provided. Publications that must be purchased are designated with price in parentheses following the title. URL addresses are listed for states that have Extension weed control information on the Internet. This report will be updated each year, and published in the Proceedings.

State: ALABAMA

Prepared by: John W. Everest and Mike Patterson

Internet URL: http://www.aces.edu/pubs/

Source: Bulletin Room, Alabama Cooperative Extension System, #6 Duncan Hall, Auburn University, Auburn, AL 36849

Number	Title
CIRCULARS	
ANR-48	Weed Control in Lake and Ponds
ANR-65	Kudzu: History, Uses, & Control
ANR-104	Controlling Smutgrass in Alabama Pastures
ANR-322	Weed Control in Home Gardens
ANR-453	Christmas Tree IPM
ANR-465	Weed Control for Commercial Nurseries
ANR-600A	Alabama Pesticide Handbook, Vol. 1 Ag ($20.00)
ANR-600B	Alabama Pesticide Handbook, Vol. 2 Hort ($19.00)
ANR-616	Weeds of Southern Turfgrasses ($8.00)
ANR-715	Cotton Defoliation
ANR-811	Conservation Tillage for Corn in Alabama
ANR-854	Weed Control in Residential Landscape Plantings
ANR-908	Moss and Algae Control in Lawns
ANR-909	Tropical Soda Apple in Alabama
ANR-951	Weed Control Around Poultry Houses and Other Farm Building
ANR-975	Poisonous Plants of the Southeastern United States ($4.00)
ANR-1058	Brush Control
ANR-1128	Weed Identification for Horticultural Crops
INFORMATION SHEETS	
2003IPM-2	Commercial Vegetable IPM
2003IPM-8	Peach IPM
2003IPM-11	Apple IPM
2003IPM-22	Weed Control in Commercial Turfgrass
2003IPM-27	Pecan IPM
2003IPM-28	Forage Crops IPM
2003IPM-223	Noncropland IPM
2003IPM-360	Peanut IPM
2003IPM-413	Soybean IPM
2003IPM-415	Cotton IPM
2003IPM-428	Corn IPM
2003IPM-429	Grain Sorghum IPM
2003IPM-453	Christmas Tree IPM
2003IPM-458	Small Grain IPM
2003IPM-478	Small Fruit IPM
2003IPM-590	Chemical Weed Control for Home Lawns
2003IPM-978	Alfalfa IPM

State: ARKANSAS

Prepared by: Bob Scott, John Boyd, and Ken Smith

Internet URL:

Order from: Dr. Bob Scott, 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: Ken Langeland, William Stall, and Brian Unruh

Internet URL: http://edis.ifas.ufl.edu

Order from: Extension Weed Specialist, Agronomy Department, 303 Newell Hall, P. O. Box 110500, University of Florida, Gainesville, FL 32611-0500

1 Dr. W. M. Stall, Extension Vegetable Weed Specialist, 1255 Fifield Hall, Univ. of Florida, Gainesville, FL 32611-0690

2 Dr. D. P. H. Tucker, Extension Citrus Management Specialist, IFAS-AREC, 700 Experiment Station Road, Lake Alfred, FL 33850

3 Dr. K. A. Langeland, Extension Aquatic Weed Specialist, Center for Aquatic Plant Research, 7922 NW 71st Street, Gainesville, FL 32606

4 Dr. B. R. Unruh, 1523 Fifield Hall, Gainesville, FL 32611

5 University of Florida Publications, P. O. Box 110011, Gainesville, FL 32611-0011

Number	Title
PUBLICATIONS	
SS-AGR-001	Weed Control in Tobacco
SS-AGR-002	Weed Control in Corn
SS-AGR-003	Weed Control in Peanuts
SS-AGR-004	Weed Control in Cotton
SS-AGR-005	Weed Control in Soybeans
SS-AGR-006	Weed Control in Sorghum
SS-AGR-007	Weed Control in Small Grains Harvested for Grain
SS-AGR-008	Weed Control in Pastures and Rangeland
SS-AGR-009	Weed Control in Sugarcane
SS-AGR-010	Weed Control in Rice
SS-AGR-012	Florida Organo-Auxin Herbicide Rule
SS-AGR-014	Herbicide Prepackage Mixtures
SS-AGR-015	Diagnosing Herbicide Injury
SS-AGR-016	Approximate Herbicide Pricing
SS-AGR-11	Weed Management in Transgenic, Herbicide-Resistant Soybeans
SS-AGR-13	Weed Management in Transgenic, Herbicide-Resistant Cotton
SS-AGR-17	Brazilian Pepper-Tree Control
SS-AGR-22	Identification and Control of Bahiagrass Varieties in Florida
SS-AGR-50	Tropical Soda Apple in Florida
SS-AGR-52	Cogongrass (*Imperata cylindrica*) Biology, Ecology and Control in Florida
SS-AGR-58	Tropical Soda Apple Control - Best Management Practices in 2003
SS-AGR-80	NATURAL AREA WEEDS: Skunkvine (*Paederia foetida*)
SS-AGR-100	Principles of Weed Management
SS-AGR-101	Application Equipment and Techniques
SS-AGR-102	Calibration of Herbicide Applicators
SS-AGR-103	Trade Name, Active Ingredient and Manufacturer
SS-AGR-104	Trade Names of Herbicides Containing a Given Active Ingredient
SS-AGR-105	Common Name, Chemical Name, and Toxicity Rating of Some Herbicides
SS-AGR-106	Names and Addresses of Some Herbicide Manufacturers and Formulators
SS-AGR-108	Using Herbicides Safely and Herbicide Toxicity
SS-AGR-109	Adjuvants
SS-AGR-111	Weed Management in Fence Rows and Non-Cropped Areas
SS-AGR-112	Poison Control Centers
SS-AGR-164	Natural Area Weeds: Air Potato (*Dioscorea bulbifera*)

SS-AGR-165	Natural Area Weeds: Carrotwood (*Cupaniopsis anacardioides*)
SS-Agr-21	Natural Area Weeds: Old World Climbing Fern (*Lygodium microphyllum*)
SS-ORH-004[4]	2003 University of Florida's Pest Control Recommendations for Turfgrass Managers
AGR-72	Labelled Aquatic Sites for Specific Herbicides
AGR-74	Listing of Herbicide, Registrant, and Amount of Active Ingredient
AGR-79	Florida Department of Environmental Protection Aquatic Plant Management Permits
A-87-6[3]	Application Procedure for Use of Grass Carp for Control of Aquatic Weeds
A-87-7[3]	Biology and Chemical Control of Algae
A-87-10[3]	Biology and Chemical Control of Duckweed
A-87-11[3]	Chemical Control of Hydrilla
A-87-12[3]	Florida DNA Aquatic Plant Control Permit Program
ENH-84	Weed Control Guide for Florida Lawns
ENH-88	Activated Charcoal for Pesticide Deactivation
ENH-90	Pesticide Calibration Formulas and Information
ENH-94	Metric System Conversion Factors
ENH-100	Response of Turfgrass and Turfgrass Weeds to Herbicides
ENH-124	Pest Control Guide for Turfgrass Managers
FS WRS-7	Tropical Soda Apple: A New Noxious Weed in Florida
HS-88	Weed Management in Apples
HS-89	Weed Management in Blackberries
HS-90	Weed Managment in Blueberries
HS-91	Weed Management in Grapes
HS-92	Weed Management in Nectarines
HS-93	Weed Management in Peaches
HS-94	Weed Management in Pears
HS-95	Weed Management in Pecans
HS-96	Weed Management in Plums
HS-97	Susceptibility of Weeds to Herbicides
HS-107	2001 Florida Citrus Pest Management Guide
HS-188[1]	Weed Management in Commercial Citrus
HS-189[1]	Weed Control in Cole or Brassica Leafy Vegetables
HS-190[1]	Weed Control in Cucurbit Crops
HS-191[1]	Weed Control in Eggplant
HS-192[1]	Weed Control in Okra
HS-193[1]	Weed Control in Bulb Crops
HS-194[1]	Weed Control in Potato
HS-195[1]	Potato Vine Dessicants
HS-196[1]	Weed Control in Strawberry
HS-197[1]	Weed Control in Sweet Corn
HS-198[1]	Weed Control in Sweet Potato
HS-199[1]	Weed Control in Pepper
HS-200[1]	Weed Control in Tomato
HS-201[1]	Weed Control in Carrots and Parsley
HS-202[1]	Weed Control in Celery
HS-203[1]	Weed Control in Lettuce, Endive, and Spinach
HS-706[1]	Estimated Effectiveness of Recommended Herbicides on Selected Common Weeds in Florida Vegetables

