PREFACE

These PROCEEDINGS of the 61st Annual Meeting of the Southern Weed Science Society contain papers and abstract of presentations made at the annual meeting. A list is also included giving the common and trade or code names, chemical names and manufacturers of all herbicides mentioned in the publication. Other information in these PROCEEDINGS includes: biographical data of recipients of the SWSS Distinguished Service, Outstanding Educator, Outstanding Young Weed Scientist, and Outstanding Graduate Students awards; the RESEARCH REPORT; lists of officers and committee members; minutes of all business meetings; and lists of registrants attending the annual meeting, sustaining members, charter members, and contributors to the SWSS Endowment Foundation.

Only papers presented at the meeting and submitted to the Editor in the prescribed format for printing are included in the PROCEEDINGS. Papers may be up to five pages in length and abstracts are limited to one page. Authors are required to submit an original abstract according to the instructions available in the "Call for Papers" and on the SWSS web site (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 2006 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.

William K. Vencill, Editor
Southern Weed Science Society
www.swss.ws

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 12 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 spacingbefore 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.

2008 Distinguished Service Award (Academia)
Tom Mueller

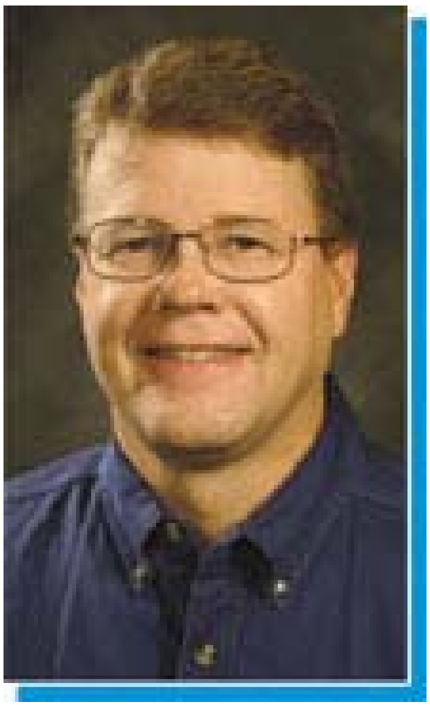
Thomas C. Mueller is a Professor in the Department of Plant Sciences, which is housed in the Institute of Agriculture within the University of Tennessee. He is located on the main campus in Knoxville, which is the

flagship campus for the land grant University for the state of Tennessee. Dr. Mueller was reared on a small diversified grain farm in southern Illinois. He received his BS from the University of Illinois in Agronomy, his MS from the University of Kentucky in Crop Science, and his PhD from the University of Georgia in Crop Science. His graduate studies focused on weed science, specifically how herbicides behave in plants and the environment. His primary research area is the environmental fate of pesticides (especially herbicides) in soils, water systems, and in the air (via drift). His main commodities of focus are corn, wheat and soybeans, although he has conducted research in cotton, rice, pastures, turf, native areas (national parks) and various other areas. This diversity in research areas and teaching several undergraduate and graduate courses has imparted a broad perspective, one that realizes that integrated pest management must consider environmental and ecological ramifications of crop productions systems. Dr. Mueller has served on an EPA Scientific Advisory Board, has served as an associate editor for Weed Science and Weed Technology, is currently on the executive board for the Weed Science Society of America where he serves as Secretary, and is active in various state, regional, and national programs. Dr. Mueller has instructed > 700 undergraduate students in a variety of classes, including Weed Management, Agricultural Pesticides, Integrated Pest Management, Pesticide Fate in Soils, Herbicide Physiology, and HPLC Methods and Applications. He has advised 17 graduate students with a 100% placement rate.

Tom Mueller has made outstanding contributions to the Southern Weed Science Society in several ways. He has served on numerous committees, including the graduate program as a judge for many years. He has served a three year term as secretary-treasurer, local arrangements chair for the annual meeting in Nashville and two (2) three-year terms as SWSS newsletter editor. He initiated a novel, exciting program into the SWSS in 2006, the Weeds Quiz Bowl. He championed this event, and it promises to be a highlight of the Southern meeting for years to come. At the request of the program chair, he also coordinated several special symposiums to focus on current topics of broad interest to the members of the society. He has also supported the annual SWSS weeds contest by bringing students from several universities, including Tennessee, Missouri, and Georgia. He has also hosted the annual Weed contest twice (1997 and 2003). He is married to the love of his life, Sara Mueller and they have 3 children; Rachel (18), John (15), and Rebecca (12).

2008 Distinguished Service Award (Industry)
Greg Stapleton

Greg Stapleton is a Senior Technical Service Representative for BASF Corporation. His received his B.S. in Agronomy & Plant Science from Delaware Valley College of Science and Agriculture in Pennsylvania and a Master of Science in Agronomy and Ph.D. in Weed Science from Clemson University. Greg's agricultural career started with the Extension service in South Carolina as Research Associate and Technician for Clemson Extension Weed Specialist, Dr. Ed Murdock. In 1995, he came to Tennessee with American Cyanamid as a Tech Service Representative and then to BASF in 2000. Primary crop focus includes corn, soybean, wheat, cotton and rice.

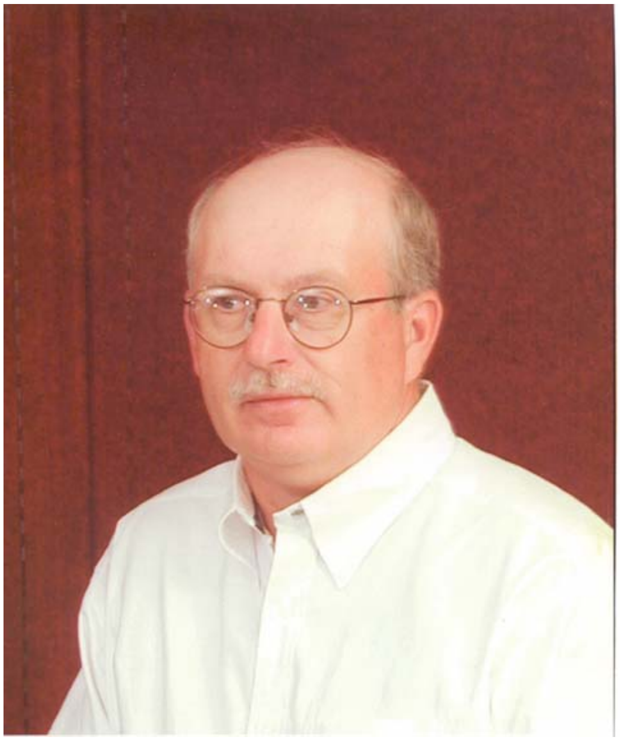


The SWSS has always been a priority for Stapleton. He has missed just one SWSS meeting in 20 years of attending the society annual event since being introduced to the organization. His primary interest has been associated with graduate student training. Stapleton helped host the Southern Weed Contest at the Agricenter International in Memphis, TN in 1998 and has helped train over 250 students in Herbicide Identification and Farmer problems from most of the Southern Weed Science Universities at one time or another prior to the Weed Contest each year. He was also chairman of the Graduate Student paper contest and has been on several Society committees over the years.

Greg’s family is the most important part of his life. He has been married to his wife Jenny for 21 years. He has three sons: Brad 20 years old, Sean 13 and Aaron 9.

2008 Weed Scientist of the Year
Wayne Keeling

Wayne Keeling was born in Sherman, Texas and grew up on a cotton and grain farm southwest of Lubbock. He received a B.S. in Agronomy from Texas Tech University in 1974 and received M.S. and Ph.D. degrees (Weed Science) from Texas Tech under the direction of Dr. John Abernathy. Wayne is Professor and Project leader in Cropping systems/Weed science at the Texas A&M AgriLife Research and Extension Center at Lubbock, where he has conducted research and advised graduate students since 1986. He serves as Adjunct professor and member of the Graduate Faculty at Tech and has Chaired or Co-chaired 24 M.S. or Ph.D. students and served on seven graduate committees. Although he does not hold official teaching or extension appointments, he has taught a weed science class and given guest lectures, and makes numerous presentations at extension/grower meetings each year.



Wayne has been a SWSS member since 1975 and has served on the Newsletter, Weed ID, Graduate Student Contest, Program, and Nominating committees. He is a member of WSSA and has served on the Finance committee. Wayne is author or co-author with colleagues and graduate students of 42 refereed journal articles in Weed Science, Weed Technology, and Agronomy Journal. He is author or co-author of 270 conference papers and abstracts and over 200 research bulletins and reports.

Wayne has received the USDA Group Award for Excellence-Team Research, West Texas Agricultural Chemicals Institute Award for Outstanding Contributions to the Agricultural Chemical Industry, and the National Conservation Tillage Cotton and Rice Conference- Outstanding Cotton Conservation Tillage Researcher. He has conducted a wide range of conservation tillage cropping system studies, as well as weed control efficacy, herbicide persistence and harvest aid trials. Weed management studies have been conducted in cotton, sorghum, corn, peanut, alfalfa, and wheat, with emphasis in cotton. In addition to weed science research, he has been involved in multi-disciplinary cropping system studies with a wide range of research and extension colleagues.

2008 Outstanding Educator
James M. Chandler

Mike Chandler was born in Wichita, Kansas on September 30, 1943 but spent his younger years in central Oklahoma. He complete his B.S. degree at West Texas State University in 1965. He developed a keen interest in weed science while working as a student employee with Dr. Allen Wiese at the Texas Agricultural Experiment Station in Bushland, Texas, during his undergraduate program. He received his M.S. and Ph.D. degrees under Paul Santlemann from Oklahoma State University in 1968 and 1971, respectively. He and his wife, Bonnie, are parents of two children Stacey and Jonathan.

He was with USDA-ARS at the Southern Weed Science Laboratory in Stoneville, Mississippi from 1971-1981. As a research agronomist, he was responsible for developing new and improved technology for controlling

weeds more economically in cotton. He joined the Texas Agricultural Experiment Station in 1982 and holds the academic rank of professor in the Department of Soil and Crop Sciences at Texas A&M University. His research concerns the ontogeny of selected weed species, crop-weed interference, and the evaluation of crop-herbicide rotations in conventional and conservation tillage systems. Development of economical weed control programs for cotton, corn, grain sorghum, and rice in Central Texas is emphasized. He has served as the major advisor for 34 graduate students and a member of 66 committees. Dr. Chandler has authored or co-authored 84 peer review journal articles with his graduate students. He also holds one patent and has prepared nine book chapters. A total of 214 oral or poster presentations of the research have been made at the SWSS and WSSA meetings. His students have received numerous awards in the SWSS paper contests at annual meetings. Recently, students co-authored the 2003 Outstanding Paper in *Weed Science* and the 2006 Outstanding Paper in *Weed Technology.* Dr. Chandler has taught his undergraduate course, Chemical Weed Control, sixteen semesters to 746 students and his graduate course, Weed Biology and Ecology, to 128 students.

He has been active in both SWSS and WSSA. In the SWSS, he has served as Vice President, President-Elect, President, and Past President. He also served as a Member-at-large on the Board of Directors, and as President of the SWSS Endowment Foundation. He received the SWSS Distinguished Service Award in 1995. In WSSA he has served as Treasurer, Vice President, President Elect, President and Past President. He has been on the Board of Directors as the SWSS representative and a member of 32 committees. He became a WSSA Fellow in 2002. He received the WSSA Outstanding Teacher Award in 2007.

2008 Outstanding Young Weed Scientist
Stanley Culpepper

Stanley Culpepper is an Associate Professor in the Crop and Soil Science Department at The University of Georgia. A native of North Carolina, he grew up on a bicentennial family farm producing cotton, peanut, and soybean. He received his BS in Agronomy from N. C. State University in 1993. His MS and PhD were also obtained at N. C. State University in weed science under the direction of Dr. Alan York in 1996 and 1999, respectively.

Stanley began his professional career as a cotton, vegetable, and small grain weed scientist in 1999, and continues with those same responsibilities at The University of Georgia today. His primary responsibilities include weed science extension programs in these crops, but he is also actively involved in applied weed management research. He has authored or co-authored 44 refereed journal articles, 2 book chapters, 193 abstracts, and 188 extension publications. Additionally, Stanley has been invited to speak at 111 non-University settings and 265 county grower meetings throughout Georgia.

Stanley is the recipient of a number of awards, including the following: Outstanding N. C. State Crop Science MS and PhD Student Awards, 1996 and 1999 respectively; Southern Weed Science Society Outstanding PhD Student Award, 1999; Weed Science Society of America Outstanding PhD Student Award, 2000; Award in Excellence in Extension given by Georgia Vegetable Growers Association, 2004; Michael J. Bader Award for Excellence for Junior Faculty, 2005; and IR-4's Meritorious Service Award, 2005.

2008 Outstanding Graduate Student Ph.D.
Darrin Dodds

He is a native of Rushville, IL and received a B.S. in Agriculture from Western Illinois University. Darrin received his M.S. in Weed Science from Purdue University in 2002 and a Ph.D. in Weed Science from Mississippi State University in 2007.

While working towards his B.S. he completed several internships with farm service cooperatives and ag-chemical companies. Darrin's thesis project at Purdue University involved control of annual ryegrass cover crops in no-till corn and soybean. Darrin's dissertation project involved the study of absorption and translocation of Regiment herbicide as affected by adjuvant systems. He and his colleagues have authored three refereed journal articles and 54 abstracts regarding these and other research projects.

Darrin has actively served in state, regional and national Weed Science Societies. Dr. Dodds has served as vice-president, president, and representative to the Endowment Committee of the SWSS Graduate Student Organization. He has also served on the Job Placement Committee of the SWSS. He served at the national level by serving as secretary of the WSSA Graduate Student Organization as well as representative for the southern region. He served as a facilitator for a symposium on glyphosate resistance. Currently, he serves on the Biology of Weeds and Membership Committees of WSSA.

He enjoys classroom instruction and has served as the instructor for seven laboratories at Purdue and MSU. He interacts well with students and was always very well prepared and articulated the information in a very clear and understandable fashion. Mr. Dodds is an excellent communicator through both oral and poster presentations. The SWSS, Beltwide Cotton Conference, American Society of Photogrammetry & Remote Sensing, and the Mississippi Weed Science Society have all recognized him as a winner of various oral or poster contests.

Mr. Dodds is very competitive and strives to make himself and those around him better by challenging them to give of their time and effort. He was a team member of the MSU Weed Team during his tenure at Mississippi State University. During this time he placed 7th, 4th, and 3rd overall and 1st individual in Problem Solving and 1st individual in Team Calibration during the 2005 contest.

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General Session

Weed Management in Agronomic Crops

Weed Management in Turf

Weed Management in Horticultural Crops

Minutes of Winter Board Meeting – Session I

Southern Weed Science Society

Hyatt Regency Jacksonville Riverfront Hotel

Jacksonville, FL

January 27, 2008

1. The meeting was called to order at 1:00 PM, January 27, 2008 by President David Monks. Persons in attendance included Jackie Driver (Past President), Ann Thurston (President-Elect), Dan Reynolds (Vice-President), Bill Vencill (Editor), Bob Scott (Member-at-Large, academia), Brad Minton (Member-at-Large, industry), Tony Driver (Member-at-Large, industry), Peter Dotray (CAST representative), John Byrd (Constitution and Operating Procedures), Bob Schmidt (Business Manager), Tom Holt (incoming Vice-President), Scott Senseman (incoming CAST rep), and Alan York (Secretary-Treasurer). Greg MacDonald (Local Arrangements Chair) was present for portions of the meeting.
2. **Minutes** of the June, 2007 Board meeting were read by York. Reynolds moved, Thurston seconded to accept minutes as read. Motion carried unanimously.
3. **Business Manager's report** given by Schmidt (attached). Total membership (members, sustaining members, student members) as of December 31, 2007 was 420 compared with 430 at the same time in previous year. Total expenses of Weed Identification Guide to data were $487,984 with total income of $801,656. Weeds of the United States and Canada CD-ROM expenses to date of $29,038 with total income of $141,912. Total expenses to date of Forest Plants of the Southeast and Their Wildlife Uses were $110,379 and with total income of $187,344. That publication has been turned over to University of Georgia Press and SWSS gets a royalty. Royalty to date is $6,948. The Weed DVD total expenses to date were $10,094 and total income $44,762. Schmidt mentioned that for the first time in its history, the SWSS had to give the hotel for current meeting a deposit of $46,577. He had to take $8,000 from the Merrill Lynch money market account to cover this. Numbers of publications now in storage are low, and Schmidt had dropped insurance on the storage. Schmidt noted that preregistration for the 2008 meeting was down compared with previous meetings. Schmidt expressed concern over the financial impact of low meeting attendance on the Society. Vencill moved, Reynolds seconded that the report be accepted. Motion carried unanimously.
4. **Treasurer's Report** (attached) presented by York. For the period of June 1, 2007 to December 31, 2007 (first 7 months of fiscal year), total income was $53,857.89. Total expenses during that period were $43,071.70, leaving a net income of $10,786.19. Total assets as December 31, 2007 were $254,477.15, with liabilities of $11,030.23 (Weed Contest monies). A balanced budget (attached with report) was approved at the summer 2007 meeting, with a projected net income of $3,255.00. York noted that the Society seemed to be in good financial shape as of December 31, 2007, but a short-fall in registration at the 2008 meeting could present a problem. Reynolds moved, Dotray seconded, to accept report. Motion carried unanimously.
5. **Local Arrangements Committee** report presented by Greg MacDonald. He reported that SWSS could not use WSSA easels due to time proximity of SWSS and WSSA meetings. That forced Local Arrangements to split the poster presentations into two sessions. Contract with hotel specified $20,000 in food and beverage charges, and MacDonald was projecting $22,000 to $23,000. He noted Society was at about 81 to 82% of room nights in contract, so no penalties were anticipated.
6. **Nominating Committee report** presented by J. Driver. Report is attached. Elections were held in the fall of 2007. Persons elected included the following: Tom Holt, Vice-President; Secretary-Treasurer, Todd Baughman; Board member at-large (academia), Donnie Miller; Proceedings Editor, Ted Webster; CAST representative, Scott Senseman; WSSA representative, Jason Norsworthy; and Endowment Foundation Trustee, Stanley Culpepper.
7. **Awards Committee report** presented by J. Driver. Report is attached. Award recipients, approved by the Board, included the following: Distinguished Service Award (Academia), Tom Mueller; Distinguished Service Award (Industry), Greg Stapleton; Weed Scientist of the Year, Wayne Keeling; Outstanding

Educator, Mike Chandler; Outstanding Young Weed Scientist, Stanley Culpepper; Outstanding Graduate Student (Ph.D.), Darrin Dodds. Driver reported that one nomination (the only nomination) for Outstanding M.S. Graduate Student and one nomination for the Outstanding Ph.D. award were found to be ineligible. Recommendations for Board Action included 1) consider an odd number of voters on committees to reduce chance for evenly split votes, and 2) clarify eligibility requirements for outstanding student awards. Consensus of Board was to ask the Awards Committee to work out language to clarify eligibility requirements and come back to Board with recommendations. Motion by Reynolds, seconded by Thurston, to accept the Nominating Committee report and the Awards Committee report. Motion carried unanimously.

8. **2009 SWSS Meeting Report** presented by Reynolds. Planning for the joint SWSS/WSSA meeting in 2009 is underway. David Shaw is program chair for the 2009 WSSA program and Reynolds is program chair for the 2009 SWSS meeting. Reynolds stated he and Shaw wanted a totally integrated program rather than overlapping meetings. In an effort to increase interaction on posters, there would be a 2-minute summary of each poster in an organized session. SWSS had agreed in principal to use WSSA system (Oasis) for title submission, but had not agreed to use WSSA system for abstracts. Reynolds wants to have a separate SWSS proceedings to maintain continuity and to allow inclusion of SWSS awards, committee reports, and other SWSS-specific things in the Proceedings. There was concern over the student contest as the WSSA student organization decided last year to not have a contest. The question was whether to open the SWSS contest to any student. Dan prefers to allow any student to enter the SWSS contest. Committee meeting space could also be a concern. Monks will visit with WSSA concerning time of summer board meetings. It was suggested that SWSS and WSSA hold summer board meetings at the same time (but separately).

9. **Editor's Report** presented by Vencill (attached). The Board, at summer 2007 meeting, had agreed upon a password protection system for Proceedings. Intent was to recover some of the revenues lost when Society previously sold proceedings to libraries. Omni press charged $415 to do that, and there will be an annual fee in the future. Many in the membership had complained about the password protection system. Vencill moved, J. Driver seconded, to do away with the password protection. Motion carried, unanimously. Following the vote, Vencill stated he was not in favor of combining 2009 SWSS Proceedings and 2009 WSSA abstracts as it would mean a loss of committee reports, awards, etc. He had informed Bob Kremer (WSSA) that SWSS had not yet agreed on using the WSSA procedure for abstract submission. Vencill asked for Board input. Consensus of the Board was to have SWSS Proceedings separate from WSSA abstracts.

10. **CAST Report** presented by Dotray (attached). CAST has set a record with numbers of publications in 2006 and 2007 (six each year). Some of these (*Biofuel Feedstocks: The Risk of Future Invasions* and *Implications of Gene Flow in the Scale-up and Commercial Use of Biotechnology-derived Crops: Economic and Policy Considerations*) are of interest to the weed science community. A follow-up publication to the gene flow paper is plAnnd. Scott raised the possibility of a publication on glyphosate-resistant weeds. Dotray reported that a paper on resistance in general (fungicides, insecticides, herbicides, historical perspectives) was underway.

11. **Graduate Student report**. Hixson was ill, but Thurston noted that the first speaker in the graduate student symposium was in an accident and would not be participating in the symposium. The students were trying to find a replacement.

12. **Program Committee report**: Presented by Thurston. A question was raised concerning whether the herbicide list was up to date. Vencill agreed to check on it as the proceedings were prepared. Monks noted that the chairman of the Continuing Education Committee had reported having difficulty in getting CEU and CCA credits approved by states with the program coming out late. It was also handicapping the Public Relations Committee. Monks was of the opinion that the program must be promoted to attract more attendees, and that the program (or least parts, such as symposia) needs to be available early enough to allow time for promotion. J. Driver suggested using the program Excel files, available shortly after title submission, to send to state agencies when requesting CCA and CEU credits. Monks agreed to check with National Cotton Council to see how they were so successful in getting credits approved. It was suggested that Chad Brommer would be a good person to get involved with promotion.

13. **Resolutions and Necrology report** presented by Monks in the absence of Bobby Walls, chairman (report attached). There were three necrology resolutions (Larry Nelson, Edward Scott Hagood, John Wilcut). Each was approved unanimously by the Board.
14. **Naming of Outstanding Graduate Student Awards**: A member had suggested naming the outstanding M.S. graduate student award as the John Wilcut Outstanding M.S. Graduate Student Award. It was noted that the outstanding student awards are SWSS awards sponsored by the Endowment Foundation. After considerable discussion, Vencill moved and J. Driver seconded to dedicate the 2008 Proceeding in memory of Larry Nelson and John Wilcut. Motion carried unanimously. Reynolds moved, Vencill seconded, that each year the outstanding M.S. and Ph.D. awards be given in honor of a deceased member of the Society who had made significant contributions to the Society, and a biography of the two persons honored be included in the banquet program. Motion carried, unanimously. The consensus was for the Necrology committee to suggest to the Board two deceased individuals annually to be honored. Byrd was directed to make the appropriate changes in the MOP. Further, the consensus was that this practice would begin in 2009, and the first two individuals honored would be John Wilcut for the M.S. award and Roy Smith, Jr. for the Ph.D. award.
15. **International Weed Science Conference**: Monks had received a request from the International Weed Science Conference soliciting monies to cover various costs of the meeting taking place in British Columbia during the summer of 2008. The consensus of the Board was not to contribute.
16. **Newsletter**. Reynolds noted that Al Rankins' term as newsletter editor was expiring. Rankins had indicated he would continue if asked. Consensus was to make that request. Monks suggested having Rankins sit at the head table during the banquet and for the emcee to recognize his service.
17. Meeting adjourned 4:22 PM.

Recorded by Alan C. York

Secretary-Treasurer

Minutes of Winter Board Meeting – Session II

Southern Weed Science Society

Hyatt Regency Jacksonville Riverfront Hotel

Jacksonville, FL

January 28, 2008

1. The meeting was called to order at 10 AM by President David Monks. Persons in attendance included Jackie Driver (Past President), Ann Thurston (President-Elect), Dan Reynolds (Vice-President), Bill Vencill (Editor), Bob Scott (Member-at-Large, academia), Brad Minton (Member-at-Large, industry), Tony Driver (Member-at-Large, industry), Peter Dotray (CAST representative), John Byrd (Constitution and Operating Procedures), Adam Hixson (student rep), Tom Holt (incoming Vice-President), Scott Senseman (incoming CAST rep), Ted Webster (incoming Editor), Donnie Miller (incoming Member-at-Large, academia), Barry Brecke (representing Site Selection Committee), and Alan York (Secretary-Treasurer).

2. **Site Selection Committee**: Report (attached) concerning site selection for 2010 meeting given by Brecke in absence of Dick Oliver. Brecke provided a hotel summary report by Helmsbriscoe that included the following properties: the Renaissance Oklahoma City Convention Center, the Sheraton Oklahoma City Hotel, the Peabody Little Rock, the Crowne Plaza Little Rock, the Adams's Mark Dallas, the Crowne Plaza Dallas, the Hilton DFW Lakes Executive Conference Center, the Hyatt Regency Dallas, the Omni Dallas Hotel at Park West, the Omni Fort Worth Hotel, the Renaissance Dallas, the Sheraton Fort Worth Hotel & Spa, the Westin Galleria Dallas, and the Wyndham Dallas North. The committee recommended either Oklahoma City or Little Rock. The committee had narrowed hotel choices to the Renaissance or the Sheraton in Oklahoma City or the Peabody in Little Rock. Case Medlin had agreed to be Local Arrangements Chair if the meeting was held in Oklahoma. Meeting date choices included Tuesday, Jan. 19 through Thursday Jan. 21 and Monday, Jan. 25 through Wednesday Jan. 27. The committee urged going with the earlier date if the WSSA meeting fell on the week following the Jan. 25-27 dates. Oliver had relayed a message stating he wanted a decision by the end of the 2008 winter Board meeting. Oliver preferred Oklahoma City because there was a volunteer to serve as local arrangements chair, and he preferred the Sheraton. Further, the Site Selection committee noted that the 2111 meeting was scheduled for the central region, and the committee suggested somewhere in Alabama.

   Meeting dates for 2010 and sites will be discussed further in Thursday Board meeting.

3. **Constitution and Operating Procedures**: The Board directed the awards committee and Byrd to work on wording for the MOP to clarify eligibility of the Outstanding M.S. and Ph.D. students. It was also suggested that Daniel Stephenson and the next chair of the student program put an article in the newsletter concerning eligibility.

4. **Endowment Foundation** report: presented by York. Accumulated donations since inception totaled $231,097.00 and interest since inception totaled $89,334.00. Contributions, interest, and expenses during the past fiscal year (Oct. 1, 2006 to Sept. 30, 2007) totaled $2,203.20, $14,156.51, and $5,928.49, respectively. The Foundation will present a copy of Forest Plants of the Southeast to each student presenting either a paper or poster during the 2008 annual meeting. For future meetings, the Foundation

plans to develop a list of publications from which students can choose, with preference given to SWSS publications. Discussions are taking place among the Foundation trustees to provide some grants in the future to support student educational experiences. Senseman asked if it would be appropriate for students receiving the grants to make a presentation on their experience. Hixon was of the opinion that would be okay.

5. **Finance Committee** report: presented by Reynolds. The Society appeared to be in good financial condition until it was learned that registration at the 2008 meeting could be as much as 50 people less than in the previous year. The resulting reduction in income was a concern. The committee looked at where expenses could be reduced, and found few places to reduce. The SWSS portion of the DSP salary was a large item, but the Board had previously committed to this for 5 years (summer meeting 2005) and reemphasized that commitment at the winter meeting in 2006. Summer board meetings are expensive. It was suggested that only two or three Board members actually visit the site and the remainder of the Board be on video conference. The committee recommended more sponsorship of the annual meeting. And, the committee expressed a need to do something to get greater attendance at the annual meeting.

6. **Student Program Committee** report: presented by Daniel Stephenson. Forty students entered a contest this year. There were two sessions for M.S. papers, two for Ph.D. papers, one for M.S. posters, and one for Ph.D. posters. Stephenson reported that all abstracts were submitted on time. There was discussion on how to handle the contest at the joint SWSS/WSSA meeting in 2009. Stephenson recommended a separate contest for SWSS students. Scott moved, J. Driver seconded, to follow the student program committee recommendation to have a separate contest for SWSS students at the 2009 joint meeting of SWSS and WSSA. Motion carried, unanimously.

7. **Graduate Student report**: presented by Hixson. Hixson reported that the Quiz Bowl would be held on Tuesday night. The student symposium will be Wednesday afternoon. BASF was sponsoring a luncheon for students. Students were reminded that the program chair has some discretionary funds to help cover speaker expenses for student program. Also, the Society usually has a few comp rooms that can be allocated to student program speakers.

8. **Newsletter Editor** report: presented by Rankins. Monks had asked Rankins to continue as editor, and Rankins had accepted the invitation. Monks and others on the Board complimented Rankins on his work.

9. **Update on Publications**: presented by Mike Defelice. Defelice reported that Weeds of the South was progressing well in spite of some delays by outside reviewers. University of Georgia Press has committed to publish. Summer 2009 is projected publication date. UGA Press originally was thinking about 10,000 copies but is now considering 20,000. Estimated selling price will be $39.95, but that could be reduced. The book will have greater than 400 species, more than any other weed id book available. The Board had previously committed $10,000 to help defray production costs by UGA Press. Defelice reported that Pioneer had recently donated $3,000. Defelice noted that he did not want Pioneer to be the only corporate sponsor, and he issued a challenge to others in the private sector to become sponsors. Non-private sponsors

(Forest Service, etc.) are also welcome. Sponsorship can be accepted up till August or September of 2008. Sponsorship reduces production costs, which means the selling price of the book could be lowered to encourage more sales.

After UGA Press approved Weeds of the South, they approached Bryson and Defelice about a similar publication for the mid-West. Bryson and Defelice want to proceed with it. Title of the book has not yet been determined. Cost to the SWSS would likely be $2,000 to $3,000 as sponsorship. Defelice and Bryson will have a more specific request for SWSS sponsorship of the mid-West book at the summer 2008 Board meeting. Royalties would be 8% of retail price. (NOTE: the 8% royalty was corrected in January 31, 2008 Board meeting to 7%.) Defelice recommended giving the NCWSS 1 to 2% of the royalty if the NCWSS gave $5,000 as sponsorship. Pioneer has already agreed to be a corporate sponsor of the mid-West book. The mid-West book would include about 350 species. Reynolds moved, Scott seconded to give Board approval to move forward with the mid-West book. Motion carried, unanimously.

Defelice reported that version 4 of the DVD was in process. There were 447 species in last version, and that 160 new species were being added. He hoped it would be ready by August 2008. He will likely ask the Board for about $6,000 at summer 2008 meeting to support version 4. Current selling price is $59.95, but he hopes the new version can be reduced to $49.95.

Defelice requested up to $500 to get some slides scAnnd for use in DVD or other publications. J. Driver moved, Reynolds seconded, to approve $500 for slide scanning. Motion carried, unanimously.

10. Meeting adjourned 12:18 PM.

Recorded by Alan C. York

Secretary-Treasurer

Minutes of Winter Board Meeting – Session III

Southern Weed Science Society

Hyatt Regency Jacksonville Riverfront Hotel

Jacksonville, FL

January 31, 2008

1. The meeting was called to order at 7:22 AM by President Ann Thurston. Persons in attendance included David Monks (Past President), Dan Reynolds (President-Elect), Tom Holt (Vice-President), Ted Webster (Editor), Donnie Miller (Member-at-Large, academia), Brad Minton (Member-at-Large, industry), Peter Dotray (current CAST representative), John Byrd (Constitution and Operating Procedures), Scott Senseman (incoming CAST rep), David Jordan (current WSSA rep), Jason Norsworthy (incoming WSSA rep), Bob Schmidt (Business Manager), Lee Van Wychen (Director of Science Policy), and Alan York (Past Secretary-Treasurer). Greg MacDonald, Chair of 2008 Local Arrangements Committee, was present for part of the meeting.

2. **Update on Publications**: Mike Defelice had obtained some additional information from University of Georgia Press and relayed information to Board by Reynolds. Defelice had given the wrong royalty to SWSS in his report on January 28, 2008. The correct royalty on Weeds of the South will be 7% of sale price. About $18,000 is needed to cover the costs of Weeds of the South, and $13,000 has been allocated to date ($10,000 from SWSS, $3,000 from Pioneer). Defelice and Reynolds were of the opinion that SWSS did not need to contribute any more. Defelice and Reynolds are going to seek additional corporate sponsorship.

   Univ. Ga Press, as noted in minutes on January 28, 2008, was interested in prints an identification book on mid-western weeds similar to Weeds of the South. Defelice suggested the SWSS put up $8,000 and the NCWSS put up $3,000. Hopefully, the remainder of money needed (about $6,000) would come from sponsors. And, he suggested that SWSS split royalties with NCWSS, with SWSS receiving 5% and NCWSS receiving 2%. Reynolds suggested SWSS go with Defelice's suggestion in light of the tremendous amount of time Defelice had donated to SWSS. Thurston suggested waiting until the summer 2008 Board meeting for a decision on sponsoring the mid-western book.

3. **Herbicide Resistance Committee** report (attached): The committee reported that it had decided that committee membership should continue with broad-based representation from academia and industry. The committee requested Board action on the following recommendations: 1) a three-year rotation of leadership, with a secretary, vice-chair, and chair that would rotate each year; 2) general committee membership should be selected in accordance with SWSS guidelines for standing committees, with consideration that membership be extended to those wishing to participate without major emphasis on committee size but with some care given to not allowing a single company or university to dominate membership.

A question was raised among Board members as to whether the HRC was a standing committee. Byrd noted that HRC was not in the constitution as a standing committee. It is currently in constitution as a "special committee". Elevation to a standing committee would require a vote of the membership to amend the constitution. York was directed to search old minutes to see if such a vote had ever taken place and perhaps the necessary changes to constitution had never been made. Reynolds was directed to check the newsletter archives. Thurston will delay action on the Committee's request until the summer 2008 Board meeting, giving York and Reynolds time to check old minutes and newsletters.

4. **Business Manager's report**: Schmidt reported that final registration at 2008 annual meeting was 301, which was better than expected earlier in the week. Attendance at the banquet was 133; had plAnnd for 175. United Phosphorus had approached Schmidt expressing a desire to become a sustaining member.

5. **Quiz Bowl** discussion: Reynolds raised question concerning having a quiz bowl at the 2009 joint SWSS/WSSA meeting. Consensus of the Board was that a quiz bowl at the joint meeting was okay in principle if logistics could be worked out.

6. **Site Selection**: Monks had followed up on some questions raised earlier in the week. The WSSA will meet February 9-12, 2010 in Denver. Room tax at the Renaissance Oklahoma City, reported to be 22.26% in the site selection committee report earlier in the week, was incorrect. The room tax at that property would be 13.87% or something close. The Renaissance would reduce set-up fees to $5,000. The Sheraton Oklahoma City had agreed to negotiate room rates and to reduce food and beverage minimum. Dick Oliver had volunteered to chair the local arrangements committee if the meeting was held in Little Rock. The Sheraton is remodeling and currently does not have meeting space. After discussion, Jordan made the following motion, seconded by Senseman: The 2010 meeting of the SWSS will be held at the Peabody in Little Rock during the week of January 25, contingent upon the site selection committee getting the hotel to allow SWSS to bring its own AV equipment. Motion carried, unanimously. In following discussion to clarify the motion, it was noted that the motion did not specify specific dates during that week, but it was assumed the SWSS would stick with its traditional start and stop times.

After some discussion on number of room nights, and a suggestion from Schmidt, the consensus was to direct the site selection committee to specify 750 room-nights in the 2010 contract.

7. WSSA rep: Jordan asked what the SWSS desired him to bring up in the upcoming WSSA Board meeting. He was told to encourage the WSSA and SWSS boards to meet during the week of July 21, 2008.

8. **DSP report**: Report (attached) was presented by Van Wychen.

9. **Request from Student Program Committee**: Monks reported that Daniel Stephenson has requested that the Board consider amending the score sheet for student contest judging to reflect a greater emphasis on the abstract. Monks had requested that the committee develop a proposed amended score sheet and present to at the summer 2008 Board meeting. Reynolds wanted the student program committee to encourage students to follow SWSS directions when preparing abstracts.

10. **Local arrangements, 2008**: Thurston complimented MacDonald and the local arrangements committee on their excellent job with the 2008 meeting and expressed gratitude for MacDonald's willingness to chair the committee for the WSSA/SWSS joint meeting in 2009, which will be held at the Disney Hilton in Orlando. MacDonald reported that he had met with the hotel management and that SWSS had met its room block for the 2008 meeting. He noted that many members had positively commented on the food and service at the banquet. He noted that the AV costs, originally set at $10,000 had been reduced to $3,500. Thurston and MacDonald expressed gratitude to BASF for sponsoring the graduate student luncheon.

11. **Revision to Resolutions and Necrology report**: Monks will revise the report to include ________ Walls in the current year report.

    Monks moved, Reynolds seconded to ask the Resolutions and Necrology Committee to develop two resolutions to reflect the good job done by the 2008 Local Arrangements Committee and by the Hyatt. Motion carried, unanimously.

12. **Recording attendance in program sections**: Reynolds asked if the MOP should be amended to request section chairs to record attendance in various sections. Reynolds will work on potential wording for that and bring to summer Board meeting.

13. **Graduate Student Organization**: Via email to Reynolds, Trent Irby (new president of the organization) relayed the following discussion items at the graduate students' meeting: 1) addition of a student mixer to enable more student interaction; 2) possible use of some of the Endowment Foundation to bring in speakers for student symposium (note: earlier in the week, the Board had emphasized that the program chair has some discretionary funds that could be used for this.); 3) raising the amount of the financial award for paper and poster contest winners; 4) addition of an essay contest (or something else) to enable students to win scholarships; 5) vice-president of organization would like to attend summer board meeting; and 6) have all posters in one session, move to an afternoon or evening and have drinks/light snacks to make it a social type event. Other new officers of the organization include Robin Bond, Vice-President; Drew Ellis, Secretary; Sanjeev Bangarwa, weed committee; Matt Goddard, Endowment Foundation; Dustin Lewis, job placement; Tom Eubank, student programs; and Jason Weirich, computer applications.

14. **Prize for Quiz Bowl**: Byrd suggested the Board could recommend to the Endowment Foundation trustees that some sort of prize be given to the team winning the quiz bowl. Reynolds suggested checking with Tom

Mueller to see if that fit with his original objective of the quiz bowl. Tee shirts were also mentioned. Thurston will put these items on the agenda for the summer board meeting.

15. **Industry Attendance at Meeting**: York raised the question as to how to encourage greater industry attendance at meetings. Holt said BASF was going to sponsor some things to encourage greater industry/student/academia interaction, and that he plans to challenge other companies to have greater participation in annual meetings.