CIRCULAR, BOOKS, AND GUIDES

SS-AGR-20	2003 Weed Management Guide in Agronomic Crops and Non-Crop Areas
280[5]	Families, Mode of Action and Characteristics of Agronomic, Non-Crop and Turf Herbicides
459[2]	Weed Control Guide for Florida Citrus
676	Weed Control in Centipede and St. Augustinegrass

678	Container Nursery Weed Control
707	Weed Control in Florida Ponds
852[4]	Weed Control in Sod Production
1114	Weed Management for Florida Golf Courses
-----[5]	Florida Weed Control Guide ($8.00)
DH-88-05[4]	Turfgrass Weed Control Guide for Lawn Care Professionals
DH-88-07[4]	Commercial Bermudagrass Weed Control Guide
SM-44[5]	Aquatic and Wetland Plants of Florida ($11.00)
SP-35[5]	Identification Manual for Wetland Plant Species of Florida ($18.00)
SP-37[5]	Weeds in Florida ($7.00)
	Florida Weeds Part II ($1.00)
SP-79[5]	Weeds of Southern Turfgrasses ($8.00)
SP-242	Control of Non-native Plants in Natural Areas of Florida

State: GEORGIA

Prepared by: Stanley Culpepper, Tim R. Murphy, and Eric Prostko

Internet URL: http://www.ces.uga.edu/pubs/pubsubj.html (use for print-on-demand publications)
http://www.gaweed.com/ (contains weed science slide presentations, some publications, etc.) http://www.georgiaturf.com (contains weed science popular articles related to turfgrasses, weed identification, etc.)

Order from: [1]Ag. Business Office, Room 203, Conner Hall, The University of Georgia, Athens, GA 30602
Make check payable to: Georgia Cooperative Extension Service
[2]HADSS, c/o AgRenaissance Software LLC, P. O. Box 68007, Raleigh, NC 27613

The University of Georgia Cooperative Extension Service is currently in the process of switching to a print -on-demand system for Extension publications. Unless noted by an asterisk (*) the publications shown below are not available at this time through the print-on-demand system. Hard copies of these publications may be obtained by contacting one of Georgia weed scientists listed above.

Number	Title
LEAFLETS	
263	Renovation of Home Lawns
400	Musk Thistle and It's Control
418	Use of Sterile Grass Carp to Control Aquatic Weeds
425	Florida Betony Control in Turfgrass and Ornamentals
CIRCULARS	
713	Commercial Blueberry Culture
796	Roadside Vegetation Management
823	Controlling Moss and Algae in Turf
855	Wild Poinsettia Identification and Control*
EXTENSION BULLETINS	
654	Weed Control in Noncropland
829	Principles and Practices of Weed Control in Cotton
978	Weed Control in Home Lawns
984	Turfgrass Pest Control Recommendations for Professionals
986	Forest Site Preparation Alternatives
996	Commercial Watermelon Production
998	Conservation Tillage Crop Production in Georgia
1004	Herbicide Use in Forestry
1005	Georgia Handbook of Cotton Herbicides
1006	Weed Control in Ponds and Small Lakes
1008	Weed Facts: Texas Panicum
1009	Weed Facts: Morningglory Complex
1010	Weed Facts: Sicklepod and Coffee Senna
1019	Cotton Defoliation and Crop Maturity
1023	Herbicide Incorporation
1032	Forestry on a Budget
1043	Weed Facts: Yellow and Purple Nutsedge
1049	Perennial Weed Identification and Control in Georgia

1069	How to Set Up a Post-Emergence Directed Herbicide Sprayer for Cotton
1070	Forage Weed Management
1072	Weed Facts: Florida Beggarweed
1093	Guide to Field Crop Troubleshooting
1098	How to Control Poison Ivy
1100	Peanut Herbicides for Georgia
1118	Non-Chemical Weed Control Methods
1125	Weed Management in Conservation Tillage Cotton
1135	Intensive Wheat Management in Georgia
1138	Conservation Tillage for Peanut Production
1144	Commercial Production of Vegetable Transplants

SPECIAL BULLETINS

28[1]	Georgia Pest Control Handbook ($15.00)*

MISCELLANEOUS

Pub. 46	2003 Georgia Peach Spray and Production Guide
Pub. 377	2003 Georgia Tobacco Growers Guide
Pub. 380	2003 Cotton Production Package
Hdbk. No. 1[1]	Peach Growers Handbook ($25.00)
[1]	Pecan Pest Management Handbook ($20.00)
[1]	Weeds of Southern Turfgrasses ($8.00)
[1]	Poisonous Plants of the Southeastern United States ($4.00)
761[1]	Weeds of the Southern United States ($3.00)
839[1]	Identification and Control of Weeds in Southern Ponds ($3.00)*
----[2]	Georgia HADSS ($95)

State: KENTUCKY

Prepared by: J. D. Green

Internet URL: http://www.ca.uky.edu/

Order from: Dr. J. D. Green, Extension Weed Control Specialist, Department of Agronomy, N-106B Ag. Sci. Bldg-North, University of Kentucky, Lexington, KY 40546
Dr. James R. Martin, Extension Weed Control Specialist, University of Kentucky Research and Education Center, P. O. Box 469, Princeton, KY 42445

Number	Title
AGR-6	Chemical Control of Weeds in Kentucky Farm Crops
AGR-12	Weeds of Kentucky Turf
AGR-78	Weed Control Recommendations for Kentucky Bluegrass and Tall Fescue Lawns and Recreational Turf
AGR-117	Winter Annual Weeds of Kentucky
AGR-118	Summer Annual Broadleaf Weeds of Kentucky
AGR-135	Perennial Broadleaf Weeds of Kentucky
AGR-139	Herbicide Persistence and Carryover in Kentucky
AGR-140	Herbicides with Potential to Carryover and Injure Rotational Crops in Kentucky
AGR-148	Weed Control Strategies for Alfalfa and Other Forage Legume Crops
AGR-172	Weed Management in Grass Pastures, Hayfields, and Fencerows
ID-2	Some Plants of Kentucky Poisonous to Livestock
ID-36	Commercial Vegetable Crop Recommendations
ID-125	A Comprehensive Guide to Wheat Management in Kentucky ($10.00)
ID-139	A Comprehensive Guide to Corn Management in Kentucky ($10.00)

State: LOUISIANA

Prepared by: Reed Lensce and Steve Kelly

Internet URL: http://www.agctr.lsu.edu

Order from: Dr. Reed Lensce, Knapp Hall, Louisiana State University, Baton Rouge, LA 70803-1900

Number	Title
PUBLICATIONS	
1565	Louisiana's Suggested Chemical Weed Control Guide for 2003 $4
1618	Prescribed Burning in Louisiana Pinelands $1
2314	Controlling Weeds in Sugarcane $0.50
2398	Aquatic Weed Management Herbicides $0.50
2410	Aquatic Weed Management Control Methods $0.50
2472	Aquafacts: Algal Blooms in Fish Production Ponds $0.50
2476	Aquafacts: Grass Carp for Aquatic Vegetation Control $0.50
2500	Herbicide Application for the Small Landowner $0.50
2740	Control Weeds in Soybeans with Pre and Postemergence Chemicals in 2000 $1
2746	2000 Controlling Weeds in Cotton $1
2778	Nonchemical Weed Control for Home Landscapes $0.50
2820	Louisiana Sugarcane Burning $1
8909	Conservation Tillage Systems for Energy Reduction -- Preplant Weed Control in Cotton $0.50

State: MISSISSIPPI

Prepared by: John D. Byrd, Jr.