16. Meeting adjourned at 10:18 AM.

Recorded by Alan C. York

Past Secretary-Treasurer

Attachments

Southern Weed Science Society

Business Manager's Report

January 27, 2008

Membership as of December 31

	2007	2006	2005	2004	2003	2002	2001	2000
Members and Sustaining Members	338	348	376	464	452	500	510	527
Students	72	81	85	104	111	118	126	131
Total	420	430	461	545	563	618	636	658

Weed Identification Guide to date

Expense $487,984 Income $801,656

Weeds of the United States and Canada CD-ROM vs 1.2.2.1

Expenses $29,038 Income $141, 912 Final

Forest Plants of the Southeast and Their Wildlife Uses

Expenses $110,379 Income $187,344 Final

Royalty to date $6,948

Weed DVD

Expenses $10,094 Income $44,762

Preregistration

	2008	2007	2006	2005	2004	2003	2002	2001	200	1999	1988
Members	138	194	177	180	181	220	226	248	249	261	285
Students	68	54	65	61	74	66	89	87	115	116	74
Total	206	248	242	241	255	266	306	335	364	377	359
Percentage of final	79	79	74	74	68	66	68	76	75	59	60
Total Attendance	260 Est	314	319	326	354	374	400	456	492	476	501

Southern Weed Science Society

Secretary-Treasurer's Report

January 27, 2008

Page 1

Income and Expenses (excluding weed contest funds) for period June 1, 2007 to December 31, 2007

Income

Annual meeting	Preregistration		$34,857.93
Program Services	Investment income		$1,569.61
	Membership dues		$110.00
	Sustaining member dues	Almaco	$200.00
		BASF	$1,000.00
		Bellspray	$200.00
		Farm Press	$500.00
		Gylling	$200.00
		Helena	$500.00
		Kumiai	$200.00
		Marathion	$200.00
		Monsanto	$1,000.00
		PBI/Gordon	$500.00
		SSI Maxim	$200.00
		Syngenta (2007)	$1,000.00
		Syngenta (2008)	$1,000.00
		TN Farmers	$200.00
		Valent	$1,000.00

		Weed Systems		$200.00
			Total, sustaining member dues	$8,100.00
			Total, Program Services	$9,779.61
Publications	Forest Plants of Southeast (royalty)			$3,211.53
	Proceedings			$260.51
	Weed DVD			$753.52
	Weed ID Guide			$4,994.79
			Total, Publications	$9,220.35
Total Income				$53,857.89

Secretary-Treasurer's Report

January 27, 2008

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Expenses

Direct Services	General printing			$391.53
	Insurance, Legal & auditing	Burgess & Cline		$508.00
		Lafferty & Associates		$3,200.00
			Total, insurance, legal, auditing	$3,708.00
	Storage	Warehouse rental		$1,749.60
		Fork lift rental		$560.00
		Trash bins		$1,425.00
			Total, storage	$3,734.60
	Management fee			$18,224.80
	Miscellaneous	Service charges		$51.95
	Newsletter	Printing		$239.00
		Editor		$500.00
			Total, newsletter	$739.00
	Office supplies			$22.18
	Postage			$98.77
	Telephone			$374.06

	Travel	Summer Board Meeting		$2,625.39
		CAST meeting		$707.22.
		WSSA Board		$734.75
			Total, travel	$4,067.36
	WSSA DSP	Salary		$9,333.31
	Total, Direct Services			$40,745.56
Annual Meeting	Miscellaneous	Packets, walk-in labels		$93.98
		Ribbons		$107.75
		Supplies		$31.88
			Total, miscellaneous	$233.61
	Name badges			$199.47
	Postage			$254.89
	Preregistration materials, printing			$227.21
			Total, annual meeting	$915.18

Secretary-Treasurer's Report

January 27, 2008

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Publications	Proceedings	Printing		$415.00
		Postage		$1.93
		Total, proceedings		$416.93
	Weed DVD	Postage		$43.91
	Weed ID guide	Postage		$950.12
			Total, publications	$1,410.96
Total Expenses				$43,071.70
Net Income				$10,786.19

Southern Weed Science Society

Weed Contest Fund

Balance, May 31, 2007		$19,661.27
Income, June 1, 2007 to December 31, 2007	Bellspray	$ 1,000.00
Expenditures, June 1, 2007 to December 31, 2007		
	Cash awards (11 total)	$ 2,225.00

Syngenta Crop Protection	$ 6,623.04
L&S Trophies	$ 783.00
Total expenditures	$ 9,631.04

Balance, December 31, 2007	$ 11,030.23

Secretary-Treasurer's Report

January 27, 2008

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Balance Sheet

December 31, 2007

Assets	Cash			$ 44,528.96
	Other assets	Certificates of deposits	AG Edwards (mature 12/08; 5.3%)	$ 25,000.00
			AG Edwards (mature 7/08; 5.1%)	$ 30,000.00
			Merrill Lynch (mature 8/08; 4.17%	$ 30,000.00
			Merrill Lynch (mature 8/09; 5.0%	$ 70,000.00
			National City (mature 10/08; 4.85%)	$ 34,850.65
			Total, certificates of deposit	$ 189,850.65
		Money Market Funds	AG Edwards	$ 8,603.33
			Merrill Lynch	$ 9,476.82
			Total, money market funds	$ 18,080.15
		Accrued interests receivable		$ 2,017.39
			Total, Other Assets	$ 209,948.19
	Total assets			$ 254,477.15
Liabilities and Equity	Current liabilities	Weed contest		$ 11,030.23

Equity	Fund balance		$ 236,115.06
	Retained earnings		$ (3,454.33)
	Net income		$10,786.19
		Total, equity	$ 243,446.92
Total liabilities and equity			$ 254,477.15

Southern Weed Science Society Budget

			FY 04-05		FY 05-06		FY 06-07		FY 07-08	
			Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual
Income	Program Services									
		Membership dues	$	$	$	$	$	$	$	
		Sustaining	$	$	$	$	$	$	$	
		Investment income	$	$	$	$	$	$	$	
		Miscellaneous	$					$		
		Sub-total	$	$	$	$	$	$	$	
	Publicatio	Weed ID Guides	$	$	$	$	$	$	$	
		Weed ID CD-	$	$						
		Proceedings	$	$	$	$	$	$	$	
		Research Methods		$	$	$		$		
		Forest Research		$						
		Forest CD-ROM	$	$				$		
		Weed ID DVD		$	$	$	$	$	$	
		Forest Plants of	$	$		$		$	$	
		Sub-total	$	$	$	$	$	$	$	
	Income less annual meeting		$	$	$	$	$	$	$	
	Annual meeting			$	$16,500					
		Registration				$				
		Sponsors				$				
		Annual meeting				$	$	$	$	
	Total			$		$	$	$	$	
Expens	Program Services									
		Telephone	$	$	$	$	$	$	$	
		Postage	$	$	$	$	$	$	$	
		Insurance, Legal,	$	$	$	$	$	$	$	
		Office supplies	$	$	$	$	$	$	$	
		Newsletter	$	$	$	$	$	$	$	
		Organization dues	$	$	$	$	$	$	$	
		General printing	$	$	$	$	$	$	$	
		Travel	$	$	$	$	$	$	$	
		Management fee	$	$	$	$	$	$	$	
		WSSA Dir. Sci.	$	$	$	$	$	$	$	
		Web site	$		$	$	$	$	$	
		Miscellaneous		$	$	$	$	$	$	
		Sub-total	$	$	$	$	$	$	$	
	Publicatio	Weed ID printing		$				$4,047		
		Weed ID postage	$	$	$	$	$200	$978	$	
		Proceedings	$	$	$	$	$6,000	$6,530	$	
		Weed ID CD-	$							
		Res. Methods								
		Forest Plants of	$	$						
		Weed DVD	$	$	$ 100	$	$100	$154	$	
		Storage	$	$	$ 4,400	$	$4,320	$4,406	$	
		Sub-total	$	$	$	$	$10,62	$16,11	$	
	Expenses less annual meeting		$	$	$	$	$70,33	$84,22	$	
	Annual meeting			$		$	$39,00	$50,51	$	
	Total expenses			$	$	$	$	$134,7	$	
TOTAL INCOME (or LOSS)			$	$	$	$	$	$(5,66	$	

* Most of the miscellaneous expenses were for consultant to address 2004 summer board meeting.

** Projected net income (gross - expenses) from 2006 annual meeting.

Committee: 102

Committee Name: AWARDS COMMITTEE PARENT (STANDING)

Summary of Progress:

Awards nominations were solicited in the August issue of the SWSS Newsletter, as well as on the website. At least one nomination was received for all awards. The nominee for the Outstanding M.S. Graduate Student Award and one of the Ph.D. candidates were ineligible. Committees performed their functions as required. The following slate of award winners were submitted to and approved by the Board:

Distinguished Service Award (Academia) – Tom Mueller

Distinguished Service Award (Industry) – Greg Stapleton

Weed scientist of the Year – Wayne Keeling

Outstanding Educator: Mike Chandler

Outstanding Young Weed Scientist – Stanley Culpepper

Outstanding Graduate Student (Ph.D.) – Darrin Dodds

Objective(s) for Next Year: Solicit multiple nominees for all awards. Ensure that multiple qualified candidates are submitted.

Recommendation or Request for Board Action:

A .Consider an odd number of voters on the committees to reduce the chance for evenly split votes.

B. In the Graduate Student Section add:

1. Adding the word "same" just before the words calendar year
2. Maybe putting this sentence in bold and/or underline it to draw attention

Finances (if any) Requested:

None, other than continued support for awards.

Respectively submitted:

J.E. Driver, Chair

B. Brecke

M. Burton

T. Grey

D. Poston

J. Richburg

Committee: 113

Committee Name: NOMINATING COMMITTEE (STANDING)

Summary of Progress:

Nominations for Vice-President (industry), Secretary-Treasurer, Board Member-at-Large (academia), Proceedings Editor, CAST representative, WSSA representative, and Endowment Foundation Trustee were solicited in the August issue of the SWSS Newsletter. Multiple nominations were solicited and received from committee members. The committee voted on the top two candidates, where necessary, and the resulting slate was submitted to the membership for voting.

Vice President – Tom Holt, Gary Schwarzlose

Secretary Treasurer – Case Medlin, Todd Baughman

Board Member at Large (academia) – Shawn Askew, Donnie Miller

Editor – Ginger Light, Ted Webster

CAST Representative – Scott Senseman, Tim Grey

WSSA Representative – Henry McLean, Jason Norsworthy

Endowment Foundation Trustee – Ken Smith, Stanley Culpepper

Based on votes returned to the SWSS Secretary, results are as follows:

Vice President - Tom Holt

Secretary Treasurer - Todd Baughman

Board Member at Large (academia) - Donnie Miller

Proceedings Editor - Ted Webster

CAST Representative - Scott Senseman

WSSA Representative - Jason Norsworthy

Endowment Foundation Trustee - Stanley Culpepper

Objective(s) for Next Year: Solicit multiple candidates for all positions. Ensure qualified and interested candidates are submitted.

Recommendation or Request for Board Action: None

Finances (if any) Requested: None

Respectively submitted:

J.E. Driver, Chair	T. Baughman	C.R. Medlin	S. Culpepper
J. Wells	S. McElroy	J. Norsworthy	
W.W. Witt	T. Teuton	E. Webster	

January 10, 2008

SWSS Endowment Foundation

Net worth as of September 30, 2007 -		$320,431
donations total	231,097	
interest balance 9/30/07	89,334	

Contributions received with registration 2008 meeting

Whatley, Laura	$100.00
Holt, Tom	50.00
Ratliff, Randy	100.00 cc
MacRae, Andrew	20.00 cc
Gealy, David	100.00
Burgos, Nilda	100.00
Murphy, Tim	100.00
Barrentine, Jim	50.00
Prostko, Eric	10.00
Culpepper, Stan	25.00
Wells, Jerry	20.00
Driver, Jackie	25.00 cc
Grey, Tim	25.00 cc

Certificates of Deposit

Amount	Rate	Maturity
$15,023	5.05%	9/09
$20,022	5.05%	9/10
$ 729	MM	
$12,567	4.23%	11/09
$29,668	4.66%	2/08
$59,646	5.05%	8/09
$28,271	MM	2.73%
$40,526	5.3%	1/08
$72,595	3.97%	10/08
$17,757	4.3%	4/08
$18,133	3.85%	4/09

Sixty four Weed Identifications Guides were purchase for $2,876.80 and distributed to the students who participated in the 2007 meeting poster and paper contests. The Endowment will purchase "Forest Plants of the Southeast and Their Wildlife " and distribute them to the 2008 student participants.

Committee: 100a

Committee Name: Editor's Report

Summary of Progress:

The 2007 Proceedings contained 315 pages, which is down from 325 in 2006and 363 in 2005 and 521 in 2004 Proceedings, respectively. The decrease is due to fewer participants and presentations at the meeting and fewer presenters submitting abstracts. I have noticed that many presenters who are not traditional members of the society do not submit abstracts (e.g. invited symposia speakers and industry presenters from outside of SWSS). Due to changes at OmniPress, the 2007 Proceedings were available online instead of a CD format. The online format provides the same content as the CD did with easier access and reduced cost to the society. The online version has the old proceedings going back to 1999. The 2007 Proceedings contained all executive board minutes, committee reports, business manager's report, award winners, and research reports that were submitted as well as 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 of Pages**
Minutes of Executive Board, Committee Reports, etc	91
Weed Management – Agronomic Crops	95
Weed Management - Turfgrass	27
Weed Management – Pastures & Rangelands	13
Weed Management – Horticultural Crops	18
Vegetation Management - Forestry	8
Vegetation Management – Rights-of-Ways	6
Physiological & Biological Aspects of Weed Control	15
Educational & Regulatory Aspects	2
Invasive Species	9
Industry Updates	1
Soil & Environmental Aspects of Weed Control	6
New Technologies	7

Symposia – Invasive Vines: A Climbing Problem	4
Symposia – Palmer Amaranth Resistance: A Dilemma in Dixie	6
Symposia – Vegetative Management in Wildlife Habitat and Natural Areas	2
Symposia – New Innovations for Organically Produced Crops	8
Symposia – Rights of Way Management in the South	2
Symposia – Graduate Students	2
Weed Survey (Most Common & Most Troublesome)	12
State Weed Control Publications - 2005	19
Herbicide Names (common, chemical, and trade)	5
Registrants of 2005 Annual Meeting	25
Sustaining Members for 2005	1

Objective(s) for Next Year:

To get the final copy of the Proceedings to membership earlier and to find ways to streamline the process . I will be working with the new editor, Ted Webster and with the WSSA Abstract editor for the joint meeting in 2009.

Recommendation or Request for Board Action:

To drop the password protection to the online proceedings. The password protection was added after the 2007 SWSS Executive Board meeting to prevent non-members from accessing the proceedings. It seems to cause confusion amongst the members.

Finances (in any) Requested:$500 for secretarial assistance.

Respectively submitted;

William K. Vencill, Editor

Report to SWSS Board of Directors, January 27, 2008

Peter Dotray

Council of Agricultural Science and Technology (CAST)

1. GENERAL COMMENTS:

The CAST Board of Directors met in Washington, DC on March 21-23 for the spring meeting and in Ames, IA on October 24-26 for the fall meeting. CAST, founded in 1972 after the National Academy of Sciences' National Research Council identified the need for better communication of the science behind food and agricultural issues, had its 35th anniversary in 2007. Issues of "Friday Notes" during the year included a short section entitled "CAST is 35: What Do You Know?", which was a collection of historical news items highlighting CAST throughout the years. John Bonner, the Executive Vice President, has made significant improvements for CAST in recognition and financial stability in the 2 ½ years he has been with this organization. The current CAST President is Dr. Kassim Al-Khatib (Weed Scientist, Kansas State University). The President-Elect is Henry Shands, and the Past President is Ed Runge. The current staff at the CAST office in Ames, IA include:

Lynette K. Allen, Associate Editor

Linda M. Chimenti, Managing Scientific Editor

Laura De Boer, Assistant Editor

Donna M. Freeman, Membership & Marketing Director, Office Manager

Thuy Ton, Administrative Assistant

Kelsey Whiley, Administrative Assistant

The primary purpose of CAST remains the publication of science-based information papers.

2. CAST MISSION STATEMENT

CAST assembles, interprets, and communicates credible, science-based information regionally, nationally, and internationally to legislators, regulators, policymakers, the media, the private sector, and the public.

3. SWSS ROLE IN CAST:

Attend the spring and fall Board of Directors' meetings and be prepared to "inform the CAST Board of significant SWSS activities that might have bearing on CAST activities". Please let me know about issues and activities that need to be addressed at the next CAST Board meeting. I can best represent SWSS if I carry ideas to the CAST meeting.

I am currently the Chair of the Plant Protection Sciences workgroup and serve on the Budget, Finance, and Investment Standing Committee. Below please find a brief summary of our workgroup efforts.

Summary of Plant Protection Work Group Report

1. Status of approved papers
    a. Biofuel Feedstocks: The Risk of Future Invasions. CAST Commentary. Released in Nov 2007 at Tri-Societies meeting in New Orleans.
    b. Postcommercialization Gene Flow from Biotechnology-derived Crops: Policy and Research Considerations. Issue Paper. In Final Review. To be released in Dec 2007.
2. Update on papers in progress
    a. Issue Paper. Low-Level Presence of Biotechnology Traits in Commercial Seed: Risk Assessment for Environmental and Food Safety (joint paper with Plant and Soil Sciences Work Group). (This paper will address the character and extent of risk posed by AP of GM seed in seed sold for planting in a country where the GM material has not been approved). Proposal given to National Concerns Committee yesterday morning. Identified some reviewers. Liaison: Tom Redick.
    b. Issue Paper. Resistance Management in Genetically-Engineered Pest Resistant Crops: Implications for Future Policy. (This paper will focus on the impact that transgenic crops plants with insect, disease, and herbicide resistant traits have had on resistance management and to look to the future and predict potential impact that resistant crops with stacked resistant traits will have on development and implementation of resistance management strategies). Viewed initial proposal and suggest reworking. Expect to view and vote (electronically) over the next month or so. Identified key authors and reviewers by region and discipline. Liaison: Jim Kells.
    c. Commentary. Endangered Species and Ecological Assessment. Viewed and discussed at length. Are asking for the proposal be reworked as a Commentary paper, which may lead to other papers. (There is a struggle between policy, public perception, and science when it comes to the interpretation of risk to endangered species from various “stressors” presented by agricultural practices). Identified a few authors (Peter Raven, Steve Dewey, Bernalyn McGaughey, Carole Lembi, Les Glasco, Greg MacDonald). Liaison: Phil Stahlman.
    d. Others from a joint meeting with Food Sciences and Ag. Technology Workgroup.
        i. Food Safety and Fresh Produce. (update and modernize). Liaison: John Bruhn
        ii. Raw Nuts and Food Safety. (Processed and non-processed). Liaison: Mary Ellen Camire.
3. New “Hot Topics” ideas:
    a. Transgenics in food crops
    b. Follow up to Invasives paper, How well was it received? What about additional, more in depth Issue Paper
    c. Non-target impact of GMO’s (plant residues – decrease in invertebrate insects and their affects on birds/fish)
4. Excellent discussion on major issues for John Bonner to discuss at CSREES workshop in Washington on November 20 (Broad Support: Importance of integrated programs in competitive grants arena; ability to apply for graduate fellowships, not just through NRI and NSF; Specific: Programs to manage new pests that will occur with changes in new cropping systems.

5. Vice-Chair for 2008: Karen Renner

4. MEMBERSHIP:

Membership continues to be a high priority for CAST. Activities of the Council for Agricultural Science and Technology are made possible by support from members. CAST addresses issues of animal sciences, food sciences and agricultural technology, plant and soil sciences, and plant protection sciences with inputs from economists, social scientists, toxicologists or plant pathologists and entomologists, weed scientists, nematologists, and legal experts. In order to continue to provide projects and publications that are vitally important to the agricultural community, legislators, and the general public, we rely on financial support to bring these endeavors to fruition.

CAST is a qualified 501(c) (3) tax-exempt organization. Therefore, your membership dues and additional contributions may qualify as charitable contributions under IRS guidelines.

Individual Members receive reports, special publications, issue papers, and Friday Notes. Individual members outside of North America receive publications via air mail. ($100/calendar year). **Friends of CAST** receive reports, special publications, issue papers, and Friday Notes. Friends of CAST members outside of North America receive publications via air mail. ($250/calendar year). **President's Club** receives reports, special publications, issue papers, and Friday Notes. President's Club members outside of North America receive publications via air mail. ($500/calendar year). **Millennium Club** receives reports, special publications, issue papers, and Friday Notes. Millennium Club members outside of North America receive publications via air mail. ($1000/calendar year). **Lifetime Members** receive reports, special publications, issue papers, and Friday Notes. Lifetime members outside of North America receive publications via air mail. ($2,500 contribution or pledge). **Retired Members** receive the same benefits as individual members. ($30/calendar year). **Student Members** receive the same benefits as individual members. ($25/calendar year).

Benefits for new members include: 1) direct input on topics for CAST publications and activities and possible participation on Task Forces and steering committees; 2) gain access to the latest agriculture information through CAST publications, activities, and weekly e-newsletters, “Friday Notes”; and 3) demonstrate support for an organization with a long history of publishing and distributing the results of the finest agricultural research and technology with a global audience of legislators, regulators, policymakers, the media, the private sector, and the public.

For more information regarding membership, please contact our membership department at 515-292-2125.

Are you a member? There are currently 25 members from the SWSS (NCWSS – 49; WSWS – 33; NEWSS – 12; WSSA – 103). Become a member at http://www.cast-science.org/cast/src/cast_top.htm

5. PUBLICATIONS:

CAST broke a record in 2006 for the number of new publications (7 in all). CAST matched that publication record in 2007.

The Role of Transgenic Livestock in the Treatment of Human Disease. **Issue Paper.** This paper, number 6 of a nine-part series titled "Animal Agriculture's Future through Biotechnology," describes the potential for transgenic livestock to advance the development of new medications and treatments of human disease and offers a brief overview of current production methods and challenges. Chair: Carol L. Keefer, University of Maryland, College Park. IP 35 May 2007.

Probiotics: Their Potential to Impact Human Health. Issue Paper. This publication describes the characteristics of probiotics, discusses the microbes that colonize the human body, explains how probiotics can treat and prevent disease, and suggests future research and policy measures. Chair: Mary Ellen Sanders, Dairy and Food Culture Technologies, Centennial, Colorado. IP 36, October 2007.

Convergence of Agriculture and Energy: II. Producing Cellulosic Biomass for Biofuels. CAST Commentary. This new Commentary provides a scientific assessment of the production potential and regional impacts of large-scale cellulosic ethanol production. It discusses the need for national investments and policy changes to address challenges limiting the production and efficient use of cellulosic biomass as a fuel feedstock to meet U.S. needs. Chair: Dr. Steven L. Fales, Iowa State University, Ames. QTA2007-2, 8 pp., October 2007.

Avian Influenza Vaccines: Focusing on H5N1 High Pathogenicity Avian Influenza (HPAI). Special Publication. Avian influenza (AI) vaccine can be used in emergency, routine, and preventive programs, although vaccine alone will not completely eliminate AI. Written and reviewed by an international Task Force, this CAST Special Publication provides a summary and education on the crucial issues surrounding AI vaccination. Chair: Dr. Karen Burns Grogan, Chicken Scratch, LLC, Dacula, Georgia. SP 26, October 2007.

Avian Influenza Vaccination: A Commentary Focusing on H5N1 High Pathogenicity Avian Influenza. CAST Commentary. The correct use of efficacious poultry vaccines is a critical component of overall control and eradication of avian influenza. Speculation about potential problems of vaccine use must be balanced with the real problem of outbreaks in susceptible poultry. Commentary text is excerpted from the larger Special Publication. Chair: Dr. Karen Burns Grogan, Chicken Scratch, LLC, Dacula, Georgia. QTA2007-3, 12 pp., October 2007.

Biofuel Feedstocks: The Risk of Future Invasions. **CAST Commentary.** In an effort to reduce greenhouse gas emissions, expand domestic energy production, and maintain economic growth, public and private investments are being used to pursue dedicated feedstock crops for biofuel production. This Commentary addresses the necessary balance between designing biofuel feedstock crops to require minimal inputs yet preventing them from surviving outside the cultivated environment. Chair: Dr. Joseph DiTomaso, University of California-Davis. QTA2007-1, 8 pp., November 2007.

Implications of Gene Flow in the Scale-up and Commercial Use of Biotechnology-derived Crops: Economic and Policy Considerations. **Issue Paper.** This Issue Paper identifies the nature of gene flow and how it relates to adventitious presence, describes the biological traits being imparted into biotech crops, summarizes present risk assessment and regulatory mechanisms, and discusses potential economic effects and policy and research ramifications of gene flow of commercial biotech crops. Chair: David Gealy, USDA--Agricultural Research Service, Stuttgart, Arkansas. IP 37, December 2007, 24 pp. $5.00 (price includes shipping). (CAST Commentary 2006-3, November 2006)

Forthcoming Publications:

Animal Productivity and Genetic Diversity: Transgenic and Cloned Animals (Issue Paper)
(Chair) Robert Wall, Animal and Natural Resources Institute, Beltsville, Maryland

Convergence of Agriculture and Energy: III. Considerations in Biodiesel Production (CAST Commentary)

Ethical and Animal Welfare Implications of Animal Biotechnology: A Framework for Ethical Decision Making (Issue Paper)
(Chair) Paul Thompson, Department of Philosophy, Michigan State University, East Lansing

Fate and Transport of Zoonotic Bacterial, Viral, and Parasitic Pathogens during Swine Waste Treatment, Storage, and Land Application (Special Publication)
(Cochair) Dana Cole, Medical Epidemiologist, Atlanta, Georgia
(Cochair) Jan Vinje, Centers for Disease Control and Prevention, Atlanta, Georgia

Food Environment and Its Influence on Human Diet and Health (Task Force Report)

Nutrients, Food, and the Future (Issue Paper)

Pasteurellosis Transmission Risks between Domestic and Wild Sheep (CAST Commentary)
(Chair) Michael Miller, Colorado Division of Wildlife, Fort Collins

Poultry Carcass Disposal Options (for Routine and Catastrophic Mortality) (Issue Paper)
(Chair)
(Cochair) John P. Blake, Department of Poultry Science, Auburn University, Alabama

Ruminant Carcass Disposal Options (for Routine and Catastrophic Mortality) (Issue Paper)
(Chair) Marty Vanier, National Agricultural Biosecurity Center, Kansas State University, Manhattan

Scientific Assessment of the Welfare of Swine Individually Housed in Crates or Stalls (Issue Paper)

Swine Carcass Disposal Options (for Routine and Catastrophic Mortality) (Issue Paper)
(Chair) Allen F. Harper, Virginia Tech Tidewater Agricultural Research & Extension Center, Suffolk

Vaccine Development Using Recombinant DNA Technology (Issue Paper)
(Chair) Mark Jackwood, PDRC, University of Georgia, Athens

Water, People, and the Future: Supply and Demand (Issue Paper)
(Chair) Sharon Megdal, Water Resources Research Center, University of Arizona, Tucson

Water Quality and Quantity Issues for Turfgrasses in Urban Landscapes (Special Publication)
(Cochair) James B. Beard, Professor Emeritus, Texas A & M University, College Station
(Cochair) Michael Kenna, U.S. Golf Association, Stillwater, Oklahoma

6. CHARLES A. BLACK AWARD:

The Charles A. Black Award honors Dr. Black, the founder and long time Executive Vice President of CAST. The Charles A. Black Award is presented annually to an individual for outstanding achievement by an agricultural, environmental, or food scientist in contributing to the advancement of science in the public policy arena. Primary consideration is given to candidates who are actively engaged in research, and who have demonstrated excellence in communicating the importance of their scientific achievements to policy makers, the news media, and the public. Nominees may have demonstrated their ability to communicate either through written or spoken material, including the use of television, radio, and/or other media. Individuals from all nations are eligible to receive the award

Dr. David H. Baker is a comparative nutritionist who has published extensively in the areas of protein-amino acid nutrition, trace-mineral and phosphorus utilization, and vitamin bioavailability. At the University of Illinois, he holds emeritus appointments in Animal Sciences, Nutritional Sciences, and Internal Medicine. He has been a member of the Illinois faculty since 1967, having received his Ph.D. degree there in 1965.

7. NEXT CAST BOARD MEETING:

The spring Board of Directors meeting will be held March 12-14 in Washington, D.C.

Committee: 101b

Summary of Progress:

The WSSA BOD met to develop strategies to implement the WSSA strategic and tactical plan and to discuss business of WSSA. The following major items were discussed.

During a discussion about the 2006 annual meeting, presence of a block of rooms for graduate students at a reduced rate and the ability of students to have their registration fees waived by working at the registration desk was mentioned. Apparently the student block did not fill in 2006 and there was a need for additional graduate students to assist with registration. Availability of these opportunities for graduate students will be advertised more frequently and clearly for the 2007 annual meeting.

The following WSSA membership dues and annual meeting registration fee structure was developed for the 2007 meeting.

Category	Early registration	Mid-term registration	Onsite registration
Member	250	350	405
Non-member	350	450	505
Student	75	75	75
Spouse	75	75	75

Special events at 2007 WSSA annual meeting:

The society lost approximately 200 members. The President will send out an e-mail inquiry, and Tom Mueller agreed to follow up with those members who did renew their membership not responding to Dr. Shaner's e-mail.

Membership fee structure for WSSA:

Online (journals) membership fee: $135

Online and print (journals) membership: $155

Student online: $40

Student online and print: $60

The WSSA BOD voted to contract with OASIS to prepare meeting abstracts and perform other meeting planner activities for the 2007, 2008, and 2009 annual meetings. Approximate cost will be $10K per year for their services. There may be a substantial savings if as a group the national and regional societies could cooperatively use OASIS (savings occur at a level of 1,000 more abstracts.) The BOD voted to discontinue providing cd copies of the abstracts.

Planning has continued for the 2008 International Weed Science Society meeting that will be held June 23-29, 2008 in Vancouver, BC Canada. Bob Blackshaw and others are developing an agenda of 22 topics with hopes of identifying WSSA members to help coordinate and develop the program.

The 9th edition of the Herbicide Handbook should be available in early 2007. Price will be $95 each or $80 if purchased in bulk. Scott Senseman is the editor.

Weed Science and *Weed Technology* formats will be streamlined over the next few years. The impact factor for these respective journals was 1.54 and 0.75 (up from 1.29 and down from 0.904, respectively.) Electronic archiving of the journals continues.

The WSSA BOD voted to encourage the special committee charged with determining the feasibility of a journal related to invasive weeds to develop a business plan for the journal by sometime this fall. The WSSA BOD voted to move forward with this publication, and the membership will be informed of more details in the coming additions of the Newsletter.

Concern over having sufficient images (150) for the next phase of the XID guide was discussed.

The difficulty in getting a significant pool of candidates for WSSA officers was discussed. The WSSA BOD encouraged the regional representatives to encourage greater participation and increased nominations. David Shaw from the SWSS was elected vice president during 2007.

Improving the interaction of graduate students with the general membership was discussed in an effort to determine ways to improve the student's experience at the annual meeting. The hope is that this may increase retention of students as long-term members of WSSA. The Western Weed Science Society encourages scientists and students to arrange for a dinner on night with 2 or 4 parties involved, and WSSA may provide an avenue for this approach at the 2007 WSSA meeting. Greater recognition of student achievements at the annual meeting was discussed.

The WSSA converted to a new website on January 15, 2007.

The survey provided at the 2006 WSSA annual meeting was discussed. In retrospect, it was felt that the survey may have been skewed toward members that may always support WSSA. A follow-up, electronic survey will be distributed to the membership this fall in an effort increase the “value” of the annual meeting to the WSSA membership.

The overhaul of the constitution and MOP of WSSA was discussed. Dr. Whiteside has done and excellent job addressing many issues with the MOP and constitution, and hopefully by the 2007 annual meeting complete and updated versions will be in place.

Symposia will include:

1. Employment Opportunities for Weed Scientists and How to Make Yourself More Marketable
2. Nursery Stocks vs. Invasive Plant: Which Is It, and Hwy Do We Care?
3. Using Emerging Technologies to Study Weed Biology
4. Integrated Weed Management

Mini-Symposium in the Education Section: Resistance Management in Glyphosate-Resistant Crops

Workshop: Statistical Assessment of Dose-Response - $150

Vegetation management one-day session: $50

WSSA and Allen press will begin working on a WSSA brochure to improve the society’s ability to educate others on the scope and benefits of WSSA.

The WSSA BOD voted to honor David Pike, former webmaster for WSSA, at the 2007 annual meeting for his services to WSSA.

Results of the Strategic and Tactical workshop were discussed with more details being presented in the Newsletter and through other forums at the 2007 annual meeting. The following items were discussed at the summer BOD meeting relative to the tactical plan. John Jachetta presented overview of tactical plan that was discussed on July 15.

1. Include information on funding opportunities on WSSA Website.
2. Increase popular press awareness of Weed Science.
3. Have impact on federal agencies and establish relationships with federal agencies.
4. Consider expanding Weed Science glossary into three languages.
5. Expand information on Extension projects.
6. Increase number of articles dealing with education and extension.
7. Improve membership development.

Objectives for Next Year:

Continue representing the SWSS at WSSA BOD meetings and at the 2007 annual meeting.

Recommendations or Request for Board Action:

Address the issue of SWSS and WSSA having a joint meeting during 2009.

Finances Requested:

Funds for travel to the 2007 summer WSSA BOD meeting in Chicago.

Respectfully submitted:

David Jordan

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

Committee Chair: C. T. Bryson

Chair Phone: 662-686-5259

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

Committee Members and Terms of Service:

J. Boyd	**2007**	**C. T. Bryson**	**2008***	**C. Smith**	**2006**
S. Askew	**2007**	**C. H. Koger**	**2008**	**M. DeFelice**	**2006**
V. Maddox	**2007**				

Recommendations for Board Action:

The price of the Weed of the South has not been established but depends on printing costs and the amount of donations provided to UGA Press to reduce the end cost. Ultimately, a lower price for the book should result in more copies sold and a larger profit to the society. Board consider a donation (ca. $10,000.00) to University Georgia Press to offset publishing costs of publishing Weeds of the South. This will reduce the price per copy and should make the book more affordable for classroom and to the public.

Finances Requested:

See above.

Summary of Progress:

Photos of additional weeds were taken by Arlyn Evans and write ups were and are being prepared for the next version of the SWSS Weed Encyclopedia of Weeds DVD-ROM. Committee members Charles Bryson and Mike DeFelice met with Arlyn Evans in November 2006 and pulled about 1,000 slides to be scanned and placed on photo CDs. These are last photos from Arlyn Evans because of filing eyesight. Photo files are being updated to in preparation for the next version of the DVD and for the Weeds of the South. A list of weeds to be included in the SWSS Weed Encyclopedia of Weeds Identification Book that was developed in September 2005 was revised in November 2006, and editing of weed write-ups was continued during 2006.

Action Plan for 2005:

1. Continue writing/editing the SWSS Weeds of the South. Estimated time to complete first draft and supply all photos is April 15, 2007. UGA Press will then send the text out for review and begin layout. The book is scheduled for publication in fall 2008.

2. Continue photographing and writing new descriptions of weeds for both the book and the next version of the DVD-ROM. Estimated time to complete Version 4 of the Weed ID DVD is summer of 2008.

Committee: 121 **Committee Name:** Southern Weed Contest (STANDING)

Summary of Progress:

The 2007 SWSS weed contest was hosted by Dr. Chris Tingle of Syngenta at the Syngenta Research farm in Vero Beach, FL. The contest was a tremendous success as attendance increased nearly three-fold compared to attendance at the 2006 contest. It was extremely encouraging to have undergraduate students (Oklahoma State Universtity) participate in the contest for the first time during my tenure as the committee chair. Several schools who had not attended the contest for many years brought teams to the contest in 2007. The University of Florida had two complete teams in attendance. Overall, 40 contestants (37 graduate / 3 undergraduate) participated in the contest compared to 16 in 2006. Chris Tingle and everyone who helped with pulling the entire event off did a fabulous job. Everyone's hard work and the amount of time put into developing each contest event really showed throughout the entire event. Words cannot describe how much the contest committee, team coaches, and participants sincerely appreciate all the hard work that Chris and his team put into hosting the contest. It was truly an outstanding educational experience for everyone involved.

Objective(s) for Next Year:

I have asked Stanley Culpepper and Eric Prostko along with others at the University of Georgia to consider hosting the 2008 contest. Stanley and Eric are strongly considering accepting the task. We should have a host for the 2008 contest by the end of the upcoming meeting in Jacksonville.

Recommendation or Request for Board Action:

None

Finances (in any) Requested:

Total expenditures for the 2007 contest were $11,297.11. Syngenta Crop Protection was gracious to absorb $4,673.07 of the total expenditures, resulting in a remaining balance of $6,624.04 that was paid for out of the contest account. Total cost of trophies and cash awards for the contest was $3,008.00. The total expenditures for the contest covered out of the contest account was $9,632.04, leaving a remaining balance of $11,030.23 in the contest account.

Respectively submitted;

Eric Webster

Jason Bond

Daniel Stephenson

Trey Koger, Chairperson

Minutes of SWSS HRC

Jan 27, 2008

Jacksonville, FL

The meeting was called to order at 9:00 am by Nilda Burgos.

Introductions were made and a list of attendees is included in this report.

Minutes of the previous meeting were reviewed and Ralph Lassiter moved to approve as distributed. Case Medlin seconded and the motion carried.

The meeting agenda was distributed and no additions were requested.

Committee Membership:

Burgos gave some history of the committee and how it was elevated to a Standing Committee in SWSS. Historically, membership and participation has been on a voluntary basis with no rotation. The committee leadership initially consisted of a chair and secretary with yearly rotation. About 4 years ago the committee voted to extend the service terms of the chair and secretary to a two-year rotation. However, with increasing active membership in the HRC, and the critical long-term issues that the HRC is dealing with, a need for a core group of leaders, besides the chair and secretary, is needed to facilitate multi-year projects and agenda. Further, membership composition and rotation were discussed. Burgos requested input from members present for effective committee makeup. William Vencill suggested keeping it open with members allowed to serve as long as they are interested. Bob Nichols suggested consideration of a rotation system, but keeping the open style allowing interested individuals to serve. Mike Chandler indicated the key should be to remain broad-based with representation from each state. Some discussion centered about a suggestion by Doug Sammons to base committee membership around crops.

After a lengthy discussion concerning representation and emphasis, it was concluded that membership should continue to be broad-based with representatives from academia and industry. A motion was offered by Nichols and seconded by Vencill to structure the committee leadership with a three-year rotation with a secretary, vice chair, and chair that would assume progressive roles each year. It was suggested that general committee membership should be selected in accordance with SWSS guidelines for standing committees with consideration that membership be extended to those wishing to participate without major emphasis on committee size, but with some care given to not allowing a single company or university to dominate the membership. Motion passed. (these suggestions were presented to the SWSS board on Jan. 30, 2008 with request that SWSS president confer with Burgos for committee membership and rotation)

To comply with the above suggestions for committee structure, it was determined that a secretary would need to be elected each year. Jason Norsworthy nominated Larry Steckel. Sammons moved to close nominations and to elect Steckel by acclamation. Nichols seconded. The motion passed and Steckel was elected as committee secretary.

Burgos indicated that Ginger Light, of Texas Tech University was unable to attend SWSS this year, but had requested to be placed on the committee. Consensus was favorable and Burgos agreed to suggest her name to SWSS president for inclusion on the committee.

Policy concerning distribution of minutes:

There was support to include minutes in the current SWSS proceedings. Vencill indicated this could be done if we got them to him within one month from the meeting date. Some concern about getting approval – especially from new committee members- by email. Nichols suggested coordinating with incoming president and proceedings editor. It was agreed by consensus that approval of the minutes would be solicited by email and approved minutes forwarded to Editor.

Standardization of Reporting Herbicide Resistance:

Doug Sammons gave a short slide presentation and led a discussion about how we report "Fold" resistance. Currently calculations concerning level of resistance are based on sensitivity of a check population. Sammons suggested that environmental variables must be removed and questioned if we are reporting mortality or growth inhibition. He suggested reporting level of resistance based on labeled rates of the herbicide. This would remove some of the variability due to different levels of sensitivity of checks, but raised the question about what is labeled with different herbicides with the same active ingredient. Norsworthy indicated that rates in the greenhouse would be much different than labeled rates in the field. There were some concerns about variability in environments between greenhouses and growth stages of weeds when treated. It was pointed out that resistance mechanism will also influence susceptibility of plants by growth stages. Chad Brewer indicated that if problems are occurring in the field, resistance is probably real, but many experiments would be required to confirm. Burgos relayed an incidence where a publication was rejected because ryegrass was not reported as being resistant although it was susceptible to field labeled rates, but more tolerant that susceptible check. Following a lengthy discussion that did not reach a consensus, Burgos appointed a committee of Burgos, Steckel and Smith to develop some guidelines for consideration by SWSS and WSSA.

National Glyphosate Stewardship Forum:

Stanley Culpepper reported that the purpose of the forum was to keep national commodity organizations informed of concerns about glyphosate resistance. The forum met in 2004, but response from organizations following the meeting was somewhat lackluster. The forum met again in 2007 with much better reception of information. Five principle actions were recommended: 1) provide uniform labeling statements on glyphosate concerning stewardship; 2) Seek to have seed dealers deliver a uniform message on the risks of glyphosate resistant weeds and core management practices; 3) Seek increased education of growers through state pesticide safety education programs; 4) Request the USDA Economic Research Service analyze the cost of glyphosate resistance to production agriculture; 5) Education on glyphosate stewardship should continue in multiple venues including to Extension, certified crop advisors, communications from NRCS, popular press articles and newsletters. It was reported that the USDA funding proposal was not funded.

Labeling Initiative:

Nichols indicated that the primary concern in Cotton Incorporated currently is conservation tillage. CI is concerned that resistance will negatively impact conservation tillage and thus reduce sustainability. He reiterated the threat of Palmer amaranth to cotton in the southeastern US. He reported that there are 27 registrants of glyphosate in the US and many have already taken the initiative to add resistance management statements to the label. EPA is reluctant to regulate resistance, but is very willing to work with registrants concerning label revisions. It was pointed out by Lassiter that generic companies will be more reluctant to add labeling or to service labeling statements. Chandler indicated the label language initiative was a good effort, but may be somewhat idealistic and not real world. Sammons indicated that sustainability depends on contributions to soil seed bank. If the practice results in a negative impact on the soil seed bank, it is sustainable, if positive, it is not sustainable. Nichols will continue with initiative.

Palmer Roundtable:

Ken Smith reported on the Palmer roundtable held in December. In addition to better understanding of the magnitude of the problem and the extent of the research being conducted, he reported that cooperative research projects are being developed due to the information exchange at the meeting. He complimented those involved in the Glyphosate Forum because the United Soybean Board, Cotton Incorporated, and the National Cotton Council all sent representatives to the roundtable.

Other Updates:

Alan York reported that NC, GA, and AR are reporting Osprey resistance in ryegrass. This was published in Pest Management Science. The AR accession does not have multiple resistance to Hoelon. NC populations (6 different populations) are resistant to Osprey – some are multiple resistant to Axial and to Hoelon. A poster was presented at SWSS and further information can be obtained from the proceedings.

Vencill reported that a population of Palmer amaranth in GA was confirmed resistant to triazine. This population is on a dairy farm with a long history of using atrazine for corn silage production. Of significance is that this population is not resistant to glyphosate, but is only five miles from confirmed glyphosate resistant populations.

Vencill reported an ACCase resistant large crabgrass on a sod farm near Tifton, GA. It is resistant to the dims, but not the fops and props. It appears to be contained to a single farm at this time – but with sod sales, it is likely to move widely.

Steckel reported giant ragweed resistant to glyphosate in TN and Norsworthy reported three similar populations in AR.

Norsworthy reported that barnyardgrass was being investigated as possible resistant to clomazone. Although the resistance is not excessively high, it is tolerant above field rates and cannot be controlled at rates safe to rice.

Burgos indicated that confirmation process is underway for ryegrass that is tolerant to 2X field rate of glyphosate.

Norsworthy reported that a single location of ALS resistant horseweed was found in AR. It is not resistant to glyphosate.

Chandler indicated that tall waterhemp collected in Texas was surviving 5X glyphosate rates.

Meeting Adjourned:

With no further business, Burgos adjourned the meeting.

Attendees:

Nilda Burgos; Nick Polge; Chad Brewer; David Black; Andrew Price; R.L. Nichols; Vinod Shivrain; Ralph Lassiter; Mike Chandler; Case Medlin; Jason Ferrell; Jason Norsworthy; Larry Steckel; William Vencill; Doug Sammons; Stanley Culpepper; Allan York; Ken Smith

IMPACT OF AN INTEGRATED TEAM, UK WHEAT SCIENCE GROUP. D.L. Call, L.W. Murdock, and J.R. Martin; Department of Plant and Soil Sciences, University of Kentucky, Princeton.

ABSTRACT

The University of Kentucky Wheat Science Group (UKWSG) is comprised of 16 individuals representing six departments in the College of Agriculture. The mission of the group is to plan and implement coordinated wheat research and extension/educational functions. Programs and activities are pro-active, when possible, but also are developed in response to specific production situations and needs. The UKWSG works closely with the Kentucky Small Grain Growers Association (KySGGA), county agricultural extension agents, wheat consultants and agribusinesses to determine short and long range goals and to implement the group activities for maximum benefit of Kentucky's wheat producers.