Internet URL: http://www.ces.msstate.edu/anr/plantsoil/weeds

Order from: Department of Plant & Soil Sciences, Box 9555, Mississippi State, MS 39762-9555

[1] Dr. Marty Brunson, Wildlife & Fisheries, Box 9690, Mississippi State, MS 39762-9690

[2] Dr. John Byrd, Plant & Soil Sciences, Box 9555, Mississippi State, MS 39762-9555

[3] Dr. Andy Londo, Forestry Department, Box 9681, Mississippi State, MS 39762-9681

[4] Mr. Herb Willcutt, Agric. & Bio. Engineering, Box 9632, Mississippi State, MS 39762-9632

[5] Dr. Joe Street, Delta Research & Extension Center, P. O. Box 68, Stoneville, MS 38776

[6] HADSS, c/o AgRenaissance Software LLC, P.O. Box 68007, Raleigh, NC 27613

Number	Title
INFORMATION SHEETS	
673[1]	Control of Fish Diseases and Aquatic Weeds
803	Grain and Forage Sorghum Weed Control
875	Cotton Postemergence and Layby Herbicides
945	Forages Weed Control in Pastures
962	Soybean Preplant Foliar and Preplant Incorporated
963	Soybean Preemergence Weed Control
1024	Soybean - Management Strategies for Sicklepod
1025[1]	Aquatic Weed Identification and Control--Bushy Pondweed and Coontail
1026[1]	Aquatic Weed Identification and Control--Willows and Arrowhead
1027[1]	Aquatic Weed Identification and Control--Cattail and Spikerush
1028[1]	Aquatic Weed Identification and Control--Pondweed and Bladderwort
1029[1]	Aquatic Weed Identification and Control--Fanwort and Parrotfeather
1030[1]	Aquatic Weed Identification and Control--Frogbit and Watershield
1031[1]	Aquatic Weed Identification and Control--Burreed and Bulrush
1032[1]	Aquatic Weed Identification and Control--White Waterlily and American Lotus
1033[1]	Aquatic Weed Identification and Control--Duckweed and Water Hyacinth
1034[1]	Aquatic Weed Identification and Control--Hydrilla and Alligatorweed
1035[1]	Aquatic Weed Identification and Control--Algae
1036[1]	Aquatic Weed Identification and Control--Methods of Aquatic Weed Control
1037[1]	Aquatic Weed Identification and Control--Smartweed and Primrose
1500	Flame Cultivation in Cotton
1527	Peanut Weed Control Recommendations
1528	Kenaf Weed Control Recommendations
1580	Nonchemical Weed Control for Home Owners
1619	Cotton Preplant and Preemergence Weed Control
-----[2]	Tropical Soda Apple in Mississippi
-----[2]	Tropical Soda Apple in the United States
-----[2]	Management Strategies for Tropical Soda Apple in Mississippi
PUBLICATIONS	
475	Corn Weed Control Recommendations
461	Commercial Pecan Pest Control-Insects, Diseases and Weeds

553	Weed Science for 4-H'ers
1005[3]	Christmas Tree Production in Mississippi
1006[4]	Calibration of Ground Spray Equipment
1091	Garden Tabloid
1100	Soybeans Postemergence Weed Control
1217[5]	Rice Weed Control
1277[3]	Forest Management Alternatives for Private Landowners
1322	Establish and Manage Your Home Lawn
1344	Weed Control in Small Grain Crops
1532	2003 Weed Control Guidelines for Mississippi ($7.00)
1664	Disease, Insect and Weed Control Guide for Commercial Peach Orchards
1744	Weed Control in Home Lawns
1907	Herbicide Resistance Prevention and Detection
1934	Weed Response to Selected Herbicides
1962	Pesticides - Benefits and Risks
2036	Organic Vegetable IPM Guide
2166[2]	Poisonous Plants of the Southeastern United States

TECHNICAL NOTES

MTN-SG[3]	Weed Control in Christmas Tree Plantations
MTN-7F[3]	An Overview of Herbicide Alternatives for the Private Forest Landowner
MTN-8F[3]	Tree Injection: Equipment, Methods, Effective Herbicides, Productivity, and Costs
MTN-11F[3]	Effective Kudzu Control

COMPUTER SOFTWARE

-----[6]	Mississippi HADSS ($95.00)

State: MISSOURI

Prepared by: Andy Kendig

Internet URL: http://etcs.ext.missouri.edu/publications/xplor/

Order from: Extension Publications, 2800 Maguire, University of Missouri, Columbia, MO 65211
Add $1.00 for shipping and handling with each order.

Number	Title
MP575	Weed Control Guide for Missouri Field Crops ($7.50)
MP581	Weed and Brush Control Guide for Forages, Pastures, and Non-Cropland in Missouri ($5.00)
MP686	Using Reduced Herbicide Rates for Weed Control in Soybeans ($1.00)
G4251	Cotton Weed Control ($0.75)
G4851	Atrazine: Best Management Practices and Alternatives in Missouri ($0.75)
G4856	Aquatic Weed Control in Missouri ($1.00)
G4871	Waterhemp Management in Missouri ($0.50)
G4872	Johnsongrass Control
G4875	Control of Perennial Broadleaf Weeds in Missouri Field Crops ($0.75)
NCR614	Early Spring Weeds of No-Till Production

State:	NORTH CAROLINA
Prepared by:	Stratford Kay, David Monks, Joe Neal, Fred Yelverton, and Alan York
Internet URL:	http://ipmwww.ncsu.edu/agchem/ac8.html
Order from:	Dr. Fred Yelverton or Dr. A. C. York, Crop Science Department, Box 7620, North Carolina State University, Raleigh, NC 27695-7620
1	Dr. J. C. Neal or Dr. D. W. Monks, Department of Horticulture, Box 7609, North Carolina State University, Raleigh, NC 27695-7609
2	Communication Services, N. C. State University, 3210 Faucette Dr., Box 7603, Raleigh, NC 27695-7603
3	Dr. David Ritchie, Department of Horticulture, Box 7609, North Carolina State University, Raleigh, NC 27695-7609
4	HADSS, c/o AgRenaissance Software LLC, P. O. Box 68007, Raleigh, NC 27613

Number	Title
PUBLICATIONS	
AG-37[1]	Agricultural Chemicals for North Carolina Apples
AG-146[1]	Peach and Nectarine Spray Schedule
AG-187	Tobacco Information - 2003
AG-208	Identifying Seedling and Mature Weeds in Southeastern United States ($7.00)
AG-331	2003 Peanut Information
AG-348	Turfgrass Pest Management Manual ($7.00)
AG-408	Pest Control for Professional Turfgrass Managers 2001
AG-417	2003 Cotton Information
AG-427[1]	Weed Control Suggestions for Christmas Trees, Woody Ornamentals and Flowers ($7.50)
AG-437	Weed Management in Small Ponds
AG-438	Weed Control in Irrigation Water Supplies
AG-442	Using Activated Charcoal to Inactivate Agricultural Chemicals Spills
AG-449	Hydrilla, A Rapidly Spreading Aquatic Weed in North Carolina
AG-456	Using Grass Carp for Aquatic Weed Management
AG-572[2]	Integrated Orchard Management Guide for Commercial Apples in the Southeast
AG-580	Small Grain Production Guide
AG-594	North Carolina Corn Production Guide
B-414	Stock-Poisoning Plants of North Carolina ($5.00)
-----	North Carolina Agricultural Chemicals Manual ($15.00-Revised yearly)
-----[3]	Southern Peach, Nectarine, and Plum Pest Management and Cultural Guide
INFORMATION LEAFLETS	
HIL205B[1]	Weed Control Options for Strawberries on Plastic
HIL325[1]	Peach Orchard Weed Management
HIL380	Orchard Floor Management in Pecans
HIL449	Weed Management in Conifer Seedbeds
HIL570	Greenhouse Weed Management
HIL643[1]	Weed Control for Bulbs in the Landscape
HIL644	Weed Management in Annual Color Beds
HIL647	Controlling Yellow Nutsedge in Landscape Plantings
HIL648	Postemergence, Nonselective Herbicides for Landscapes and Nurseries
HIL649	Weed Management in Conifer Seedbeds and Transplant Beds
HIL8101[1]	Weed Control in Vegetable Gardens
HIL900	Musk Thistle
HIL901	Canada Thistle

HIL902	Mugwort
HIL903	Mulberry Weed
HIL904	Florida Betony
HIL905	Japanese Stiltgrass
—[4]	North Carolina HADSS ($95)

State: OKLAHOMA

Prepared By: Case Medlin

Internet URL: http://agweb.okstate.edu/pearl/

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-943	Alfalfa Harvest Management Discussions with Cost-Benefit Analysis
E-948	Aerial Pesticide Drift Management
E-949	Alfalfa Stand Establishment Questions and Answers
F-2089	Alfalfa Stand Establishment
B-812	Hogpotato: Its Biology, Competition, and Control
F-2586	Wheat for Pasture
F-2587	Bermudagrass for Grazing or Hay
F-2850	Eastern Redcedar and Its Control
F-2868	Eastern Redcedar Ecology and Management
F-2873	Ecology and Management of Western Ragweed on Rangeland
F-2874	Ecology and Management of Sericea Lespedeza
E-832	OSU Extension Agent's Handbook of Insect, Plant Disease, and Weed Control
F-2776	Thistles in Oklahoma and Their Identification
F-2869	Management Strategies for Rangeland and Introduced Pastures
F-2875	Intensive Early Stocking
F-7318	Integrated Control of Musk Thistle in Oklahoma

State: SOUTH CAROLINA

Prepared By: Bert McCarty, Ed Murdock, and Jason Norsworthy

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
697	Turf Herbicide Families and Their Characteristics
698	Designing and Maintaining Bermudagrass Sports Fields in the United States
699	2003 Pest Control Recommendations for Professional Turfgrass Managers
702	Sod Production in the Southern United States
707	Southern Lawns
-----[1]	2003 Pest Management Handbook ($25.00)
BULLETINS	
150	Weeds of Southern Turfgrasses
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	2003 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 ($20.00 per copy)

WEED SURVEY – SOUTHERN STATES

2003

Aquatic, **Industrial**, **Nursery** and **Container Ornamentals**, **Power Lines**, and **Rights-Of-Way**

Theodore M. Webster
Chairperson

Information in this report is provided by the following individuals:

Alabama	Mike Patterson	John W. Everest
Florida	Barry J. Brecke	
Georgia	Tim R. Murphy	Mark A. Czarnota
Kentucky	J. D. Green	J. R. Martin
Mississippi	John Byrd	
North Carolina	Fred Yelverton Leon S. Warren	Travis W. Gannon

Table 1. The Southern States 10 Most Common and Troublesome Aquatic Weeds.

	States		
Ranking	Alabama	Florida	Georgia
Ten Most Common Weeds			
1	Filamentous algae	Hydrilla	Filamentous algae spp.
2	Duckweed spp.	Waterhyacinth	Cattail spp.
3	Watermilfoil spp.	Algae spp.	Duckweed spp.
4	Parrotfeather	Torpedograss	Waterlily spp.
5	Pondweed spp.	Waterlettuce	Parrotfeather
6	Waterlily spp.	Melaleuca	Coontail
7	Southern naiad	Brazilian pepper	Naiad spp.
8	Slender spikerush	Common duckweed	Alligatorweed
9	Watershield	Spatterdock	Torpedograss
10	Coontail	Fragrant waterlily	Willow spp.
Ten Most Troublesome Weeds			
1	Hydrilla	Hydrilla	Watermeal spp.
2	Filamentous algae	Waterhyacinth	Duckweed spp.
3	Slender spikerush	Melaleuca	Slender spikerush
4	Watermeal spp.	Algae spp.	Hydrilla
5	Duckweed spp.	Torpedograss	Parrotfeather
6	Parrotfeather	Eurasian watermilfoil	Naiad spp.
7	Pondweed spp.	Cattail spp.	Pondweed spp.
8	Water willow	Maidencane	Waterlily spp.
9	Southern naiad	Fragrant waterlily	Torpedograss
10		Spatterdock	Salvinia spp.

Table 1. The Southern States 10 Most Common and Troublesome Aquatic Weeds (continued).

	States	
Ranking	Kentucky	Mississippi
Ten Most Common Weeds		
1	Blue-green algae	Blue-green algae
2	Pondweed spp.	Common duckweed
3	Cattail spp.	Giant duckweed
4	Duckweed spp.	Chara spp.
5	Watershield	Nitella spp.
6	Water primrose	Smartweed spp.
7	Waterlily spp.	Spikerush spp.
8	Chara spp.	Southern cattail
9		Alligatorweed
10		Waterhyacinth
Ten Most Troublesome Weeds		
1	Algae spp.	Blue-green algae
2	Duckweed spp.	Common duckweed
3	Watershield	Spikerush spp.
4	Cattail spp.	Pondweed spp.
5	Chara spp.	Naiad spp.
6	Pondweed spp.	Southern cattail
7		Chara spp.
8		Nitella spp.
9		Bladderwort spp.
10		Willow-primrose

Table 2. The Southern States 10 Most Common and Troublesome Weeds in Industrial Areas.

	States	
Ranking	Georgia	Mississippi
Ten Most Common Weeds		
1	Crabgrass spp.	Southern crabgrass
2	Goosegrass	Bermudagrass
3	Vaseygrass	Bahiagrass
4	Honeysuckle spp.	Johnsongrass
5	Bahiagrass	Goldenrod spp.
6	Broomsedge	Knotroot foxtail
7	Bermudagrass	Goosegrass
8	*Rubus* spp.	Prostrate spurge
9	Kudzu	Southern dewberry
10	Privet spp.	Vaseygrass
Ten Most Troublesome Weeds		
1	Privet spp.	Bermudagrass
2	Bamboo	Pine spp.
3	Greenbriar (*Smilax*) spp.	Dallisgrass
4	Trumpetcreeper	Vaseygrass
5	Vaseygrass	Privet spp.
6	Dallisgrass	Broomsedge
7	Virginia creeper	Fescue spp.
8	Bermudagrass	Honeysuckle spp.
9	Dogfennel	Greenbriar (*Smilax*) spp.
10	Honeysuckle spp.	Cogongrass

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Nursery and Container Ornamentals.

	States		
Ranking	Alabama	Florida	Georgia
Ten Most Common Weeds			
1	Woodsorrel spp.	Creeping spurge	Bittercress spp.
2	Spurge spp.	Spotted spurge	Woodsorrel spp.
3	Crabgrass spp.	Woodsorrel spp.	Spurge spp.
4	Common chickweed	Bittercress spp.	Phyllanthus spp.
5	Hairy bittercress	Cudweed spp.	Yellow nutsedge
6	Henbit	Common chickweed	Purple nutsedge
7	Nutsedge spp.	Chamberbitter	Mulberry weed
8	Annual bluegrass	Eclipta	Florida betony
9	Goosegrass	Crabgrass spp.	Bermudagrass
10	Carpetweed	Goosegrass	Vetch spp.
Ten Most Troublesome Weeds			
1	Nutsedge spp.	Bittercress spp.	Purple nutsedge
2	Florida betony	Common chickweed	Yellow nutsedge
3	Chamberbitter	Creeping spurge	Spurge spp.
4	Dogfennel	Spotted spurge	*Phyllanthus* spp.
5	Woodsorrel spp.	Eclipta	Bittercress spp.
6	Spurge spp.	Woodsorrel spp.	Woodsorrel spp.
7	Hairy bittercress	Cudweed spp.	Florida betony
8	Common chickweed	Florida pusley	Bermudagrass
9	Henbit	Goosegrass	Vetch spp.
10		Crabgrass spp.	Eclipta

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Nursery and Container Ornamentals (continued).