Prior to the inception of the UKWSG, research and educational efforts on wheat were done by individual programs without much coordination. Wheat consulting became a private enterprise in Kentucky in 1989. Wheat consultants were hired from England to work with Kentucky wheat producers for the sole purpose of increasing wheat yields in the state. However, the recommendations being expounded by the consultants were based on European growing conditions and were often not economically appropriate for use in Kentucky. Individual University research and extension faculty countered with the more appropriate recommendations, but this situation created an "us against them" environment. The consultants were often viewed by wheat producers as being pro-active and on the cutting edge of wheat science because of their English heritage, and due to the fact that their comments and recommendations were not bound by scientific protocol and standards. University scientist, in contrast, were looked upon as being behind the times and unresponsive to grower's needs. This was partly due to the fact that recommendations must be based on multiple years of data and developed using accepted scientific protocol. However the perception of farmers was also due to inadequate coordination of the various University wheat science programs (i.e., agronomy, agricultural economics, agricultural engineering, entomology, and plant pathology). It was clear that the University's wheat science program needed to develop and present a unified, systems approach in order to remain a viable entity in the eyes of Kentucky wheat producers.

In response to the above situation, the UKWSG was established in 1997. With leadership from the Agronomy Department Chair and College Director, funds were earmarked to underwrite activities of the group and hire a UKWSG Coordinator for a trial period of two years. The group adopted a logo and mission statement and identified numerous areas of research and educational program needs, based on input from the KySGGA and others. No-tillage and head scab research and programs have been a major program thrust, but many other wheat topics have been addressed via coordinated research and extension programs and activities. The group meets twice a year to review past activities and plan future activities. Because of the activity of the UKWSG coordinator, individuals work very closely on all aspects of program development and implementation. In addition, a distinct effort was made by the UKWSG to work <u>with</u> the wheat consultants in the state. The group has invited the consultants to participate in a variety of educational programs and research projects. As a result, the UKWSG has enhanced the scientific expertise of the consultants. Currently, the UKWSG is recognized by the farm community as the premier source of wheat science information in Kentucky. Proof of this fact is evidenced by a much higher level of grower participation in field days, meetings and educational materials of the UKWSG. The success of this program has been recognized not only in Kentucky but also by other states with nominations for awards, letters of appreciation and accolades for publications, newsletters and other efforts such as an invited presentation at the National Agronomy Society meeting on organization and success of the UKWSG. This success has resulted in the UKWSG receiving additional funds to support group activities by the Kentucky IPM program and continued support from administration to fund the wheat coordinator position. The UKWSG follows a unique and innovative organizational approach which has been a model for a least two other programs in the University.

MEASUREMENTS, CALCULATIONS, AND SCIENTIFIC TERMS: COGENT ELUCIDATIONS AND ILLUMINATIONS. T.C. Mueller and S. Mueller; University of Tennessee, Knoxville, TN; and Bearden High School, Knoxville, TN

ABSTRACT

Given the uniqueness of some of the words in the title, the following definitions are provided: cogent = forcibly convincing; elucidate = to make clear or plain; and illuminate (in this context) = to make understandable. This presentation discussed several basic ideas in science, which would be helpful for new students and old professors to know.

The Scientific Method is a logical approach to solving problems by observing, collecting data, formulating hypotheses, testing hypotheses, and formulating theories that are supported by data. Two types of observations include qualitative data, which is descriptive, non-numerical information; and quantitative data which is objective, numerical information. A hypothesis is a testable statement to help explain the basis for an observed phenomenon. Many folks prefer research with a hypothesis, and I personally prefer conducting research which has not already been done. A model in science is not only a physical object, but rather is an explanation of how phenomena occur and how data or events are related. A model can be visual, verbal or mathematical. A theory is a broad generalization that explains a body of facts or phenomena and is considered successful if the theory predicts the results of many new experiments.

The System Internationale (SI System) is an international system of units (French, I think) and is defined in terms of standards of measurement. The authors point out that European scientists use commas and decimal points differently than Americans do, so 75 000 and 75,000 are not the same value. Additionally, the SI uses exponents, and not a slash "/", so Kg/ha is Kg ha^{-1}. The SI includes Base Units that involve direct measurements of mass, weight, and length, as well as derived units such as volume and density.

Accuracy is the closeness of measurements to the correct or accepted value of the quantity measured. Precision is the closeness of a set of measurements of the same quantity to each other. Significant figures indicate that measurements consist of all the digits known with certainty plus one final digit, which is somewhat uncertain or estimated. Rules for determining significant figures include: zeros appearing between nonzero digits are significant, zeros appearing in front of all nonzero digits are not significant, zeros at the end of a number and to the right of a decimal point are significant, and zeros at the end of a number but to the left of a decimal point may or may not be significant. If a zero has not been measured or estimated but is just a placeholder, it is not significant. A decimal point placed after zeros indicates that those zeros are significant. Care should be taken to not overstate the precision of a measurement.

PROBLEM WEED SPECIES IN SOUTHERN ROUNDUP READY CROPPING SYSTEMS: PERCEPTIONS VERSUS OBSERVATIONS. W.J. Everman, S.B. Clewis, D.L. Jordan, J.W. Wilcut, North Carolina State University; J.W. Weirich, D.R. Shaw, Mississippi State University; W.G. Johnson, S.C. Weller, Purdue University; M.D.K. Owen, Iowa State University; R.G. Wilson, University of Nebraska; and B.G. Young, Southern Illinois University.

ABSTRACT

In 2006, a 4-year study was established to evaluate the temporal aspects of weed populations in Roundup Ready production systems in 6 states. During the initial year of the study, we identified producer fields currently in continuous Roundup Ready cotton systems, split them into producer and researcher halves, and established sampling points. The producer half of the field is managed the same as it was prior to study initiation while the researcher side of the field is managed with additional residual herbicide inputs as needed. At each sampling point, weed counts were taken before preplant weed control, before the first postemergence (POST) application, 2 weeks after the last POST (LAYBY postemergence directed) application, and before cotton defoliation. Weed populations were recorded at each sampling point and totals on the two sides were compared to determine if the additional modes of action impacted weed species and numbers. Growers perceptions were that weed pressure had decreased with the use of Roundup Ready systems when compared to pressure before using Roundup Ready. Morningglory and pigweed species were cited as the most common and troublesome weeds by producers in the same survey. Weed counts before the first POST application in Mississippi and North Carolina showed the greatest differences in weed numbers. In North Carolina, 4 times as many weeds were observed on the producer managed side of the field and are likely due to several producers opting to apply no preemergence residual herbicide. In Mississippi, there was virtually no difference in weed count numbers for the majority of weed species. Two weeks after the last POST application there were 8 and 24 weed species observed in Mississippi and North Carolina, respectively. Weed diversity and numbers were affected by herbicide selection on the producer and researcher halves of the fields, with fewer weeds observed where residual herbicides were used, with greatest differences observed in North Carolina. Yields were not greatly affected by herbicide selection and subsequent weed control due to the overall excellent control of weeds on both the producer and researcher sides of the fields.

In all, greater weed numbers were observed on the grower side of the field than on the researcher side of the field, showing a reduction in weed numbers due to residual herbicide use. Grower perceptions of troublesome weed species, morningglory and pigweed, were accurate as these species were the most common on the producer side of the field when compared to the researcher side.

GROWER AWARENESS OF GLYPHOSATE-RESISTANT WEEDS AND MANAGEMENT STRATEGIES IN SOUTHERN CROPPING SYSTEMS. S.B. Clewis, W.J. Everman, D.L. Jodan, and J.W. Wilcut, North Carolina State University, Raleigh, NC; D.R. Shaw, Mississippi State University, Starkville, MS; B.G. Young, Southern Illinois University, Carbondale, IL; R.G. Wilson, University of Nebraska, Scottsbluff, NE; M.D.K. Owen, Iowa State University, Ames, IA; S.C. Weller, and W.G. Johnson, Purdue University, West Lafayette, IN.

ABSTRACT

A 6-state project assessing the long-term viability of Roundup Ready (RR) technology as a foundation for corn, cotton, and soybean production began in 2006 in Illinois, Iowa, Indiana, Mississippi (MS), Nebraska, and North Carolina (NC). The survey was used to gain information on the short- and long-term performance of RR crops and glyphosate use and to determine if critical data and information is being generated through previous commercial experience. The objectives were to characterize the historical utilization of RR crops, discern herbicide use patterns, gain grower insight on the performance of glyphosate-based weed control systems, and identify any practices which may lead to greater weed management challenges and/or to determine practices that may lead to sustainability. The project surveyed 1,195 growers about their perceptions of RR cropping systems across the 6 states representative of some of the US production regions. The grower survey was selected from Monsanto's historical base of RR trait licenses and was conducted from November 2005 to January 2006 by Marketing Horizons, Inc. and academia. The growers represented a cross-section of seed brands and were randomly selected from the list. Growers requirements included: growers still had to be actively involved in farming, responsible for decision-making, not employed in crop protection or seed industry, farming a minimum of 250 acres of soybean, cotton, or corn, and had been planting a RR trait for a minimum of 3 years. The survey covered a broad range of topics from current and future practices, cropping systems, tillage systems, herbicide resistance, and resistance management strategies. This talk focused on the cotton production portion of the survey conducted across MS and NC.

Cotton production data was collected from 178 growers in MS and 207 from NC. MS cotton growers planted 97% of 20,645 ha in 2005 and 93% of 19,629 ha in 2006 to RR technology. NC cotton growers planted 97% of 17,313 ha in 2005 and 92% of 18,174 ha in 2006 to RR technology. Cotton growers in MS and NC averaged 5 years with RR cotton in production of their farms. Prior to the introduction of RR technology, 48 and 40% of MS and NC growers, respectively, ranked their weed pressure as very light to moderate. Eighty-five and 92% of MS and NC growers, respectively, ranked their current weed pressure as very light to moderate. Eighteen, 11, and 71% of 97 continuous RR cotton growers were in no-till, reduced, and conventional tillage, respectively, prior to the introduction of RR cotton with 38, 36, and 26% of the growers currently in no-till, reduced, and conventional tillage, respectively. Forty-six percent of the growers felt shifting tillage practices had positively impacted their weed pressure on their farms. Seventy-eight and 86% of MS and NC growers, respectively, made 2 to 5 applications of glyphosate to cotton in 2005. Sixteen and 22% of MS and NC growers, respectively, have not made a non-glyphosate application in the last 3 years to cotton. Greater than 90% of the cotton growers surveyed were aware of the potential for weeds to develop resistance to glyphosate herbicides. However, when asked how serious of a problem they thought glyphosate resistant was, only 36 to 52% of the growers rated the resistance as 'very serious'. Fifty-six and 64% of MS and NC growers, respectively, were aware of specific weeds in their home states that have been documented as resistant to glyphosate. Twenty-nine and 20% of MS and NC growers, respectively, had personally experienced weeds resistant to glyphosate. Sixty-two and 63% of MS and NC growers, respectively, were currently incorporating management programs to minimize the potential for weeds to develop resistance to glyphosate on their farms. Growers in both MS and NC ranked "Using correct label rates at proper timing for size and type of weeds present" and "Rotating crops" 1 and 2 as very effective was to manage potential glyphosate weed resistance, while "tillage" was ranked last. MS and NC cotton growers recognized the potential for glyphosate resistance; however the majority continued to use only glyphosate as their primary weed control year after year. These data also show almost an unparalleled satisfaction with the RR cotton technology as documented with this survey and the percentage of cotton acreage planted in RR cotton in both states.

ASSESSING ECONOMIC BENEFIT WITH GLYPHOSATE AS A FOUNDATION HERBICIDE FOR SOUTHERN CROPPING SYSTEMS.J.W. Weirich, D. R. Shaw, W. A. Givens, J. A. Huff; Mississippi State University, Mississippi State, MS. W.J. Everman, S.B. Clewis, D.L. Jordan, and J.W. Wilcut; N.C. State University, Raleigh, NC; W.G. Johnson, S.C. Weller; Purdue University, West Lafayette, IN; M.D.K. Owen, Iowa State University, Ames,IA; B.G. Young; Southern Illinois University,Carbondale, IL and R. G. Wilson University of Nebraska, Scotts Bluff, NE.

ABSTRACT

One of the factors a producer considers when selecting a production practice is the economic benefit of the system. This study was conducted to assess long-term viability of glyphosate-resistant technology as a foundation for cropping systems. Researchers in North Carolina and Mississippi established 43 on-farm sites in 2006-2007. Production systems were divided into two groups for this assessment: continuous glyphosate-resistant (GR) cotton and soybean and GR crop followed by a non-GR rice (Mississippi) or corn (North Carolina). The on-farm sites were divided into two treatments on halves of the field ranging from 8 to 20 acres: the producer's normal glyphosate-based program and university recommendations based on weed resistance management principles. All costs were kept constant between the two systems except the cost and application of the herbicides on each of the two treatments. Data from 2006 and 2007 were analyzed by herbicide cost, yield and net return. Among the four cropping systems herbicide cost was only different for corn in the 2007 growing season. In 2006 and 2007, weed management systems were not different in yield or net returns. In continuous GR cotton herbicide costs for grower vs. university systems were $43.54 and $60.17, respectively; net returns were $417.19 and $409.79, respectively. In continuous GR soybean herbicide costs for grower vs. university were $22.50 and $30.27, respectively; net returns were $220.52 and $223.91, respectively. When GR soybean was followed by a non GR crop, the GR soybean herbicide costs for grower vs. university were $24.76 and $33.15, respectively; net returns were $257.59 and $265.70. Thus, even though the university-recommended weed resistance management program required more intensive inputs and management, they resulted in similar yields and net returns.

SHARPPOD MORNINGGLORY CONTROL IN ROUNDUP READY FLEX AND LIBERTYLINK COTTON SYSTEMS. T.W. Janak, M.E. Matocha, and P.A. Baumann, Texas AgriLife Extension, Texas A&M University, College Station, TX.

ABSTRACT

Perennial morningglory in Texas cotton fields can reduce the harvestability and yield of cotton. Field studies conducted in 2006 and 2007 compared herbicide treatments in Roundup Ready Flex and LibertyLink cotton systems. Studies were conducted at the TAES research farm in the Brazos bottom on a site infested with sharppod morningglory and Palmer amaranth pigweed.

Herbicides evaluated included preemergence treatments of Prowl H_2O at 3 pt/A alone or with Caparol and Cotoran at 3.2 pt/A, followed by postemergence treatments of either Roundup WeatherMax at 22 or 32 oz/A, or Ignite at 22 or 29 oz/A. A post-directed treatment of Direx was applied in both cotton systems. All treatments were compared to plots that were untreated, weed free, or pigweed free/morningglory infested.

At 14 to 17 days after the early-post timing all treatments containing Roundup WeatherMax provided greater than 80% control of sharppod morningglory, with no significant differences in control among treatments in 2006 and 2007. At this same rating date, all treatments containing Ignite resulted in greater than 85% control, with no significant differences among treatments in either year as well.

By 35 days after the mid-post and post-directed application in 2006, all treatments containing Roundup WeatherMax provided greater than 80% control of sharppod morningglory, with the treatment including Direx post-directed at 2 pt/A resulting in significantly higher control than the other treatments. At 30 days after the mid-post and post-directed application in 2007, all treatments containing Roundup WeatherMax provided greater than 90% control, with the treatment including Direx post-directed at 2 pt/A resulting in the numerically highest control.

At 35 days after the mid-post and post-directed application in 2006, all treatments containing Ignite resulted in greater than 85% control, with the treatment including Direx post-directed at 2 pt/A providing significantly greater control than the other treatments. By 30 days after the mid-post and post-directed application in 2007, all treatments containing Ignite provided greater than 90% control, with the treatment including Direx post-directed at 2 pt/A resulting in the numerically highest control.

All treatments resulted in significantly greater lint yield than the untreated plot. In both years, no significant increase in yield was observed by any treatment that included either Roundup WeatherMax or Ignite when compared to the pigweed free plot that was infested with sharppod morningglory, except for the two Caparol and Cotoran containing treatments in the LibertyLink variety in 2007. The entire research area was treated with a harvest aid that provided mechanical harvestability of all plots except the untreated plots, although two harvest aid applications were required to make the pigweed free/morningglory infested plots mechanically harvestable

SPRING FORWARD OR FALL BACK: GLYPHOSATE RESISTANT HORSEWEED MANAGEMENT IN NO-TILL COTTON. L. N. Owen, L. E. Steckel, Chris C. Main, T. C. Mueller, Department of Plant Sciences, University of Tennessee, Knoxville, TN.

ABSTRACT

Glyphosate-resistant (GR) horseweed (*Conyza canadensis)* is a common problem for Tennessee cotton growers. However, control has been achieved in recent years with early spring burndown applications. These early spring applications had more success controlling GR-horseweed than other burndowns that went out closer to planting. Now the question is, will farmers be able to effectively control GR-horseweed with fall applications? Therefore, a study was initiated to compare November with April applications for the control of GR horseweed.

The study was conducted in 2006 and 2007. The cotton variety selected was Phytogen 485 WRF. Fall burndown applications were applied on Nov. 8, 2006 and early spring burndown applications were applied on April 3, 2007. Fall burndowns were accompanied with Roundup WEATHERMAX 22 oz/ac at planting. Control of GR horseweed from fall burndown applications were rated 30, 113, 179, and 236 days after treatment (DAT), and control ratings from the spring applications were rated 12 and 69 DAT. Cotton was harvested and seed cotton yield was taken.

Glyphosate-resistant horseweed can be controlled with fall or spring applied preemergence herbicides and each tank mix tested controlled GR-horseweed better than the Roundup-WEATHERMAX check. When rated 236 DAT, fall applications of Clarity + Reflex, Clarity + Envoke at both the 0.05 and 0.1 oz/ac rate, Clarity + Gangster and Clarity + Autumn controlled horseweed (>90%). These treatments provided more control than the other fall applications of Clarity + Valor, Clarity + Direx, Clarity + Gangster, and Clarity alone (80 to 90%). Spring applications also controlled GR horseweed. When rated 69 DAT, tank mixes of Clarity+Reflex, Clarity+Direx, and Ignite 280 had the best control (>95%) of the spring applied applications. All treatments tested provided the same cotton lint yield and all out yielded the Roundup check. This is good news for Tennessee cotton growers in that they have many options and a large window of opportunity to control this major weed pest in their cotton fields.

WEED SEEDBANK COMPOSITION IN A LONG-TERM TILLAGE AND LANDSCAPE VARIABILITY STUDY.
J.A. Kelton[1], A.J. Price[2], F.J. Arriaga[2], K.S. Balkcom[2], R.L. Raper[2], D.W. Reeves[3] J.N. Shaw[1], and E. Van Santen[1]. [1]Department of Agronomy & Soils, Auburn University, Auburn, AL 36849, [2]USDA-ARS National Soil Dynamics Laboratory, Auburn, AL 36832, [3]USDA-ARS J. Phil Campbell Sr. Natural Resource Conservation Center, Watkinsville, GA 30677.

ABSTRACT

Weed composition has been shown to be influenced by numerous environmental and cropping system attributes. The objective of this study was to evaluate cropping and landscape effects on weed seedbank composition. Soil samples at two depths (0-7.6 cm and 7.6-15.2 cm) were collected from an established experiment located on a 24-acre Coastal Plain field at the E.V. Smith Research and Extension Center near Shorter, AL. The experimental design was a factorial arrangement of two tillage systems (conventional and non-inversion subsoiling), with and without manure, three landscape positions (summit, depression and sideslope), and a corn (*Zea mays* L.)-cotton (*Gossypium hirsutum* L.) rotation with both phases of the rotation present each year, with six replications imposed on 6.1 m by 240 m long strips across the field. Each strip in the field was divided into 6.1 m by 18.3 m cells. Five soil cores were taken from each of 72 cells representing 3 replications of all treatment combinations. The five cores from each depth were sieved and mixed to represent one sample from each cell. Soil samples were then placed in plastic trays and kept moist for approximately five months until seedling emergence ceased, chilled, and the process repeated. Weed seedlings were identified and subsequently removed. The six major weeds (totaling 19,087 individual seedlings) included annual bluegrass (*Poa annua* L.) (739), carpetweed (*Mollugo verticillata* L.) (539), common chickweed [*Stellaria media* (L.)Vill.] (851), henbit (*Lamium amplexicaule* L.) (15,376), purple cudweed [*Gamochaeta purpurea* (L.)Cabrera] (398), and smallflowered bittercress (*Cardamine parviflora* L.) (587). Weed composition and density was influenced by tillage, crop, manure, and landscape position.

VERTICAL SIMULATED WEED SEED MOVEMENT FOLLOWING VARIOUS TILLAGE PRACTICES AND OVERHEAD IRRIGATION. A. Folgart, A.J. Price, R.L. Raper and J.S. Bergtold, USDA-ARS National Soils Dynamics Laboratory, Auburn, AL 36830.

ABSTRACT

Vertical weed seed movement has been shown to be influenced by tillage system. The objective of this study was to evaluate vertical movement of simulated weed seed following different conservation-tillage practices. The experiment was conducted in 2005 and 2006 on a Coastal Plain field at E. V. Smith Research and Extension Center near Shorter, AL. This site is an upland area with Marvyn sandy loam (fine-loamy, kaolinitic, thermic, Typic Kahapludults), 0-2% slopes. The experimental design was a randomized complete block design which contained a factorial treatment arrangement and 4 replications of each treatment. 10,500 1 mm ceramic beads (5,250 ≥ specific gravity of water; 5,250 ≤ specific gravity of water) were scattered evenly in nine equally divided square cells within a one square meter area in each plot, centered on the crop row, prior to tillage and irrigation treatments. Tillage treatments included: 1) none, 2) a KMC™ straight leg subsoiler, and 3) a bent leg Paratill™. Cotton was then planted using a row-cleaner equipped John Deere® MaxEmerge™ planter. Plots were then overhead irrigated with 0, 2.5, or 5 cm of water. The ceramic beads were then vacuumed from the nine cells separately. Additionally, visible beads outside the square meter were vacuumed into one sample. Following vacuuming, a 25 cm diameter soil core was taken to a maximum depth of 40 cm and divided vertically into 5 cm increments. Soil samples were then sieved. Beads from each sub-sample were removed, counted and expressed in percentages.

In both years statistical tests revealed that an interaction exists between tillage, irrigation and depth. Differences among irrigation are apparent among years, probably due to differences in soil conditions and climate.

SIMULATED FOMESAFEN CARRYOVER EFFECTS ON CORN (*ZEA MAYS*). A.M. Wise, E.P. Prostko, T.L. Grey, and W.K. Vencill. The University of Georgia, Department of Crop & Soil Sciences, Tifton, GA 31794.

ABSTRACT

Field trials were conducted in 2007 at Tifton, Plains, and Watkinsville, to evaluate the effects of simulated fomesafen residues on corn growth and yield. Preemergence (PRE) applications of fomesafen at 9, 18, 35, 69, 140, and 280 g ai/ha were made to a Roundup Ready corn hybrid (Pioneer 31R87) immediately after planting. All rates of fomesafen caused significant visual crop injury, and injury increased in severity as the herbicide rate increased at the Tifton and Plains location. The Watkinsville location showed slight crop injury at 280 g, but did not have any other visual symptoms. Generally, corn heights were not reduced except when fomesafen was applied at 280 g. Yields from the Tifton location were significantly reduced with a 100% and 46% yield loss at the 280 and 140 g rates, respectively. The Plains location had similar results with yield reductions of 90% and 34% at the same rates. Corn yields at the Plains and Tifton locations were not affected by the lower rates of fomesafen. The Watkinsville location did not display any yield loss for any rate of fomesafen. Further trials will be conducted to ensure that a 10 month rotation is adequate to decrease the chances of fomesafen carryover to field corn.

HERBICIDE EFFECTS ON NATIVE GRASS ESTABLISHMENT. Jester J.L., S.D. Askew, Virginia Tech, Blacksburg, VA.

ABSTRACT

The addition of adaptable perennial grasses typically referred to as “native species” to golf courses is a relatively new practice. Unlike conservation efforts, golf courses must establish cover quickly for aesthetics and weed control. Utilizing methods such as increased seeding rates and scheduled watering can expedite the maturation of the stand but weeds still pose a constant problem. Herbicide usage is critical to promote development of slow-maturing perennial grasses by reducing weed competition. The selection of an herbicide depends on its effectiveness and level of tolerance by the grass species. Evaluating the effects of commonly used herbicides on blue grama grass *(Bouteloua gracilis)* and little bluestem grass *(Schizachyrium scoparium*) can provide data necessary to make herbicide selection easier while protecting the developing stand. Our objectives were to evaluate 25 herbicides or herbicide combinations for effects on blue grama grass and little bluestem.

Little bluestem and blue grama grass were seeded in rows on June 22, 2007 in Blacksburg, VA as part of an endeavor to transition managed turf to an unmanaged meadow. Initial plant densities ranged from 1 to 78 blue grama plants and 18 to 103 little bluestem plants per plot. The study was established as a randomized complete block design with 3 replications and 26 treatments. Little bluestem and blue grama grass had a minimum of three leaves at time of application. Herbicides included in this study are: Amicarbazone; aminopyralid; bentazon; carfentrazone; carfentrazone + 2,4-D + MCPP + dicamba; chlorsulfuron; 2,4-D + MCPP + dicamba; fenoxaprop; flazasulfuron; fluazifop; flucarbazone; foramsulfuron; halosulfuron; imazapic; mesotrione; metsulfuron; nicosulfuron; primisulfuron; quinclorac; simazine; sulfentrazone; sulfosulfuron; tembotrione; topramezone; and trifloxysulfuron. All herbicides were applied with appropriate adjuvant and at label-recommended rates for crops on which the products are registered. Blue grama grass and little bluestem levels of phytotoxicity were assessed weekly for 6 week by visually estimating plant discoloration and stunting compared to the non-treated control. Plant counts were taken at the initiation of the trial and final week, change in stand density per herbicide treatment was then calculated.

Little bluestem was not significantly injured by the following: Aminopyralid; bentazon; carfentrazone; carfentrazone + 2,4-D + MCPP + dicamba; chlorsulfuron; 2,4-D + MCPP + dicamba; fenoxaprop; flazasulfuron; foramsulfuron; halosulfuron; mesotrione; metsulfuron; nicosulfuron; primisulfuron; quinclorac; simazine; sulfentrazone; sulfosulfuron; tembotrione. Amicarbazone; fluazifop; flucarbazone; imazapic; trifloxysulfuron and topramezone induced the greatest loss in plant counts for little bluestem. Trifloxysulfuron had the greatest phytotoxic injury in little bluestem of 37.5% at 4 WAT. Blue grama grass was not injured by the following herbicides: Bentazon; carfentrazone; carfentrazone; 2, 4-D + MCPP + dicamba; fluazifop; flucarbazone; halosulfuron, metsulfuron; and sufentratzone. Topramezone; imazapic; nicosulfuron; foramsulfuron; and tembotrione induced the greatest loss in plant counts and the highest rates of phytotoxicity in blue grama. Tembotrione induced phytotoxic rates of 90% or greater at 4, 5, and 6 WAT. All other herbicides caused tolerable levels of phytotoxic injury to blue grama grass. These data indicate that several herbicides are safe to use on these adaptable perennial grasses.

CRITICAL PERIOD OF OVERSEEDED PERENNIAL RYEGRASS COMPETITION WITH BERMUDAGRASS. T.L Mittlesteadt, and S.D Askew, Virginia Tech, Blacksburg, VA.

ABSTRACT

In the transition zone, a common practice is to overseed warm season bermudagrass (*Cynodon dactylon*) with cool season perennial ryegrass (*Lolium perenne*) to improve winter aesthetics on golf courses. Most golf revenue is generated during spring and early summer due to ideal weather conditions. Perennial ryegrass is needed to provide desirable quality and playing conditions for fairway turf, but competitively injures bermudagrass during this period. Bermudagrass has the ability to recover from perennial ryegrass competition given enough time during the summer. It has been suggested that healthy bermudagrass needs 100 days of weed-free growth in summer, yet research has not been conducted to validate or test this claim. "Healthy" bermudagrass is a subjective term that is usually based on biomass accumulation, total nonstructural carbohydrate (TNC), and ability of plants to survive stresses such as cold, heat, or UV light. Our objective is to measure how duration of perennial ryegrass competition influences bermudagrass cover, biomass accumulation and resistance to stress.

Studies were conducted in Blacksburg, VA on Patriot bermudagrass at Virginia Tech's Glade Road Research Facility and on Midiron bermudagrass at the Turfgrass Research Center in 2006. In 2007 the study was repeated on Riviera bermudagrass at Virginia Tech's golf course in Blacksburg, VA. Foramsulfuron (Revolver) at 1.24 L/ha, was applied at weekly intervals for 24 weeks between April 4 and September 12, 2006 and between April 6 and September 14, 2007. To evaluate how the duration of perennial ryegrass competition influences bermudagrass cover, visual bermudagrass cover ratings and biomass accumulation measurements were recorded. To determine if perennial ryegrass competition influences the ability of bermudagrass to resist stress, TNC and electrolyte leakage measurements were recorded in 2006 and will be collected for the 2007 study. Data were subjected to analysis of variance using a repeated measures technique and regressions were used to describe effects of bermudagrass weed-free period on measured responses.

Perennial ryegrass left to compete with bermudagrass beyond July 25, 2006 (less than 68 days of competition free growth) reduced bermudagrass visual cover 10 to 20% and 13 to 35% in Patriot and Midiron bermudagrasses, respectively. Perennial ryegrass left to compete with Riviera bermudagrass after August 3, 2007 (less than 50 days of competition free growth) resulted in a 13 to 38% decrease in bermudagrass. Patriot and Riviera dry biomass increased as the number of competition-free days of growth increased, while Midiron biomass exhibited a hyperbolic response with an asymptote at approximately 100 days. This differential biomass accumulation indicates that Patriot and Riviera continues to compete with ryegrass and grow during the entire season while Midiron does not. TNC and electrolyte leakage measurements for Patriot and Midiron show no differences between treatments. Riviera TNC and electrolyte leakage measurements have not been completed to date. Based on the data from these studies, we can conclude that 100 days of non-competitive growth is a safe general estimate for bermudagrass to reach acceptable cover and reach sustained health.

TURFGRASS COVER INCREASES SOILS SORPTION AND DEGRADATION OF SIMAZINE. A.C. Hixson, J.B. Weber, W. Shi, and F.H. Yelverton. Crop Science Department, North Carolina State University, Raleigh, NC, 27695.

ABSTRACT

Triazine herbicides such as simazine [6-chloro-N,N'-diethyl-1,3,5-triazine-2,4-diamine] are subject to higher mobility in alkaline, sandy soils commonly associated with coastal turfgrass systems. Organic matter is the most important soil constituent influencing pesticide sorption by soils. Bermudagrass is a perennial crop with a constant deposition of organic material creating a soil system that can change drastically with time. These changes in soil physicochemical characteristics could affect the environmental fate of pesticides applied to turfgrass systems. Typically, environmental pesticide regulations are based on research results from row-crop agriculture and may not be applicable to turfgrass systems. Therefore, sorption and degradation characteristics of UL-ring-labeled ^{14}C-simazine were determined in soils from a 10-year-old bermudagrass system and adjacent bareground area. Surface (0-5 cm) and subsurface (5-15 cm) soil from both systems were air-dried and passed through a 4-mm sieve. Using a batch-equilibrium method, sorption isotherms were determined for each soil. Data were fit to the Freundlich equation and K_d (distribution coefficient) values were determined. In addition, degradation of simazine in soils was monitored for three months, using sterile and nonsterile soil microcosms. A factorial design with soil treatments (sterile and non-sterile), soil depths (0-5 and 5-15 cm), and soil system (bermudagrass and bareground) as variables was employed. Distribution coefficients (K_d) indicated sorption was greatest on the surface soil from the bermudagrass soil system (2.47) and lower in all other soils. Sorption decreased as soil depth increased in the turfgrass soil system, but sorption was similar in the bareground system as depth increased. Sorption isotherm slope values ($1/n$) ranged from 0.78 to 0.83 indicating sorption was nonlinear. Degradation results show that $^{14}CO_2$ evolution was highest in the subsurface soil of the turfgrass system, indicating higher simazine bioavailability contributes greatly to its increased microbial degradation. Simazine mineralization rate peaked from two to three weeks following soil inoculation indicating quick adaptation of soil microorganisms to simazine in the turfgrass soil. These results indicate leaching potential and bioavailability of simazine is greater in bareground soil and increases with depth in the turfgrass system.

RESPONSE OF ZOYSIAGRASS TO VARIED RATES AND TIMINGS OF FLUAZIFOP AND TRICLOPYR. D.F. Lewis, J.S. McElroy, J.C. Sorochan, and G.K. Breeden; Department of Plant Science, University of Tennessee, Knoxville.

ABSTRACT

One of the most problematic weeds to control when managing zoysiagrass (*Zoysia* spp.) fairways is bermudagrass (*Cynodon dactylon*). Controlling bermudagrass in zoysiagrass turf is difficult due to its rapid growth habit and few available selective herbicides. Glyphosate applications are normally unsuccessful due to bermudagrass's ability to regrow from deep, underground rhizomes and out-compete the slower establishing zoysiagrass. Aryloxyphenoxypropionate (AOPP) herbicides have been applied post-emergence for the selective control of annual and perennial grass weeds. Previous research indicates that tank-mixing the AOPP herbicide fluazifop with triclopyr increased bermudagrass suppression and decreased zoysiagrass injury. Additional research to determine the optimal rate and timing of fluazifop tank-mixed with triclopyr could lead to improved selective herbicide programs for bermudagrass control in zoysiagrass turf.

Research was conducted in 2007 at the University of Tennessee East Tennessee Research and Education Center (ETREC)-Plant Science Unit in Knoxville, TN. Treatments included are: fluazifop (0.11, 0.16, 0.21, and 0.26 kg ai/ha) alone or tank-mixed with triclopyr (1.12 kg ai/ha) at two or four week intervals. Treatments were made to 'Compadre' zoysiagrass (*Zoysia japonica*) beginning June 11, 2007. Sequential applications were made every 7 or 14 days (depending on treatment) for a total of four applications of each treatment. Turfgrass injury was visually rated every two weeks utilizing a 0-100% scale (0%=no visible turfgrass injury; 100%=complete turfgrass death). Digital images were taken every two weeks for each plot utilizing a 0.28 m^2 light box equipped with a Canon G5 digital camera. Images were analyzed for percent cover, hue, saturation, and brightness according to published methods. Due to space limitations we will only present cover reduction data from 8 weeks after trial initiation. This trial was replicated four times in a randomized complete block design. Experimental units measured 1.5m x 3m^2. Herbicide applications were applied with a CO_2 pressurized sprayer calibrated at 280 L/ha.

At two week intervals, all rates of fluazifop alone reduced zoysiagrass cover unacceptably (55-97%). When tank-mixed with triclopyr, percent cover reduction was reduced when compared to fluazifop alone, but percent cover reduction was unacceptable (28-69%). At four week intervals, fluazifop alone at 0.11 and 0.16 kg ai/ha caused minimal cover reduction (<20%), but increased fluazifop rates led to increased reduction (>30%). When tank-mixed with triclopyr, all rates fluazifop rates were safe to apply on zoysiagrass (<12%) at four week intervals. According to contrast, increasing fluazifop rates amplified zoysiagrass cover reduction linearly when treated with fluazifop alone and fluazifop plus triclopyr at two week intervals and fluazifop alone at four week intervals. No differences were observed between increasing rates of fluazifop plus triclopyr applied at four week intervals. These data indicate that triclopyr safens fluazifop when applied at two and four week intervals. However, due to unacceptable injury at two week intervals, four week intervals of fluazifop tank-mixed with triclopyr are the safest strategy for controlling bermudagrass in zoysiagrass turf.

PHENYL ISOTHIOCYANATE AS AN ALTERNATIVE OF METHYL BROMIDE FOR WEED CONTROL IN TOMATO AND BELL PEPPER PRODUCTION. S.K. Bangarwa, J.K. Norsworthy, and G.A. Griffith; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

ABSTRACT

Methyl bromide (MeBr) is widely used for weed control in plasticulture tomato and bell pepper production systems. With the impending ban of MeBr in the United States, an effective alternative is needed. Greenhouse experiments were conducted to: 1) determine the effect of phenyl isothiocyanate (PITC) concentration and exposure period on yellow nutsedge sprouting and 2) compare the persistence of PITC in soil under Low Density Polyethylene (LDPE) and Virtual Impermeable Film (VIF) mulches. Additionally, field experiments were conducted in 2006 and 2007 to evaluate tomato and bell pepper tolerance and the effectiveness of PITC against yellow nutsedge, Palmer amaranth, and large crabgrass. The greenhouse experiments were organized as a completely randomized design with three replications. Soil containing yellow nutsedge tubers was treated with PITC at 500 and 5000 nmol g^{-1} dry soil and placed in closed glass jars from 0 to 21 d after treatment. Tubers were evaluated for sprouting for 21 d under greenhouse conditions following each exposure concentration and duration. Persistence of PITC applied to soil at 5000 nmol g^{-1} dry soil in glass jars which were open, closed, or covered with LDPE or VIF mulches from 0 to 21 d after treatment were compared. Phenyl ITC was extracted from two 25 g sub-samples of treated soil from each jar and analyzed by gas chromatography. The field experiments were organized in a randomized complete block design with 2 mulch types and 5 rates of PITC (15, 75, 150, 750, 1500 kg ha^{-1}), replicated four times. A standard rate of MeBr and a nontreated control was included for comparison. Phenyl ITC was applied to the soil and immediately incorporated using a roto-tiller. Raised beds were prepared after PITC incorporation and covered with LDPE or VIF mulch. Tomato and bell pepper were transplanted three weeks after applying the plastic mulch. Crop injury and weed control were visually rated every other week. Marketable fruits were harvested and graded according to USDA standards. Data were subjected to analysis of variance, and treatment means were separated using Fisher's protected LSD (α=0.05). Based on scatter plots, regression curves were fitted for rate response to weed control and crop injury after double square-root transforming the PITC rates.

A PITC concentration of 5000 nmol g^{-1} soil (equivalent to 750 kg PITC ha^{-1}) for 3 d in a closed environment reduced yellow nutsedge tuber germination by 98% compared to the nontreated control. PITC was more persistent in soil covered with VIF mulch compared with LDPE mulch. In field experiments, greater crop injury was observed in 2006 than in 2007. The difference in injury was due to the time holes were punched in the mulch prior to transplanting, which was 0 h in 2006 and 48 h in 2007. Unacceptable crop injury occurred in tomato and bell pepper at the highest phenyl ITC rate of 1500 kg ha^{-1}. Phenyl ITC at 750 kg ha^{-1} provided effective control of yellow nutsedge (82%), Palmer amaranth (95%), and large crabgrass (85%) through 4 wk after transplanting. Overall, VIF mulch improved weed suppression over the LDPE mulch. Moreover, tomato (54 tons ha^{-1}) and bell pepper (48 tons ha^{-1}) fruit yields when PITC was applied at 750 kg ha^{-1} in 2007 were equivalent to MeBr. It is concluded that the combination of PITC at 750 kg ha^{-1} beneath a VIF mulch provides effective weed control and tomato and bell pepper fruit yields comparable to MeBr when beds are allowed to aerate 48 h prior to transplanting.

WEED CONTROL AND PEACH RESPONSE TO SULFENTRAZONE HERBICIDE SYSTEMS. J.K. Buckelew, D.W. Monks, W.E. Mitchem, L.M. Jennings, North Carolina State University, Raleigh, NC.

ABSTRACT

Studies were conducted in 2006 at the Central Crops Research Station in Clayton, NC and in 2007 in an orchard near Vale, NC, to evaluate peach tree tolerance to sulfentrazone applied twice and sequentially at 0.21, 0.28, 0.35, and 0.42 kg ai ha^{-1}. Herbicides were applied in May and early August at Clayton. At Vale, herbicides were applied in March and June. Visual estimates of peach tree injury were determined at 4 and 8 weeks after each treatment application.

In addition to crop tolerance studies, a systems trial was conducted in 2007 in Vale, NC to determine weed response and peach tree response to the following sequentially-applied tankmixes: sulfentrazone at 0.21 or 0.28 kg ai ha^{-1} plus norflurazon at 1.34 kg ai ha^{-1}, sulfentrazone at 0.21 or 0.28 kg ai ha^{-1} plus oryzalin at 1.12 kg ha^{-1}, terbacil alone at 0.89 kg ha^{-1}, terbacil at 0.89 kg ha^{-1} plus rimsulfuron at 1.12 kg ha^{-1}, and flumioxazin alone at 0.28 kg ha^{-1}. Herbicide treatments were applied in March, and again in June. Visual estimates of percent weed control and percent bareground (area weed-free) were recorded at 4 and 8 weeks after each treatment application. Percent bareground is used in orchards to measure weed efficacy.

For both studies, trunk cross-sectional area (TCSA - a common measurement to indicate fruit tree growth) was measured 30 cm up from soil surface at the end of the season.

With respect to the tolerance trials, sulfentrazone did not injure peach trees or reduce TCSA.

In the systems study, all treatments provided excellent control of henbit (*Lamium amplexicaule* L.) and common lambsquarters (*Chenopodium album* L.) at 4 weeks after the first treatment timing. Sulfentrazone alone exhibited poor to fair control of large crabgrass (*Digitaria sanguinalis* L. Scop.) through the study, while flumioxazin, terbacil alone, terbacil plus rimsulfuron, and sulfentrazone plus norflurazon exhibited large crabgrass control of 95 % or higher. At eight weeks after the second treatment timing (the last rating date of the study), the plots treated with sulfentrazone plus norflurazon, sulfentrazone plus oryzalin, flumioxazin, terbacil, and terbacil plus rimsulfuron all exhibited 87 % or greater bareground, while the weedy check was 21 % bareground. With the weedy check excluded from statistical analysis, TCSA was the same across herbicide treatments.

BUCKWHEAT FOR WEED SUPPRESSION IN FLORIDA.[1] P. Huang, C.A. Chase, B.M. Santos, and X. Zhao; Department of Horticultural Sciences, University of Florida, Gainesville.