Ranking	State Mississippi
Ten Most Common Weeds	
1	Southern crabgrass
2	Common bermudagrass
3	Annual bluegrass
4	Annual sedge
5	Prostrate spurge
6	Henbit
7	Common chickweed
8	Common purslane
9	Yellow woodsorrel
10	Swinecress
Ten Most Troublesome Weeds	
1	Prostrate spurge
2	Annual sedge
3	*Phyllanthus* spp.
4	Yellow woodsorrel
5	Goosegrass
6	Common bermudagrass
7	Wild garlic
8	Nutsedge spp.
9	Eclipta
10	Florida betony

Table 4. The Southern States 10 Most Common and Troublesome Weeds of Power-Lines.

	States		
Ranking	Georgia	Kentucky	Mississippi
Ten Most Common Weeds			
1	Sweetgum	Sumac spp.	Pine spp.
2	Pine spp.	Sweetgum	Sweetgum
3	Oak spp.	Black locust	Eastern red cedar
4	Red maple	Wild black cherry	Persimmon
5	Kudzu	Eastern red cedar	Oak spp.
6	*Prunus* spp.	Redbud	Sourwood
7	Privet spp.	Musk thistle	Privet spp.
8	Black locust	Trumpetcreeper	Cogongrass
9	*Nyssa* spp.	Honeysuckle spp.	Hickory spp.
10	Wax myrtle	Common milkweed	Ash spp.
Ten Most Troublesome Weeds			
1	Privet spp.	Sweetgum	Pine spp.
2	Willow spp.	Black locust	Privet spp.
3	Sassafras spp.	Kudzu	Ash spp.
4	Persimmon	Russian olive	Eastern red cedar
5	Kudzu	Eastern red cedar	Maple spp.
6	Black locust	Honeysuckle spp.	Cogongrass
7	Hickory spp.	Japanese knotweed	Persimmon
8	Oak spp.	Multiflora rose	Willow spp.
9	*Nyssa* spp.		Honey locust
10	Bamboo spp.		Bois d’arc

Table 4. The Southern States 10 Most Common and Troublesome Weeds of Power-Lines (continued).

Ranking	State North Carolina
Ten Most Common Weeds	
1	Sweetgum
2	Pine spp.
3	Oak spp.
4	Maple spp.
5	Kudzu
6	Sumac spp.
7	Black cherry
8	Locust spp.
9	Bramble spp.
10	Poplar spp.
Ten Most Troublesome Weeds	
1	Kudzu
2	Sumac spp.
3	Pine spp.
4	Sweetgum
5	Oak spp.
6	Black cherry
7	Locust spp.
8	Hickory spp.
9	Maple spp.
10	Bramble spp.

Table 5. The Southern States 10 Most Common and Troublesome Weeds in Rights-of-Way.

	States		
Ranking	Florida	Georgia	Kentucky
Ten Most Common Weeds			
1	Bahiagrass	Bahiagrass	Johnsongrass
2	Hairy indigo	Thistle spp.	Eastern red cedar
3	Saltbush	*Verbena* spp.	Broomsedge
4	Dogfennel	Tropic croton	Musk thistle
5	Pigweed spp.	Horseweed	Tall ironweed
6	Spanish needle	Hairy fleabane	Goldenrod spp.
7	Smutgrass	Catchweed bedstraw	Common teasel
8	Periwinkle	Italian ryegrass	Multiflora rose
9	Greenbriar (*Smilax*) spp.	Vaseygrass	Common milkweed
10	Horseweed	*Lactuca* spp.	Honeysuckle spp.
Ten Most Troublesome Weeds			
1	Cogongrass	Hairy fleabane	Musk thistle
2	Brazilian pepper	Catchweed bedstraw	Canada thistle
3	Spanish needle	Hemp dogbane	Kudzu
4	Australian pine	Florida paspalum	Eastern red cedar
5	Napiergrass	Asparagus	Johnsongrass
6	Dogfennel	Giant reed	Tall ironweed
7	Smutgrass	Italian ryegrass	Japanese knotweed
8	Vaseygrass	Kudzu	Trumpetcreeper
9	Thistle spp.	Honeysuckle spp.	Honeysuckle spp.
10	Melaleuca	*Verbena* spp.	Joepyeweed

Table 5. The Southern States 10 Most Common and Troublesome Weeds in Rights-of-Way (continued).

	States	
Ranking	Mississippi	North Carolina
Ten Most Common Weeds		
1	Carolina geranium	Crabgrass spp.
2	Field madder	Dallisgrass
3	Catchweed bedstraw	Johnsongrass
4	Wild chervil	Henbit
5	Rootknot foxtail	Carolina geranium
6	Broomsedge	Broomsedge
7	Southern crabgrass	Ragweed spp.
8	Silver beardgrass	Dock spp.
9	Italian ryegrass	Dandelion spp.
10	Fescue spp.	Dogfennel
Ten Most Troublesome Weeds		
1	Johnsongrass	Broomsedge
2	Knotroot foxtail	Dallisgrass
3	Cogongrass	Goldenrod spp.
4	Broomsedge	Dandelion spp.
5	Thistle spp.	Kudzu
6	Hemp sesbania	Johnsongrass
7	Fescue spp.	Thistle spp.
8	Silver beardgrass	Dogfennel
9	Smutgrass	Bramble spp.
10		

Economic Losses Due to Weeds in Southern States

Aquatic, Industrial, Nursery ornamentals, Container ornamentals, and Right-of-way

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. 2002 Estimated Losses Due to Weeds in Alabama[1]

	Aquatic	Industrial	Nursery Ornamentals	Container Ornamentals	Right-of-way
Cost of Herbicides					
a. Acres	2.3		4	5	
b. Cost/A	$140		$95	$460	
c. Value	$322		$380	$2300	
Loss in Yield					
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 Quality					
a. Acres	N/A		1	1.5	
b. Cost/A	N/A		$500	$2000	
c. Value	N/A		$500	$3000	
Loss in Extra Land Preparation and Cultivation					
a. Acres	2		3	5	
b. Cost/A	$130		$300	$1000	
c. Value	$260		$900	$5000	
Loss in Increase Cost of Harvesting					
a. Acres	N/A		N/A	1	
b. Cost/A	N/A		N/A	$200	
c. Value	N/A		N/A	$200	
Total Losses	$582		$1780	$10500	

[1]Acres = no. X 1000; Cost/A = $/A; Value = Acres X Cost/A X 1000.

Contributing Author: John Everest

Table 2. 2002 Estimated Losses Due to Weeds in Georgia[1]					
	Aquatic	Industrial	Nursery Ornamentals	Container Ornamentals	Right-of-way
Cost of Herbicides					
a. Acres	10	1	5.8	3.6	100
b. Cost/A	$150	$150	$50	$500	$50
c. Value	$1500	$150	$290	$1800	$5000
Loss in Yield					
a. Acres	N/A	N/A	N/A	N/A	N/A
b. Cost/A	N/A	N/A	N/A	N/A	N/A
c. Value	N/A	N/A	N/A	N/A	N/A
Loss in Quality					
a. Acres	N/A	0.25	0.29	0.18	2
b. Cost/A	N/A	$100	$500	$500	$100
c. Value	N/A	25	$145	$90	200
Loss in Extra Land Preparation and Cultivation					
a. Acres	0.5	0.25	N/A	N/A	2
b. Cost/A	$200	$150	N/A	N/A	$100
c. Value	$100	$37.5	N/A	N/A	$200
Loss in Increase Cost of Harvesting					
a. Acres	N/A	N/A	N/A	N/A	N/A
b. Cost/A	N/A	N/A	N/A	N/A	N/A
c. Value	N/A	N/A	N/A	N/A	N/A
Total Losses	$1600	$212.5	$435	$1890	5400

[1]Acres = no. X 1000; Cost/A = $/A; Value = Acres X Cost/A X 1000.

Contributing Author: Tim Murphy

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Herbicide Names and Manufacturers

Common or Code Name	Trade Name	Chemical Name	Manufacturer
A			
Acetochlor	Harness Surpass Micro-Tech	2-chloro-*N-(*ethoxymethyl*)* *N*-(2-ethyl-6-methylphenyl) acetamide	Monsanto Dow AgroSciences Monsanto
Acifluorfen	Ultra Blazer	5-[2-chloro-4-(trifluoromethyl)phenoxy] -2-nitro-benzoic acid	BASF
Acifluorfen + bentzaon	Storm	see acifluorfen and bentazon	BASF
Alachlor	Lasso, Partner	2-chlor-*N*-(2,6-diethyl-phenyl)-*N*- (methoxymethyl) acetamide	Monsanto
Ametryn	Evik	*N*-ethyl-*N*-(1-methylethyl)-6- (methylthio)-1,3,5-triazine-2,4-diamine	Syngenta
Asulam	Asulox	methyl[(4-aminophenyl) sulfonyl] carbamate	Aventis
Atrizine	Aatrex /others	6-chloro-N-ethyl-*N*-(1-methylethyl)- 1,3,5-triazine-2,4-diamine	Syngenta / others
Azafenidin	Milestone	2-[2,4-dichloro-5-(2-propynyl-oxy_phen)	DuPont
AEF 130060			Dow AgroSciences
B			
BAS 625H	Aura	2-[1-2-(4-chlorophenoyx) propoxyimino) -butyl]3-oxo-5-thian-3-ylcyclohex-1-enol	BASF
BAY FOE5043	Axiom	*N*-(4-fluorophenyl)-*N*-(1-methyl-ethyl) -2-[[5-(trifluoromethyl)-1,3,4-thiadiazol-2-yl] oxy]acetamide	Bayer
BAY MKH 6561		methyl 2-[[[(4,5-dihydro-4-methyl-5-oxo- 3-propoxy-1H-1,2,4-triazole-1-yl) carbonyl]amino]sulfonyl]benzoate, sodium salt	Bayer

Benefin	Balan	*N*-butyl-*N*-ethyl-*N*-2,6-dinotro-4-(trifluoromethyl)benzeneamine	Dow AgroSciences
Bensulfuron	Londax	2-[[[[[4,6-dimethoxy-2-pyrimidiny) amino]sulfonyl]methyl]benzoic acid	DuPont
Bentazon	Basagran	3-(1-methylethyl)-(1*H*)-2,1,3-benzothidiazin-4(3*H*)-one 2,2-dioxide	BASF
Bispyribac-sodium	Regiment	Sodium2,6-bis[(4,6-dimethozypyrimidin-2-yl)oxy]benzoate	Valent USA
Bromacil	Hyvar X	5-bromo-6-methyl-3-(1-methylpropyl) -2,4(1*H*,3*H*) pyrimidinedione	DuPont
Bromoxynil	Buctril, Bronate	3,5-dibromo-4-hydroxy-benzonitrile	Aventis
Butroxydim	Falcon	2-[1-(ethoxyimino)propyl]-3-hydroxy-5-[2,4,6-trimethyl-3-(1-oxobutyl)phenyl] -2-cyclohexen-1-one	
C			
Carfentrazone	Aim, Shark	∝2-dichloro-5-[4-difluoro-methyl)-4,5-dihydro-3-methyl-5-oxo-1*H*-1,2,4-triazol -1-yl]-4-fluoro-benzenepropanoic acid	FMC
CGA-362622	Envoke		Syngenta
Chlorimuron	Classic	2-[[[[(4-chloro-6-methoxy-2-pyrimidinyl) amino]carbonyl]amino]sulfonyl]benzoic acid	DuPont
Chlorimuron + sulfentrazone	Canopy Extra	see chlorimuron and sulfentrazone	DuPont
Chlorimuron + metribuzin	Canopy XL	see chlorimuron and sulfentrazone	DuPont
Chlorimuron + thifensulfuron	Synchrony	see chlorimuron and sulfentrazone	DuPont

Chlorsulfuron	Glean	2-chloro-*N*-[[(4-methoxy-6-methyl) -1,3,5,-triazin-2-yl)amino]carbonyl] benzene-sulfonamide	DuPont
Chlorsulfuron + metsulfuron	Finesse	see chlosulfuron and metsulfuron	DuPont
Clethodium	Select, Envoy	(*E*,*E*)-±-2-[1-[[3-chloro-2-propenyl) oxy]imino]propyl]-5-[2-ethylthio) propyl]-3-hydroxy-2-cyclohexen-1-one	Valent USA
Clomazone	Command	2-[(2-chlorophenyl)methyl]-4,4 -dimethyl-3-isoxazoli-dinone	FMC
Clopyralid	Lontrel Stinger	3,6-dichloro-2-pyridine-carboxylic acid	Dow AgroSciences
Cloransulam	FirstRate Amplify	3-chloro-2-[[5-ethoxy-7-fluoro[1,2,4] triazolo[1,5-*c*]pyrimidin-2yl)sulfonyl] amino]benzoic acid	Dow AgroSciences
Chloransulam + flumetsulam	Frontrow	see cloransulam and flumetsulam	Dow AgroSciences
Cyanazine	Bladex CyPro	2-[[4-chloro-6-(ethylamino)-1,3,5,-triazin -2-yl]amino]-2-methylpropanenitrile	DuPont Griffin Dow AgroSciences
Cyhalofop-butyl		2-[4-(4-cyano-2-fluorophenoxy)phenoxy] propanoic acid, butyl ester, (R)	Dow AgroSciences
D			
2,4-D	Several	2,4-dichlorophenoxy)acetic acid	Several
2,4-D + MCPP + dicamba	Trimec Classic	see 2,4-D and MCPP and dicamba	PBI Gordon
2,4-DB	Butoxone Butyrac	4-(2,4-dichlorophenoxy) butanoic acid	Aventis Aventis
DCPA	Dacthal	dimethyl 2,3,5,6-tetra-chloro-1,4-benzenedicarboxylate	Amvac

Dicamba	Banvel Clarity Vanquish	3,6-dichloro-2-methoxy-benzoic acid	MicroFlo BASF Syngenta
Dicamba + diflufenzopyr	Distinct	see dicamba and diflufenzopyr	BASF
Dicamba + diflufenzopyr + nicosulfuron	Celebrity Plus	see dicamba and difluzenopyr and nicosulfuron	BASF
Dicamba + 2,4-D	Weedmaster	see dicamba + 2,4-D	BASF
Dichlobenil	Casoron	2.6-dichlorobenzonitrile	Uniroyal
Dichlorprop (2,4-DP)	Several	(±)-(2,4-dichlorophenoxy)propanoic acid	Aventis
Diclofop	Hoelon	(±)-(2,4-dichloro-phenoxy)phenoxy] propanoic acid	Aventis
Diclosulam	Strongarm	*N*-(2,6-dichloropheyyl)-5-ethoxy -7-fluoro [1,2,4]triazolo[1,5-*c*]pyrimidine -2-sulfonamide	Dow AgroSciences
Dimethenamid	Frontier	2-chloro-*N*-[1-methyl-2-methoxy)ethyl]-*N* -(2,4-dimethyl-thien-3-yl)-acetamide	BASF
Dimethenamid-P	Outlook	(S)-2-chloro-N[(1-methyl-2-methoxy)ethyl] -N-(2,4-dimethyl-thien-3-yl)-acetamide	BASF
Diquat	Reglone, Reward	6,7-dihydrodipyrido[1,2-∝:2',1'-*c*] pyrazinediium ion	Syngenta
Dithiopyr	Dimension	*S*,*S*-dimethyl 2-(difluoro-methyl)-4-(2-methylpropyl)-6-(trifloromethyl) -3,5-pyridine-dicarbothioate	Rohm & Haas
Diuron	Karmex Direx	*N*'-(3,4-dichlorophenyl)-*N*,*N*-dimethylurea	Griffin Griffin
E			
Endothall	Endothal	7-oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid	Pennwalt