ABSTRACT

Buckwheat (*Fagopyrum esculentum*) is a promising cover crop species for sustainable and organic cropping systems with the potential to suppress weeds by competing for resources, limiting weed seed germination and propagule sprouting through soil microclimate modification, and allelopathy. An experiment was conducted in Citra, Florida in spring 2007 to evaluate optimal planting date for use of buckwheat as a cover crop for weed suppression in Florida. A strip-plot experimental design was used with 6 planting dates (Mar. 13, Mar. 27, Apr. 10, Apr. 24, May 8 and May 22) as main plot treatments. Three fallow treatments (buckwheat, harrowed control, and weedy control) were assigned to sub-plots and replicated three times. Buckwheat was drilled 2.5 cm deep at a rate of 56 kg/ha with an 18-cm interrow spacing. Photosynthetically active radiation, buckwheat plant height, leaf area index (LAI), cover percentage, and weed counts were determined weekly. Buckwheat and weed shoot biomass samples were collected at 35 days after planting (DAP). Subplots were mowed at 42 DAP and persistence of weed suppression was evaluated using weed counts at 2-week intervals for 6 weeks and by sampling weed biomass at 6 weeks after mowing. Data were analyzed using the Mixed procedure of SAS and least square means were compared using the PDIFF option. Maximum biomass (247 g/ m2), buckwheat height (66 cm), LAI (2.15), and cover percentage (89%) occurred with buckwheat planted on Apr. 24. Both biomass and LAI responded in a similar manner to planting date, increasing when planted after Apr. 10 and then decreasing with May planting dates. Buckwheat height and cover percentage were lowest with March planting dates, increased with April planting dates, then declined with May planting dates. Before mowing, weed biomass was lower with earlier planting dates than later planting dates, and monocots were the predominant weed species. The rate of increase in total weed biomass and monocot weed biomass was greater in the weedy control than in the buckwheat cover crop. Therefore, with the planting date of May 22 weed biomass in weedy control was 3.7 and 3.3-fold more, respectively, than buckwheat control. Dicot weed biomass was 3.1-fold less with buckwheat than with the weedy control when averaged over planting dates. After mowing, however, suppression of dicot weed biomass was not consistent with the result before mowing. Conversely, buckwheat reduction of total weed biomass and monocot weed biomass was similar to the harrowed control, but significantly better than weedy control. Total weed biomass and monocot weed biomass were more effectively suppressed with buckwheat planted in March and April than planted in May. These preliminary results suggest that when used as a cover crop for weed suppression in north central Florida, buckwheat should be planted prior to May 8.

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EFFECTS OF GLYPHOSATE AND GLUFOSINATE AT LOW RATES ON RICE. B.M. Davis*, Scott, R.C., and J.K. Norsworthy. Cooperative Extension Service, University of Arkansas, Little Rock, AR.

ABSTRACT

A study was conducted to assess the injury caused by low rates of glufosinate and glyphosate on rice. The experiment was conducted near Lonoke, AR in 2007. Wells and XP723 varieties were grown using conventional tillage practices. Herbicide treatments consisted of glyphosate applied at 0 kg ae/ha, 0.13 kg ae/ha, 0.26 kg ae/ha, and 0.53 kg ae/ha. Glufosinate was applied at 0 kg ai/ha, 0.07kg ai/ha, 0.15 kg ai/ha, and 0.31 kg ai/ha. These represent 0x, 1/2x, 1/4x and 1/8x rates, respectively. Treatments were applied at the 3-4 lf, ¼ inch panicle initiation (PI), and boot stages using Roundup Weathermax® (glyphosate) and Ignite280® (glufosinate). Applications were made using a pressurized CO_2 backpack sprayer with a four-nozzle boom delivering a spray volume of 93 liters per hectare. The study design was a randomized complete block with four replications. Visual injury, visual stunting, canopy heights (cm) (taken at heading), heading dates, flag leaf length, and days to heading were recorded for all treatments. Yields were obtained using a small plot combine and adjusted to 12.5% moisture.

Visual injury from the 3-to-4 lf timing for glufosinate ranged from 0 to 83% depending on rate at 2 weeks after treatment (WAT). Glyphosate injury at the 3-to-4lf timing ranged from 0 to 45% injury. At the ¼ inch PI timing glufosinate injury ranged from 16 to 78% and glyphosate injury ranged from 5 to 10% at 2 WAT. Injury at the boot timing for glufosinate ranged from 15 to 85%. Glyphosate at the boot timing did not show any increase in injury at any rate. By comparison glufosinate caused 15 to 85% more visual injury at the boot timings than glyphosate.

Canopy height was reduced the greatest when both herbicides were applied at the PI timing. Glyphosate reduced canopy height at the PI timing from 5 to 26 cm. Glufosinate applied at the PI timing reduced canopy heights from 7 to 24 cm.

Flag leaf length was not affected by either herbicide when applied at the 3-to-4 lf timing. Glufosinate reduced flag leaf length from 12 to30 cm when applied at PI. Glyphosate reduced flag leaf length from 3 to 21 cm when applied at PI. Both herbicides did not affect flag leaf length when applied at boot due to the emergence of the flag leaf prior to application.

Days to heading were not affected by either herbicide when applied at the 3-to-4 lf timing. However, days to heading was delayed by both herbicides when applied at the PI and boot timings. The greatest delay in heading occurred at the boot timing with glufosinate delaying heading from 34 to 44 days. Glyphosate delayed heading at the boot stage from 27 to 44 days.

Glufosinate applied at 0.31 kg ai/ha reduced the yield of Wells by 37% and XP723 by 29% when applied at the 3-to-4 lf timing. Glyphosate applied at 0.53 kg ae/ha reduced yields at the 3-4 lf timing of Wells by 65% and XP723 by 91%. When herbicides were applied at the PI timing yields were reduced from 9 to 70%. Glufosinate at 0.31 kg ai/ha reduced yield of Wells by 55% and XP723 by 39%. Glyphosate applied at 0.53 kg ae/ha reduced yields of both cultivars by 70%. Yields were reduced the greatest when herbicides were applied at the boot timing. Glufosinate applied at 0.31 kg ai/ha reduced yield of Wells by 93% and XP723 by 91%. When glyphosate was applied at 0.53 kg ae/ha yields were reduce by 93% for Wells and 95% for XP723.

BELL PEPPER TOLERANCE TO V-10142 AND THIFENSULFURON-METHYL. R.A. Pekarek, D.W. Monks, and K.M. Jennings; Department of Horticultural Science, N.C. State University, Raleigh.

ABSTRACT

Vertical weed seed movement has been shown to be influenced by tillage system. The objective of this study was to evaluate vertical movement of simulated weed seed following different conservation-tillage practices. The experiment was conducted in 2005 and 2006 on a Coastal Plain field at E. V. Smith Research and Extension Center near Shorter, AL. This site is an upland area with Marvyn sandy loam (fine-loamy, kaolinitic, thermic, Typic Kahapludults), 0-2% slopes. The experimental design was a randomized complete block design which contained a factorial treatment arrangement and 4 replications of each treatment. 10,500 1 mm ceramic beads (5,250 ≥ specific gravity of water; 5,250 ≤ specific gravity of water) were scattered evenly in nine equally divided square cells within a one square meter area in each plot, centered on the crop row, prior to tillage and irrigation treatments. Tillage treatments included: 1) none, 2) a KMC™ straight leg subsoiler, and 3) a bent leg Paratill™. Cotton was then planted using a row-cleaner equipped John Deere® MaxEmerge™ planter. Plots were then overhead irrigated with 0, 2.5, or 5 cm of water. The ceramic beads were then vacuumed from the nine cells separately. Additionally, visible beads outside the square meter were vacuumed into one sample. Following vacuuming, a 25 cm diameter soil core was taken to a maximum depth of 40 cm and divided vertically into 5 cm increments. Soil samples were then sieved. Beads from each sub-sample were removed, counted and expressed in percentages.

In both years statistical tests revealed that an interaction exists between tillage, irrigation and depth. Differences among irrigation are apparent among years, probably due to differences in soil conditions and climate.

PHYSIOLOGICAL BEHAVIOR OF ROOT-ABSORBED DISCLOSULAM IN PEANUT PITTED MORNINGGLORY, AND SICKELPOD. S.b. Clewis, W.J. Everman, D.L. Jordan, and J.W. Wilcut, North Carolina State University, Raleigh, NC.

ABSTRACT

Laboratory experiments using 14C-diclosulam were conducted to investigate differential tolerance exhibited by peanut, pitted morningglory, and sicklepod to root-applied diclosulam. Treatments were arranged in a randomized complete block design with six replications to evaluate absorption, translocation, and metabolism of diclosulam. For absorption and translocation studies, peanut plant roots, cotyledon pitted morningglory, and sicklepod were placed into 3 mL of 50% Hoagland's solution containing 1.85 kBq of 14C-diclosulam contained in 5 mL glass vials. Treated plants were harvested 4, 24, 48, or 72 HAT and roots washed with 10 ml of methanol:water (1/1, v/v) and 0.25% (v/v) nonionic surfactant (Induce®) solution to remove non-absorbed herbicide. A 1 mL aliquot from each stem wash was added to 25 mL of scintillation cocktail and quantified by liquid scintillation spectroscopy (LSS) (Packard® TRI-CARB 2100TR). Peanuts, pitted morningglory, and sicklepod were sectioned into two parts, shoot and roots. These parts were placed into paper bags and dried at 65 C for at least 72 h. The plant parts were then ground with a coffee grinder and subsample was oxidized in a biological oxidizer, where 14C was trapped in scintillation cocktail, and radioactivity quantified by LSS. For the metabolism portion of the study, plants were treated and harvested as previously described for absorption and translocation studies. Plant portions were ground in a tissue homogenizer with 10 mL of methanol. The homogenate was then rinsed into a vacuum filtration apparatus with an additional 10 mL of solvent. The remaining extracted plant material was oxidized and non-extracted 14C quantified as previously described. The filtrate was evaporated to near dryness and then brought to 0.5 mL volume with methanol, shaken, and stored at 4 C until analysis. 150 μL of each sample was spotted on a 20 by 20-cm silica gel thin layer chromatography (TLC) plate and developed to a 16-cm solvent front to separate the parent herbicide from possible metabolites. The solvent consisted of benzene:acetone:formic acid (30:10:1, v/v). TLC plates were partitioned into nine 2-cm wide lanes. A 14C-diclouslam standard was spotted on the first lane of each plate. The remaining eight lanes received a single replicate of a treated plant portion sample from each of the 3 species for the 6 runs of the studies. Plates were air dried and radioactive positions, proportions, and corresponding R*f* values were determined by scanning TLC plates with a radiochromatogram scanner. Radioactive trace peaks were integrated with Win-Scan software and the parent herbicide was identified by comparing R*f* values from the standard.

Absorption of 14C-diclosulam. At 4 HAT, absorption of applied 14C-diclosulam was 43 and 51% by pitted morningglory and sicklepod, respectively. Total 14C-diclosulam absorbed by pitted morningglory 72 HAT was 83% whereas sicklepod absorbed only 60%. Most of the herbicide was absorbed within the first 4 HAT for both weed species and both species exhibited linear 14C-diclosulam absorption with time. Peanuts absorbed 64% of the applied 14C-diclosulam at 4 HAT and absorbed 88% of the applied 14C-diclosulam 72 HAT. Most 14C-diclosulam was absorbed within the first 4 HAT and exhibited linear 14C-diclosulam absorption with time.

Translocation of 14C-diclosulam. The majority (>90%) of absorbed 14C-diclosulam remained in the roots of peanut with only 11% of absorbed 14C-diclosulam translocated to the shoots after 72 HAT. The majority (91%) of absorbed 14C-diclosulam occurred within the first 4 HAT for the roots of sicklepod. 60% of absorbed 14C-diclosulam remained in the roots of sicklepod with only 40% of absorbed 14C translocated to the shoots after 72 HAT. For pitted morningglory roots, 65% of absorbed 14C-diclosulam occurred within the first 4 HAT. However, 58% of absorbed 14C-diclosulam was translocated to the shoots within the first 24 HAT. 57% remained in the roots of pitted morningglory with 43% of absorbed 14C-diclosulam translocated to the shoots after 72 HAT.

Metabolism of 14C-diclosulam. The majority of the metabolism occurred within the first 4 HAT in the roots of peanut. Peanuts metabolized 14C-diclosulam rapidly with less than 40% of absorbed 14C-diclosulam remaining as parent herbicide 4 HAT. In the shoots of peanuts, a high number of metabolites were seen at 4 HAT as there was very limited translocation of 14C-diclosulam to the shoots of peanut. The majority of the metabolism also occurred within the first 4 HAT in roots of sicklepod. Sicklepod, like peanut, also metabolized 14C-diclosulam rapidly with less than 40% of absorbed 14C-diclosulam remaining as parent herbicide 4 HAT. In the shoots of sicklepod, again a high number of metabolites were seen at 4 HAT as there was very limited translocation of 14C-diclosulam to the shoots of sicklepod. Pitted morningglory had 37% of the 14C-diclosulam remain as parent herbicide 4 HAT and 30% 72 HAT. The regression slopes indicate slower metabolism by pitted morningglory compared to that of peanut and sicklepod. Visual systems of injury began to appear in the leaves of pitted morningglory 48 HAT.

Absorption into the roots for the three species was peanut > pitted morningglory > sicklepod. In pitted morningglory, there was rapid absorption and translocation to the shoots. 60% of the 14C-diclosulam was

metabolized a 4 HAT in pitted morningglory compared to >90% for both peanut and sicklepod. Therefore the increased uptake and translocation in pitted morningglory combined with the reduced metabolism results in more herbicidal activity and increased control. Peanuts and sicklepod exhibited limited translocation of 14C-diclosulam and can quickly metabolize it into a non-active form. This rapid metabolism and limited translocation results in peanuts and sicklepod having a high tolerance to soil-applied diclosulam. Differential tolerances exhibited by peanut, pitted morningglory, and sicklepod are likely due to differential translocation and metabolism. Weeds that do emerge through a diclosulam treatment continue to absorb and distribute the herbicide throughout the plant. Although only a portion of the diclosulam taken up by the pitted morningglory reaches the growing points, this quantity is more than sufficient to provide satisfactory control.

EFFECT OF SHADE ON TEXASWEED (*CAPERONIA PALUSTRIS*) EMERGENCE AND GROWTH. R.K. Godara, B.J. Williams and A.B. Burns; Louisiana State University Agcenter, Baton Rouge, LA.

ABSTRACT

Field experiments were conducted at Northeast Research Station near St. Joseph, La. to study the effect of shade on Texasweed (*Caperonia palustris*) emergence and growth. Shade levels of 0, 30, 50, 70 and 90% were achieved using cubical (1.82 m side) shade cloth. Shade intensities expressed as PAR with the polypropylene fabric were confirmed within three percent using an AccuPAR Linear PAR Ceptometer. Temperatures inside the shade tents were ± 2° C of the ambient air temperature out side the tents.

Emergence study involved planting of 75 Texasweed seeds, one cm deep, in 3L capacity plastic pots filled with Sharky clay soil taken from a rice field with no Texasweed infestation history. Treatments consisted of five shade levels: 0, 30, 50, 70 and 90%. The experiment was laid out as an RCB design with four replications and four pots were used for each tent. Texasweed emergence was recorded weekly over one month duration. Total emergence was tested for differences using ANOVA. There were no significant differences in emergence under various shade levels, and 60-70 percent emergence was observed under all the shade levels.

The growth response experiment was conducted on potted plants (3L capacity pots). Three uniform sized plants were retained per pot at first thinning (3 days after emergence), which after 30 days of emergence were further thinned to one plant per pot. Treatments for the experiment were different shade regimes obtained by transferring plants (pots) to increasing shade level every two weeks. For plants emerging under 0% shade the different regimes were R1: 0 %, R2: 0% - 30%, R3: 0% - 30% - 50%, R4: 0% - 30% - 50% - 70%, R5: 0% - 30% - 50% - 70%- 90% shade. Similarly there were different shade regimes for plants emerging under 30, 50, 70 and 90% shade. Once transferred to highest shade level of the respective shade regime (treatment) Texasweed grew undisturbed for rest of the duration. The experiment was laid out as a RCB design with four replications. Plant height, leaf count and dry weight per plant were recorded every two weeks. Canopy diameter and seed production was also recorded at the time of last observation. Texasweed growth under different shade regimes was modeled by fitting a nonlinear Gompertz growth model using NLIN procedure of SAS. The growth parameters thus estimated, canopy width and fruit production were tested for differences using ANOVA. Texasweed seed production decreased significantly with the increasing shade level. Canopy width was highest in case of 0% shade and was significantly different from that observed under most of the shade regimes. Texasweed could grow satisfactorily under 30% and 50% shade, but not under 70% and 90% shade. In general, Texasweed plants transferred gradually to any shade level produced higher dry matter compared to the plants transferred directly to that shade level.

It can be concluded that studies involving transfer of plants gradually to increasing shade levels are better at simulating the growth of weeds under a crop canopy. Effective use of shading as a strategy for Texasweed management will require a crop to provide 50-70% ground cover within 30 days of planting.

PHYSIOLOGICAL AND MORPHOLOGICAL ACCLIMATION OF PALMER AMARANTH TO SHADING. P. Jha, J.K. Norsworthy, D.G. Bielenberg, M.B. Riley, and M.S. Malik. Clemson University, Clemson, SC; University of Arkansas, Fayetteville, AR.

ABSTRACT

Palmer amaranth, a dioecious summer annual, is one of the most problematic weeds in row crop production in the southern United States. Characterizing the physiological and morphological response of Palmer amaranth to shading would improve our understanding of crop-weed competition and weed population dynamics. It would also aid selection of crop planting densities and row spacings as an efficient tool for reducing weed interference, especially from those cohorts that emerge after crop emergence. Based on the previous research on C_4 species, we hypothesized that Palmer amaranth would be shade sensitive; however, documented research on shade acclimation of Palmer amaranth is lacking. The objectives of this research were to 1) investigate the effects of shading on Palmer amaranth photosynthetic light response and 2) describe Palmer amaranth physiological and morphological characteristics typically associated with shade acclimation.

Palmer amaranth seeds were collected in fall 2006 and experiments were conducted in June and July 2007 at Clemson, SC. The experiment was arranged in a completely random design with four replications (one plant constituted a replication) and was repeated (June and July plantings). Plants were grown in the field beneath black shade cloths providing 47 and 87% shade and in full sunlight (no shading). Daily minimum and maximum temperatures were recorded to calculate growing degree days (GDD; base 10 C). Plant height, number of leaves, and main stem branches were recorded once weekly for 4 wk after subjecting the plants to various levels of shading. After 4 wk, photosynthetic measurements were taken on the two most recently fully expanded leaves using a portable photosynthetic system. Photosynthetic rates at each shade level were determined at 30 C, 19 mbar moisture, 380 ppm external CO_2 concentration (ambient), and at photosynthetic active radiation (PAR) levels of 0 (dark respiration), 50, 100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 800, 1000, and 1200 µmol m^{-2} s^{-1}. Following photosynthetic measurements, leaves were excised from the plant and specific leaf area was calculated as the ratio of leaf area to leaf weight expressed in cm^2 g^{-1}. A single leaf in close proximity to the leaves used for photosynthetic measurements was excised from each plant for chlorophyll determination using UV/VIS spectrophotometer.

Palmer amaranth photosynthetic rate at the highest measured PAR (1200 µmol m^{-2} s^{-1}) was 45.8 and 42.4 µmol m^{-2} s^{-1} in 0 and 47% shade, respectively, and was reduced to 24.9 µmol m^{-2} s^{-1} in 87% shade. Light-saturated photosynthetic rates were predicted to occur at intensities of 2953 and 2865 µmol m^{-2} s^{-1} PAR for plants grown under 0 and 47% shade; however, 1388 µmol m^{-2} s^{-1} PAR were predicted to cause light-saturating photosynthetic rates in plants grown under 87% shade. Plants acclimated to increased shading by decreasing light-saturated photosynthetic rates per unit leaf area from 60.5 to 26.4 µmol m^{-2} s^{-1}. Rate of increase in plant height was similar among shade levels. Plants responded to increased shading by a 13 to 44% reduction in leaf appearance rate (leaf number GDD^{-1}) and a 22 to 63% reduction in main stem branch appearance rate (main stem branch number GDD^{-1}) compared with full sunlight. Palmer amaranth specific leaf area increased from 68 to 97 cm^2 g^{-1} as shading increased to 87%. Plants acclimated to 47% shade by increasing total leaf chlorophyll from 22.8 µg cm^{-2} in full sunlight to 31.7 µg cm^{-2} when shaded. However, plants grown under 87% shade failed to increase leaf chlorophyll content, which resulted in reduced photosynthetic rates. In conclusion, Palmer amaranth, a C_4 plant, is well adapted to elevated PAR environments because of high light-saturated photosynthetic rates. Photosynthetic efficiency of plants was reduced under 87% shade, but plants showed physiological and morphological acclimations to shading.

EFFECT OF EMERGENCE DATE ON PHENOLOGICAL DEVELOPMENT AND SURVIVAL OF WILD RADISH (*RAPHANUS RAPHANISTRUM*). M.S. Malik, J.K. Norsworthy, M.B. Riley, and P. Jha, Department of Entomology, Soils, and Plant Sciences, Clemson University, Clemson, SC; Department of Crop, Soils, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

ABSTRACT

Wild radish is an indeterminate, facultative winter annual that emerges throughout the year in the southeastern United States. It is most commonly found in abandoned fields, along roadsides, and in active crop production fields in early spring prior to crop establishment and in late fall following crop harvest. Due to the abundance of wild radish and its frequent occurrence with cultivated crops, there is the need to understand its phenological development to aid management strategies to minimize seed production and success of this weed in crops. Field experiments were conducted from 2004 through 2006, at Clemson, SC, to determine the influence of seasonal emergence of wild radish on phenological development, survival, and seed and biomass production. The experimental design was a randomized complete block with 12 sowing dates, which occurred after the second week of each month. Duration of four developmental phases – emergence to bolting, bolting to flowering, flowering to silique formation, and silique formation to senescence – was recorded following monthly sowing of approximately 200 wild radish seeds per 10 m row. Wild radish seedlings were thinned to 25 plants per row within 2 weeks of emergence. Four replications of these plants were monitored for survival from emergence through bolting. Aboveground biomass of 4 plants per replication was harvested at bolting, flowering, silique formation, and senescence. Seed production was determined from those plants harvested at senescence. The importance of growing degree days (GDD; base 4.5 C) and daylength (photoperiod) on the duration of the developmental phases were evaluated using linear regression analysis in SAS. Seed and biomass production data were subjected to ANOVA, and means were separated using Fisher's protected LSD at $\alpha = 0.05$.

Seedling emergence occurred 2 to 4 weeks after sowing for all planting dates. Seedlings emerged when seeds were sown each month from mid-November through mid-February; however, none of these plants survived the winter months. Those plants emerging in October following the mid-September sowing had bolted by early December, and all of these plants persisted through the winter months. Similarly, plants emerging in November following the mid-October sowing had formed a rosette of 5 to 6 leaves by early December, and these plants persisted through the winter months. Wild radish plants emerging from April through August completed their life cycle during the summer or early fall prior to winter. Planting dates also had an effect on phenological development and duration of the developmental stages. The stages most affected by planting dates were emergence to bolting and bolting to flowering. Plants that emerged in the summer months had a reduced duration for each of these phases relative to plants emerging in early fall. The duration of emergence to bolting ranged from 12 to 120 days, and bolting to flowering ranged from 11 to 90 days. The total life cycle of wild radish varied from a low of 66 days following mid-May sowing to 247 days following mid-October sowing. Duration of developmental phases of wild radish was also affected by temperature and photoperiod. Linear regression analysis revealed that temperature mainly controlled the duration of emergence to bolting and bolting to flowering. However, the duration of flowering to silique formation was dependent on both temperature and photoperiod. Photoperiod had no appreciable influence on the duration of silique formation to senescence. Seed and biomass production was influenced by sowing date with as few as 1,470 seeds/plant produced when emergence occurred in July following mid-June sowing. Plants that emerged in November following the mid-October sowing produced an average of 10,170 seeds. Plants that emerged in October and November exhibited minimal growth during the winter months. However, conditions during late March and April were highly conducive for growth; thus, these plants were the most robust of the twelve planting dates, with biomass production as high as 808 g/plant at silique formation following November emergence. The ability of wild radish to complete its life cycle over a wide array of environmental conditions in as few as 2 months contributes to the success of this weed in crop production fields in the southeastern United States.

CLEARFIELD SUNFLOWER TOLERANCE TO CADRE. E.P. Prostko, Department of Crop & Soil Sciences, The University of Georgia, Tifton, GA.

ABSTRACT

Clearfield sunflowers (*Helianthus annuus* L.) are hybrid sunflowers that were bred for resistance to certain members of the imidazolinone (IMI) herbicide family. The Clearfield sunflower trait was originally discovered in 1996 by weed scientists from Kansas State University. Clearfield sunflowers became commercially available in 2003. Currently, the only IMI-herbicide registered for use on Clearfield sunflowers is Beyond (imazamox). Since Beyond is ineffective on many weeds that are common to the southern region, particularly sicklepod (*Senna obtusifolia* L.), there has been much interest in the tolerance of Clearfield sunflowers to other members of the IMI-family of herbicides. In Georgia, Cadre (imazapic) is a widely used peanut herbicide that growers would prefer to use on Clearfield sunflowers because of its broader spectrum of control and abundant availability. Therefore, the objective of this research was to evaluate the tolerance of three Clearfield sunflower hybrids to POST applications of Cadre.

A field trial was established in 2007 at the UGA Ponder Research Farm located near Tifton, GA. All treatments were arranged in a split-plot design with four replications. Whole plots were sunflower hybrids (Dekalb DKF3880CL, Mycogen 8N386CL, Mycogen 8H419CL) and sub-plots were herbicides (NTC, Beyond 1AS @ 4 oz/A + Activator 90 @ 0.25% v/v + 28% UAN @ 2.5% v/v; Cadre 2AS @ 4 or 8 oz/A + Activator 90 @ 0.25% v/v). The sunflower hybrids were planted on April 2 and the herbicides were applied on May 1 (29 DAP). All herbicides were applied with a CO_2-powered, backpack sprayer calibrated to deliver 15 GPA using 11002DG flat-fan nozzles. At the time of application, the sunflowers were 3-6" tall with 6-8 leaves. The entire plot area was maintained weed-free throughout the season using a PRE application of Prowl H_2O 3.8ASC (pendimethalin) @ 2 pt/A + Spartan 4L (sulfentrazone) @ 3.5 oz/A, mechanical cultivation, and hand-weeding.

Plant height and above-ground biomass data (fresh weight) were collected 8 and 31 days after treatment (DAT) by measuring and harvesting five plants from each plot. Total seed-head numbers were counted from one row in each plot. Seed-head weights (fresh) were collected by harvesting five heads from each plot at maturity. All data were subjected to ANOVA and means separated using Fisher's Protected LSD Test (P = 0.10) when appropriate.

There was no interaction between sunflower hybrid and herbicide. Cadre @ 8 oz/A caused significant sunflower chlorosis early in the season. Cadre 2AS @ 4 or 8 oz/A had no effect on sunflower biomass, height, seed-head production, or seed-head weight. These results suggest that the Clearfield sunflower hybrids evaluated in this study have adequate tolerance to Cadre.

AMINOPYRALID USE IN ARKANSAS RICE. R.C. Scott, K.L. Smith, and J.K. Norsworthy; University of Arkansas, Division of Agriculture, Lonoke, AR 72086.

ABSTRACT

Aminopyralid is a member of the pyridine carboxylic acid group of herbicides. It is currently registered for use in rangeland, pasture, and non-crop areas and other road side, ditch and natural areas under the trade name Milestone™. It primarily has activity on broadleaf weeds with both postemergence and preemergence (PRE) activity. It will provide residual control of many weeds at relatively low rates. Recently, studies have been conducted evaluating the potential of aminopyralid as a rice herbicide. Aminopyralid appears to have good activity on hemp sesbania, northern jointvetch and other weeds that are typically missed by pre-emerge applications of clomazone (Command 3ME), the most widely used grass herbicide in rice. Potentially, aminopyralid could be an excellent tank-mix partner for clomazone in rice. At the current rates being evaluated, it also has the potential to be quite economical to growers.

The objectives of this research were to 1) evaluate the efficacy of aminopyralid on common broadleaf weeds in rice when used in combination with clomazone herbicide and 2) to evaluate crop safety at rates required for sufficient weed control. Studies were conducted in 2007 to evaluate weed control and crop safety to DE-750 TIPA (aminopyralid) in rice. Two studies were conducted on silt loam soils near Lonoke and Stuttgart, AR. Two additional studies were also conducted on clay soils near Keiser, and Rohwer, AR. Herbicide treatments were Command 3 ME (clomazone) at 1.6 pt/A tank mixed with 0.5, 1, 2, and 4 oz/A of Milestone (aminopyralid) applied PRE.

Weeds controlled from the residual activity of aminopyralid greatly complimented Command 3 ME herbicide. Aminopyralid at 1 to 4 oz/A provided 90% control and higher of hemp sesbania, entireleaf morningglory, annual sedge, and northern jointvetch. Aminopyralid displayed excellent crop safety in four of five University of Arkansas locations in 2007 at rates as high as 4 oz/A (one study was not included in this report). On silt loam soils at Lonoke and Stuttgart and the clay soil at Keiser, soybean injury with any aminopyralid rate was 15% or less. Significantly higher soybean injury was observed in the Rohwer study. At 2 WAT, injury ranged from 33 to 85%, and at 4 WAT ranged from 0 to 80%. Increased rice injury at Rohwer may be attributed in part to higher rainfall levels immediately following application and during rice emergence, however, all other locations were either irrigated or received natural rainfall following application. Due to these injury inconsistencies between locations, further evaluation of rice tolerance under multiple environmental conditions is needed.

Crop rotational concerns remain high, especially to soybean. However, rates as low as 0.5 oz/A were still providing control of some key weeds missed by Command 3 ME. Further evaluation of the rate structure of aminopyralid for rice is needed.

EFFECT OF ADJUVANT SELECTION ON WEED CONTROL IN DRILL-SEEDED RICE WITH SELECTED HERBICIDES. A.B. Burns, B.J. Williams and R.K. Godara. LSU AgCenter, Baton Rouge, LA.

ABSTRACT

In 2006 and 2007, several studies on the effect of adjuvant class on weed control in drill-seeded rice with penoxsulam, bispyribac and cyhalofop were conducted at the Northeast Research Station near St. Joseph, LA on a Sharkey Clay soil. Traditionally, crop oil concentrate (COC) has been recommended for penoxsulam and cyhalofop and an organo-silicone has been recommended for bispyribac. In 2006 and 2007, penoxsulam efficacy when mixed with organo-silicone, COC, modified seed oil (MSO) or organo-silicone plus MSO premixes (blend) was evaluated. Several representatives from each class were included. Two additional studies were conducted in 2007. In the first study, bispyribac efficacy when mixed with MSO, non-ionic surfactant (NIS), organo-silicone, blends and blends plus N was evaluated. In the second study, cyhalofop efficacy when mixed with COC, MSO, NIS, organo-silicones or blends was evaluated. In all studies, rice was seeded at 100 kg/ha to plots measuring 2 by 4.5 m. Permanent floods were established 4 to 5 weeks after planting. Nitrogen, in the form of urea, was applied at 126 kg/ha just before permanent flood. At panicle initiation an additional 42 kg/ha of nitrogen was applied. Herbicide treatments were applied in 140 L/ha of water using a CO_2 pressurized backpack sprayer. The experimental design for all trials was an RCB. Barnyardgrass (<i>*Echinochloa crus-galli*</i>(L.) Beauv.), sesbania (<i>*Sesbania exaltata</i>* (Raf.) Rydb. ex A.W.Hill) and volunteer soybean (<i>*Glycine max</i>*) control with penoxsulam did not differ when mixed with COC, MSO or blends. Texasweed (*Caperonia palustris* (L.) St. Hil.) control, however, was best when penoxsulam was applied with an MSO. Applying penoxsulam with MSO resulted in 57 to 88% Texasweed control. Texasweed control was slightly lower (63 and 73%) when penoxsulam was applied with a blend. The lowest (33 to 63%) Texasweed control was observed when penoxsulam was applied with COC. A clear trend on the effect of adjuvant selection on weed control with bispyribac could not be established. Variability within and adjuvant class was equal to that observed between classes. Barnyardgrass control 2 weeks after application (WAA) was similar when cyhalofop was applied with COC, MSO, NIS, organo-silicone or blends. However, at 4 WAA cyhalofop failed to control barnyardgrass when applied with NIS. Cyhalofop applied with all other adjuvants resulted in similar levels of control. These data suggest that the control of some weeds, like Texasweed, can be improved when penoxsulam is applied with an MSO instead of COC. Clear trends on the effect of adjuvant class on weed control with bispyribac and cyhalofop were not established. However, adjuvant selection did affect weed control dramatically demonstrating the need to choose a quality adjuvant.

EVALUATION OF RIMSULFURON FOR PREPLANT WEED CONTROL IN CORN. B.J. Williams, R.K. Godara and A.B. Burns. LSU AgCenter, Baton Rouge, LA.

ABSTRACT

In 2006 and 2007, studies conducted to evaluate combinations of glyphosate, atrazine and rimsulfuron for preplant weed control in corn at the Northeast Research Station near Saint Joseph, La. on a Commerce Silt Loam soil. Roundup Ready corn was planted at 67, 000 seed/ha to plots measuring 5 by 15 M. Nitrogen, in the form of 32% UAN, was applied at 81 kg/ha two weeks after corn emergence. Treatments were 1.12 kg/ha glyphosate, glyphosate plus 1.12 kg/ha 2, 4-D, glyphosate plus 0.56 kg/ha atrazine, glyphosate plus atrazine plus 13 g/ha rimsulfuron, glyphosate plus atrazine plus 17 g/ha rimsulfuron, glyphosate plus 13 g/ha rimsulfuron and glyphosate plus 17g/ha rimsulfuron and were applied 15 days before planting. After corn emergence all weeds were removed with 1.12 kg/ha glyphosate plus 1.7 kg/ha atrazine at V3 followed by 1.12 kg/ha glyphosate plus 1.12 kg/ha atrazine at V6. Herbicide treatments were applied, using CO2 pressurized backpack sprayer calibrated to deliver 140 L/HA. The experimental design was a randomized complete block. Glyphosate plus 17 kg/ha rimsulfuron was as effective at controlling cutleaf eveningprimrose (<i>*Oenothera laciniata</i>*), henbit (<i>*Lamium amplexicaule</i>*), swinecress (<i>*Coronopus didymus</i>*) and annual bluegrass (<i>*Poa annua</i>*) as glyphosate plus 2, 4-D or glyphosate plus atrazine. The data indicates that rimsulfuron rates should not be reduced below 17 kg/ha. Rimsulfuron provided excellent early season (2 WAP) broadleaf signalgrass (<i>*Brachiaria platyphylla</i>*) control. Glyphosate alone, glyphosate plus 2, 4-D and glyphosate plus atrazine resulted in 0, 0, and 60% signalgrass control 2 WAP. The improved signalgrass control from rimsulfuron also resulted in better corn yields than glyphosate alone, glyphosate plus 2, 4-D or glyphosate plus atrazine. Adding 17 g/ha rimsulfuron to glyphosate plus atrazine increased yields by 20 bu/A. Based on these data rimsulfuron will be excellent tool for managing weeds prior to planting corn.

HALOSULFURON CROP SAFETY AS A PRE-PLANT HERBICIDE FOR SOYBEAN. T.W. Dillon, R.C. Scott, N.D. Pearrow, and B.M. Davis; University of Arkansas, Division of Agriculture, Lonoke, AR 72086.

ABSTRACT

Permit (halosulfuron) is a selective herbicide for the control of broadleaf weeds and sedges in several crops. Permit is not currently labeled for use in soybean and has a nine month plant-back interval for soybean. If a shorter crop-rotation restriction could be established, Permit could be a valuable tool for controlling yellow nutsedge (*Cyperus esculentus*) prior to planting.

Studies were conducted in 2007 at the University of Arkansas at Pine Bluff farm near Lonoke, AR, to evaluate the effects of Permit on soybean when applied preplant. Experimental design was a randomized complete block with four replications. Soybean variety DK4967 (a non-STS® tolerant variety) was planted at 74 lbs/A using a no-till drill. Herbicide treatments were Permit at 1, 2, 3, and 4 oz/A applied and 0, 7, and 14 days preplant (DPP). In order to visualize what severe Permit injury might look like, a 10 oz/A Permit rate applied PRE was also included. All plots were maintained weed-free using applications of Roundup Weathermax as needed. Plots received at least 0.5 in of natural rainfall or irrigation after each treatment timing to maximize Permit effects on the soybean crop.

Permit at 1 to 2 oz/A applied 14 DPP had no significant soybean injury 2, 4, or 8 WAP, with soybean injury ranging from 5 to 28%. Although Permit applied 7 DPP had significant soybean injury 2 and 4 WAP (35 to 58%), by 8 WAP no significant soybean injury was seen (0 to 10%). Further research would be needed before 7 DPP applications could be recommended, with other factors such as the effect on canopy closure due to early season injury evaluated. Permit applied 7 and 14 DPP had no significant impact on soybean canopy height at 10 WAP, soybean maturity date at 18 WAP (as illustrated by percent leaf drop), or soybean yield. Permit applied 0 DPP generally showed significant soybean injury at all timings (61 to 99%), as well having significant impacts on soybean canopy height (7 to 27 cm height decrease), maturity, and yield (21 to 52% yield reduction).

PALMER AMARANTH CONTROL OPTIONS FOR SOYBEAN IN THE ABSENCE OF GLYPHOSATE.
B.A. Goldschmidt, R.C. Scott, K.L. Smith, and J.W. Dickson; Division of Agriculture, University of Arkansas, Lonoke, AR 72086.

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ABSTRACT

Glyphosate-resistant Palmer amaranth (*Amaranthus palmeri*) was first confirmed in the United States in Georgia in 2004. Other resistant populations have since been confirmed in Arkansas and Tennessee. Arkansas's first glyphosate-resistant Palmer amaranth population was confirmed in 2006 from a producer's field in Mississippi county. Arkansas now has several different confirmed fields containing resistant Palmer amaranth. Glyphosate has shown to be very effective in controlling *Amaranthus* weed species. Because of extensive use of glyphosate as the primary method of weed control in soybean, the occurrence of glyphosate-resistant Palmer amaranth has become a concern for a number of producers and researchers.

Two studies were conducted at the Newport Research Station 1) to evaluate Palmer amaranth control with Ignite 280 SL herbicide in Liberty Link soybean and 2) to determine the value of residual herbicides in a Liberty Link system. Experimental design was a randomized complete block with four replications. Glufosinate-resistant soybean was planted with a seed drill at 60 lbs/A. Herbicide treatments for Study 1 were Ignite 280 SL at 22, 32, and 42 oz/A applied at 5-in or 5-ft Palmer amaranth or sequentially at 5-in and 5-ft Palmer amaranth. The 5-ft amaranth application timing developed due to severe drought, but illustrated the limits of Ignite herbicide for control of large Palmer amaranth. Herbicide treatments for Study 2 were Prefix at 1 qt/A, Valor 51 WG applied at 2 oz/A, Prowl H2O 3.8 CS at 2.1 pt/A, and Valor 51 WG + Prowl H2O 3.8 CS at 2 oz/A and 2.1 pt/A. These herbicides were applied preemergence (PRE). Although all treatments were scheduled to be followed by an Ignite application, only Prowl H2O treatments were followed by Ignite 280 SL at 22 oz/A applied at 9-in or 3-ft Palmer amaranth. All other treatments provided excellent Palmer amaranth control, and sequential applications of Ignite 280 were not needed. PRE applications were activated by use of sprinkler irrigation for a total of 1 in simulated rainfall approximately 12 days after application.

When using Ignite, Palmer amaranth size was more important than herbicide rate, and Ignite must be applied to small Palmer amaranth for effective control. All rates of Ignite 280 controlled 5 in Palmer amaranth 98 to 100%. Control of 5 ft amaranth ranged from 56 to 73%, significantly less control than on smaller amaranth. Prefix, Valor, and Prowl H_2O + Valor were highly effective in controlling Palmer amaranth. By 7 WAT, these herbicide treatments continued to control Palmer amaranth 100%. Prowl H_2O was not effective for Palmer amaranth control unless tank mixed with another residual herbicide or followed by a postemergence Ignite application to small amaranth. When applied alone, Palmer amaranth control ranged from 78 to 86%. When tank mixed with Valor or followed by Ignite applied to 9 in Palmer amaranth, control increased to 100%.

Although Ignite effectively controlled Palmer amaranth when used in single or sequential applications, it should be used in conjunction with residual herbicides to help prevent weed resistance.

EVALUATION OF GOAL 2XL, GRASP, PYTHON, AND FIRSTRATE FOR FALLOWBED WEED CONTROL AND CROP TOLERANCE IN COTTON AND SOYBEAN. D.K. Miller and M.S. Mathews, Northeast Research Station, LSU AgCenter, St. Joseph.

ABSTRACT

A field study was conducted in 2007 at the Northeast Research Station near St. Joseph, La. to evaluate weed control and soybean and cotton tolerance following late fall/early winter herbicide application. Treatments evaluated included Goal 2XL (oxyflurofen) at 16 oz/A, Grasp (penoxsulam) at 1 oz/A alone or plus Goal 2XL at 16 oz/A, Python (flumetsulam) at 1 oz/A alone or plus Goal 2XL at 16 oz/A, and Firstrate (chloramsulam) at 0.6 oz/A alone or plus Goal 2 XL at 16 oz/A. Treatments were applied at 15 GPA on 11/11/06 to a silty clay loam soil with pH 5.8. Weeds present were ≤1 inch in size in each 6.67' x 25' plot. Cotton 'DP 164 B2RF' and soybean 'DK 4967 RR' were planted in each plot on 5/2/07. Parameter estimates included visual weed control 125 d after treatment (DAT), visual crop injury 7 and 15 d after planting (DAP), and crop height 28 and 56 DAP.