Ethalfluralin	Sonalan	*N*-ethyl-*N*-(2-methyl-2-propenyl)-2,6-dinitro-4-(tri-fluoromethyl)benzenamine	Dow AgroSciences
Ethofumesate	Prograss	(±)-2-ethoxy-2,3-dihydro-3,3-dimethyl -5-benzofuranyl-methanesulfonate	Aventis
F			
Fenoxaprop	Option, Bugle	(±)-2-[4-[(6-chloro-2-bezoxazoly)oxy] phenoxy] propanoic acid	Aventis
Fluzazifop-P	Fusilade DX	(*R*)-2-[4-[[5-(trifluoro-methyl)-2pyridinyl] oxy]phenoxy]propanoic acid	Syngenta
Fluazifop + fenoxaprop	Fusion	see fluazifop and fenoxaprop	Syngenta
Flufenacet + metribuzin + atrazine		*N*-(4-Fluorophenyl)-*N*-(1-methylethyl)-2-[[5-(trifluoromethyl)-1,3,4-thiadiazol-2-yl] -oxy]acetamide and metribuzin and atrazine	Bayer
Flumetsulam	Broadstrike	N-(2,6-difluorophenyl)-5-methyl[1,2,4] triazolo[1,5-∝] pyrimidine-2-sulfonamide	Dow AgroSciences
Flumetsulam + clorpyralid	Hornet	see flumetsulam and clopyralid	Dow AgroSciences
Flumetsulam + clopyralid +2,4-D	Scorpion III	see flumetsulam and clopyralid and 2,4-D	Dow AgroSciences
Flumetsulam + metolachlor	Dual	see flumetsulam and metolachlor	Dow AgroSciences
Flumiclorac	Resource	[2-chloro-4-fluoro-5-(1,3,4,5,6,7-hexahydro-1,3-dioxo-2*H*-isoindol-2-yl) phenoxy]acetic acid	Valent USA
Flumioxazin	Valor, V-53482	2-[7-fluoro-3,4-dihydro-3-oxo-4-(2-propynyl)-2*H*-1,4-benzoxazin-6-yl]-4,5,6,7 -tetrahydro-1*H*-isoindole-1,3,(2*H)*-dione	Valent USA
Fluometuron	Cotoran Meturon	*N*,*N*-dimethyl-*N*'-[3-(tri-fluoromethyl) phenyl]urea	Griffin Griffin

Fluoroxypyr	Vista	4-amino-3,5-dichloro-6-fluoro-2-pyridyloxyacetic acid	Dow AgroSciences
Fluthiaceat methyl	Action		Syngenta
	Appeal		KI USA
Fomesafen	Reflex	5-[2-chloro-4-(trifluoro-methyl)phenoxy] -*N*-(methyl-) sulfonyl)-2-nitrobenzamide	Syngenta
Fosamine	Krenite	ethyl hydrogen (aminocarbonyl)-phosphonate	DuPont
G			
Glufosinate	Liberty	2-amino-4-hydroxymethyl	Aventis
	Rely	phosphinyl)butanoic acid	Aventis
	Ignite		Aventis
Glyphosate	Roundup Ultra	N-(phosphonomethyl)glycine	
	Max		Monsanto
	Accord, Rodeo		Dow AgroSciences
	D-Pak		Monsanto
	Roundup Original		Monsanto
	Roundup Ultra Dry		Monsanto
	Touchdown		Syngenta
H			
Halosulfuron	Permit	methyl 5-[[4,6-dimethoxy-2-pyrimidinyl]	Monsanto
	Sempra	amino]carbonylamino-sulfonyl] -3-chloro -1-methyl-1-*H*- pyrazole -4-carboxylate	
Hexazinone	Velpar	3-cyclohexyl-6-(dimethyl-amino)-1-methyl- 1,3,5-triazine-2,4(1*H*,3*H*)-dione	DuPont
I			
Imazamethabenz	Assert	(±)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl) -5-oxo-1*H*-imidazol-2yl]-4(and 5)-methyl-benzoic acid (3:2)	BASF
Imazamox	Raptor	2-[4,5-dihydro-4methyl-4-(1-methylethyl)-5 -oxo-1*H*-imidazol-2yl]-5-(methoxy-methyl)-3-pyridinecarboxylic acid	BASF

Imazapic	Cadre Plateau	(±)-2-[4,5-dihydro-4-methyl-4-4(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-5-methyl-3-pyridine-carboxylic acid	BASF
Imazapyr	Arsenal Chopper Stalker Habitat	(±)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-3-pyridinecarboxylic acid	BASF BASF BASF BASF
Imazaquin	Scepter Image	2-[4,5-dihydro-4-methyl-4-(1-methylethy)-5-oxo-1*H*-imidazol-2-yl)-3-ethyl-3-quinoline-carboxylic acid	BASF BASF
Imazaquin + glyphosate	Backdraft	see imazaquin and glyphosate	BASF
Imazethapyr	Pursuit NewPath	2-[4,5-dihydro-4methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2yl]-5-ethyl-3-pyridinecarboxylic acid	BASF BASF
Imazethapyr + glyphosate	Extreme	see imazethapyr and glyphosate	BASF
Imazethapyr + imazapyr	Event	see imazethapyr and imazapyr	BASF
Isoxaben	Gallery	*N*-[3-(1-ethyl-1-methyl-propyl)-5-isoxazoyl]-2,6-dimethyl-benzamide	Dow AgroSciences
Isoxaben + oryzalin	Snapshot DF	see isoxoben and oryzalin	Dow AgroSciences
Isoxoben + trifluralin	Snapshot TG	see isoxoben and trifluralin	Dow AgroSciences
Isoxaflutole	Balance	5-cyclopropyl-4-(2-methyl-sulphonyl-4-trifluoromethyl-)benzoyl)isoxazole	Aventis
L			
Lactofen	Cobra	(±)-2-ethoxy-1-methyl-2-oxoethyl-5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenzoate	Valent USA
M			
MCPA	Several	(4-chloro-2-methyphenoxy acetic acid)	Several

Mecoprop	Several	(±)-2-(4-chloro-2-methyl-phenoxy) propanoic acid	Several
Mesotrione	Callisto	2-[4-methylsulfonyl-2-nitrobenzoyl]-1,3-cyclohezanedione	Syngenta
Metham	Vapam	methylcarbamodithioic acid	Amvac
Methyl bromide	Bromo-gas	bromomethane	Great Lakes
Metolachlor	Dual Magnum Pennant	2-chloro-*N*-(2-ethyl-6-methylphenyl)-*N*-(2-methoxy-1)-methylethyl)acetamide	Syngenta Syngenta
Metolachlor + atrizine	Bicep	see metolachlor and atrazine	Syngenta
Metribuzin	Sencor	4-amino-6-(1-dimethyl-ethyl)-3-(methylthio)-1,2,4 triazin -5(4*H*)-one	Bayer
Metribuzin + metolachlor	Turbo	see metribuzin and metolachlor	Bayer
Metribuzin + trifluralin	Salute	see metribuzin and trifluralin	Bayer
Metsulfuron	Ally Escort	2-[[[[(4-methoxy-6-methyl-1,3,5-triazin -2-yl)amino] sulfonyl]benzoic acid	DuPont DuPont
Molinate	Ordram	*S*-ethyl hexahydro-1*H*-azepine-1-carbothioate	Syngenta
MSMA	Several	monosodium salt of methyl-arsenic acid	Several
N			
Napropamide	Devrinol	*N*-*N*-diethyl-2-(1-naphthalen-yloxy) propanamide	Syngenta
Nicosulfuron	Accent	2-[[[[4,6-dimethoxy-2-pyrimidinyl-amino] carbonyl]amino]sulfonyl]-*N*,*N*-dimethyl -3-pyridinecarboxamide	DuPont