At 125 DAT, control of henbit (94 to 100 %) and annual bluegrass (93 to 100%) was greatest following application of Firstrate alone or all Goal 2XL combination treatments. Control of cutleaf evening primrose was at least 88% for all treatments. Swinecress control was at least 86% and similar among all treatments except Goal 2XL (63%) and Grasp (76%) applied alone. Treatments including Python applied alone or in combination with Goal 2XL at 7 (31 to 40%) and 15 (18 to 26%) DAP resulted in greatest cotton injury. Cotton injury for all other treatments was no greater than 11 and 5% at these respective evaluation timings. Soybean exhibited no visual injury at either evaluation interval. Cotton height differences among treatments were not observed at 28 or 56 DAP. Soybean height 28 DAP averaged 14 cm following application of Firstrate alone, which was equivalent to height following Grasp alone (11 cm) and Goal 2XL applied in combination with Python (14 cm) or Firstrate (13 cm), and greater than all other treatments. At 56 DAP, soybean height following application of Firstrate alone averaged 59 cm, which was equivalent to the 51 cm for Python alone, and greater than all other treatments. Lack of significant rainfall early to mid-season resulted in extreme variability in yield, therefore yield data will not be discussed.

Good control of winter weeds evaluated can be achieved 125 DAT with Firstrate and Goal 2XL in combination with Grasp, Python, or Firstrate. Application of Python can result in early season visual cotton injury. Further research is needed to evaluate injury impact on crop yield.

EVALUATION OF ATRAZINE AND RESOLVE FOR FALLOWBED WEED CONTROL. D.K. Miller and M.S. Mathews. Northeast Research Station, LSU AgCenter, St. Joseph.

ABSTRACT

A field study was conducted in 2007 at the Northeast Research Station near St. Joseph, La to evaluate weed control and soybean and cotton tolerance following winter herbicide application. Treatments evaluated included Roundup Weathermax (glyphosate) at 22 oz/A applied in combination with atrazine at 16 or 32 oz/A, Salvo (2,4-D) at 12.8 oz/A, Harmony Extra (thifensulfuron + tribenuron) at 0.3 oz/A, or Resolve (rimsulfuron) at 1 or 2 oz/A. Treatments were applied at 15 GPA on Jan. 26 to a silt loam soil with pH 6.8. Cotton 'DP 164 B2RF' and soybean 'DK 4967 RR' were planted in each plot on May 2. Parameter estimates included visual weed control 28, 59, and 84 d after treatment (DAT), visual crop injury 7, 15, and 28 d after planting (DAP), and crop height 15, 28, and 56 DAP.

At 28 DAT, control of swinecress, shepherdspurse, and annual bluegrass was at least 98% and equal among all treatments. Henbit was controlled 99% with atrazine at 32 oz/A, which was equal to control with Resolve (95 and 96%), and greater than control with Salvo (88%) and Harmony Extra (89%). At 59 DAT, results were similar with at least 95% control of all weeds except henbit, which was controlled greatest by atrazine at the high rate and Resolve (94 to 99%). At 84 DAT, entireleaf morningglory, broadleaf signalgrass, swinecress, shepherdspurse, and annual bluegrass were controlled at least 90, 83, 94, 90, and 99% and equally by all treatments while henbit control was greatest with atrazine and Resolve (99 to 100%) in comparison to Salvo (78%) and Harmony Extra (80%). Soybean injury was no greater than 1% at any evaluation interval. Cotton injury ranged from 1 to 8%, 3 to 6%, and 0% at 7, 15, and 28 DAP, respectively, with no differences noted among treatments. Cotton and soybean height was equivalent among all treatments at each evaluation interval. Lack of significant rainfall early to mid-season resulted in extreme variability in yield therefore yield data will not be discussed.

Winter application of atrazine and Resolve to fallowbeds can provide excellent POST and residual control of henbit, swinecress, shepherdspurse, and annual bluegrass and residual control of entireleaf morningglory and broadleaf signalgrass. Further research is needed to assess impact on crop yield.

TWO-YEAR EVALUATION OF COTTON TOLERANCE TO POST APPLICATION OF PROWL H_2O.
D. R. Lee, D. K. Miller, and M. S. Mathews. Northeast Research Station, LSU AgCenter, St. Joseph.

ABSTRACT

Field studies were conducted at the Northeast Research Station in St. Joseph, La in 2006 and 2007 to evaluate application timing effects on Roundup Ready Flex cotton tolerance to postemergence application of Prowl H_2O. Treatments evaluated included Roundup Weathermax (glyphosate) at 32 oz/A applied alone or in combination with Prowl H_2O (pendimethalin) at 32 or 64 oz/A or Dual Magnum (s-metolachlor) at 16 or 32 oz/A. Treatments were applied to STV 4554 B2RF cotton in 2006 and DP 164 B2RF cotton in 2007 at the 4 to 5 or 6 to 8 leaf growth stage. Treatments were evaluated in a randomized complete block experimental design with four replications. Treatments were applied to each 6.67' by 40' plot at 15 GPA. Parameters measured included cotton injury and height 14 and 21 d after treatment (DAT) and seedcotton yield.

In 2006, 14 d after the 4 to 5 leaf application, Prowl H_2O at 32 (13%) or 64 oz/A (16%) and Dual Magnum at 32 oz/A (12%) resulted in similar injury, which was greater than the 6% observed with Dual Magnum at 16 oz/A. Injury following the 6 to 8 leaf application was no greater than 1% for any treatment. In 2007, averaged across application timing, injury with Prowl H_2O applied at 64 oz/A resulted in greatest injury of 11%. Prowl H_2O applied at 32 oz/A and Dual Magnum applied at 32 oz/A resulted in equivalent injury of 4 and 7%, respectively. Averaged across herbicide treatment, injury was greater following the 4 to 5 leaf application timing (8 vs 2%). At 21 DAT, injury was no greater than 1% following either application in both years. All treatments in both years resulted in similar plant height at 14 and 21 DAT. Cotton yield following application of Prowl H_2O or Dual Magnum ranged from 3250 to 3520 lb/A in 2006 and 2380 to 2589 lb/A in 2007 and was not reduced in comparison to yield for Roundup Weathermax applied alone.

POST over-the-top application of Prowl H_2O to 4 to 5 leaf cotton can result in greater initial injury than 6 to 8 leaf application. Injury observed was transient and not evident 21 DAT and did not result in negative effects on cotton growth or yield.

SURFACE RUNOFF LOSSES OF COTTON HERBICIDES: EFFECTS OF TILLAGE AND COVER CROP. L.J. Krutz[1], M.A. Locke[2] and R.W. Steinriede[2], Jr.; [1]USDA-ARS-SWSRU, Stoneville, MS 38776; [2]USDA-ARS-WQERU, Oxford, MS 38655.

ABSTRACT

Frequent pesticide detections in surface water bodies merit investigating the effects of best management practices (BMPs) on the surface transport of agrochemicals applied to row crops. One day after a pre-emergent application of fluometuron and metolachlor to a Dundee silt loam, simulated rainfall (60 mm h^{-1}) was applied to 0.0002 ha plots for 1.25 h to elucidate tillage (no tillage and reduced tillage) and cover crop (no cover and rye cover) effects on herbicide transport in surface runoff. Independent of tillage, rye cover delayed time-to-runoff 26%, reduced cumulative runoff volume 31%, but increased average herbicide concentrations in surface runoff by at least 16%. The cumulative loss of fluometuron in runoff was independent of treatment and averaged 13%. Conversely, cumulative metolachlor losses were 8.4% for no tillage with a rye cover crop, 8.0% for no tillage no cover crop, 7.7% for reduced tillage with a rye cover crop, and 11.5% for reduced tillage no cover crop. A significant tillage by cover crop interaction indicated rye cover reduced cumulative metolachlor losses only in the reduced tillage system. Under the conditions of this experiment our data indicate 1) rye cover crop increases infiltration, delays time-to-runoff, and reduces cumulative runoff volume in both no-tillage and reduced-tillage systems; 2) independent of tillage, rye cover crop increases metolachlor and fluometuron concentrations in surface runoff; 3) reduced runoff volumes in rye cover crops can off-set higher herbicide concentrations thereby maintaining and (or) reducing cumulative losses relative to tillage systems without a rye cover; and 4) fluometuron and metolachlor respond differently to tillage and cover crop indicating potential to optimize herbicide and BMPs for abatement of pesticide transport in surface runoff.

TWO-YEAR EVALUATION OF COTTON TOLERANCE TO POST CO-APPLICATION OF PROWL H_2O AND INSECTICIDES. D.R. Lee, D.K. Miller, and M.S. Mathews, Northeast Research Station, LSU AgCenter, St. Joseph.

ABSTRACT

Field studies were conducted at the Northeast Research Station in St. Joseph, La in 2006 and 2007 to evaluate the tolerance of Roundup Ready Flex cotton to postemergence co-application of Prowl H_2O with Roundup Weathermax and insecticides. Treatments evaluated included Prowl H_2O (pendimethalin) at 32 oz/A co-applied with Roundup Weathermax (glyphosate) at 22 oz/A alone or in combination with one of the following insecticides: Acephate at 0.55 lb/A, Baythroid (cyfluthrin) at 2.1 oz/A, Bidrin (dicrotophos) at 6.4 oz/A, Centric (thiamethoxam) at 1.88 oz/A, Dimethoate at 8 oz/A, Karate Z (*lambda* cyhalothrin) at 2 oz/A, Mustang Max (zeta cypermethrin) at 3.5 oz/A, Trimax (imidacloprid) at 1.5 oz/A, or Vydate C-LV (oxamyl) at 13.6 oz/A. Roundup Weathermax alone at 22 oz/A was also included. Applications were made to ST 4554 B2RF cotton in 2006 and DP 164 B2RF cotton in 2007 at the 4 node growth stage. Treatments were evaluated in a randomized complete block experimental design with four replications. Treatments were applied to each 6.67' by 25' plot with a backpack sprayer at 15 GPA. Visual crop injury observations were made 5, 14, and 28 d after treatment (DAT). Crop height 7 and 21 DAT and seedcotton yield were also determined.

In 2006, visual injury was not observed 5 DAT. In 2007, co-application of the insecticide Dimethoate resulted in 20% visual injury while all other treatments resulted in injury no greater than 6%. At 14 DAT, equivalent injury ranging from 14 to 23% was observed for Roundup Weathermax plus Prowl H_2O applied alone or co-applied with insecticides in 2006. In 2007, co-application with insecticides Bidrin, Centric, Dimethoate, Karate Z, and Trimax resulted in similar injury ranging from 9 to 11%. By 28 DAT, no greater than 5% injury was observed for any treatment in both years. At 7 and 21 DAT, cotton height ranged from 17 to 19 and 34 to 41 cm, respectively, in 2006 and 16 to 19 and 33 to 36 cm, respectively, in 2007 and was equal for all treatments. Seedcotton yield ranged from 3349 to 4039 lb/A in 2006 and 2462 to 2763 lb/A in 2007 with no differences noted among treatments.

In Roundup Ready Flex cotton, glyphosate co-application with Prowl H_2O and insecticides can offer producers the ability to integrate pest management strategies and reduce application costs with no long term effect on the crop.

IS REPLANTING CRUCIAL FOLLOWING AN OFF-TARGET APPLICATION OF HARMONY EXTRA TO COTTON? D.K. Miller[1], D.M. Scroggs[2], C.H. Koger[3], and M.S. Mathews[1], Northeast Research Station[1] and Dean Lee Research Station[2], LSU AgCenter, and MSU Delta Research and Extension Center[3].

ABSTRACT

Field studies were conducted in 2007 at the Northeast Research Station near St. Joseph, La, the Dean Lee Research Station near Alexandria, La, and the Delta Research and Extension Center near Stoneville, Ms to determine the necessity of replanting following an off-target or misapplication of Harmony Extra (thifensulfuron + tribenuron) to cotton. Treatments evaluated included Harmony Extra at 0, 1/4, 1/8, 1/16, 1/32, or 1/64 x rate of a 1x rate of 0.3 oz/A applied to cotton at the 2 to 3 leaf growth stage. Varieties evaluated included DP 164 B2RF at St. Joseph and Stoneville and DP 143 B2RF at Alexandria. Application dates were May 24 at St. Joseph, May 22 at Stoneville, and May 31 at Alexandria. Cotton was replanted in adjacent plots on June 21 at St. Joseph (delayed due to lack of adequate moisture), May 29 at Stoneville, and June 11 at Alexandria. Parameters measured included visual crop injury and height 14 and 28 d after treatment (DAT), node above white flower (NAWF) (St. Joseph and Alexandria only), and seedcotton yield.

At 14 DAT, cotton height was reduced with Harmony Extra applied at 1/4 to 1/32 x rates at Stoneville, 1/4 x rate at St. Joseph, and not reduced at Alexandria when compared to when no herbicide was applied. At 28 DAT, height reduction was observed with Harmony Extra at 1/4 to 1/16 x rates at Stoneville, 1/4 and 1/8 x rates at St. Joseph, and at the 1/4 x rate at Alexandria. Injury 14 DAT following application of Harmony Extra was 20% or greater at rates of 1/16 x or greater at Stoneville and St. Joseph and 1/4 x at Alexandria. At 28 DAT, injury was at least 20% at rates of 1/8 x or greater at Stoneville and St. Joseph and 1/4 x at Alexandria. A delay in cotton maturity as determined by an increase in NAWF number was observed only at St. Joseph at the 1/4 x rate when compared to when no herbicide was applied. Early-season injury and height reduction following Harmony Extra application resulted in yield reduction only at the 1/4 and 1/8 x rate at St. Joseph. Yield comparison indicated no advantage to replanting cotton as in all but one instance, when yield was equal, cotton recovered from initial injury and yielded greater than replanted cotton.

Application of Harmony Extra resulted in significant injury and height reduction at higher rates evaluated. In these studies, replanting of cotton was not the best option following reduced rate application of Harmony Extra.

IS REPLANTING CRUCIAL FOLLOWING AN OFF-TARGET APPLICATION OF 2, 4-D TO COTTON?

D.K. Miller[1], D.M. Scroggs[2], C.H. Koger[3], and M.S. Mathews[1], Northeast Research Station[1] and Dean Lee Research Station[2], LSU AgCenter, and MSU Delta Research and Extension Center[3].

ABSTRACT

Field studies were conducted in 2007 at the Northeast Research Station near St. Joseph, La, the Dean Lee Research Station near Alexandria, La, and the Delta Research and Extension Center near Stoneville, Ms to determine the necessity of replanting following an off-target or misapplication of 2,4-D to cotton. Treatments evaluated included Salvo at 0, 1/4, 1/8, 1/16, 1/32, or 1/64 x rate of a 1x rate of 12.8 oz/A applied to cotton at the 2 to 3 leaf growth stage. Varieties evaluated included DP 164 B2RF at St. Joseph and Stoneville and DP 143 B2RF at Alexandria. Application dates were May 24 at St. Joseph, May 22 at Stoneville, and May 31 at Alexandria. Cotton was replanted in adjacent plots on June 21 at St. Joseph (delayed due to lack of adequate moisture), May 29 at Stoneville, and June 11 at Alexandria. Parameters measured included visual crop injury and height 14 and 28 d after treatment (DAT), node above white flower (NAWF) (St. Joseph and Alexandria only), and seedcotton yield.

At 14 DAT, cotton height was reduced with 2,4-D applied at all rates at Stoneville, at 1/4 and 1/8 x rates at St. Joseph, and at 1/4 x rate at Alexandria when compared to when no herbicide was applied. At 28 DAT, height reduction was observed with 2,4-D at all rates at Stoneville, 1/4 x rate at St. Joseph, and at the 1/4 and 1/8 x rates at Alexandria. Injury 14 and 28 DAT following application of 2,4-D was 20% or greater with all rates applied at each location. A delay in cotton maturity as determined by an increase in NAWF number was observed only at St. Joseph at the 1/4 x rate when compared to when no herbicide was applied. Early-season injury and height reduction following 2,4-D application resulted in yield reduction at the 1/4 to 1/32 x rates at Stoneville and the 1/8 x rate at Alexandria. Yield comparison indicated no advantage to replanting cotton as in the vast majority of instances cotton recovered from initial injury and yielded greater than replanted cotton and in no instance did replanting result in a yield advantage.

Application of 2,4-D resulted in significant injury and height reduction at higher rates evaluated. In these studies, replanting of cotton was not the best option following reduced rate application of 2,4-D.

EFFECT OF DELAYED POSTEMERGENCE WEED CONTROL IN LIBERTY-LINK COTTON. M.G. Patterson, C. D. Monks, R.W. Goodman, B.C. Dillard, and R.M. Durbin, Department of Agronomy and Soils, Auburn University, Auburn, Alabama.

ABSTRACT

Field trials were conducted in 2006 and 2007 to evaluate the interaction of pendimethalin and/or fluometuron applied preemergence followed by multiple applications of Ignite herbicide on weed control and seed cotton yield. A research area at the E. V. Smith Research Center located in east central Alabama and infested with spiny pigweed (*Amaranthus spinosus*), goosegrass (*Eleusine indica*) 80% and crowfootgrass (*Dactyloctenium aegyptium*) 20% was planted to Fibermax 966 LL cotton each year. Pendimethalin at 1.0 lb per acre (Prowl H20) alone, fluometuron at 1.5 lb per acre (Cotoran 4L) alone, or a combination of the two were applied preemergence after planting. These were compared to no preemergence herbicide. Gluphosinate (Ignite 280) at 0.39 lb per acre was applied postemergence at different cotton growth stages across all preemergence herbicides. Individual plots received from one to four postemergence applications (one, four, eight, and 12 leaf cotton). A layby treatment of linuron + diuron (Layby Pro) tank mixed with MSMA was applied to the entire trial area when cotton was approximately 18 inches tall. Visual weed control ratings were obtained 7 to 10 days after postemergence applications. Seed cotton yield was machine harvested from each plot and all data was subjected to an analysis of variance with means separated by the appropriate LSD (.05)

Application of any preemergence herbicide provided 790 (pendimethalin) to 1411 (pendimethalin + fluometuron) lbs of cotton more than when no preemergence herbicide was used in the absence of any gluphosinate postemergence application. Three applications of gluphosinate at four, eight, and 12 leaf cotton stages were needed to obtain optimum weed control and seed cotton yield in the absence of any preemergence herbicide. However, the first application of gluphosinate could be delayed until cotton reached the 12 leaf stage without incurring yield loss if any preemergence herbicide was applied with this weed spectrum.

PRELIMINARY ESTIMATES OF POLEN LONGEVITY FOR *AMARANTHUS PALMERI*. L.M. Sosnoskie, A.S. Culpepper University of Georgia, Crop and Soil Sciences Department, Tifton, GA 31794, and T.M. Webster USDA-ARS, Tifton, GA 31794.

ABSTRACT

Herbicide resistance can develop *de novo* in plant populations via spontaneous genetic mutation, meiotic recombination and transposable element activity. Herbicide resistance can also be acquired via gene-flow, which is achieved through the movement of fertilized ovules (seeds) and viable gametophytes (pollen). For species that are dioecious and/or produce seed that lack specialized dispersal structures pollen-flow is mandatory for maintaining genetic variability. Although the importance of gene flow, relative to genetic mutation, as a source of resistance is still unknown, it is accepted that inter-population gene-flow for out-crossing species occurs at rates that are evolutionarily significant. Because *A. palmeri* is wind-pollinated, it is likely that the herbicide-resistance trait can be transferred between spatially segregated intra- and inter-specific populations via atmospheric currents.

Previous research in our lab has been focused on describing Palmer amaranth pollen dispersal empirically and theoretically. The probability of a successful germination event occurring at any given distance from a pollen source is dependant upon the performance of pollen grains post-anthesis. The objective of this study was to evaluate the influence of the atmosphere properties, such as relative humidity and temperature, on pollen viability over time. Our ultimate goal is to develop a predictive bio-physical model of pollen transport and gene-flow for Palmer amaranth.

Because members of the family Amaranthaceae produce tri-nucleate pollen (tri-nucleate pollen produced by dicot species tend to have limited germinability *in vitro*), enzymatic assays, as opposed to an artificial germination media, were used to evaluate pollen longevity. In particular we employed 3-(4,5-dimethyl-2-thiazolyl)-2,5-diphenyl-2H-tetrazolium bromide (MTT). MTT is enzymatically converted (via dehydrogenase) from a yellow, soluble liquid to a reddish-purple, insoluble crystal in living cells.

Freshly harvest pollen grains were dusted onto microscope slides using a painter's brush and exposed to local atmospheric conditions for up to four hours for five days in July and August of 2007. Pollen grain sub-samples were brought into the lab at regular intervals and stained with MTT to monitor the change in dehydrogenase activity over time. Because the evaluation of color intensity is highly subjective (i.e. the concepts of dark, medium and light may differ among observers), we used a Diagnostic Instruments® SPOT™ Insight camera attached to an Olympus® BH-2 research microscope (400x magnification) to capture digital images of the pollen grains and then evaluated the degree of color development using RGB Color Analysis Software ©. The RGB software describes the color of any object, numerically, with respect to the amounts of red (R), green (G) and blue (B) present. No less than 300 pollen grains were scored for each time period each day.

The factorial effects of temperature (15, 25 and 35°C), relative humidity (50, 75 and 100%) and exposure time (30-360 min) on pollen longevity were investigated using a split-plot design. Temperature (main plot) was regulated using a Conviron growth chamber. Rubbermaid® storage containers (37 L, low density polyethylene) housed within each growth chamber served as humidity chambers (subplots); the desired RH values were generated using saturated salt solutions. Freshly harvest pollen grains were dusted onto microscope slides using a painter's brush and exposed to the temperature x RH conditions for up to six hours. Pollen grain sub-samples were removed at regular intervals and stained with MTT to describe the level of dehydrogenase activity over time. A Diagnostic Instruments® SPOT™ Insight camera attached to an Olympus® BH-2 research microscope (400x magnification) was used to capture digital images of the pollen grains at each sample period and the degree of enzymatically-induced color development was evaluated using RGB Color Analysis Software

GLYPHOSATE EFFICACY AS AFFECTED BY CO-APPLICATION WITH ZINC PRODUCTS. D.M. Scroggs[1], M.M. Kenty[2], and A.B. Curry III[3], LSU AgCenter, Dean Lee Research and Extension Center, Alexandria, LA[1]; Helena Chemical Company, Collierville, TN[2] and Brandon, MS[3].

ABSTRACT

Research was conducted in 2007 at the Dean Lee Research and Extension Center in Alexandria, La, to evaluate the response of weeds to co-applications of glyphosate and selected zinc products. Treatments included glyphosate (Roundup WeatherMax® = RWM) alone @ 22 oz/A plus the following tank-mix partners: + TraFix® Zn (citric acid + glucoheptonate) @ 16 oz/A, + TraFix® Zn @ 32 oz/A, + Ele-Max® Zn (nutrient concentrate EDTA) @ 32 oz/A, + Liberal Zn (EDTA) @ 0.94 lb/A, + Liberal Zn @ 1.88 lb/A, + TraFix® Zn @ 16 oz/A + CoRoN® (25-0-0) @ 32 oz/A. A non-treated control (UTC) was also included in the study. Treatments were applied with a tractor mounted compressed air sprayer at 15 GPA. Experimental design was a randomized complete block replicated three times. Visual assessment of weed control was estimated at 7, 14, and 28 days after treatment (DAT). Additionally, cotton plant height was recorded at 35 DAT and plots were harvested using a spindle picker with weighing system and yield was determined as lb seed cotton/A. Data were subjected to analysis of variance and means were separated using Tukey's HSD at the 0.05 level of probability.

At 7 DAT, weed control from glyphosate alone for all weeds evaluated ranged from 95 to 96%. Weed control from all other treatments were similar to glyphosate alone, except for glyphosate plus TraFix® Zn @ 32 oz/a. This treatment resulted in 85, 88, 88, and 88% control of Palmer amaranth, barnyardgrass, browntop millet, and johnsongrass, respectively.

At 14 DAT, weed control from glyphosate alone resulted in 97, 95, 95, and 97% control of Palmer amaranth, barnyardgrass, browntop millet, and johnsongrass, repsectively. All other treatments resulted in similar control compared to glyphosate alone except for glyphosate plus TraFix® Zn @ 32 oz/a. This treatment resulted in a reduction of control for Palmer amaranth, barnyardgrass, browntop millet, and johnsongrass of 34, 32, 32, 29%, repsectively.

At 28 DAT, results were very similar to the previous rating intervals (7 and 14 DAT). Glyphosate alone controlled all weeds from 80 to 88%. The only treatment that showed less control was glyphosate plus TraFix® Zn @ 32 oz/a which resulted in an average weed control reduction of 21% for all weeds. Cotton plant height was similar for all treatments, and all treatments resulted in cotton plant height greater than the UTC. Seed/cotton yield was also similar for all treatments and all treatments yielded higher than the UTC.

Results indicate that growers should use EDTA chelated zinc products when a need arises to apply with glyphosate. In this study, Trafix® Zn @ 32 oz/A compromised the efficay of glyphosate, which would be expected since it isn't an EDTA chelated product. However, the EDTA chelated zinc products, ENC @ 32 oz/A and Librel Zn @ 0.94 lb/A or 1.88 lb/A, applied with glyphosate did not compromise weed control. Therefore, growers needing to apply a zinc product with glyphosate need to select an EDTA chelated zinc product to eliminate the chance for compromised weed control.

DETERMINATION OF EFFECTIVE CLEANING METHODS FOR SPRAYER HOSE AFTER APPLICATIONS OF 2,4-D. D.M. Scroggs[1], A.M. Stewart[1], D.K. Miller[2], B.R. Leonard[3], J.L. Griffin[4], and D.C. Blouin[4], LSU Agricultural Center: Alexandria[1], St. Joseph[2], Winnsboro[3], and Baton Rouge[4], LA.

ABSTRACT

This study was initiated at the Dean Lee Research and Extension Center, Alexandria, LA, in the fall of 2006. Cotton was sowed and grown in trade gallon nursery containers, three seed per pot, in a greenhouse. Soil type in each pot consisted of a fifty percent mixture of potting soil plus a fifty percent mixture of a sandy loam soil. Experimental design was a Randomized Complete Block (RCB) with 4 replications. Plants were grown under a solar light for twelve hours a day with daytime temperature at 80 degrees and nighttime temperature at 70 degrees. Plants were watered with an automatic misting system for 5 minutes once a day. Treatments consisted of a factorial arrangement of two pesticide applications (Factor A: 1= glyphosate (Roundup WeatherMax®) alone @ 22 oz/A or 2= glyphosate @ 22 oz/A + dimethoate @ 12 oz/A) and six clean-out solutions (Factor B: 1= water, 2= ammonia @ 1% solution, 3= bleach @ 1% solution, 4= nitrogen @ 100% solution, 5= Wipe-Out® @ 1% solution, or 6= none). Two foot sections of sprayer hose (1 for each treatment) were allowed to soak for two weeks in a solution of 2,4-D (ester formulation). After drying, sprayer hose was attached to a backpack sprayer and subjected to a clean-out procedure. When clean-out was complete, either glyphosate alone or glyphosate + dimethoate was applied to cotton plants. Cotton plants were rated for 2,4-D injury at 5, 11, and 14 days after treatment (DAT) and were assigned an indicator variable 0= no injury or 1= injury. Data were subjected to ANOVA using SAS PROC MIXED and means were separated using Tukey's HSD at the 0.05 level of significance.

For treatments that contained glyphosate alone, sprayer hose clean-out with water, ammonia, bleach, nitrogen, and Wipe-Out® resulted in cotton injury incidences of 31, 33, 25, 22, and 19%, respectively. When no clean-out solution was used, the chance of having cotton injury rose to 100%, higher than all other clean-out solution treatments. For treatments that contained glyphosate plus dimethoate, sprayer hose clean-out with water, ammonia, bleach, nitrogen, and Wipe-Out® resulted in cotton injury incidences of 81, 67, 92, 75, and 64%, respectively. Unlike when glyphosate alone was applied, chances of having cotton injury from all clean-out solutions were similar to that of applying nothing at all, which resulted in 100% injury.

When water, bleach, nitrogen, and Wipe-Out® were used to clean-out sprayer hose before treatments of glyphosate alone, cotton injury incidences resulted in 31, 25, 22, and 19%, respectively. These results were lower than cotton injury incidences when the same clean-out solutions were used and treatments of glyphosate plus dimethoate were applied with resulting chances of injury at 81, 92, 75, and 64%, respectively. When ammonia was used to clean-out sprayer hose prior to applications of glyphosate alone, chance of cotton injury was at 33%, which was similar to the chance of having injury when dimethoate was included in the treatment, which was at 67%. When no attempt was made to clean-out sprayer hose, resulting cotton injury incidences were at 100% for both treatments, which would indicate that a proper hose contamination procedure was used for the study.

Chances of having cotton injury increased over time. Cotton injury incidences at 5, 11, and 14 DAT were 49, 60, and 68%, respectively, indicating a slow presence of 2,4-D injury to cotton, which may be accounted for by the growth hormonal activity that 2,4-D exhibits.

Results suggests only minimal differences exit between clean-out solutions. An increase in release of 2,4-D from contaminated sprayer hose was realized when application involved glyphosate plus dimethoate. Cotton injury from contaminated hose may not appear immediately and can be persistent over time. Growers should be cautioned when using sprayers that have applied 2,4-D previously before making post applications to cotton.

CONTROL OF RYEGRASS IN WHEAT. D.M. Scroggs and P.R. Vidrine, LSU AgCenter, Dean Lee Research and Extension Center, Alexandria, LA.

ABSTRACT

Research was conducted between 2006 and 2007 at the Dean Lee Research and Extension Center in Alexandria, La, to evaluate control of annual ryegrass (*Lolium perenne* L.) in wheat with selected herbicides. Treatments included Axial @ 8.2 oz/A + Adigor @ 9.6 oz/A, Hoelon @ 42.6 oz/A, Osprey @ 4.75 oz/A, and Sencor @ 3 oz/A. A non-treated control (UTC) was also included in the study. Treatments were applied to wheat at the 2 tiller growth stage and 3 inches tall, while ryegrass was at the 2 tiller growth stage and 2-3 inches tall. Treatments were applied with a tractor mounted compressed air sprayer at 15 GPA. Experimental design was a randomized complete block replicated three times. Visual assessment of weed control was conducted 26 and 48 d after treatment (DAT). Plots were harvested with a plot combine and yield was determined as bu/A. Data were subjected to analysis of variance and means were separated using Tukey's HSD at the 0.05 level of probability.

The most effective herbicide treatments for control of ryegrass in the study were Axial + Adigor and Hoelon at both observation timings. At 26 DAT, Axial + Adigor and Hoelon resulted in ryegrass control of 95 and 98%, respectively. Ryegrass control from Osprey was 43% at 26 DAT and lower than Axial + Adigor and Hoelon. At 48 DAT, Axial + Adigor and Hoelon resulted in ryegrass control of 92 and 98%, respectively, and were once again similar to each other. Control exhibited from Osprey at 48 DAT was 63%, and lower than that of Axial + Adigor and Hoelon. Sencor did not control ryegrass at either timing and was similar to the UTC.

Wheat yield results had a similar trend in comparison to visual ryegrass control ratings. Treatments of Axial + Adigor and Hoelon resulted in wheat yields of 36 and 39.3 bu/A, respectively. Both of these treatments yielded higher than that of Osprey, which resulted in wheat yield of 25.1 bu/A. Wheat yield from the treatment of Sencor was 13.7 bu/A and was similar to that of the UTC (14.4 bu/A).

GLYPHOSATE/GLUFOSINATE TANK-MIX COMBINATIONS IN CORN. D.M. Scroggs[1], P.R. Vidrine[1], and B.J. Williams[2], LSU AgCenter, Dean Lee Research and Extension Center, Alexandria, LA[1] and Northeast Research Station, St. Joseph, LA[2].

ABSTRACT

Research was conducted in 2006 and 2007 at the Dean Lee Research and Extension Center in Alexandria, La, to evaluate weed control effectiveness of glyphosate/glufosinate combinations in glyphosate/glufosinate resistant corn. Treatments included were: glyphosate (Roundup WeatherMax®) @ 22 oz/A alone, glufosinate (Ignite®) @ 32 oz/A alone, glyphosate @ 11 oz/A + glufosinate @ 16 oz/A, glyphosate @ 22 oz/A + glufosinate @ 32 oz/A, glyphosate @ 22 oz/A + glufosinate @ 16 oz/A, and glyphosate @ 11 oz/A + glufosinate @ 32 oz/A. A non-treated control (UTC) was also included in the study for visual comparisons. Treatments were applied with a tractor mounted compressed air sprayer at 15 GPA. Experimental design was a randomized complete block replicated three times. Weeds evaluated consisted of pitted morningglory (*Ipomoea lacunosa*), Palmer amaranth (*Amaranthus palmeri*), hophornbeam copperleaf (*Acalypha ostryfolia*), barnyardgrass (*Echinochloa crus-galli*), browntop millet (*Urochloa ramosa*), and johnsongrass (*Sorghum halepense*). Applications were made EPOST when both corn and weeds were fairly small. Visual assessment of weed control was estimated at 14 and 28 days after treatment (DAT). Plots were harvested with a plot combine and yield was determined as bu/A. Data were analyzed using SAS PROC MIXED and means were separated using Tukey's HSD at the 0.05 level of probability. Years were treated as random effects in the model.

At 14 DAT, weed control was similar for most treatments. The treatment of glyphosate @ 11 oz/A + glufosinate @ 16 oz/A reduced control of pitted morningglory and Palmer amaranth to 87 and 81%, respectively, and was lower than all other treatments except for glufosinate @ 32 oz/A applied alone. Glyphosate @ 11 oz/A + glufosinate @ 16 oz/A controlled barnyardgrass 88%, browntop millet 88%, and johnsongrass 86%, which was only lower than glyphosate @ 11 oz/A + glufosinate @ 32 oz/A (93%).

At 28 DAT, pitted morningglory and hophornbeam copperleaf were controlled similarly by all treatments. Palmer amaranth control was reduced from the treatment of glyphosate @ 11 oz/A + glufosinate @ 16 oz/A (70%), which was similar to glufosinate @ 32 oz/A alone (73%) and glyphosate @ 22 oz/A + glufosinate @ 16 oz/A (82%). Control of barnyardgrass, browntop millet, and johnsongrass was 72% from the treatment of glyphosate @ 11 oz/A + glufosinate @ 16 oz/A, which was only lower than glyphosate @ 22 oz/A alone (80%) and glyphosate @ 22 oz/A + glufosinate @ 32 oz/A (80%).

Corn yield was similar for all treatments. Corn yield among treatments ranged from 164 to 169 bu/A. No crop injury to corn was observed.

Results suggest tank-mixes of glyphosate and glufosinate do not compromise weed control, hence, no antagonism exists. If co-applying these two herbicides in a weed control system, reducing both rates by half could result in slightly lower control. An advantage to co-applying glyphosate and glufosinate would be for resistance management; however, a disadvantage to this co-application would most likely be the cost of application.

RESPONSE OF SOYBEAN TO POST APPLICATIONS OF PYRAFLUFEN-ETHYL. D.M. Scroggs[1], P.R. Vidrine[1], and D. King[2], LSU AgCenter, Dean Lee Research and Extension Center, Alexandria, LA[1] and Nichino America, Inc., San Antonio, TX[2].

ABSTRACT

Research was conducted in 2007 at the Dean Lee Research and Extension Center in Alexandria, La, to evaluate soybean response to post applications of pyraflufen-ethyl (ET) at two soybean growth stages. Treatments included two rates of ET: (0.75 and 1.0 oz/A), three rates of glyphosate (Roundup Weathermax): (0, 22, and 32 oz/A), and two soybean growth stages: (EPOST = V3-V4 and LPOST = R1). A non-treated control (UTC) was also included in the study. Treatments were applied with a CO_2 back-pack sprayer at 20 GPA. Experimental design was a randomized complete block replicated three times. Visual assessment of soybean injury was estimated at 7, 14, and 28 days after treatment (DAT). Additionally, soybean plant height and soybean fresh weight biomass was recorded at 7 and 28 DAT. Plots were harvested with a plot combine and yield was determined as bu/A. Data were subjected to analysis of variance and means were separated using Tukey's HSD at the 0.05 level of probability.

When treatments were applied EPOST, soybean visual injury was highest at 7 DAT and injury severity lessened over time. At 7 DAT no differences among treatments existed and only ET @ 0.75 oz/A + RWM @ 32 oz/A, ET @ 1.0 oz/A + RWM @ 22 oz/A, and ET @ 1.0 oz/A + RWM @ 32 oz/A were more injurious than the UTC. At 14 and 28 DAT, soybean injury was equal to the UTC and ranged from 0 to 4% and 0 to 2%, respectively. Soybean plant height at 7 and 28 DAT was also equal to the UTC and ranged from 14 to 16 inches and 32 to 35 inches, respectively. No differences in treatments were observed for soybean plant biomass at 7 and 28 DAT and all treatments were equal to the UTC. Soybean plant biomass at these timings ranged from 18 to 22 grams and 39 to 54 grams, respectively. Soybean yield was also similar for all treatments including the UTC and yield ranged from 56 to 60 bu/A.

When treatments were applied LPOST, soybean visual injury was highest at 7 DAT and injury severity decreased over time. At 7 DAT no differences among treatments existed and all were more injurious than the UTC. At 14 DAT, soybean injury was equal for all treatments, ranging from 2 to 5%, with all but ET alone at 0.75 and 1.0 oz/A being higher than the UTC (0%). At 28 DAT, soybean injury was equal for all treatments, including the UTC, and injury ranged from 0 to 2%. Soybean plant height at 7 and 28 DAT was equal to the UTC and ranged from 20 to 22 inches and 40 to 42 inches, respectively. Treatments were also similar for soybean plant biomass at 7 and 28 DAT and all treatments were equal to the UTC. Soybean plant biomass at these timings ranged from 33 to 40 grams and 68 to 83 grams, respectively. Soybean yield was also similar for all treatments, including the UTC, and yield ranged from 55 to 60 bu/A.

Results suggest POST treatments of pyraflufen-ethyl are safe to soybean over a range of growth stages. Slight to moderate visual injury in the form of leaf burn can be seen from the day after application to 7 DAT. However, this injury is only acute, mostly cosmetic, and decreases over time. The use of pyraflufen-ethyl alone or in combination with glyphosate could be beneficial for resistance management and could also be effective for increased control of hard to control weeds, such as morningglories and other vines.

APPLICATION TIMING FOR BURNDOWN CONTROL OF LITTLE BARLEY (*HORDEUM PUSILLUM*) AND COVER-CROP WHEAT (*TRITICUM AESTIVUM*). J.R. Martin and C.R. Tutt, Department of Plant and Soil Sciences, University of Kentucky, Princeton 42445.

ABSTRACT

Cool-season grasses tend to be difficult to control with burndown herbicides, especially when plants have overwintered and developed multiple tillers. Examples of grasses include wheat planted as a cover crop and little barley that occurs as a weedy plant during the winter following corn or soybean harvest. Studies were conducted to determine if application timing influenced burndown control of these grasses.

The first study evaluated control of cover-crop wheat when treatments were applied February 8, March 21, or April 18, 2007 when plants were 3, 4.5, or 12.5 inches in height, respectively. Burndown herbicides included glyphosate at 0.56, 0.77 and 1.13 lb ae/A; or paraquat at 0.5 and 0.75 lb ai/A. These herbicides were applied either alone or in combination with atrazine at 1.5 lb ai/A. The second study evaluated control of little barley when treatments were applied November 14, 2006, February 21, March 14, or April 12, 2007 when plants were 4, 3.5, 5, or 11 inches in height, respectively. Glyphosate and paraquat were applied at the same rates as those in the first study. All burndown treatments in the second study included simazine at 1 lb ai/A as a tank mix partner. Burndown control was evaluated at weekly intervals during the first four weeks after application.

Results of the cover-crop wheat study indicated that initial burndown control was more rapid with paraquat than with glyphosate; however in some cases regrowth of wheat occurred by four weeks after application of paraquat.

Control of wheat with paraquat alone was more favorable when it was applied on March 21 compared with treatments made on February 28 or April 18. Increasing the paraquat rate from 0.5 to 0.75 lb/A improved control by 20 to 25% when applied alone on February 28 or April 18. Including atrazine increased control from 63 to 90% when paraquat was applied at the low rate on February 28 to 3 inches tall wheat. The benefit of including atrazine was similar when paraquat was applied on April 18 to 12.5 inches tall wheat; however the level of control by four weeks after application was only 77 and 83% for paraquat at 0.5 and 0.75 lb ai/A, respectively.

Burndown control with glyphosate was more variable when applied February 28 to 3 inches tall wheat compared with applications made on March 21 or April 18 to wheat 4.5 or 12.5 inches tall, respectively. Glyphosate at 0.56 lb/A was less effective when applied February 28 to wheat 3" tall than on March or April to wheat 4.5 or 12.5 inches tall, respectively. Antagonism from atrazine occurred when the 0.56 lb/A rate of glyphosate was applied on February 28. Atrazine caused some antagonism in all glyphosate treatments within the first few weeks after application. However, wheat treated on March 21 or April 18 outgrew the antagonism by four weeks after application. Antagonism was still present at four weeks after application for glyphosate at 0.56 lb/A on February 28 and reduced wheat control by 12%.

Results of the little barley study indicated that control was at least 95% when glyphosate or paraquat was applied with simazine on November 14 to 4 inches tall plants. However, control of little barley from applications on February 14, March 21, or April 12 was usually better with glyphosate than with paraquat. Control at 4 weeks after application ranged from 96 to 100% when glyphosate plus simazine was applied February 21, March 14 or April 12. The use of paraquat at 0.5 or 0.75 lb/A in combination with simazine provided 63 or 77% control, respectively, when applied February 21. Delaying the application of paraquat treatments until March 14 or April 12 improved control of little barley, however the low rate of paraquat provided seven to 10 % less control than that of the high rate.

In summary, glyphosate tended to provide effective control of wheat and little barley more consistently than paraquat in spring burndown treatments. Applications of glyphosate in late February at the low rate of 0.56 lb/A was less effective in controlling wheat compared with glyphosate at 0.77 or 1.13 lb/A. Atrazine caused temporary antagonism to all glyphosate treatments applied to wheat, yet long-term effects of antagonism occurred only when glyphosate was applied in February at the low rate of 0.56 lb/A. The use of glyphosate or paraquat with simazine in the fall provided effective season-long control of little barley. Applications of glyphosate plus simazine during late February through mid April were usually more effective than the low rate of paraquat plus simazine in controlling little barley. Increasing the rate of paraquat improved little barley control to an acceptable level, especially when treatments were applied in March or April.

EVALUATION OF RESIDUAL HERBICIDES FOR CONTROL OF GLYPHOSATE-RESISTANT PALMER AMARANTH IN COTTON. J.R. Whitaker and A.C. York, Department of Crop Science, North Carolina State University; A.S. Culpepper, Department of Crop Science, University of Georgia.

ABSTRACT

Glyphosate-resistant Palmer amaranth (AMAPA) has been confirmed in five cotton-producing states. Extension personnel are actively promoting resistance management strategies, including integration of other modes of action into a glyphosate-based program, to reduce selection pressure on glyphosate. In fields where resistance is already present, good control by residual herbicides is absolutely critical for successful management. The objective of our study was to evaluate residual control of Palmer amaranth by herbicides that can be applied preemergence (PRE), postemergence (POST), and postemergence-directed (POST-DIR) to cotton.

This RCB design experiment was conducted at one location in Georgia and two locations in North Carolina in 2006 and one location in each state in 2007. Soil at all locations was loamy sand with low organic matter. Glyphosate-resistant AMAPA densities varied from 60 to 350 plants per square yard, depending upon location. Soil was thoroughly tilled to destroy surface residue. Treatments consisted of a factorial arrangement of 13 herbicides applied at 1 and 1.5X use rates. Herbicides and their 1X rates were as follows: Caparol (prometryn, 1 lb ai/A), Cotoran (fluometuron, 1 lb ai/A), Direx (diuron, 1 lb ai/A), Dual Magnum (s-metolachlor, 0.95 lb ai/A), Envoke (trifloxysulfuron, 0.0047 lb ai/A), Layby Pro (diuron 0.5 lb ai/A + linuron 0.5 lb ai/A), Linex (linuron, 1 lb ai/A), Prowl H_20 (pendimethalin, 0.95 lb ai/A), Reflex (fomesafen, 0.25 lb ai/A), Stalwart (metolachlor, 1 lb ai/A), Staple LX (pyrithiobac, 0.043 lb ai/A), Suprend (prometryn 0.8 lb ai/A + trifloxysulfuron 0.007 lb ai/A), and Valor SX (flumioxazin, 0.048 lb ai/A). Regardless of the normal application method (PRE, POST, or POST-DIR), all herbicides were applied PRE in order to compare residual control of AMAPA.

Rainfall within the first 2 weeks after application in 2006 measured 5.5, 5, and 1.6 inches at the Georgia location, Location 1 in North Carolina, and Location 2 in North Carolina, respectively. In Georgia during 2007, no rainfall occurred within the first 2 weeks, and only 0.8 inches of rainfall occurred in North Carolina. Weed control was visually estimated at 20 and 40 days after treatment (DAT). Data were subjected to ANOVA with partitioning appropriate for a factorial treatment arrangement. Means were separated with Fisher's Protected LSD (P = 0.05).

Herbicide and herbicide rate main effects were significant, but the interaction generally was not. Control by all herbicides was generally greater at locations which received more rainfall, but differences in AMAPA control among herbicides were similar regardless of locations. The 1.5X rate was 8 and 7% more effective when averaged over locations and herbicides 20 and 40 DAT, respectively. Among the herbicides typically applied PRE to cotton, Palmer amaranth was controlled 90, 85, 77, 71, 62, and 59% by Staple, Reflex, Dual Magnum, Cotoran, Prowl H_2O, and Caparol, respectively, 20 DAT. Control declined to 62, 63, 46, 44, 32, and 31%, respectively, at 40 DAT. Herbicides typically applied POST included Dual Magnum, Envoke, Stalwart, and Staple LX. Staple was the most effective of these herbicides, Dual Magnum and Envoke were intermediate, and Stalwart was the least effective herbicide. Palmer amaranth was controlled 90, 76, 69, and 60% at 20 DAT and 62, 51, 47, and 37% at 40 DAT by Staple, Dual Magnum, Envoke, and Stalwart, respectively. Among the herbicides typically applied POST-DIR, Direx, Layby Pro, and Linex were similarly effective but controlled AMAPA less than Valor or Suprend. At 20 DAT, Valor, Suprend, Direx, Layby Pro, and Linex controlled AMAPA 90, 82, 77, 79, and 78%, respectively. Control at 40 DAT declined to 64, 56, 45, 45, and 46%, respectively.

Previous research by the authors has clearly demonstrated that good residual control, beginning with PRE herbicides, is critical to manage glyphosate-resistant AMAPA. Combinations of herbicides were not evaluated in this experiment, but other research by the authors has shown better control with combinations than with herbicides applied individually. The results suggest a system including Reflex or Staple alone or combinations containing Reflex or Staple applied PRE followed by Dual Magnum or Staple mixed with glyphosate early POST and then a POST-DIR application containing Valor or Suprend should provide excellent residual control of Palmer amaranth. Results of this experiment have been incorporated into management recommendations for Palmer amaranth in cotton, with adjustments made for fields suspected of having ALS-resistant AMAPA. Additionally, growers are being encouraged to limit use of PPO inhibitors (Reflex, Valor) and ALS inhibitors (Envoke, Staple, Suprend) to one application per year.

RICE CUTGRASS CONTROL IN DRILL-SEEDED RICE. J.K. Norsworthy, G.M. Griffith, J. Still, and R. C. Scott, University of Arkansas, Fayetteville, AR.

ABSTRACT

Consultant and producer calls concerning control of rice cutgrass in rice, particularly reduced-tillage fields where rice is grown without rotation to other crops, has been increasing in recent years. Little is known about the effectiveness of herbicides in controlling rice cutgrass. Based on the experience of producers, it appears that most rice herbicides fail to provide effective control. The objective of this research was to evaluate the effectiveness of various herbicides and herbicide programs for control of rice cutgrass under greenhouse and field conditions. A greenhouse experiment was conducted evaluating labelled rates of propanil, quinclorac, bispyribac, clomazone, imazethapyr, halosulfuron, thiobencarb, cyhalofop, fenoxaprop, penoxsulam, glyphosate, glufosinate, and sethoxydim applied at the two- to three-leaf stage of rice cutgrass. Additionally, a field trial was conducted at Stuttgart, AR, in 2007 evaluating six herbicide programs in drill-seeded rice. 'CL 171' was seeded in 7.5-inch wide rows at 24 seed/ft of row. For the field trial, rice cutgrass was grown in the greenhouse in 3-inch-diameter pots containing silt loam soil and later transplanted at the two-leaf stage into field plots. Field plots were flushed (irrigated) prior to transplanting rice cutgrass for ease of transplanting and to minimize physiological stress caused by transplanting. Herbicides were applied to three-leaf rice cutgrass and three-leaf rice followed by a preflood application 2 weeks after the initial treatment. Herbicide programs included: imazethapyr at 0.063 lb ai/A followed by (fb) imazethapyr at 0.063 lb/A, imazethapyr at 0.094 lb/A fb imazethapyr at 0.094 lb/A, clomazone at 0.6 lb ai/A plus thiobencarb at 4 lb ai/A fb propanil at 4 lb ai/A plus fenoxaprop at 0.077 lb ai/A, clomazone at 0.6 lb/A plus quinclorac 0.5 lb ai/A fb propanil at 4 lb/A plus V-10142 at 0.009 lb ai/A, clomazone at 0.6 lb/A plus V-10142 at 0.009 lb/A fb propanil at 4 lb/A plus bispyribac at 0.032 lb ai/A, and clomazone at 0.6 lb/A plus penoxsulam at 0.031 lb ai/A fb propanil at 4 lb/A plus cyhalofop at 0.28 lb ai/A. Weed control and crop injury were rated preflood prior to applying the second tank-mixture and at 2, 4, and 8 weeks after the final treatments. Appropriate adjuvant was added to each herbicide in the greenhouse and field experiments, and experiments were replicated four times. In the greenhouse experiment, a single application of glyphosate, glufosinate, and sethoxydim provided at least 90% control of rice cutgrass. A single application of imazethapyr and bispyribac provided 52 to 62% control. Propanil, fenoxaprop, cyhalofop, quinclorac, and clomazone provided $\leq$25% control, which partially explains the proliferation of rice cutgrass in continuous rice culture. In the field trial, multiple applications of imazethapyr, regardless of rate, provided complete control of rice cutgrass. However, the first application of imazethapyr at three-leaf rice provided no more than 60% control. Propanil plus bispyribac applied preflood was the most effective conventional (non-imazethapyr tolerant) rice herbicide program probably because of the effectiveness of bispyribac on rice cutgrass (based on the greenhouse trial). Bispyribac stunted rice cutgrass, which eventually led to shading of these plants by rice. This research shows that most rice herbicides are not effective in controlling rice cutgrass, but multiple applications of imazethapyr provide complete control and bispyribac appears to be the most effective herbicide for use in non-imazethapyr tolerant rice. As a result of findings from this research, additional experiments are underway evaluating multiple applications of bispyribac, the impact of fall management practices, particularly tillage and glyphosate applications, on rice cutgrass vegetative persistence, and the impact of rice cutgrass on rice grain yield.

AXIAL® XL FOR THE CONTROL OF ITALIAN RYEGRASS IN WHEAT. J.C. Sanders, D.J. Porter, B.D. Black, J.C. Holloway, M.J. Urwiler, P.C. Forster, and S.E. Cully, Syngenta Crop Protection, Greensboro, NC.

ABSTRACT

Axial XL is a new formulation of Axial Herbicide from Syngenta Crop Protection that contains the active ingredient pinoxaden, the safener cloquintocet-mexyl, and a novel built-in adjuvant system. Axial XL has shown excellent crop safety to all varieties of spring wheat, winter wheat, and barley. Axial XL can be applied in the fall or spring from the 2-leaf stage up to the pre-boot stage of crops. At a use rate of 16.4 oz/A, Axial XL effectively controls wild oat, (*Avena fatua*), foxtails (*Setaria species*), Italian ryegrass (*Lolium multiflorum*), Persian darnel (*Lolium persicum*), barnyardgrass (*Echinochloa crus-galli*), as well as, several other annual grasses. Axial XL can be tank mixed with broadleaf herbicides for flexible one-pass grass and broadleaf weed control in wheat and barley crops.

Prior to Axial XL's introduction into the marketplace, the performance of Axial + Adigor® adjuvant provided consistent and excellent control of ACCase susceptible Italian ryegrass. Field trials were initiated by university and Syngenta scientists in the fall of each year from 2003 to 2006 in winter wheat in the Southeastern US. Comparisons of Axial to competitors (Hoelon® or Osprey™) were drawn from this data set, as well as those to broadleaf herbicide tank-mixtures. Applications were initiated from early November to late March, but primarily in November or December to 1 to 3 tiller Italian ryegrass (non-resistant ACCase populations). Visual percent control of Italian ryegrass was assessed 28 to 70 days after application (DAA). Axial + Adigor consistently provided high levels of Italian ryegrass control with multi-trial averages ≥91%. When averaged over 24 trials in paired comparisons, Axial + Adigor provided 3% greater Italian ryegrass control than that of Hoelon. Axial + Adigor provided 12% greater Italian ryegrass control than that of Osprey when averaged over 23 trials in paired comparisons. Axial + Adigor combinations with Amber®, Finesse®, Harmony® Extra XP, and Peak® had minimal antagonism on Italian ryegrass control. Harmony Extra XP was the most antagonistic broadleaf herbicide, but on average antagonism did not exceed 3%.

To compare Axial + Adigor to Axial XL, field trials were initiated by university and Syngenta scientists in the fall or spring of 2006 to 2007 in winter or spring wheat. A large portion of the trials were conducted in the Pacific Northwest in spring wheat. Most applications were initiated from May to early June to 2 to 3 tiller Italian ryegrass (non-resistant ACCase populations). Percent control of Italian ryegrass was evaluated from 28 to 49 DAA. Axial XL and Axial + Adigor provide equivalent control of Italian ryegrass.

Based on its broad grass weed control spectrum, flexibility of use, excellent crop safety and convenience of a built-in spray adjuvant, Axial XL will be the new standard for grass weed control in wheat and barley.

USING DIFFERENT SPRAY TIPS AND SPRAY VOLUMES FOR WEED CONTROL WITH IMAZAPIC AND IMAZETHAPYR. W.J. Grichar, P.A. Dotray, L.V. Gilbert, and T.A. Baughman, Texas AgriLife Research, Beeville and Lubbock, Texas AgriLife Extension Service, Lubbock and Vernon.

ABSTRACT

Imazapic and imazethapyr at 0.063 lbs ai/A was evaluated in four separate small-plot studies during the 2006 and 2007 growing seasons in the south Texas and the High Plains of Texas peanut growing regions. Spray tips evaluated included 110015 FF, 110015 TT, 110015 DG, 110015 AI, 110015 XR, and 110015 TD. With the spray tip study, spray volume at the High Plains location was 10 gallons per acre (GPA) while at the south Texas location, the spray volume was 20 GPA. A crop oil concentrate (Agridex) was included with all treatments at the rate of 1% v/v. The spray volume study was also conducted with imazapic or imazethapyr at 0.063 lbs ai/A using Agridex at 1% (v/v). Spray volumes evaluated included 5, 7.5, 10, 12.5, 15, 17.5, and 20 GPA applied with 11001 DG and 110015 TT spray tips in south Texas and in the High Plains of Texas, respectively. Weed control was observed 28 days after treatment and is reported based on a scale of 0 (no control) to 100 (complete control).

Spray volume study. Only spray volume and herbicide were significant and there was a spray volume and herbicide by year interaction. In 2006, all spray volumes except 5 GPA controlled Texas panicum at least 94% with the 5 GPA rate controlling the least. In 2007, spray volumes of 5.0 to 10.0 GPA controlled Texas panicum at least 86% while volumes greater than 12.5 GPA controlled less than 60%. Palmer amaranth control in 2006 at the High Plains location varied from 44 to 65% while at the south Texas location control with all spray volumes was at least 98%. In 2007, Palmer amaranth control varied from 65 to 74% and was least with the 20 GPA rate. No difference in weed control was noted between imazapic and imazethapyr with the exception of the High Plains location in 2006 where imazapic controlled Palmer amaranth better than imazethapyr. Imazapic will control Texas panicum when applied to Texas panicum less than 1 in tall, while imazethapyr alone provides inconsistent control when applied to small Texas panicum.

Spray tip study. No response to spray tip was noted for all weeds evaluated with the exception of Palmer amaranth at the High Plains location in 2006 which showed reduced control with AI and XR tips. Palmer amaranth control was less than 70% with all tips but the AI and XR tips controlled less than 50%. Imazapic controlled annual grasses and Palmer amaranth better than imazethapyr.

Generally, annual grass and Palmer amaranth control was variable with spray volumes. However, spray tip had little effect on weed control. Also, imazapic controlled weeds better than imazethapyr.

EVALUATION OF HERBICIDES FOR CONTROL OF DUCKSALAD (*HETERANTHERA LIMOSA*). J.S. Atwal, E.P. Webster, S.L. Bottoms, J.B. Hensley; School of Plant, Environmental, and Soil Sciences, Louisiana State University AgCenter, Baton Rouge.

ABSTRACT

A study was initiated in 2007 to evaluate control of ducksalad [*Heteranthera limosa* (Sw.) Willd.] in a water seeded rice production system. The experimental design was a randomized complete block with four replications. The herbicides were applied preemergence, at the cotyledon stage, and at the spoon (spatulate) leaf stage of ducksalad. Herbicide applications were made with a CO_2-pressurized backpack sprayer calibrated to deliver 15 gallons per acre. The herbicide treatments included: Command at 17 oz/A and Facet at 6.6 oz/A applied preemergence; Bolero at 3 pt/A, Newpath at 4 oz/A, and V-10142 at 0.2 oz/A applied at all three timings; Aim at 1 oz/A, Basagran at 1.5 pt/A, Grasp at 2 and 2.8 oz/A, Grandstand at 0.67 pt/A, Londax at 1 oz/A, Permit at 1 oz/A, Regiment at 0.5 oz/A, Strada at 2.1 oz/A, and Unison at 3.3 qt/A applied at the cotyledon and spoon stages of ducksalad.

The seedbed was prepared using conventional tillage; however, to insure a uniform ducksalad stand and to avoid competition between the crop and weed, rice was not planted. A flood was established on April 16, 2007 to simulate a water seeded system rice production system. Twenty-four hours prior to each application the area was drained to allow for complete spray coverage and prevent wash-off during application, and the flood was re-established 24 hours after herbicide application.

Command, Newpath, and V-10142 applied preemergence controlled ducksalad 94 to 98% at 17 days after treatment. However, by 50 days after treatment control dropped to below 30% when ducksalad was treated with Command and below 75% when treated with Newpath and V-10142. With these three herbicides it is important to establish a uniform stand of rice before control drops below acceptable levels, and this can be achieved by planting recommended seeding rates. Herbicides applied at the cotyledon and spoon leaf stages which controlled ducksalad above 90% for two or more weeks were Newpath, Regiment, and both rates of Grasp. Basagran, Strada, and Unison controlled ducksalad 92 to 98% at 14 days after treatment when applied at the spoon leaf stage.

In conclusion, the most important management tool for ducksalad control is to establish a uniform stand of rice, based on recommended seeding rates, prior to ducksalad emergence. Preemergence applications of Command and Newpath allow for rice stand establishment prior to a ducksalad infestation. Postemergence applications should be applied early in the growing season prior to the development of spoon leaf to manage ducksalad.

OVER THE TOP APPLICATION OF RESIDUAL HERBICIDES IN ROUNDUP READY® COTTON.
B.J. Varner, J.T. Irby, D.B. Reynolds and D. M. Dodds, Mississippi State University.

ABSTRACT

Since the introduction of Roundup Ready® cropping systems, glyphosate usage has increased dramatically. Annual grass and small seeded broadleaf weed control has become more difficult due to lack of residual activity and germination of these species throughout the growing season. Glyphosate resistant weeds have also developed due to extensive use of a single mode of action. The use of soil residual herbicides may have the potential to achieve higher overall weed control and crop yield as well as reduction in total number of herbicides applications in a growing season while also managing weed resistance.

Experiments were conducted at the Plant Science Research Center in Starkville, MS and the Black Belt Branch Experiment Station in Brooksville, MS. The soil consists mostly of silty clay loam soil at the Brooksville, MS location and a loam soil at the Starkville, MS location. The cotton seed used in these experiments was DP 444 BG/RR planted at 3.75 seeds/row foot. A randomized complete block design was used with each treatment being replicated four times. The experiment plot size was 12.66 ft. by 40ft. The factors analyzed were application rate and herbicide timing. Applications were made using a compressed air hooded sprayer system at an output rate of 15 gallons per acre (GPA). Visual ratings were recorded 7, 14, and 28 days after each application. These ratings observed cotton injury and percent weed control.

The data show that for several annual grasses and small seeded broadleaf weeds that over the top application of a residual herbicide in Roundup Ready cotton increased weed control. A tankmixed application of glyphosate plus a residual herbicide provided 84 to 96% control of large crabgrass compared to only 71% when glyphosate was applied alone. Applications of preemergence residual herbicides may allow for a delayed glyphosate applications. An application of glyphosate plus pendimethalin (Prowl H_2O) provided 79, 78, and 86% control of hemp sesbania, pitted morningglory, and barnyardgrass, respectively. Further research needs to be conducted in order to properly assess which residual herbicides best fit into the Roundup Ready® cotton systems.

TRIALS AND TRIBULATIONS: TNNESSEE'S SWITCHGRASS EXPERIENCE. G.N. Rhodes, Jr., L.E. Steckel and T.C. Mueller, University of Tennessee, Knoxville, TN.

ABSTRACT

High and volatile energy prices, coupled with national security concerns, have increased the interest in a greater degree of energy independence in the United States. In his 2007 State of the Union Address, President George Bush outlined his "20 in 10" target which would replace 20 percent of our nation's transportation fuels with renewable sources by 2017. Similar targets, such as the United States Department of Energy's "30 by 30" goal have also been articulated in recent years. Biofuels, according to some experts, can play a large role in this process. Currently, corn-based ethanol and soy-based biodiesel are two of the most widely produced biofuels. In 2006 the United States produced 4.9 billion gallons of ethanol, primarily from corn. It is widely acknowledged, however, that there is a limit to corn-based ethanol production due to potential disruption of the agricultural sector, high input costs, and relative lack of efficiency of producing ethanol from corn. Because of this, interest has increased in the manufacture of ethanol from cellulose produced by herbaceous and woody plants. Because of its wide geographic adaptability, relatively low input requirements, ability to grow well on marginal soils, and high tonnage per acre, most current research and development is with switchgrass (Panicum virgatum).

The Tennessee Biofuels Initiative is a unique partnership among the State of Tennessee, The University of Tennessee, Oak Ridge National Laboratory (ORNL), and private industry. The centerpiece of the program is a 5 million gallon per year cellulosic ethanol pilot research plant near Knoxville. When operational, the plant will consume as much as 170 T of biomass per day for the production of cellulosic ethanol. To supply this need, we will need approximately 8,000 to 10,000 acres of switchgrass within 50 miles of the plant. Our previous experience with switchgrass establishment for wildlife food plots revealed that the stand is slow to establish, and weeds problems during the first year can be severe. While it was found that most broadleaf weeds can be effectively managed with existing herbicides used in grass pastures and hay fields, grass weeds such as large crabgrass, broadleaf signalgrass, goosegrass and johnsongrass are more challenging. Research was initiated to identify herbicides which are efficacious on grass weeds and safe on switchgrass.

Greenhouse tolerance studies conducted at Jackson in 2006 revealed that Envoke (0.5 oz/A), Beacon (1.52 oz/A), Oust (1 oz/A), Select (6 oz/A) and Poast (16 oz/A) severely injured (80 percent or greater) seedling switchgrass. Accent (0.67 oz/A) and Osprey (4.75 oz/A), however, were much less injurious (less than 20 percent). A field study conducted at Milan the same year showed that Accent (0.67 oz/A) effectively controlled broadleaf signalgrass (greater than 80 percent) with no injury to seedling switchgrass. In a 2007 field study at Milan, Accent (0.67 oz/A), Accent (0.67 oz/A) + Direx (1 pt/A), atrazine (2 pt/A), and Plateau (4 oz/A) caused 13, 0, 17, and 30 percent injury, respectively, to seedling switchgrass. Goosegrass control was 50, 7, 53 and 66 percent, respectively.

MANAGING GLYPHOSATE-RESISTANT PALMER AMARANTH IN CONVENTIONAL AND STRIP-TILL COTTON. A.S. Culpepper and A.M. MacRae; Department of Crop and Soil Sciences, University of Georgia, Tifton; and A.C. York and J.R. Whitaker; Department of Crop Science, North Carolina State University, Raleigh.

ABSTRACT

In both Georgia and North Carolina, conservation tillage production systems comprise of at least 50% of the total cotton produced. Early research results suggest management of glyphosate-resistant Palmer amaranth will depend heavily on effective residual herbicides. These residual herbicides can only be effective if they contact the soil and are activated by rainfall/irrigation. An experiment was conducted to determine if this resistant pest could be managed in conservation tillage production.

The split-plot design experiment was conducted at two locations in North Carolina and three locations in Georgia during 2006 and 2007. Treatments were arranged factorially with seven herbicide systems (sub-plots) and two tillage regimes (whole plots). The seven herbicide systems (Table 1) were implemented in both conventionally tilled and strip-tilled production systems.

Table 1. Herbicide systems implemented in two tillage regimes.*

<table>
<tr><th>Program #</th><th>Preemergence</th><th>Early POST</th><th>Layby</th></tr>
<tr><td>1</td><td>Prowl</td><td rowspan="4">Roundup WeatherMax
+
Dual Magnum</td><td rowspan="7">Direx + MSMA</td></tr>
<tr><td>2</td><td>Prowl + Cotoran</td></tr>
<tr><td>3</td><td>Prowl + Staple LX</td></tr>
<tr><td>4</td><td>Prowl + Reflex</td></tr>
<tr><td>5</td><td>Prowl</td><td rowspan="3">Roundup WeatherMax
+
Staple LX</td></tr>
<tr><td>6</td><td>Prowl + Cotoran</td></tr>
<tr><td>7</td><td>Prowl + Reflex</td></tr>
<tr><td>8</td><td>None</td><td>None</td><td>None</td></tr>
</table>

*Cotoran = 1 lb ai/A, Direx = 1 lb ai/A, Dual Magnum = 0.95 lb ai/A, MSMA = 2 lb ai/A, Prowl H_20= 1.2 lb ai/A, Reflex = 0.25 lb ai/A, Staple = 0.043 lb ai/A, Roundup Weathermax = 0.75 lb ae/A.

The cover crop in the conservation tillage system varied at the five locations but included 1) weedy cover only, 2) 4-inch wheat, 3) 8-inch wheat, 4) 24-inch wheat, and 5) 32-inch wheat. When averaging over herbicide systems, tillage method did not impact control when weedy cover (strip-till = 77% control, conventional = 77% control) or 4-inch wheat (strip-till = 68% control, conventional = 67% control) was present at burndown. Glyphosate-resistant Palmer amaranth control was greater in strip-till production when wheat was at a height of 8-inch (strip-till = 73% control, conventional = 60% control), 24-inch (strip-till = 47% control, conventional = 28% control) and 32-inch (strip-till = 66% control, conventional = 21% control) at burndown. Greater control was likely noted in strip tillage because the cover crop reduced Palmer amaranth emergence 12%, 54%, and 76% when wheat was 8, 24, and 32 inches tall at burndown, respectively. Yields were greater in strip-till production as compared to conventional production at the three locations with 8- to 32-inch tall wheat at burndown.

Combined over locations and tillage options, the four most effective herbicide systems included the two programs with Reflex PRE (77 to 82% control), the Prowl + Cotoran followed by Roundup + Staple program (74% control), and the Prowl + Staple PRE program (70% control). Although these four programs were the most effective options, they provided less than 76% control at two locations, 84% to 93% control at two locations, and 80 to 96% control at the other location. Yields from these four programs were similar and greater than yields from other programs.

Managing glyphosate-resistant Palmer amaranth in conservation tillage will offer growers more challenges with a greater dependence on heavy residues and postemergent herbicides, especially Staple, which may quickly promote Palmer amaranth resistance to both glyphosate and Staple. However, heavy residues from cover crops may be a successful tool in areas not infested with glyphosate-resistant biotypes by reducing Palmer amaranth emergence and delaying its emergence and size at time of treatment thereby reducing selection pressure for resistance.

COTTON RESPONSE TO PREEMERGENCE APPLICATIONS OF FOMESAFEN. C.L. Main, J.C. Faircloth, A.S. Culpepper, L.E. Steckel, and A.C. York, University of Tennessee, Virginia Tech, University of Georgia, University of Tennessee, and North Carolina State University.

ABSTRACT

Field studies were conducted in Georgia, North Carolina, South Carolina, Tennessee, and Virginia during 2006 to investigate the tolerance of cotton to preemergence (PRE) application of fomesafen at 0.14, 0.28, 0.35, 0.42, 0.49, 0.56, and 0.84 kg ai ha^{-1} compared to standard PRE herbicides fluometuron at 1.12 kg ai ha^{-1}, pendimethalin at 1.12 kg ai ha^{-1} , and pyrithiobac at 0.0.06 kg ai ha^{-1}. Maximum labeled use rates of fomesafen only caused greater than 10% injury in Virginia (16%) Doubling the fomesafen rate did not increase cotton injury in South Carolina, or Tennessee but did cause 11, 21, and 37% injury in Gerogia, North Carolina, and Virginia respectively. Fomesafen applied at labeled rates did not adversely affect cotton stand, fruit number, fruit distribution, yield, or fiber quality. Fomesafen at 0.42 kg ha-1 or greater reduced cotton height by 16 to 22% in Georgia at 27 DAT but cotton recovered with no differences by 39 DAT; fomesafen did not impact plant height at any other location. Results from these studies indicate that while cotton may show signs of injury from fomesafen during early to mid-season season, yield and fiber quality are not compromised.

PALMER AMARANTH CONTROL WITH LACTOFEN, ACIFLUORFEN, AND 2,4-DB. S.B Clewis, D.L. Jordan, B.R. Lassiter, and A.C. York; Department of Crop Science, North Carolina State University, Raleigh.

ABSTRACT

Increasingly, growers are faced with how to manage large weeds that have escaped previous herbicide applications. In recent years weed escapes have been associated with development of herbicide-resistant weeds, especially weed biotypes resistant to acetolactate synthase (ALS)-inhibiting herbicides. Peanut growers have few alternatives to control large weeds, especially Palmer amaranth (*Amaranthus palmeri*) and other Amaranthus species, when these weeds express resistance to ALS. Research in the southeastern US has demonstrated that applying the protox (PPO)-inhibiting herbicides lactofen and acifluorfen applied four to five days after application of 2,4-DB is more effective than simultaneous application of PPO inhibitors co-applied with 2,4-DB. Research was conducted in North Carolina during 2007 at the Upper Coastal Plain Research Station, the Central Crops Research Station, and in two separate areas at one on-farm location to compare control of Palmer amaranth (> 8 inches in height) with combinations of lactofen (Cobra at 8 and 12.5 oz product/acre) or acifluorfen (Ultra Blazer at 1.0 and 1.5 pints/acre) co-applied or sequentially following 2,4-DB (Butyrac 200 at 1 pint/acre). A single application of imazapic (Cadre at 4 oz/acre) and a non-treated control were also included. With the exception of the non-treated and imazapic-treated peanut, a second application of 2,4-DB was made approximately 4 weeks after the initial 2,4-DB application. A percentage of the population at each location was suspected as being resistant to imazapic.

When combinations and sequential applications of these PPO inhibitors and 2,4-DB were compared in North Carolina, few differences in control were observed (generally less than 60% control). Imazapic also controlled Palmer amaranth poorly. Relatively poor control by PPO-inhibiting herbicides at this stage of weed control was expected (> 8 inches tall.) Interestingly, although not as effective initially as PPO-inhibiting herbicides, sequential applications of 2,4-DB were as effective as co-applied or sequential treatments of PPO-inhibiting herbicides and 2,4-DB approximately 4 weeks after the initial application. Additionally, sequential applications were as effective as PPO-inhibiting herbicides in reducing weed seed head production of Palmer amaranth (reduction of seed head production from 22 heads/m^2 to approximately 7 heads/m^2) These results suggest that while complete control of large Palmer amaranth could not be obtained by any of these herbicide combinations, to avoid injury from PPO-inhibiting herbicides later in the season when escaped weeds are common, sequential applications of 2,4-DB may be as effective as PPO-inhibiting herbicides when suppression is the only possibility. This result would certainly not be the case if PPO-inhibiting herbicides were applied when Palmer amaranth was small (3 inches or less.) However, when resistant weeds are noted in the field they are generally large and above the peanut canopy at a size where PPO-inhibiting herbicides are ineffective.

Palmer amaranth has historically been difficult to control in peanut without effective ALS-inhibiting herbicides. During the mid 1990s and through the mid 2000s growers could use imazapic, imazethapyr, or diclosulam to control this weed. However, resistance to these herbicides has increased the need to apply PPO inhibitors like lactofen, acifluorfen, and flumioxazin. While these herbicides are currently effective when applied in a timely manner, there is great concern that overuse could result in selection for biotypes that are resistant to multiple mechanisms of action.

PALMER AMARANTH (*AMARANTHUS PALMERI*) CONTROL IN COTTON (*GOSSYPIUM HIRSUTUM*) AS INFLUENCED BY HERBICIDE RATES, WEED SIZES, AND APPLICATION METHODS. J.A. Bullington[1], K.L. Smith[1], N.R. Burgos[2], R.C. Doherty[1] and J.R. Meier[1]; [1]University of Arkansas Division of Agriculture; Monticello, AR; [2]University of Arkansas; Fayetteville, AR

ABSTRACT

Palmer Amaranth has been a major problem in cotton since the 1970's. Many different studies in the past have shown it competitive ability, and how it is capable of severely reducing cotton yield. Palmer Amaranth is known to produce as many as 500,000 seeds, which increase its genetic diversity to astronomical levels. Since 1989, resistance has been a growing issue with palmer amaranth, more recently; resistance to glycine chemistries has proven to be a major obstacle for producers. The objectives of this research was to evaluate the efficacy of glufosinate alone and in tankmixes, compare the efficacy of glufosinate and glyphosate, determine if palmer amaranth could be controlled with a layby application.

This project was made up of 4 different experiments to evaluate methods of palmer amaranth control. All experiments were setup in a randomized complete block design with four replications. Experiments were conducted on a Herbert Silt Loam soil at the Southeast Research and Extension Center Branch Station at Rohwer, AR. All applications were made at twelve gallons per acre with a CO_2 propelled backpack or tractor sprayer with two nozzles per row on nineteen inch spacing. Statistical analysis consisted of analysis of variance with means separated using Fisher's Protected LSD at α=0.05 level. The first experiment consisted of seventeen treatments with four application timings (2, 4, 8, and 12 inches) and four Ignite application (0.53, 0.73, 0.53 fb 0.53, and 0.53 fb 0.79 lb ai/A). The second experiment consisted of seventeen treatments planted in Fibermax 955 Liberty Link, Boll Guard II; with four application timings (PRE, 4 leaf, 10 leaf, and Layby) and five tank mixes (Cotoran, Reflex, Valor, Direx, and Dual Magnum) with Ignite. The third experiment consisted of twelve treatments planted in Phytogen 485 Roundup Ready Flex, Wide Strike; at four application timings (PRE, 3-4 leaf, 6-8 leaf, and Layby) of three herbicides (Ignite, Roundup, and Cotoran). The fourth experiment nineteen treatments using four herbicides (Valor, Reflex, Caparol, and Direx) applied alone or tankmixed with MSMA, applied to two and six inch palmer.

The first experiment showed that palmer could be controlled using 0.53 lb ai/A of Ignite 280 when applied to two to twelve inches using 0.53 lb ai/A. The second experiment showed that palmer amaranth control was improved when a soil residual was applied PRE or at the four leaf stage. It also showed that Reflex applied at 4 leaves gave better control than Reflex applied at layby. The third experiment showed that 0.53 lb ai/A of glufosinate and 0.77 lb ae/A of glyphosate gave equal control of palmer amaranth. The fourth experiment showed that palmer could be controlled with a layby application, but that the weeds must be no larger than two inches for effective control.

Palmer Amaranth (*Amaranthus Palmeri*) control in Cotton (*Gossypium hirsutum*) as influenced by herbicide rates, weed sizes, and application methods.

J.A. Bullington[1], K.L. Smith[1], N.R. Burgos[2], R.C. Doherty[1] and J.R. Meier[1]; [1]University of Arkansas Division of Agriculture; Monticello, AR; [2]University of Arkansas; Fayetteville, AR

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GLYPHOSATE-RESISTANT PALMER AMARANTH (AMARANTHUS PALMERI) RESPONSE TO DICAMBA. R. D. Wallace, A. S. Culpepper, W. K. Vencill, A. C. York, and T. L. Grey. University of Georgia, Crop and Soil Sciences Department, Tifton, GA 31794.

ABSTRACT

The control achieved by applying dicamba to glyphosate-resistant Palmer amaranth was examined. Field trials were performed in Macon county, Ga and Mt. Olive, NC in 2007 on known glyphosate-resistant populations of Palmer amaranth. At the Macon county location plants were sprayed with a backpack sprayer at heights of 3, 6, and 12 inches and evaluated at 26, 24 and 19 days after application, respectively. Control of glyphosate-resistant Palmer amaranth when sprayed at three inches was 45, 86, 97, and 99% at rates of 4, 8, 12, and 16 oz/A, respectively. Control of glyphosate-resistant Palmer amaranth when sprayed at six inches was 35, 60, 65, and 91% at rates of 4, 8, 12, and 16 oz/A, respectively. Control of glyphosate-resistant Palmer amaranth when sprayed at twelve inches was 43, 46, 54, and 78% at rates of 4, 8, 12, and 16 oz/A, respectively. When the initial application was followed by a secondary application of dicamba at 12 oz/A, control increased over all heights and rates. At the Mt. Olive location plants were sprayed with a backpack sprayer at 6-7 inches at two initial rates 8 oz/A and 16 oz/A and three secondary rates at 0, 8, and 16 oz/A. The plots were evaluated at 14 days after the first application and 14 and 42 days after the second application. At 8 oz/A followed by no secondary application, 50% control of glyphosate-resistant Palmer amaranth. At 8 oz/A followed by 8 oz/A secondary application, there was 63% control. At 16 oz/A followed by 0, 8, and 16 oz/A there was 53, 90, and 97% control achieved, respectively. As expected, control was greater with increasing amounts of herbicide. Secondary applications also increased control at all heights by varying amounts. Spraying when the weed is small and using at least the label recommended 8 oz/A rate should provide control.

EMPIRICAL ESTIMATES OF POLLEN GRAIN SIZE AND SETTLING VELOCITY FOR *AMARANTHUS PALMERI*. L.M. Sosnoskie, A.S. Culpepper University of Georgia, Crop and Soil Sciences Department, Tifton, GA 31794, D. Dales and G.C. Rains University of Georgia, Biological and Agricultural Engineering Department, Tifton, GA 31794,and T.M. Webster USDA-ARS, Tifton, GA 31794.

ABSTRACT

An accurate prediction of long-distance dispersal of any particle requires *a priori* knowledge regarding its size, shape, density and/or terminal velocity. At least 20% of all angiosperm families employ abiotic pollination strategies to affect gene-dispersal; specifically, anemophily (=wind-mediated dispersal) has been reported in 16% of the families. Evolutionary forces have shaped the pollination syndrome for anemophilous species. Pollen grains are typically small and smooth; small particles with unornamented surfaces experience less clumping and are more likely to be transported away from the paternal plant.

The ease with which pollen grains are liberated from the crop canopy and the length of time they remain airborne are determined, in part, by their gravitational settling velocity (*Vs*) in still air. The *Vs* for small (1 to ~100 µm), round particles, such as pollen, can either be determined, empirically, using a settling chamber, or else estimated using an application of Stoke's law

$$Vs = \frac{2}{9}\left(r^2\right)\left(g\right)\left(\frac{\sigma_p - \sigma_f}{\mu}\right)$$

where *r* is the radius of the particle (m), *g* is the acceleration due to gravity (981 m s^{-1}), σ_p is the density of *A.* palmeri pollen and σ_f is the density of air (1.184 kg m^{-3}), and μ is the dynamic viscosity of air (1.89 x 10^{-5} kg m^{-1} s^{-1}). Assuming that the density of *A. palmeri* pollen is a real number between 995 kg m^{-3} (the density of water) and 1500 kg m^{-3} (the density of pure starch, *A. palmeri* pollen grains are approximately 50% water and 7% starch), the *Vs* of *a. palmeri* pollen can be approximated after determining the mean diameter of the grains. Pollen density can be difficult to determine and there is some debate regarding methodology.

Fresh pollen was collected from multiple plants at the USDA/UGA Jones Farm in Tifton, GA for six days in July and August 2007. Pollen diameter measurements (N_{grains} = 1825) were made using digital images captured with a Diagnostic Instruments® SPOT™ Insight camera attached to an Olympus® BH-2 research microscope (400x magnification). Our results indicate that the mean diameter for *A. palmeri* pollen was 31 µm (min= 21, max = 38), as opposed to 19.8 µm (as is reported in the literature). All of the pollen grains examined were almost perfectly spherical when fully hydrated. Assuming a mean pollen diameter of 31 µm, the mean theoretical *Vs* for *A. palmeri* pollen grains should range from 2.7-4.1 cm s^{-1} if pollen density is between 995 kg m^{-3} (pure water; ~ 50% of an *A. palmeri* pollen grain is water) and 1500 kg m^{-3} (pure starch; starch is a major component of *A. palmeri* pollen (~7%)).

The distribution of settling velocities for *A. palmeri* pollen grains was determined, empirically, using a settling chamber. Our settling chamber is comprised of two nested, acrylic columns 1.8 m in height; the inner cylinder is 15 cm in diameter. Freshly harvested pollen grains (see previous) were released at the top of a 2 m tower and captured at the base using greased microscope slides attached to a rotating disk. The position of the slide on the disc and the speed at which the disc rotates determines the fall rate for grains trapped on each individual slide; grains on the first slides have faster *Vs* than grains on the last slides.

Results from the laboratory studies indicate that the bulk of single pollen grains settled at a rate of approximately 4.5 to 5.0 cm s^{-1}. The disparity between the empirical (4.5 to 5.0 cm s^{-1}) and the theoretical (2.7-4.1 cm s^{-1}) estimates of pollen *Vs* are likely the result of the assumptions associated with Stoke's law. The range of mean theoretical values for *Vs* was established using a model that assumes particles maintain a constant shape, size and density. As *A. palmeri* pollen becomes desiccated, the grains assume the shape of a deflated basketballs or bowls; this shape has a lower drag coefficient than does a sphere. Furthermore, the movement of a pollen grain may be affected by neighboring particles; an ensemble of pollen grains will settle faster than an individual. Stoke's law predicts the *Vs* of individual particles in the absence of particle-particle interactions.

TILLAGE SYSTEM AND CEREAL RYE RESIDUE AFFECTS PIGWEED ESTABLISHMENT AND COMPETITIVENESS IN COTTON. A.J. Price, F.J. Arriaga, K.S. Balkcom, J.S. Bergtold, T.S. Kornecki, and R.L. Raper, USDA-ARS-National Soil Dynamics Laboratory, Auburn, AL.

ABSTRACT

An integral component of conservation-agriculture systems in cotton (*Gossypium hirusutum* L.) is the use of a winter cover crop; however, managing problematic weeds in such systems is a challenge. To evaluate pigweed (*Amaranthus* spp.) dynamics in conventional vs. conservation systems, a rye (*Secale cereale* L.) winter cover crop was established at the E.V. Smith Research and Extension Center located near Shorter, AL in the fall of 2006 and at the Tennessee Valley Research and Extension Center near Bella Mina, AL. Horizontal strips consisted of four conservation-tillage treatments: high, medium, and low amounts of cereal rye plus a winter fallow treatment, as well as a conventional tillage treatment that was left fallow prior to tillage. Additionally, vertical strips consisted of four herbicide regimes: 1) S-metolachlor at 1.12 kg/ha applied broadcast preemergence (PRE) application followed by (fb) glyphosate at 1.12 kg ae/ha applied postemergence (POST) fb a LAYBY application of diuron at 1.12 kg ai/ha plus MSMA at 2.24 kg ai/ha plus 0.25% (v/v) NIS, 2) S-metolachlor at 1.12 kg/ha applied banded PRE fb glyphosate at 1.12 kg/ha POST fb a LAYBY application of diuron at 1.12 kg /ha plus MSMA at 2.24 kg/ha plus 0.25% (v/v) NIS, 3) glyphosate applied at 1.12 kg/ha POST fb a LAYBY application of diuron at 1.12 kg/ha plus MSMA at 2.24 kg/ha plus 0.25% (v/v) NIS, and 4) a non-treated control. Cotton was then established after within-row sub-soiling at E.V. Smith and no-till at Tennessee Valley. At both locations, the highest rye biomass was attained following the earliest planting date and the lowest rye biomass was attained following the latest planting date. At both locations, the highest pigweed density was attained following the winter fallow conservation-tillage treatment; the second highest densities were attained following the conventional-tillage and third planting date conservation-tillage treatments; pigweed density decreased as winter cover residue increased. Also at both locations, cotton yield was not dependent on pigweed density or pigweed biomass. Additionally, all conservation-tillage treatments regardless of winter cover yielded more seed cotton lint than the conventional tillage treatment.