Nicosulfuron + rimsulfuron + atrazine	Basis Gold	see nicosolfuron and rimsulfuron and atrazine	DuPont
Nicosulfuron + rimsulfuron +	Steadfast	see nicosulfuron and rimsulfuron	DuPont
Norflurazon	Zorial, Solicam, Evital	4-chloro-5-methylamino)-2-(3-(trifluoromethyl)phenyl) -3(2*H*)-pyridazinone	Syngenta Syngenta
O			
Oryzalin	Surflan	4-(dipropylamino)-3,5-dinitrobenzenesulfonamide	Dow AgroSciences
Oxadiazon	Ronstar	3-[2,4-dichloro-5-(1-methyl-ethoxy)phenyl] -5-(1,1-)dimethyl-ethyl)-1,3,4-oxadiazol -2-(3*H*)-one	Aventis
Oxadiazon + prodiamine	Regalstar	see oxadiazon and prodiamine	Regal Chemical Company
Oxasulfuron		2-[[[[(4,6-dimethyl-2-pyrimidinyl)amino] carbonyl]amino]sulfonyl]benzoic acid	Syngenta
Oxyfluorfen	Goal	2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4 -trifluoro-methyl)benzene	Rohm & Haas
Oxyfluorfen + oryzalin	Rout	see oxyfluorfen and oryzalin	The Scotts Company
Oxyfluorfen + oxadiazon	Regal	see oxyfluorfen and ozadiazon	Regal Chemical Company
Oxyfluorfen + pendimethalin	Ornamental Herbicide II	see oxyfluorfen and pendimethalin	The Scotts Company
P			
Paraquat	Gramoxone Max Gramoxone Extra, Starfire Cyclone	1,1'-dimethyl-4,4'-bi-pyridinium ion	Syngenta

Pelargonic Acid	Scythe	nonanoic acid	Mycogen
Pendimethalin	Prowl Pendulum Pentagon Lesco PRE-M Corral	N-(1-ethylpropyl)-3,4-dimethyl-2,6 -dinitrobenzeneamine	BASF BASF BASF Lesco The Scotts Company
Pendimethalin + imazaquin	Squadron	see pendimethalin+imazaquin	BASF
Pendimethalin + imazaquin + imazethapyr	Steel	see pendimethalin+imazaquin+imazethapyr	BASF
Pendimethalin + trifluralin	Tri-Scept	see pendimethalin+trifluralin	BASF
Picloram	Tordon	4-amino-3,5,6-trichloro-2-pyridinecarboxylic acid	Dow AgroSciences
Picloram + 2,4-D	Grazon P+D		
Primisulfuron	Beacon	primisulfuron + 3,6-dichloro -2-methoxybenzoic acid	Syngenta
Primisulfuron + dicamba	NorthStar	see primisulfuron and dicamba	Syngenta
Prodiamine	Barricade Factor	2,4-dinitro-N^3,N^3-dipropyl-6-(trifluoromethyl) -1,3-benezenediamine	Syngenta
Prohexadione		3,5-dioxo-4-(1-oxopropyl) cyclohexanecarboxylic acid	BASF
Prometryn	Caparol Cotton Pro	*N*,*N'*-bis(1-methylethyl)-6-(methylthio) -1,3,5-triazine-2,4-diamine	Syngenta Griffin
Propanil	Stam, Stampede	*N*-(3,4-dichlorophenyl) propanamide	Rohm & Haas

Prosulfuron	Peak	1-(4-methoxy-6-methyl-triazin2-yl)-3-[2-(3,3,3-)trifluoropropyl)phenyl-sulfony]urea	Syngenta
Prosulfuron + Primisulfuron	Exceed Spirit	see prosulfuron and primisulfuron	Syngenta Syngenta
Pyridate	Tough	*O*-(6-chloro-3-phenyl-4-pyridazinyl)*S*-octyl-carbonothioate	Syngenta
Pyrithiobac	Staple	2-chloro-6-[(4,6-dimethoxy-2-pyrimidiny) thio]benzoic acid	DuPont
Pyrithiobac + glyphosate	Staple Plus	see pyrithiobac and glyphosate	DuPont
Q			
Quinclorac	Facet Drive Paramount	3,7-dichloro-8-quinoline-carboxylic acid	BASF BASF BASF
Quizalofop	Assure II	(±)-2-[4-[(6-chloro-2-quinoxalinyl)oxy] phenoxy]propanoic acid	DuPont
R			
Rimsulfuron	Titus, Matrix	N-[[4,6-dimethoxy-2-pyrimidinyl)amino] carbonyl]-3-(ethylsulfonyl)-2-pyridine-sulfonamide	DuPont
Rimsulfuron + thifensulfuron	Basis	see rimsulfuron and thifensuluron	DuPont
S			
Sethoxydim	Poast, Poast Plus Vantage	2-[1-(ethoxyamino)-butyl]-5-[2-(ethylthio) propyl]-3-hydroxy-2-cyclohexen-1-one	BASF
Simazine	Princep	6-chloro-*N*,*N*'-diethyl-1,3,5-triazine -2,4-diamine	Syngenta
Sulfentrazone	Authority Spartan	N-[2,4-dichloro-5-[4-difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1*H*-1,2,4-triazol -1-yl]phenyl]methanesulfonamide	FMC

Sulfentrazone + clomazone	Authority One-Pass	see sulfentrazone and clomazone	FMC
Sulfometuron	Oust	2-[[[[(4,6-dimethyl-2-pyrimidinyl)amino] carbonyl]amino]sulfonyl]benzoic acid	DuPont
Sulfosulfuron	Monitor Maverick Outrider	1-(4,6-dimehoxypyrimidin-2-yl)-3-[(ethanesulfonyl-imidazo) [1,2-a]-pyridine-3-yl)sulfonyl]urea	Monsanto
T-Z			
Tebuthiuron	Spike	*N*-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol l-2-yl]-*N*,*N'*dimethylurea	Dow AgroSciences
Terbacil	Sinbar	5-chloro-3-(1,1-dimethyl-ethyl)-6-methyl-2,4 (1*H*,3*H*)-pyrimidinedione	DuPont
Thiafluamide + metribuzin	Axiom	see thiafluamide and metribuzin	Bayer
Thiazopyr	Dimension Spindle, Visor	methyl 2-(difluoromethyl)-5-(4,5-dihydro-2 -thiazolyl)-4- (2-methylpropyl)-6-(trifluoromethyl)-3-pyridinecarboxylatea	Rohm & Haas Rohm & Haas
Thifensulfuron	Harmony GT		DuPont
Thifensulfuron + tribenuron	Harmony Extra	see thifensulfuron and tribenuron	DuPont
Triasulfuron	Amber	2-(2-chloroethoxy)-*N*-[[(4-methoxy-6-methyl-1,3,5-)triazin-2-yl)amino]carbonyl]benezene-sulfonamide	Syngenta
Triasulfuron + dicamba	Rave	2-(2-chloroethoxy)-N-[[4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl] benzenesulfonamide and dicamba	Syngenta
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
Triclopyr + clopyralid	Redeem R&P	see triclopyr and clopyralid	Dow Agro Sciences
Trifloxysulfuron	Envoke		Syngenta
Trifluralin	Treflan Trifluralin	2,6-dinitro-*N*-*N*-dipropyl-4-(trifluoromethyl) benzeneamine	Dow AgroSciences Dow / Others
Trinexapac-ethyl	Primo Palisade	ethyl 4-(cyclopropylhydroxymethylene)-3,5-dioxocyclohexanecar=boxylate	Novartis Novartis

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