INTRODUCTION

Conservation-tillage systems are primarily used to address concerns about soil erosion, soil quality, and water availability (Blevins et al. 1971, Reeves 1997, Kaspar et al. 2001). Cotton acreage in conservation tillage systems is estimated to be 30% in the U.S. and approaches 60% in the southeastern U.S. (Anonymous 2003). The use of cover crops in conservation tillage offers many advantages, one of which is weed suppression through physical as well as chemical allelopathic effects (Nagabhushana et al. 2001). Cereal rye (*Secale cereale* L.) is one of the most common winter cover crops recommended for cotton production in the U.S.

Recently, glyphosate resistant Palmer amaranth (*Amaranthus palmerii*) has been discovered in Arkansas, Georgia, North Carolina, South Carolina, and Tennessee and populations in Alabama may also be resistance. Current resistant Palmer amaranth control recommendations in Georgia rely on soil applied herbicides (Cullpepper 2007). However, conservation tillage systems are disadvantaged due to herbicide interception by winter cover residue. An alternative method may be to band herbicides over the drill, thus protecting cotton yield while reducing inputs. Previous research has also shown that high amounts of residue can inhibit weed germination and emergence (Price et al. 2006, Saini et al. 2006). We hypothesize that pigweed control will be higher in high-residue systems vs. low residue systems and at control levels equivalent to conventional tillage systems utilizing soil applied herbicides. Therefore, field studies were conducted evaluating pigweed density, biomass, and cotton yield provided by two tillage systems containing four winter residue amounts in the conservation tillage system and four herbicide systems.

MATERIALS AND METHODS

Identical field experiments were established at the E.V. Smith Research and Extension Center located near Shorter, AL and at the Tennessee Valley Research and Extension Center near Bella Mina, AL in the fall of 2006. The experimental design was a randomized complete block, having a split block restriction on randomization, with three treatment replicates. Native populations of Palmer amaranth and redroot pigweed (*Amaranthus hybridus*) were present at E. V. Smith and Tennessee Valley locations, respectively. However, an additional 120,000 seed of each respective pigweed species was broadcast early spring over each plot at each location, to assure an adequate seedbank.

The experiment involved two tillage systems, four winter residue amounts in the conservation-tillage system, and four herbicide regimes. Parallel strips consisted of four conservation-tillage treatments: high (PD1), medium (PD2), and low (PD3) amounts of cereal rye plus a winter fallow treatment, as well as a conventional tillage treatment that was left fallow prior to spring tillage. The three cereal rye residue amounts were generated by utilizing three fall planting dates: 2 and 4 wks prior to and on the historical average first frost. The rye was established with a no-till drill at a seeding rate was 100 kg/ha; 56 kg of nitrogen (N) as ammonium nitrate was applied to rye in fall after establishment. Additionally, perpendicular strips consisted of four herbicide regimes: 1) S-metolachlor at 1.12 kg/ha applied broadcast preemergence (PRE) application followed by (fb) glyphosate at 1.12 kg ae/ha applied postemergence (POST) fb a LAYBY application of diuron at 1.12 kg ai/ha plus MSMA at 2.24 kg ai/ha plus 0.25% (v/v) NIS, 2) S-metolachlor at 1.12 kg/ha applied banded PRE fb glyphosate at 1.12 kg/ha POST fb a LAYBY application of diuron at 1.12 kg /ha plus MSMA at 2.24 kg/ha plus 0.25% (v/v) NIS, 3) glyphosate applied at 1.12 kg/ha POST fb a LAYBY application of diuron at 1.12 kg/ha plus MSMA at 2.24 kg/ha plus 0.25% (v/v) NIS, and 4) a non-treated control.

In the spring, the rye cover crop as well as weeds in the winter fallow treatment were terminated using glyphosate at 1.12 kg ae/ha and flattened prior to cotton seeding with a mechanical roller-crimper to form a dense residue mat on the soil surface. Cover biomass from each plot was measured immediately before termination; the above-ground portion of the rye cover was clipped from one randomly-selected 0.25-m^2 section in each plot, dried and weighed.

The cotton variety DP 555 BG/RR was seeded at E.V. Smith following within-row subsoiling all plots with a narrow-shanked parabolic subsoiler, equipped with pneumatic tires to close the subsoil channel. Subsoiling was necessary because this location had a well-developed hardpan. The cotton variety DP 444 BG/RR was direct-seeded at Tennessee Valley. The conventional tillage treatment was prepared with multiple disk passes and cotton was seeded with a four-row planter equipped with row cleaners and double-disk openers at both locations. Both experimental areas were exposed to extreme drought, and the experimental area at E.V. Smith received minimal supplemental irrigation so that the experiment was not terminated. Plot size was four-rows (102 cm row spacing) wide at both locations by 6 m in length.

Evaluations also included pigweed density, dry weight and fresh weight before and after POST and LAYBY herbicide applications, cotton stand establishment and height, and cotton seed lint yields were determined by machine-harvesting the middle two rows of each plot with a spindle picker. Due to recommended manuscript limits, results from the herbicide regimes have been omitted.

RESULTS AND DISCUSSION

Winter Cover Crop Biomass and Weed Density

At both locations, the highest rye biomass was attained following the earliest planting date (PD1) and the lowest biomass was attained following the latest planning date (PD3) (Figures 1 and 2). At Tennessee Valley, biomass yields of 8,680, 7,390 and 6,430 kg/ha were attained for planting dates one, two and three, respectively (Figure 1). At Tennessee Valley, the highest pigweed density (1,073,000 plants/ha) was observed following the winter fallow conservation-tillage (WF) treatment. The second highest densities were observed following the third planning date (493,000 plants/ha) and the conventional-tillage (CT) (560,000 plants/ha) treatments. The lowest densities followed the first (90,000 plants/ha) and second planting dates (123,000 plants/ha). At E.V. Smith, biomass yields of 8,430, 6,050 and 4,170 kg/ha were attained for planning dates one, two and three respectively (Figure 2). At E.V. Smith, the highest pigweed density again followed the winter fallow conservation-tillage treatment (797,000 plants/ha). The second highest density followed the conventional-tillage treatment (580,000). All three conservation-tillage systems provided lower densities ranging between 210,000 and 230,000 plants/ha compared to both the winter fallow conservation tillage and conventional tillage treatments.

Winter Cover Crop Biomass and Pigweed Biomass

Differences between location, and thus pigweed species biomass response, were significant. At Tennessee Valley, redroot pigweed biomass generally reflected pigweed density, with the highest pigweed biomass (270 kg/ha) attained in winter fallow conservation tillage and conventional tillage (200 kg/ha) treatments (Figure 3). Planting date three resulted in 20 kg biomass/ha while planting dates one and two resulted in < 3kg biomass/ha. At E.V. Smith, similar Palmer amaranth biomasses were observed in the winter fallow conservation tillage (85 kg/ha) and conventional tillage treatments (95 kg/ha) (Figure 4). Densities of 60 kg/ha and 55 kg/ha were observed in planting date treatments one and two, respectively. However, the third planning date which provided similar pigweed density compared to planning dates one and two provided the lowest pigweed biomass (25 kg/ha). Because the experimental area experienced severe drought stress throughout the season, the larger pigweed in the earlier planting dates may be due to increased moisture conservation provided by the higher mulch residue attained in these treatments, resulting in larger plants.

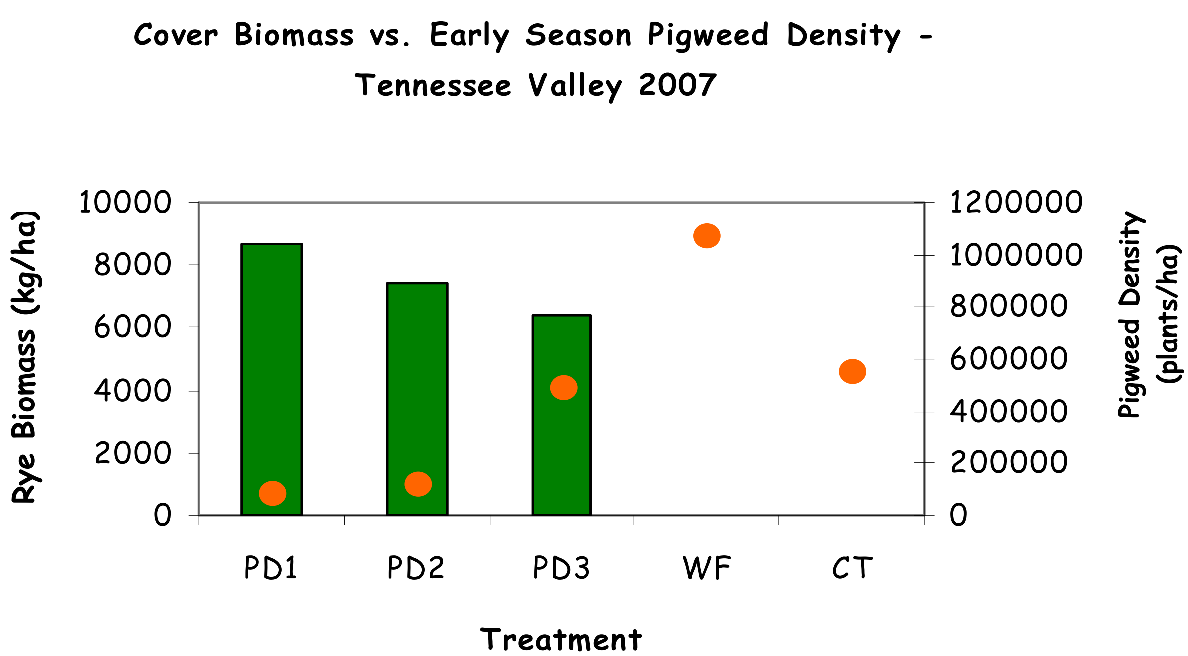

Figure 1. Bars represent rye biomass, dots represent pigweed density.

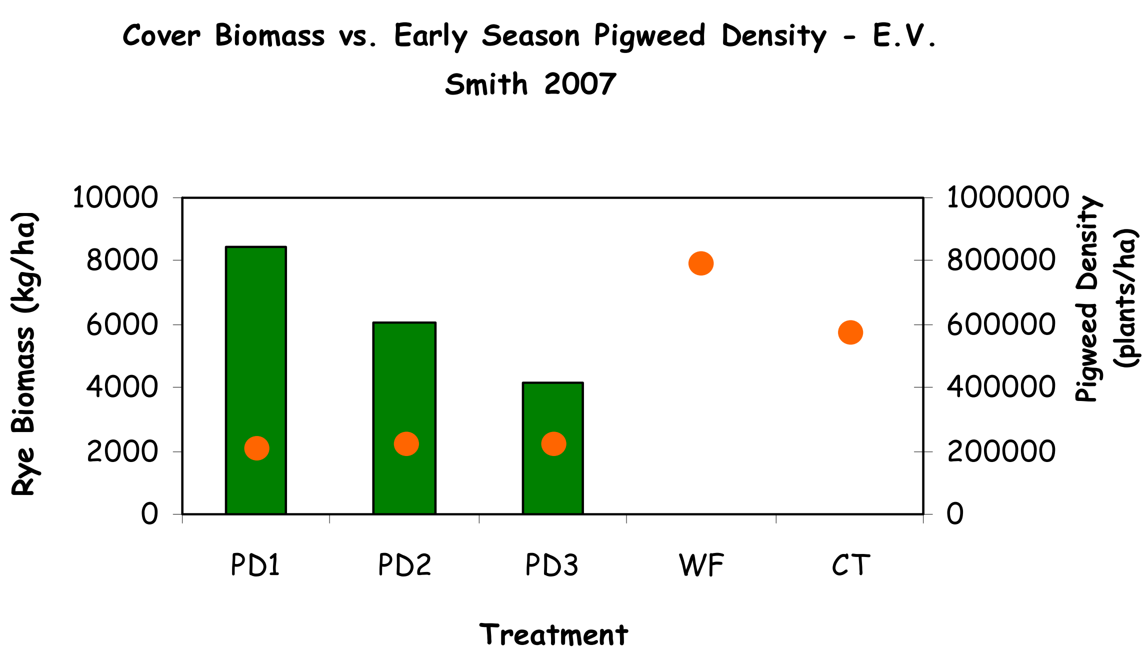

Figure 2. Bars represent rye biomass, dots represent pigweed density.

Cotton Yield

At Tennessee Valley and E.V. Smith, cotton yield was not dependent on pigweed density (Figures 5 and 6) or pigweed biomass (data not shown). Additionally, all conservation-tillage treatments yielded more seed cotton lint than the conventional tillage treatment.

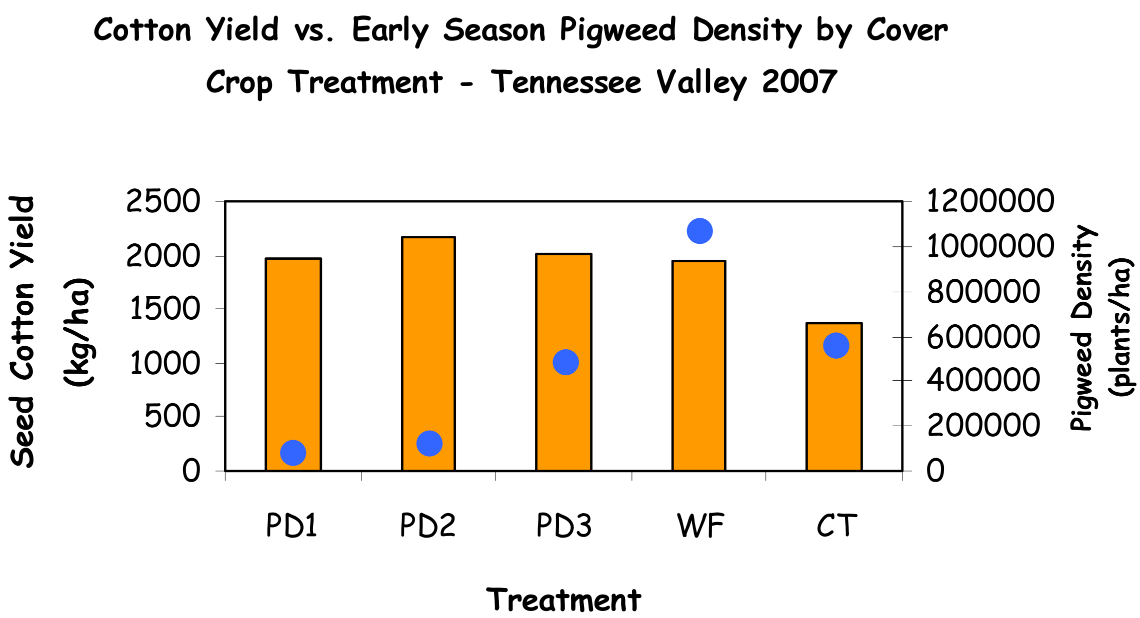

Figure 5. Bars represent cotton yield, dots represent pigweed density.

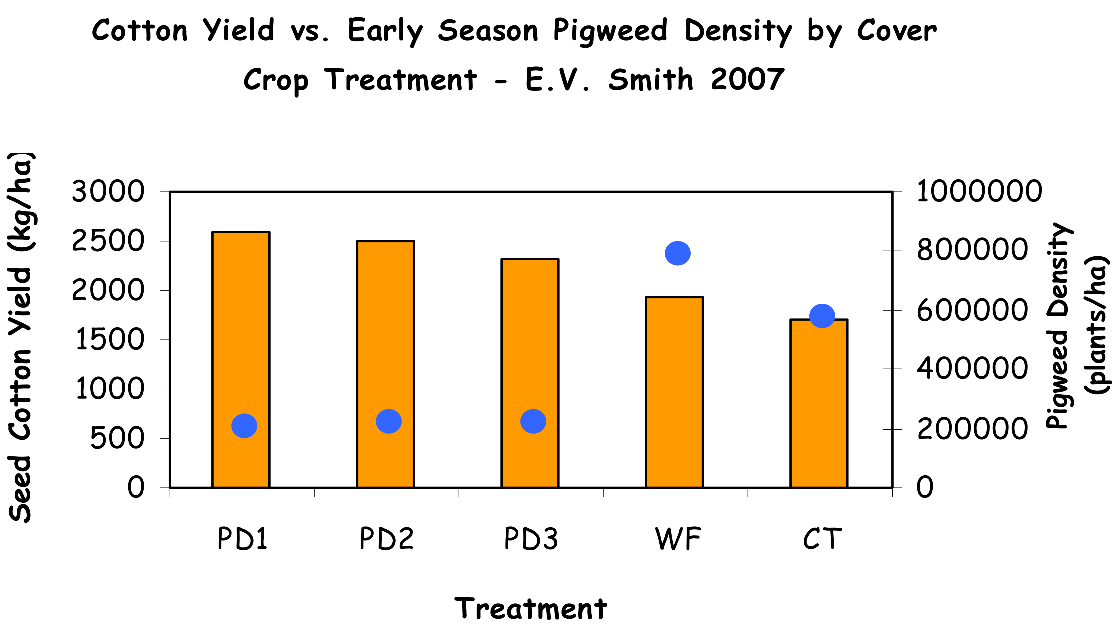

Figure 6. Bars represent cotton yield, dots represent pigweed density

CONCLUSIONS

- Increasing amounts of winter cover biomass can decrease early season pigweed density in conservation-agriculture systems, thus allowing for a size differential between pigweed and crop for future herbicide applications.

- Conservation-agriculture systems that do not utilize high-residue winter cover crops may have increased pigweed densities.
- Weed control provided by shallow tillage is similar to conservation-agriculture systems that have moderate amounts of residue; systems with maximum levels of residue will have fewer pigweed.

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BROADLEAF LEVEE WEED CONTROL IN RICE. J. Still, J.K. Norsworthy, G.M. Griffith, S.K. Bangarwa, and R.C. Scott, University of Arkansas, Fayetteville, AR.

ABSTRACT

Broadleaf levee weed control is one of the most challenging weed management decisions that consultants and producers face each year. The complex of weeds that are common on rice levees is more diverse than that found in flooded bays due to the continuous moist conditions on top of levees after flood establishment in bays. As a result, weeds emerge from levees long after the permanent flood has been established. By the time herbicides are applied to levees, weeds are often larger than those sizes recommended for adequate control on product labels. Furthermore, most weed efficacy ratings published in state-recommended weed control guides are based on small-sized weeds and establishment of a permanent flood to prevent further infestations, which does not occur on top of levees. The objective of this research was to develop effective late-season control options for managing difficult-to-control broadleaf weeds on rice levees. Field experiments were conducted at Lonoke and Stuttgart, AR, in 2007. Rice levees were constructed on 12-ft centers and over-seeded with hemp sesbania at both sites and palmleaf morningglory at Stuttgart. The levees were also broadcast overseeded with 'Wells' rice at 90 lb/A. Clomazone was applied preemergence and fenoxaprop applied postemergence to both test sites to control grass weeds and promote growth of broadleaf weeds. Additional broadleaf weeds that were present included prickly sida at Stuttgart and Pennsylvania smartweed at Lonoke. Propanil, triclopyr, 2,4-D, acifluorfen, carfentrazone, penoxsulam, quinclorac, halosulfuron, bentazon, and bispyribac were evaluated alone and in combination with propanil and quinclorac. All herbicides were applied at labeled rates, and the combination that resulted in a 2X rate of propanil and quinclorac was not included. Additionally, a nontreated control was included, and the experiments were replicated four times. Weed control and rice injury were visually rated at 14 and 28 days after treatment. At Stuttgart, hemp sesbania was 12- to 24-inches tall, prickly sida was 2- to 6-inches tall, and palmleaf morningglory had 4- to 18-inch long vines at application. At Lonoke, hemp sesbania was 18- to 36-inches tall and Pennsylvania smartweed was 5- to 12-inches tall. Acceptable control was deemed to be any treatment that provided at least 90% control through 28 days after treatment. Acceptable hemp sesbania control was obtained at both sites with propanil alone or tank-mixed with any herbicide and triclopyr, 2,4-D, aciflurofen, or carfentrazone alone or tank-mixed with propanil or quinclorac. Prickly sida was one of the most difficult weeds to control, which may have been partially because of its shorter stature and hence poor spray coverage due to the taller rice and hemp sesbania at application. Acceptable prickly sida control was obtained only with quinclorac plus 2,4-D and quinclorac plus bispyribac. Palmleaf morningglory was effectively controlled with only 2,4-D alone or in combination with propanil or quinclorac. Acceptable control of Pennsylvania smartweed was obtained with 2,4-D, acifluorfen, and carfentrazone alone or tank-mixed with propanil or quinclorac, except for the propanil plus acifluorfen combination. Additionally, halosulfuron plus propanil and penoxsulam plus quinclorac effectively controlled Pennsylvania smartweed. Assuming the presence of the these five weeds on a rice levee, only the combination of quinclorac plus 2,4-D would provide acceptable control of all weeds. Of the herbicides applied alone, 2,4-D provided the most consistent, effective control across all weeds. However, current restrictions in Arkansas prohibit the use of 2,4-D at certain times of the year, meaning that other less effective herbicides or herbicide mixtures must be used during the restricted period. Although propanil is commonly applied to rice levees in combination with other herbicides, it was observed that antagonism can occur when applied with systemic herbicides. Future research efforts will include focusing on additional broadleaf weeds such as Palmer amaranth and cutleaf groundcherry and evaluating control options for late-season grass control on levees.

EVALUATION OF POSTEMERGENCE ACIFLUORFEN, BENTAZON AND FOMESAFEN APPLIED TO SNAP BEAN (PHASEOLUS VULGARIS). R.B. Batts[1], R.W. Wallace[2] and A.K. Petty[2], North Carolina State University, Raleigh[1] and Texas A & M University, Lubbock[2]

ABSTRACT

Weed control, crop injury and yield were evaluated in 2007 for processing snap beans grown in North Carolina and Texas by comparing selected rates of acifluorfen (0.188, 0.25 and 0.375 lb ai/A) and fomesafen (0.188, 0.25, and 0.31 lb ai/A) to bentazon (0.75 lb ai/A) when applied postemergence (POST) 21 days after planting (DAP). Trifluralin applied pre-plant incorporated (PPI) at 0.75 lb ai was used as a grower standard alone (without POST herbicides), and was applied over the entire test site at both locations. Weed populations in North Carolina were low and no ratings were recorded. In Texas, Palmer amaranth (*Amaranthus palmeri* S. Wats.) and common sunflower *(Helianthus annuus* L.) were controlled by all three herbicide treatments at 97% or better, regardless of rate. Crop injury (leaf chlorosis or necrosis) with bentazon rated 28 DAP was higher (13%) in North Carolina, while no injury was observed in Texas. In North Carolina, crop injury with all three rates of acifluorfen ranged from 24 to 36%, while injury with fomesafen was 7.5% or less. In contrast, injury from acifluorfen and fomesafen in Texas was 6.3% or less, regardless of rate. Differences in crop injury between states may have been a factor of the choice of snap bean variety (North Carolina = Ambra; Texas = Titan) as well as relative humidity (North Carolina = high; Texas = low). While injury from acifluorfen observed in North Carolina was high, yields from all treatments were equal to or greater than trifluralin applied alone. Lower yields in the trifluralin alone treatment may have been due to season-long weed pressure (even though it was low). There were no significant differences in yields for any of the treatments applied in Texas; however, yields in acifluorfen-treated plots averaged 25% less than the trifluralin alone or bentazon treatments. Average yields in plots treated with fomesafen were equivalent to trifluralin alone and the bentazon treatments. These results indicate that POST applications of fomesafen to snap beans is safe within the range of rates tested, and that while acifluorfen may cause significant early injury, yields may not necessarily be decreased. However, as seen in the Texas trial, although weeds were successfully controlled and bean injury low, yields may still be reduced, and this may prohibit its use under these conditions.

EVALUATION OF WEED CONTROL AND SWEET POTATO TOLERANCE WITH POST DIRECTED HERBICIDE APPLICATION. D.K. Miller, T.P. Smith, and M.S. Mathews, Northeast Research Station, LSU AgCenter, St. Joseph.

ABSTRACT

A field study was conducted in 2007 at the Sweet Potato Research Station near Chase, La to determine sweet potato tolerance and weed control with POST directed herbicide application. Treatments evaluated included Roundup Weathermax (glyphosate) at 22 oz/A, Staple LX (pyrithiobac) at 2.6 oz/A, Envoke (trifloxysulfuron) at 0.15 oz/A, or Synchrony XP (chlorimuron + thifensulfuron) at 1.5 oz/A applied 14 d POST transplant, and the same treatments applied 28 d POST transplant following an at planting POST transplant application of Command 3 ME (clomazone) at 1.3 pt/A. Nonionic surfactant at 0.25% v/v was included with Staple LX, Envoke, and Synchrony XP. A weed-free control was included for comparison. Beauregard sweet potato was transplanted to a silt loam soil on June 28. Herbicides were applied with a backpack sprayer equipped with a Layby type nozzle directed to contact the bottom 1 to 2 inches of each sweet potato plant while providing complete row coverage. The portion of the plant above the contact zone was shielded from spray contact. Weeds present at application timing ranged from 1 to 3 inches in height. Parameters measured included crop injury 14 and 28 d after treatment (DAT), weed control prior to harvest, and yield.

At 14 and 28 DAT for the 14 d POST transplant applications, injury ranged from 3 to 9 and 0 to 1%, respectively, with no differences noted among treatments. For the 28 d POST transplant applications, injury for these respective evaluation timings was 10 to 23 and 5 to 18% with no differences noted among treatments. Rice flatsedge was controlled 88 to 100% late season by Staple LX, Envoke, and Synchrony XP applied 14 or 28 d POST transplant while control with Roundup Weathermax was only 78 and 74% at these respective application timings. Cutleaf groundcherry was controlled 74 to 84% with application of Roundup Weathermax and Synchrony but only 26 to 59% by Staple LX and Envoke. All treatments resulted in similar control of purple nutsedge and spiny amaranth ranging from 91 to 100 and 63 to 86%, respectively. Staple LX and Envoke applied at both timings and Roundup Weathermax applied at the later timing controlled carpetweed 86 to 100% compared to no greater than 70% control for all other treatments. U.S. #1 yield was significantly lower for Staple LX applied 14 d POST transplant (100 bu/A) and Roundup Weathermax (148 bu/A) and Envoke (103 bu/A) applied 28 d POST transplant when compared to the weed-free control (248 bu/A). Total yield (U.S. #1, canner, and jumbo) was significantly lower than the weed-free control (499 bu/A) only for Roundup Weathermax applied 28 d POST transplant (264 bu/A).

Results suggest that good weed control and sweet potato tolerance to evaluated herbicides not currently labeled for use in the crop can be observed from POST directed applications that limit plant/herbicide contact.

EVALUATION OF WEED MANAGEMENT IN EVANGELINE AND BEAUREGARD SWEET POTATO.
D.K. Miller, T.P. Smith, and M.S. Mathews. Northeast Research Station, LSU AgCenter, St. Joseph.

ABSTRACT

A field study was conducted in 2007 at the Sweet Potato Research Station near Chase, La to evaluate the tolerance of Beauregard and Evangeline sweet potato to commercially available herbicides and potential inherent ability of each variety to effectively compete against weeds. Herbicide treatments evaluated included clomazone (Command 3 ME) at 1.3, 2, 2.5, or 3 pt/A POST-transplant, flumioxazin (Valor SX) at 2 or 2.5 oz/A PRE-transplant, s-metolachlor (Dual Magnum) at 1 pt/A POST-transplant, flumioxazin at 2 oz/A PRE-transplant followed by clomazone at 2 or 2.5 pt/A or s-metolachlor at 1 pt/A POST-transplant, and flumioxazin at 2 oz/A PRE-transplant followed by clomazone at 2 pt/A POST-transplant followed by halosulfuron (Sandea) at 0.6 oz/A 34 days POST-transplant. A weed-free control was included for comparison. Beauregard and Evangeline were transplanted into a silt loam soil on June 28. Experimental design was a randomized complete block with four replications. Crop injury and weed control were visually rated 13 and 34 d after treatment, respectively. Plots were harvested on October 18. Yield comparison was made between varieties within each respective herbicide treatment and the weed-free control. In addition, yield comparison was made for each variety within a herbicide treatment and the weed-free control for that respective variety.

Visual injury was not observed for any herbicide treatment for either variety. Control of carpetweed, cutleaf groundcherry, spiny amaranth, yellow nutsedge, and purple nutsedge was no greater than 54, 79, 75, 51, and 46%, respectively, when clomazone was applied alone. Flumioxazin at 2.5 oz/A provided 86, 100, 98, 76, and 73% control of these respective weeds while control with metolachlor was 60, 96, 89, 85, and 83%. Within each respective herbicide treatment and the weed-free control, U.S. #1 yield and total yield (U.S. #1, canner, and jumbo) were statistically similar comparing Beauregard to Evangeline. Under weed-free conditions, yield of U.S. #1's and total yield grade for Beauregard was 291 and 526 bu/A, respectively, compared to 378 and 655 bu/A for Evangeline. For all clomazone alone treatments, yield of U.S. #1's for Evangeline was reduced 72 to 77% compared to the weed-free Evangeline treatment while total yield was reduced 53 to 63%. With respect to Beauregard and the clomazone treatments, U.S. #1 yield was reduced 53 to 59% compared to the weed-free Beauregard treatment while total yield was reduced 0 to 42%. All other herbicide treatments did not result in yield reductions when comparing each variety within each herbicide treatment to its respective weed-free control.

Results indicate that under weed management strategies currently employed by sweet potato producers, there does not appear to be an advantage in competitiveness between Evangeline and Beauregard varieties with weeds evaluated.

BELL PEPPER, CANTALOUPE, CUCUMBER, SUMMER SQUASH, AND TOMATO PLANT BACK INTERVALS FOLLOWING A DMDS FUMIGANT APPLICATION. A.W. MacRae and A.S. Culpepper; Crop and Soil Sciences Department, University of Georgia, Tifton, GA 31793.

ABSTRACT

A study was conducted in 2007 to investigate two plant back intervals for the fumigant dimethyl disulfide (DMDS). Treatments consisted of methyl bromide (MeBr) 98:2 at 240 lbs/A shank injected and covered with low density polyethylene (LDPE) mulch, DMDS @ 74 gal/A shank injected and covered with LDPE mulch, and DMDS @ 74 gal/A shank injected and covered with virtually impermeable film (VIF) mulch. Four plant back intervals were tested with each treatment: 1) wait 7 days after fumigation, punch the holes and transplant the same day (7 day), 2) wait 7 days after fumigation, punch the holes and wait 24 hours to plant (7+1 day), 3) wait 14 days after fumigation, punch the holes and transplant the same day (14 day), and 4) wait 14 days after fumigation, punch the holes and wait 24 hours to plant (14+1 day). Five crops were hand transplanted at each plant back interval; 'Heritage' bell pepper, 'Athena' cantaloupe, 'Thunder' cucumber, 'Prelude II' squash, and 'Amelia' tomato. Data collected were crop yield and visual injury rated 21 days after planting on a scale of 0 to 100 where 0 = no injury and 100 = complete plant death. Cucumber data will not be discussed due to an additional factor that affected plant growth which made treatment separation unreliable.

7 day plant back interval - Bell pepper was injured 7 and 22% by the DMDS treatments under LDPE and VIF mulches, respectively. These same treatments caused injury to cantaloupe (13 and 37%), squash (13 and 28%), and tomato (18 and 40%). A reduction in tomato yield was only observed for the DMDS treatment under the VIF mulch. There were no negative effects on bell pepper, cantaloupe, and squash yields from any of the treatments.

7+1 day plant back interval – Although bell pepper was injured 13% and cantaloupe was injured 20% by the DMDS under VIF treatment, these values were not found to be different than the MeBr treatment. Squash was injured 22% by the DMDS under VIF treatment. Although tomato was injured 8 and 15% by the DMDS treatments under LDPE and VIF mulches, respectively, these values were not found to be different than the MeBr treatment. There were no negative effects on bell pepper, cantaloupe, squash, and tomato yields from any of the treatments.

14 day plant back interval – Although bell pepper was injured 10% by the DMDS under VIF treatment, this value was not found to be different than the MeBr treatment. Cantaloupe was not injured by any of the treatments. Squash was injured 20% by the DMDS under VIF treatment. Although tomato was injured 10% by the DMDS under VIF treatment, this value was not found to be different than the MeBr treatment. There were no negative effects on bell pepper, cantaloupe, squash, and tomato yields from any of the treatments.

14+1 day plant back interval – No treatment was observed to cause an increase in injury or a decrease in yield for bell pepper and cantaloupe. Although squash was injured 12% and tomato was injured 8% by the DMDS under VIF treatment, these values were not found to be different than the MeBr treatment. Squash and tomato yields were not negatively affected by any treatment.

Only tomato planted into the DMDS under VIF mulch treatment 7 days after fumigation was observed to have a yield decrease. This same treatment showed the possibility for injury to squash and tomato with a 14+1 day plant back interval. According to our data, the use of methyl bromide or DMDS under LDPE mulch will allow for a plant back of 7 days without observing a reduction in yield. However, waiting until 14 days after fumigation prior to planting eliminated the possibility of injury to the crops with either of these treatments. As shown by the injury observed by the crops in this study, VIF was very effective in holding the DMDS fumigant in the bed. Thus a possible reduction in the rate of DMDS used, when placed under VIF mulch, may be possible without losing the effectiveness of this product on the control of targeted pests.

EFFECT OF AMINOPYRALID ON VEGETABLE CROPS IN FLORIDA. B.J. Fast, J.A. Ferrell, and W.M. Stall; University of Florida, Gainesville.

ABSTRACT

A field experiment was conducted near Live Oak, Florida in 2006-2007 to determine the effect of aminopyralid carryover on tomato, eggplant, bell pepper, watermelon, and muskmelon. Aminopyralid was applied on November 26, 2006 at rates of 0, 0.013, 0.025, 0.05, and 0.1 lb ae ac^{-1}, and vegetable plants were transplanted into the treated areas on April 9, 2007. Crop injury was visually rated 8 weeks after transplanting on a percentage scale of 0 (no injury) to 100 (crop death), and fruit was harvested from each plot 11 weeks after transplanting. At the lowest (0.013 lb ae ac^{-1}) and highest (0.1 lb ae ac^{-1}) aminopyralid rates, crop injury percentages were 70.0 and 88.8 (tomato), 50.0 and 85.0 (eggplant), 23.8 and 53.8 (bell pepper), 18.8 and 37.5 (watermelon), and 0 and 1.3% (muskmelon), respectively. Yield losses (also at the lowest and highest aminopyralid rates) were 55.3 and 98.6 (tomato), 58.5 and 94.1 (eggplant), 8.9 and 96.0 (bell pepper), 28.3 and 34.9 (watermelon), and 11.7 and 11.0% (muskmelon), respectively. These results indicate that tomato, eggplant, and bell pepper are extremely sensitive to aminopyralid carryover, watermelon is moderately sensitive, and muskmelon is only slightly sensitive.

TOLERANCES OF FRESH MARKET DILL, PARSLEY AND CILANTRO TO POTENTIAL HERBICIDES IN FLORIDA. W.M. Stall and E.J. McAvoy; University of Florida, Gainesville and LaBelle, FL.

ABSTRACT

Dill (*Anethum graviolens*), parsley *(Petroselinum crispum)* and cilantro *(Coriandrum sativum)* are grown on minor acreages in Florida, but are a major part of many fresh market mixed-load shipments to northern markets. Registered herbicides on these three crops are few. Linuron is labeled on parsley for application pre emergence (PRE) and post emergence (POST) on muck soils, but only for PRE application on mineral soils. Prometryn is labeled through Third Party Registrations, Inc. in Florida for applications to parsley and dill post emergence for fresh market shipments only.

Trials were established in Hendry County, Florida at C & B Farms on an Immokalee fine sand in December, 2006 and February, 2007 to evaluate several herbicides on dill, parsley and cilantro on mineral soils. Treatments consisted of PRE applications of s-metolachlor (Dual Magnum at 0.66 and 1 pt/A), dimethenamid-p (Outlook at 6, 12, and 14 fl oz/A) and pendimethalin (Prowl H2O at 1 and 1.5 pt/A). In 2006, prometryn (Caparol) was applied at 1, 2, and 3 pt/A PRE. In 2007, Caparol was applied at 2 and 4 pt/A PRE and 2 and 4 pt/A POST. Linuron (Lorox) was applied at 1 lb/A PRE, 1 lb/A POST and 1 plus 0.5 lb/A PRE plus POST in 2006 but the 1 plus 0.5 was changed to 1 plus 1 lb/A PRE + POST in 2007.

There were differences in tolerance among the crops to the herbicides and differences in tolerances to the herbicides of the crops. The crops were least tolerant to Outlook applied PRE. Germination and emergence of parsley was reduced 10 to 30% in 2006 and 0 to 17% in 2007. Later in the season, stunting ranged from 36 to 93% in 2006 and 40 to 98% in 2007. There was no reduction in emergence in cilantro, but the highest applied rates had 10 to 33% stunting. Emergence of dill was reduced in the 12 and 14 fl oz/A rates by 25% in 2006 and 54 to 60% in 2007.

No stand reduction nor stunting was seen in the three crops in the Dual Magnum and Prowl H2O treatments. Applications of these two herbicides at the rates used were seen as safe for use in all three crops.

There were no stand reductions in any of the crops when Caparol was applied PRE. There was mild stunting in cilantro (16%) when Caparol was applied PRE at 4 pt/A. This was outgrown by harvest. Slight leaf burn was observed when Caparol was applied at 2 and 4 pt/A POST. The plants quickly outgrew the burn from the 2 pt/A application. No stunting was seen in parsley from the PRE applications. Again, slight leaf burn (10%) was observed with the POST applications. In dill, late stunting was observed in the 4 pt/A PRE treatments. Leaf burn was also seen in the POST applications. Slight stunting was observed also in the 4 pt/A POST treatments.

There were no stand reductions either year from PRE applications of Lorox. PRE applications in both years, however, stunted parsley growth (7 and 30% in 2006 and 2007, respectively). POST applications caused leaf burn in parsley. The burn was 3% at 0.5 lb/A and up to 13% at 1 lb/A. There was no stunting from PRE applications in cilantro. The 1 lb/A rate applied POST did cause leaf burn in cilantro. The 0.5 lb/A POST application did not cause any phytotoxicity. Dill was similar to cilantro in safety, in that PRE applications were safe and the 0.5 lb/A POST application was safe while the 1 lb/A POST application caused leaf burn.

Results indicate that under weed management strategies currently employed by sweet potato producers, there does not appear to be an advantage in competitiveness between Evangeline and Beauregard varieties with weeds evaluated.

TOMATO, PEPPER AND WATERMELON TOLERANCE TO EPTC APPLIED UNDER MULCH IN FLORIDA. E.J. McAvoy and W.M. Stall; University of Florida, LaBelle and Gainesville, FL.

ABSTRACT

For over 35 years, Florida tomato growers have relied on methyl bromide for most of their soil borne pest, disease and weed control problems. The use of methyl bromide as a soil fumigant is now being phased out internationally under the Montreal Protocol.

As the phase out proceeds, research indicates that Florida growers will have to increasingly rely on a combination of a chemical and non chemical pest and weed management strategies which will likely involve the use of cocktails of alternate fumigants such as 1,3 dichloropropene, metam sodium and chloropicrin in combination with an herbicide.

Nutsedge (yellow and purple) are among the major weed control challenges in many tomato production systems. Since the leading alternative fumigants provide less than satisfactory control of nutsedge, Florida growers may have to consider the use of a preplant herbicide for control. EPTC is an old but effective material that provides selective pre-emergent control of grasses, sedges and many broadleaf weeds and is labeled for various crops including tomatoes in California.

Three years of small plot trials in Florida has shown that application of EPTC to the bed surface just prior to mulch application with a 14 day pre transplant waiting period delivered excellent crop safety with very good nutsedge control. Also, on-farm demonstration trials in Southwest Florida on tomato using EPTC applied to the bed and immediately covered with polyethylene film demonstrated excellent nutsedge control and had no apparent effect on the crop. Early indications are that EPTC may be an important tool in tomato weed management in the development of methyl bromide alternative strategies. A 24c state label has been issued in Florida. Small plot trial results warrant further study of this compound for use also in pepper and watermelon.

TIMING OF *S*-METOLACHLOR, PENDIMETHALIN, AND PRONAMIDE PREEMERGENCE APPLICATION IN TRANSPLANTED LETTUCE. P.J. Dittmar, K.M. Jennings, W.R. Jester, and D.W. Monks, Department of Horticultural Science, North Carolina State University, Raleigh.

ABSTRACT

Trials were conducted at the Cunningham Research Station in Kinston, NC in the spring and fall of 2007 to evaluate crop tolerance and weed control of PRE herbicides applied at two application timings in transplanted lettuce. *S*-metolachlor (0.9 kg ai/ha), pendimethalin (5.1 kg ai/ha), and pronamide (1.4 kg ai/ha) were applied to transplanted Romaine lettuce 1 and 3 wk after planting (WAP). Applications were made with a CO_2 pressurized back sprayer equipped with one 8002DG flat fan nozzle calibrated to deliver 187 L/ha. In the spring planting, weed species included henbit (*Lamium amplexicaule*), common lambsquarters (*Chenopodium album*), yellow woodsorrel (*Oxalis stricta*), and grasses. In the fall planting, weed species included goosegrass (*Eleusine indica*), annual sedges, carpetweed (*Mullugo verticillata*), and common purslane (*Portulaca oleracea*).

In the spring planting, weed control was greater for the 3WAP treatments (21%) than 1WAP treatments (6%). Pronamide (36%) and pendimethalin (33%) 1WAP treatments had greater control than *S*-metolachlor (15%) 1WAP. No differences were observed among 3 WAP treatments. No herbicide injury was observed and no differences in yield were observed among treatments.

In the fall planting, herbicide injury occurred when *S*-metolachlor (45%) and pendimethalin (75%) were applied 1WAP treatments. Injury occurred only in the left row of the planting bed and the same row was injured in all plots, which received these treatments. This observation may be an effect of transplanting depth and *S*-metolachlor or pendimethalin interaction because the transplanter was always aligned on the same side of the planting bed. Pendimethalin and *S*-metolachlor at 3 WAP did not cause crop injury. Pronamide applied 1WAP and 3WAP did not injure the lettuce. All herbicide treatments controlled weed populations at least 15% and 1WAP (46%) treatments had greater control than 3WAP (20%) treatments. Pendimethalin (74%) and *S*-metolachlor (72%) at 1WAP application provided greater control than pronamide at 1WAP (40%). Pendimethalin and pronamide applied 3WAP (25%) provided greater control than *S*-metolachlor at 3 WAP (15%) treatment. Lettuce yield was similar for the nontreated check, pronamide, and all 3 WAP applications. Pendimethalin and *S*-metolachlor applied 1WAP treatment reduced lettuce yield by 63 and 78%, respectively.

SYSTEMS UTILIZING 'CALIENTE' MUSTARD, *S*-METOLACHLOR, AND V-10142 FOR WEED MANAGEMENT IN BELL PEPPER. R.A. Pekarek, D.W. Monks, K.M. Jennings, and G.D. Hoyt, Department of Horticultural Sciences, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

A study was conducted at Clinton, NC to determine the effects of systems of a 'Caliente' mustard (a mixture of *Sinapsis alba* and *Brassica juncea*) cover crop, *S*-metolachlor PRE, and V-10142 POST-DIR on plasticulture bell pepper (*Capsicum annuum* 'Heritage') production. Main plot treatments were a 'Caliente' cover crop seeded at 19.7 kg/ha or no cover crop. Subplot treatments were *S*-metolachlor PRE at 0.8 and 1.6 kg/ha, V-10142 POST-DIR at 112 and 224 g/ha a.i., 0.8 kg/ha *S*-metolachlor PRE followed by (fb) 112 g/ha V-10142 POST-DIR, 0.8 kg/ha *S*-metolachlor PRE fb 224 g/ha V-10142 POST-DIR, 1.6 kg/ha *S*-metolachlor PRE fb 112 g/ha V-10142 POST-DIR, and 1.6 kg/ha *S*-metolachlor PRE fb 224 g/ha V-10142 POST-DIR. Weedy and weed-free subplots were also included for a total of twenty treatments. At approximately 3 weeks after transplanting (WAT), the 'Caliente' cover crop had no effect on yellow nutsedge count and visual weed control, plant height, and injury. *S*-metolachlor at 1.6 kg/ha resulted in more injury (50%), a greater reduction in bell pepper plant height, and better overall weed control than the 0.8 kg/ha rate, as well as, the weedy and weed-free treatments. By 6 WAT there were no differences in bell pepper height, and injury was <15% for all subplot treatments indicating that bell pepper overcame early season injury and height reduction. Also at 6 WAT, yellow nutsedge counts in all herbicide subplot treatments were not different from the weedy control. There was an interaction between 'Caliente' cover crop treatment and herbicide subplot treatments indicating that *S*-metolachlor caused more injury to bell pepper grown on plots receiving a 'Caliente' cover crop than those plots receiving no cover crop. There was a significant effect of cover crop on weed control at 6 WAT. Weed control was 58% in bare ground plots compared to 51% in 'Caliente' plots, although this difference is not striking. At 6 WAT the *S*-metolachlor fb V-10142 treatments resulted in better weed control than all of the single chemical treatments except 1.6 kg/ha *S*-metolachlor PRE. At 8 WAT, both *S*-metolachlor treatments resulted in better weed control and lower yellow nutsedge counts than the weedy plots, but weed control was not as high (and yellow nutsedge counts not as low) as in the weed-free plots. A similar trend was observed for V-10142 treatments. In terms of total yield, marketable yield, and No. 1 yield, the subplot herbicide treatments were not different from the weedy check yield. The cover crop treatment only affected the total yield of Fancy grade bell pepper; 'Caliente' cover crop increased yield of Fancy bell pepper. The 0.8 kg/ha *S*-metolachlor treatment resulted in greater total yield and marketable yield compared to 1.6 kg/ha *S*-metolachlor. Bell pepper stand (plants/plot) and cull yield were not affected by any of the treatments.

INTEGRATED USE OF COVER CROP AND REDUCED HERBICIDE RATES FOR WEED CONTROL IN TOMATO AND BELL PEPPER PRODUCTION. S.K. Bangarwa, J.K. Norsworthy, and G.A. Griffith, University of Arkansas, Fayetteville, AR.

ABSTRACT

Methyl bromide, a pre-plant soil fumigant, has been the foundation of effective weed control in plasticulture tomato and bell pepper production systems. However, due to ozone-depleting potential, methyl bromide is scheduled for phase-out from U.S. agriculture in the near future. The impending ban on methyl bromide will complex the weed problem in vegetable crops. Thus, there is an urgent need to develop a suitable alternative for effective weed control without injuring tomato and bell pepper. Field experiment was conducted in 2007 at Fayetteville, AR, to evaluate weed control using *S*-metolachlor, halosulfuron, and trifloxysulfuron in combination with Brassicaceae cover crop. The experiment was arranged in a randomized compete block design with a 2×2×4×3 factorial arrangement. The treatment factors were: 1) two cover crops (Caliante, no cover crop), 2) two crops (tomato, bell pepper), 3) two preemergence (PRE) herbicides (*S*-metolachlor, halosulfuron), and two postemergence (POST) herbicides (halosulfuron, trifloxysulfuron), and 4) three application rates (0, 0.5, 1X of the labeled rate). The label rates of *S*-metolachlor, halosulfuron, and trifloxysulfuron were 1.6, 0.027, and 0.0079 kg ai ha^{-1}. Caliante, a blend of canola and wild mustard was drill-seeded in spring, and was mowed and incorporated into the soil at mid-flowering stage. Raised beds were prepared immediately after incorporation, and PRE herbicides were applied by using a CO_2-backpack sprayer. The beds were covered with standard low density polyethylene mulch immediately after herbicide application. Seven tomatoes and 20 bell peppers plants were transplanted after one week. The POST herbicides were applied along with non-ionic surfactant at pre-flowering stage, with over-the-top application in tomato and post directed (POST DIR) in bell pepper. Plots were rated for crop injury and weed control every other week. Marketable fruits were harvested throughout the season and graded according to USDA standards.

No crop injury occurred in tomato from PRE or POST herbicides. However, bell pepper was injured by PRE herbicides but the injury was <10%. Bell pepper was not injured from POST DIR herbicides. PRE application of halosulfuron at 1X provided 90% control of yellow nutsedge, and *S*-metolachlor controlled yellow nutsedge, Palmer amaranth, and large crabgrass 55, 93, and 90%, respectively at 2 wk after treatment. POST application of halosulfuron at 1X provided excellent control of yellow nutsedge (94%), whereas trifloxysulfuron at 1X provided 74% control of yellow nutsedge and 72% control of Palmer amaranth at 2 wk after treatment. Overall Caliante cover crop improved weed control in non-treated plots up to 18%, especially during early stages, but the cover crop effect was not prominent in herbicide-treated plots. Cover crop improved the crop yield up to 27% compared to no cover crop in non-treated plots. In herbicide-treated plots, cover crop had no significant impact on crop yield. PRE application of *S*-metolachlor at the rate 1X provided tomato fruit yield comparable to weed-free plots, while *S*-metolachlor PRE and trifloxysulfuron POST at the 1X rate provided bell pepper fruit yield comparable to weed-free plots.

COWPEA TOLERANCE TO PREPLANT AND PREEMERGENCE HERBICIDES. N. R. Burgos, M. R. McClelland, V.K. Shivrain, D. Motes, S. Eaton, and L. Martin, University of Arkansas, Fayetteville.

ABSTRACT

Cowpea (*Vigna unguiculata* L.) is an important specialty crop in southern U.S.A. It is grown commercially for canning, but numerous home growers produce cowpea for consumption of young, green peas. Weed control is a major production issue. An experiment was conducted at the Vegetable Substation, Kibler, Arkansas in June to September, 2007 to evaluate the tolerance of cowpea to preplant and preemergence applications of various herbicides. The soil type was a Roxanna Silt Loam with 0.7% organic matter and pH of 7.0. Experimental units were arranged in a split-split block design, with application timing [12 d preplant (PPL) and preemergence (PRE)] as main plot, herbicide (flumioxazin, fomesafen, halosulfuron, and sulfentrazone) as subplot, and herbicide rate (low and high) as sub-subplot. Halosulfuron was applied at 0.027 and 0.054 kg ai/ha, respectively for the low and high rates. All other herbicides were applied at 0.21 and 0.42 kg ai/ha. Treatments were replicated four times. 'Early Scarlet' cowpea was planted on June 25 at 13 seeds/m on rows 0.91 m apart, 6.1 m long. The whole experiment was blanket-sprayed with metolachlor (0.84 kg ai/ha) and imazethapyr (0.07 kg ai/ha) to remove weed competition effects from all treatments. Data collected included plant stand, crop injury ratings, flowering, pod maturity, and yield. The crop was harvested on September 14. Flumioxazin reduced cowpea stand 98-100% regardless of rate and application timing. Halosulfuron did not affect cowpea stand, at the full rate, regardless of application timing. Fomesafen reduced cowpea stand 70% when applied PRE at the low rate, but had no effect when applied PPL even at the full rate. Sulfentrazone is labeled for use on cowpea in Arkansas at the reduced rate of 0.21 kg ai/ha, PRE. This rate and application timing showed slight reduction in crop stand in this test because of some period of excessive moisture early in the season. However, the PPL application timing of sulfentrazone did not cause any stand loss even at the full rate. The crop injury ratings reflected the observations on stand reduction. Cowpea maturity was delayed significantly by the reduced rate of fomesafen applied PRE, but was not affected by the full rate of fomesafen applied PPL. The reduced rate of sulfentrazone did not delay cowpea maturity when applied PPL, but caused a slight delay in maturation when applied PRE. Despite differences in response to herbicide rates in terms of stand loss, crop injury, and pod maturation, cowpea yield was generally not affected by herbicide rate. Fomesafen, halosulfuron, and sulfentrazone produced equivalent yields when applied PPL. Fomesafen reduce cowpea yield, even at reduced rates, when applied PRE. The cowpea-label rate of sulfentrazone did not reduce cowpea yield regardless of application timing, but the full rate did regardless of application timing. Fomesafen is safe to use on cowpea preplant, but not preemergence. Sulfentrazone also has a higher margin of safety for cowpea when applied pleplant rather than preemergence. Halosulfuron was completely safe on cowpea at any rate or timing, but this would only be useful if the weed species are not ALS-resistant, or are composed of the appropriate spectrum. Sulfentrazone and fomesafen have a broader spectrum of activity on weeds than halosulfuron, especially when applied to soil.

Acknowledgment: This research was partially funded by Syngenta.

EFFECTS OF SELECTED HERBICIDES ON THE EFFICACY OF TOBACCO MILD GREEN MOSAIC VIRUS TO CONTROL TROPICAL SODA APPLE. J.A. Ferrell and R. Charudattan, University of Florida, Gainesville, FL.

ABSTRACT

Experiments were initiated to determine if the tropical soda apple (TSA) biological control agent, tobacco mild green mosaic tobamovirus (TMGMV), could be mixed with synthetic herbicides to provide effective broad-spectrum weed control. When TMGMV was mixed with 2,4-D ester or amine, metsulfuron, or hexazinone, TSA control ranged between 80 and 100%. On average, TMGMV increased TSA control by 81% as compared to these herbicides applied alone. When TMGMV was mixed with dicamba or 2,4-D + dicamba, control ranged between 80 and 100%, while the herbicides alone provided between 21 and 77% control. It was also observed that adding organosilicone adjuvants or low rates of crop oil or nonionic adjuvants to TMGMV solutions resulted in TSA infection ratios of 4 /6 or 5/6. However, higher concentration of crop oil or nonionic adjuvants decreased the infection ratio to 2/6 and 1/6, respectively. Therefore, TMGMV retains its pathogenic effect when mixed with 2,4-D, dicamba, metsulfuron, or hexazinone. Spray adjuvants can be included in the spray mixture, but caution must be taken as to the type and concentration of the adjuvant.

USING VOLUNTEERS TO CREATE INVASIVE PLANT MAPS OF LAKE GASTON. B.R. Lassiter, R.J. Richardson, G.G. Wilkerson, M.C. Sturgill, and R.E. Austin, Department of Crop Science, North Carolina State University, Raleigh.

ABSTRACT

Lake Gaston, located on the border of Virginia and North Carolina, is colonized by several aquatic invasive species including hydrilla (*Hydrilla verticillata*) which cover over 15% of the lake. Hydrilla forms dense mats, and restricts swimming, boating, and suppresses property values. Hydrilla also displaces natural vegetation, reduces habitat quality for fish, provides breeding habitat for mosquitoes, impedes commercial navigation, reduces drainage and increases flooding, and blocks intakes for hydroelectric turbines and potable water. Few management tools are available for aquatic weeds. Proper selection and integration of management techniques requires accurate vegetation surveys. In Lake Gaston, private contractors are hired yearly to generate vegetation maps at a cost of $30,000 to $40,000. The accuracy of these maps could be increased or the cost of production decreased by utilizing trained volunteers. Volunteer scouts (Lake Gaston residents) were trained in the identification of seven aquatic plant species, (including hydrilla) and the use of handheld GPS units. Fourteen volunteers worked alone or in groups of two to scout weeds during the months of October and November. Scouts sampled in areas of their own choosing, and used their own boats (both motor boats and kayaks). Volunteers recorded GPS coordinates using a specialized computer program written by one of the volunteers. The scouts measured water clarity and depth, as well as presence or absence of hydrilla and 6 other aquatic weeds. Over 97 man-hours of labor were spent scouting an estimated 60 miles of shoreline (approximately 17% of total lakeshore) from at least 1,180 distinct sampling points. Data points were overlaid on existing topographic maps for relatively detailed documentation of hydrilla presence or absence in certain areas. Volunteers recorded the locations of floating mats of hydrilla, grass carp sightings, length of hydrilla shoots, whether the area had been treated with herbicides, and condition of the plants collected. Current efforts will be extended through 2008 with additional volunteers expected. Volunteers will be surveyed to determine time investment of each volunteer. The data collected from this research may serve as a complement (to ground-truth) data collected by the independent contractors. Future efforts could include assigning part of the lake to contractors in an effort to reduce scouting costs. It is also expected that the location of hydrilla growth could be tracked using the GPS data and comparing growth from year to year to determine long-term spread or control.

HERBICIDE FORMULATIONS FOR MANAGING FREE-FLOATING AQUATIC PLANTS. J.D. Madsen and R.M. Wersal; Mississippi State University, Mississippi State, MS.

ABSTRACT

Floating plants, such as waterhyacinth, giant and common salvinia, are widespread problems in U.S. waterways. Cost-effective and environmentally-compatible control technologies are necessary for controlling these species, yet many invasive aquatic plants, such as the salvinia species, do not have appropriate herbicide recommendations for consistent control. Penoxsulam is efficacious as an aqueous exposure for control of waterhyacinth and salvinia at less than 10 ppb, but foliar application rates for use as a spot treatment are largely undefined. In addition, penoxsulam activity following a foliar application has been reported to take more than 60 d to control hyacinth. We set up trials of penoxsulam with and without diquat in 100-gallon outdoor tanks at the R. R. Foil Plant Research Facility, Mississippi State University, Starkville, MS. Each tank was inoculated with 200 g wet weight of either waterhyacinth (*Eichhornia crassipes* (Mart.) Solms) or common salvinia (*Salvinia minima* Baker), and allowed to grow for 4 weeks before treatment. All tanks were amended with nutrients regularly to maintain growth. Tanks of both species were treated with foliar application at rates of 0, 1.4, 2.8 and 5.6 oz. /acre (5.6 oz/acre is the proposed maximum label rate) of penoxsulam alone (as Galleon^{tm}) and in combination with 4 oz. /acre diquat (as Reward^{tm}). A methylated seed oil surfactant labelled for aquatic use (Sunwet^{tm}) was used (0.5% v/v). Tanks were flushed and refilled three times to remove any residual herbicide in the water, 48 hours after treatment. Each treatment was replicated three times, for a total of 24 tanks per species or 48 tanks total. Each week, tanks were rated on a 0-100% scale for control, at 10% increments. Two 0.05 m^2 samples were taken from each before treatment for pretreatment biomass, and again at 6 and 10 weeks after treatment (WAT). Percent control ratings for penoxsulam-treated common salvinia, with or without diquat added, were 70% to 80% at 1 WAT, and significantly higher than plants treated with diquat alone (30%). Beginning by 4 WAT, however, those plants not exposed to sufficient penoxsulam began to regrow, resulting in negligible control by 7 WAT. While better than diquat alone, penoxsulam did not provide even three months of control for common salvinia. Control estimates from biomass data for common salvinia indicated that, while biomass for treated plants was still less than the untreated reference at 6 and 10 WAT, percent control was 50% or less. In contrast, penoxsulam was highly effective on waterhyacinth. Penoxsulam alone at all rates provided only 25% control at 1 WAT, but by 3 WAT percent control had increased to 80% and by 4 WAT percent control was 95% or greater. While penoxsulam with diquat treatments provided higher initial control, percent control after 4 WAT was reduced relative to penoxsulam alone. Biomass data for waterhyacinth also substantiate that all rates of penoxsulam provided at least 95% control at 6 and 10 WAT, while penoxsulam with diquat or diquat alone provided significantly less control. This trial indicates that 1.4 oz. /acre of penoxsulam alone with a surfactant provided excellent control for waterhyacinth, but no treatments were found to adequately control common salvinia. Further work needs to be done on ensuring full contact with common salvinia plants, either through the use of aqueous treatments, adjusting the timing of treatment, or utilizing multiple treatments of penoxsulam or other herbicides.

DEVELOPMENT & APPLICATIONS OF EDDMAPS - EARLY DETECTION & DISTRIBUTION MAPPING SYSTEM FOR INVASIVE PLANTS IN THE SOUTHEAST. D.J. Moorhead and C.T. Bargeron, Warnell School of Forestry & Natural Resources, Bugwood Network, University of Georgia, Tifton, GA 31794.

ABSTRACT

The University of Georgia's Bugwood Network has developed an Early Detection and Distribution Mapping System, or EDDMapS as a tool to map and depict local, state and regional level distribution data of invasive species, identify "leading edge" ranges of new invasive threats, provide a means of implementing for Early Detection and Rapid Response (EDRR), and help corroborate and refine invasive species threats, lists and management priorities.

The North American Weed Management Association's (NAWMA) Invasive Plant Mapping Standards (*www. nawma.org*) are used as the basic EDDMapS data mapping fields along with additional fields to include addition of the Florida Exotic Pest Plant Council (FLEPPC) georeferenced database records (*www.fleppc.org/EDDMapS/Georeferenced.pdf*), and allow for mapping of occurrence data for all taxa of invasive species. In the field, infestations are mapped using a GPS unit to determine a latitude/longitude point in decimal degrees (DD.DDD). In addition to the location and description of the infestation, up to five digital images can be entered into EDDMapS to characterize each infestation. It is recommended that a series of close-up images of specific plant characteristics with enough detail to make species identification possible plus landscape level images to characterize the extent of the infestation be submitted.

Data is entered by logging on to the EDDMapS site and creating a user name and password. This will provide state coordinators (appointed by each EPPC to review and verify data and, as appropriate, notify regulatory agencies of new reports of federal noxious weeds) with contact information if there is a question regarding the occurrence. The data form for each point collected is then filled in and corresponding images are uploaded. If a latitude/longitude point was not determine on-site, the "Choose Location" feature can be used to locate the point by viewing street maps and satellite imagery using the Google Maps application to locate the infestation point on a map to determine the corresponding GPS coordinates. To insure each point location is displayed correctly the "Preview Location" feature will display the point on the map before the file is uploaded. Each species occurrence record is stored in a Microsoft SQL Server 2005 database. Adobe ColdFusion is used to link the database to the mapping software and display the records in HTML format. EDDMapS utilizes a customized Flashmaps application (Flashmaps Geospatial Company *www.flashmaps.com*) and Adobe Flash to display state and southeastern county level interactive distribution maps. County data is stored using the five-digit Federal Information Processing Standard (FIPS) code.

Once a record is submitted, the state coordinator will receive and e-mail of the new record and the point is displayed on a species distribution map. Records are listed as "unverified" until they are reviewed and verified by the state coordinator. In cases where public display of point locations of certain regulated species may infringe on confidentially issues, point locations can be made "Private" by contacting the EDDMapS site administrator.

Current EDDMapS applications include use by the eight-state Southeast Exotic Pest Plant Council, The Florida Exotic Pest Plant Council, all taxa mapping by the Everglades Cooperative Invasive Species Management Area, and the Georgia Cogongrass Task Force. Additional projects are proposed with the Mid-Atlantic EPPC, Alaska Exotic Plant Information Clearing House, US Fish & Wildlife Service and the Rocky Mountain EPPC.

Visit the EDDMapS website at ***www.eddmaps.org*** *. If you are interested in using EDDMapS in a project, or submitting data you currently have, please contact Dave Moorhead (moorhead@uga.edu) or Chuck Bargeron (cbargero@uga.edu) or phone (229)386-3298.*

SELECTIVE CONTROL OF COGONGRASS AND OTHER WEEDS WHEN RESTORING NATIVE PLANT COMMUNITIES ON PHOSPHATE MINED LANDS. S.G. Richardson, Florida Institute of Phosphate Research, University of South Florida, Bartow, FL 33830.

ABSTRACT

Cogongrass (*Imperata cylindrica*), natalgrass (*Melinis repens* or *Rhynchelytrum repens*), smutgrass (*Sporobolus indicus*) and bahiagrass (*Paspalum notatum*) are among the exotic grasses that are problems in re-established native plant communities on reclaimed phosphate mined lands (and unmined lands as well) in central Florida.

High rates of imazapyr (0.75 to 1.0 lb a.i./acre) are commonly used for non-selective control of cogongrass (*Imperata cylindrica*) and result in nearly complete vegetation control. At lower rates of imazapyr (e.g., 0.188 to 0.375 lb a.i./acre) some plant species exhibit greater tolerance than does cogongrass, making selective control possible. Field studies were conducted on reclaimed phosphate mines in central Florida to evaluate rates and timing of applications for selective control of cogongrass that had invaded desirable re-established plant communities.

In one experiment, plots were treated August 31 or November 30, 2005, with imazapyr at 0.188 or 0.250 lb a.i./acre (12 or 16 oz/acre of Arsenal/Habitat), 20 gal water carrier plus 0.25% nonionic surfactant. Percent cover was determined by line-point transects before treatment and then in August 2006 (8.5 to 11.5 months after treatment). Cogongrass cover was reduced by 97% with the November 0.250 lb a.i./acre treatment and 90% with the August treatment, while cogongrass cover was reduced by 86% with the November 0.188 lb a.i./acre treatment and 63% with the August treatment. Several native species exhibited minor injury and/or good recovery, including wiregrass (*Aristida beyrichiana*), golden aster (*Pityopsis graminifolia*), swamp sunflower (*Helianthus angustifolia*), and milk pea (*Galactia elliotii*). The exotic species bahiagrass and hairy indigo (*Indigofera hirsuta*) were not controlled and either maintained or increased their cover after treatment. We have also used imazapyr for selective cogongrass control in bahiagrass pastures.

Maidencane (*Panicum hemitomon*) treated with imazapyr at up to 0.5 lb a.i./acre during the dormant winter season regrew in the spring with no apparent injury while cogongrass was well controlled.

Fluazafop butyl at 0.375 lb a.i./acre was used to selectively control cogongrass in young broadleaf tree stands, but repeated applications were necessary.

Seedling natalgrass and bahiagrass were controlled by imazapic at 0.125 lb a.i./acre, but much higher rates (0.375 lb a.i./acre) were required for control of the established grasses. Hexazinone at 0.75 lb a.i./acre (the only rate tested) effectively controlled natalgrass and smutgrass. Wiregrass has shown tolerance (none to minor injury and good recovery) to hexazinone at 0.75 lb a.i./acre and to imazapic at 0.375 lb a.i./acre. We have also used hexazinone for selective control of smutgrass in bahiagrass pastures.

GLYPHOSATE INJURY TO CLEARFIELD® RICE BEFORE AND AFTER IMAZETHAPYR APPLICATIONS. J.R. Meier*, and K.L. Smith, University of Arkansas Division of Agriculture, Monticello, AR. and R.C. Scott; University of Arkansas Division of Agriculture, Little Rock, AR.

ABSTRACT

The imazethapyr tolerant (Clearfield) rice system has been readily adopted by Arkansas farmers as a tool to help manage red rice infestations. Unfortunately, glyphosate drift onto rice continues to be a problem in Arkansas. Previous work has examined the tolerance of cultivars to imazethapyr as well as the effects of sub-lethal rates of glyphosate. However, it is unclear whether an increased response is noted when applications of imazethapyr and low rates of glyphosate occur simultaneously or sequentially. Field and greenhouse experiments were conducted in 2007 to examine Clearfield® rice response to imazethapyr and low rates of glyphosate when applied sequentially at 0, 1, 3, 7, and 14 days. In the field trial, CL-161 was drill seeded into a Sharkey clay soil in nine rows 19.1 cm apart at 101 kg ha^{-1}. Plots were 2.1 m wide by 10 m long with 1.6 m allies and arranged in a randomized complete block design with four replications. In the greenhouse trial CL-161 was hand-seeded into pots 10.2 cm square and 12.7 cm tall. A randomized complete block design with six replications was used and this trial was duplicated. In all three trials CL-161 was allowed to reach 4-5 leaf stage before treatments were initiated. Glyphosate (Roundup WeatherMax) was applied at 0, 45, and 90 g ae ha^{-1} at 0, 1, 3, 7, and 14 d prior to applications of imazethapyr (Newpath) at 0, 105, or 210 g ai ha^{-1}. Imazethapyr was also applied at the above rates 0, 1, 3, 7, and 14 days prior to receiving glyphosate to determine any predisposition of plants to either herbicide. Plant height (cm) was measured 14 and 21 d after the final applications in all three trials. Yield was obtained in the field trial with a small plot combine. In the greenhouse trials, chlorophyll content (SPAD) was also measured 14 and 21 d after the final applications. At 21 d, plants were cut at the soil surface, dried, and dry weight (g) recorded.

Glyphosate at all application timings in all three trials resulted in plant height reduction 14 and 21 d after the final applications and dry weight was reduced in both greenhouse trials, but this reduction was not influenced by imazethapyr rate or timing. SPAD readings from both greenhouse trials showed no consistent treatment influences on leaf chlorophyll content at any application interval. From these trials there is no evidence that imazethapyr applications will predispose CL-161 to greater injury from glyphosate or that glyphosate will predispose CL-161 to injury from imazethapyr. However, it is uncertain how a Clearfield® hybrid cultivar or a conventional cultivar with less tolerance to imazethapyr than CL-161 will respond to a combination of these herbicides.

EVALUATION OF REFLEX AND VALOR FOR PREPLANT AND PREEMERGENCE CONTROL OF PALMER AMARANTH IN COTTON. R.C. Doherty, K.L. Smith, D.O. Stephenson, L.R. Oliver, J.A. Bullington, and J. R. Meier; University of Arkansas, Monticello, AR.

ABSTRACT

Palmer amaranth is a common and very troublesome weed in cotton fields throughout the southern U. S. It has been effectively controlled with glyphosate in Roundup Ready® cotton; however, glyphosate-tolerant Palmer amaranth is present in 11 counties in AR. The ability of these plants to tolerate high rates of glyphosate has caused major problems and requires a different weed control system. The objective of this research was to evaluate the efficacy of preplant and preemergence residual herbicides for control of glyphosate-tolerant Palmer amaranth in Arkansas cotton.

In 2006 and 2007, duplicate experiments were established in Rohwer, AR, on the Southeast Research and Extension Center in a Hebert silt loam soil and in Keiser, AR, on the Northeast Research and Extension Center in a Sharkey clay soil. The trials were arranged in a randomized complete block design with four replications. Parameters evaluated were visual ratings of Palmer amaranth control, visual ratings of cotton injury, and cotton yield. Herbicides used in this experiment were Reflex at 0.187 and 0.25 lb ai/acre, Valor at 0.063 lb ai/acre, Cotoran at 1 lb ai/acre, Caparol at 1 lb ai/acre, Direx at 0.5 lb ai/acre, and Prowl H_2O at 1 lb ai/acre.

In 2006, cotton injury was noted with Reflex applied 14 and 0 days preplant (DPP) at 0.25 lb ai/acre, Reflex applied 7 and 0 DPP at 0.187 lb ai/acre, Valor, Cotoran, and Caparol applied 0 DPP, and Prowl H_2O applied 21 and 0 DPP at Rohwer and only with Valor 0 DPP at Keiser. Cotton yield was affected only by Valor applied 0 DPP, which caused death of the cotton at the Rohwer location. Forty-five days after emergence (DAE) at Rohwer, Reflex at 0.25 lb ai/acre and Prowl H_2O applied 14 DPP provided 98% control of Palmer amaranth, while Valor applied 21 DPP provided 99% control. Valor applied 14 and 7 DPP and Direx applied 0 DPP provided 100% control, while Cotoran and Caparol applied 14 DPP provided 96 and 83% control, respectively. Twenty-four DAE at Keiser, Reflex applied 21 and 14 DPP at 0.25 lb ai/acre and Valor applied 21, 14, and 7 DPP provided 99% control, while Reflex applied 14 DPP at 0.187 lb ai/acre, Cotoran applied 21 DPP, Caparol applied 14 DPP, Direx applied 14 DPP and Prowl H_2O applied 21 DPP provided 97, 95, 97, 98, and 94% control respectively.

In 2007, cotton injury was not noted with any treatment at Rohwer, while Valor applied 21, 14, 7, and 0 DPP caused injury at Keiser. Twenty-nine DAE at Rohwer, Reflex at 0.25 lb ai/acre applied 21, 7 and 0 DPP provided 92, 97, and 91% control of Palmer amaranth, while Reflex at 0.187 lb ai/acre applied 14 and 7 DPP provided 90 and 93% control. Direx applied 0 DPP provided 93% control of Palmer amaranth. Twenty-one DAE at Keiser, Valor applied 21, 14, and 7 DPP provided 95, 96, and 92% control of Palmer amaranth respectively, while Reflex at 0.187 lb ai/acre applied 7 DPP provided 88% control. Residual herbicides applied preplant and preemergence did provide excellent control of glyphosate-tolerant Palmer amaranth in Arkansas cotton

PROFITABLE SYSTEMS FOR ULTRA-EARLY SOYBEAN PRODUCTION. F.H. Lyons IV, L.R. Oliver, L.C. Purcell, and M.P. Popp, Departments of Crop, Soil, and Environmental Sciences and Agricultural Economics, University of Arkansas, Fayetteville, AR.

ABSTRACT

Rising input cost for soybean production is a major constraint for Arkansas producers. Thus, lowering fuel, seed, and herbicide cost can influence a producer's profit margin. Conventional soybean varieties can reduce cost by avoiding technology fees associated with Roundup Ready varieties, and early-maturing varieties can reduce irrigation cost. Planting any of these varieties at high populations can also reduce herbicide cost due to earlier canopy closure. The objective of this research was to determine the influence of soybean maturity group (MG), plant density, and herbicide program on soybean yield. All production methods were subjected to economic analysis to discover the most profitable method of producing ultra-early soybean.

Experiments were conducted at Keiser and Fayetteville, AR, in 2006 and 2007. The planting dates ranged from May 16 to May 22. The experimental design was a split-split plot with four replications. Main plots were maturity group: MG II (AG2203), MG III (S31-V3), and MG IV (AG4801). Subplots were a factorial arrangement of planting density, 75,000, 125,000, and 200,000 seed/A, and herbicide program, which consisted of a conventional program and two Roundup Ready programs. The conventional program was S-metolachlor plus metribuzin applied preemergence at the recommended rates for soil texture followed by fomesafen plus sethoxydim applied at V4. The Roundup Ready programs were glyphosate (Roundup WeatherMax) applied at 0.75 lb ae/A at the V3 and V6 stages and glyphosate applied at 0.375 lb/A at the V2 stage and again whenever control reached less than 80% on a particular treatment. Soybean density, growth stage, and light interception were recorded throughout the growing season. Weed size and density measurements were recorded prior to each herbicide application, and weed control ratings were taken throughout the season. Soybean yield was obtained for a final economic analysis.

A significant interaction of year by location by cultivar was noted for yield. The 2007 growing season was better than the 2006. Fayetteville had higher yield for all cultivars than Keiser, with the greatest difference being MG II soybean (58 vs 29 bu/A). MG IV responded the best among varieties with 65 vs 58 bu/A at Fayetteville and Kesier, respectively. MG III and IV gave equivalent yield at Fayetteville but not at Keiser, which yielded 62 bu/A for MG IV and 45 bu/A for MG III. The main effects of cultivar and density showed that yield was greater at the 200,000 seed/A planting rate than at 125,000 or 75,000 seed/A.

At each location, entireleaf *(Ipomoea hederacea var. integriuscula*) and pitted (*Ipomoea lacunosa*) morningglory species were controlled better at the high planting density than the low planting density. Herbicide program had no effect on soybean yield; however, the conventional program did not control entireleaf morningglory late into the season. The lack of adequate late-season morningglory control was more prevalent for the MG II soybean than for other maturity groups. Both Roundup Ready programs provided good control of both morningglory species (>90%), but the full-rate Roundup program did provide slightly higher control. Late-season rainfalls along with MG II and III soybean maturing in August caused for required applications of paraquat prior to harvest for morningglory control. Partial profit per acre for MG IV conventional soybean planted at 200,000 seed/A was $322 compared to $285 and $292 for the half and full glyphosate treatments, respectively. MG IV soybean planted at 125,000 seed/A with a half rate of glyphosate applied exhibited the second highest partial profit at $306/A. MG II soybean, regardless of other factors, failed to exceed $230/A and MG III soybean failed to exceed $255/A. Thus, conventional MG IV soybean planted at high plant density is more profitable than any combination of glyphosate tolerant soybean tested. The recommended method of producing early-maturing soybean based on this research is conventional MG IV soybean planted at 200,000 seed/A.

USE OF PLASTIC AND FARM WASTES AS A WEED SUPPRESSING MULCH IN AGROFORESTRY

H.D. Stevenson, D.J. Robison, J.P. Mueller, F.W. Cubbage, M.H. Gocke, and M.G. Burton; NC State University, Raleigh, NC 27695

ABSTRACT

Agroforestry is the practice of managing crops and trees on the same land, and has long been practiced in tropical regions. The positive social and environmental benefits of these systems have been studied in the tropics, but they are only recently being recognized in many temperate regions, including the U.S. Using mulch around newly planted trees can have a positive impact on tree success, including the potential for weed suppression. Further, the use of on-farm waste materials as mulch can be helpful as excess organic material on farms is often problematic to the farmer. An agroforestry study was installed at the North Carolina State University Research Farm in Goldsboro, North Carolina on a field that had previously been in conventional corn production. The study was operational farm scale (ca. 5 ha) with five replications blocked across elevation. Each block included 6.1 by 128m alley strips for trees and either 12.2 or 24.4m wide (the distance between the alley strips for trees) by 128m long blocks for crops. The three tree species planted in single species stands across the width of the site were longleaf pine (Pinus palustris), loblolly pine (Pinus taeda), and cherrybark oak (Quercus pagoda). The crop plan followed a typical annual rotation of corn, wheat, and soybeans, with soybeans (Glycine max) planted in the first season of the study (2007). The wastes used as mulch were bermudagrass hay (Cynodon dactylon) from the 2005 field season, and corn stover that had been used as hog bedding. Black plastic film (4 mil) was also used as a mulching material. All treatments were compared to a no-mulch control. Mulch material was placed in 91cm diameter areas around 450 study trees in a replicated approach superimposed on the larger tree-crop study. Hay and corn stover-hog waste were applied to a depth of either 2.5cm or 7.5cm.

Mulched trees and the areas immediately around them were measured and evaluated for first year weed suppression, growth in tree seedlings, temperature of soil, moisture of soil, soil nutrient content, and nutrients in leaf tissue. Waste materials were also analyzed for nutrient content. Weed suppression was evaluated in July, the time of highest weed competition. The weeds were cut at the soil surface, stems were counted and biomass dried and weighed. Tree heights and diameters were recorded before mulch application in April, following mulch application in late May, mid-season in August, and at the end of the season in November. Soil temperature and soil moisture readings were measured twice in the growing season, once in June and once in August. Soil was analyzed for nutrient concentration in July, and leaf tissue was analyzed for nutrient concentration in early August during the growing season. Data were subjected to ANOVA for treatment differences in weed biomass and stem count found in treatment plots, ground line diameter (excluding longleaf pine which was still in the grass stage development), height to terminal bud (for longleaf pine to tips of needles), soil temperature and soil moisture, and nutrients in soil, leaf tissue and waste material.

Weeds were observed in 113 of the 450 individual-tree treatment plots, and 75% of the weedy plots were no-mulch controls. Control plots had significantly more weed biomass and weed stems than all other plots. On average, the control areas had over twice as many weed stems per plot than did mulched plots. Hay mulch, at the 7.5cm application, had a positive effect on the height of the longleaf pine as compared to the other mulches. In longleaf pine, 7.5cm hay mulch resulted in increased height as compared to the other mulches. Soil temperatures fluctuated in June, but were steady in August across species. Soil moisture in May and August was higher under 7.5cm of corn stover-hog waste mulch across species as compared to all other treatments. Nutrient content (K, S, and Na) of the soil was significantly higher in the corn stover-hog waste treatments than in all other treatments. Nutrient content (K, B, and Na) in leaf tissue was also higher in the corn stover-hog waste treatments than in other treatments. These first-year findings support the position that weed suppression by mulching may be a valuable tool for weed management in agroforestry systems. Continued monitoring of this study is planned.

Acknowledgements
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OPTIMUM SPRING RYEGRASS (*Lolium perenne* L.) TRANSITION USING CULTURAL & CHEMICAL OPTIONS. R.K. McCauley, L.B. McCarty, H. Liu, and J.E. Toler: Department of Horticulture, Clemson University, Clemson, SC 29634.

ABSTRACT

Bermudagrass is often overseeded with perennial ryegrass to maintain its aesthetic value during dormancy. However, newer varieties of perennial ryegrass fail to timely transition back to the bermudagrass base and may linger throughout the summer. Unchecked perennial ryegrass effectively overshadows the bermudagrass base delaying spring green-up and promoting stand decline. Therefore, from April to July 2007, a study was conducted evaluate combinations of mowing height, fertilizer rate, and trifloxysulfuron timing and rate for best spring transition from overseeded ryegrass back to permanent bermudagrass base.

The study was arranged as a split plot design with completely randomized subplots. Whole plot treatments included mowing heights at either 0.5 or 1.0-inch (1.2 or 2.5 cm) and 0.375 or 0.75 lbs N 1,000 ft^2 $week^{-1}$ (24.4 or 48.8 kg N ha^{-1}) fertilizer rates. Meanwhile subplot treatments included trifloxysulfuron at either 0.1 or 0.3 oz $acre^{-1}$ and mid-April or mid-May application dates. Visual ratings taken throughout the study included turf quality and percent ryegrass density. Turf quality was rated on a 1 to 9 scale, where 1 = poor turf, 9 = excellent turf, and < 7 was deemed unacceptable. Meanwhile, percent ryegrass density was rated on a 0-100% scale with 0 = no ryegrass and 100 = complete ryegrass coverage. Trifloxysulfuron treatments were applied on either April 13 or May 15, and all treatments received a non-ionic surfactant at 0.25% V/V.

All control plots and 0.5 in. mowing height + 0.75 lbs. N wk^{-1} fertility rate + low May trifloxysulfuron treatments provided acceptable (>7) turf quality throughout 2007. On July 1, 2007, all trifloxysulfuron treatments had 0% ryegrass and 100% bermudagrass coverage; meanwhile, 0.5 and 1.0 in. control plots had 21 and 35% less bermudagrass coverage versus treated plots in July.

Future research at Clemson University will evaluate new and existing products as spring transition aids including the use of different combinations of treatments and cultural practices at various timing. The allelopathic potential of perennial ryegrass on bermudagrass will also be evaluated in future green house studies.

EFFECT OF HERBICIDE AND MOWING HEIGHT ON CRABGRASS (*Digitaria spp.*) INCIDENCE IN TURF. J.A. Hoyle, F.H. Yelverton, T.W. Gannon and L.S. Warren; North Carolina State University, Raleigh, NC.

ABSTRACT

Tall fescue (*Lolium arundinaceum*) and common bermudagrass (*Cynodon dactylon*) are widely used in North Carolina (NC) turf areas including golf courses, home lawns, commercial properties, and athletic fields. Large crabgrass (*Digitaria sanguinalis*) and smooth crabgrass (*Digitaria ischaemum*) are two of the most troublesome weeds that homeowners and turfgrass managers must contend with when managing these turf species. These common weeds can become a major problem because of their ability to establish and reproduce quickly, especially in less dense turf stands. Field experiments were conducted during 2007 at two locations (Sandhills Research Station, Jackson Springs and Lake Wheeler Field Labs, Raleigh) to determine if turf mowing height could suppress large crabgrass in common bermudagrass and tall fescue. Additionally, trials were initiated to evaluate preemergence herbicide efficacy for large crabgrass control. Large crabgrass was seeded in each experiment in early March. Evaluated mowing heights included 0.5”, 1.0”, 1.5” and 2.0” for bermudagrass and 1”, 2”, 3” and 4” for tall fescue, which were initiated once soil temperatures reached an optimum for crabgrass emergence. In bermudagrass, no significant differences (P = 0.05) were discerned among mowing heights or locations. However, there were significant differences in tall fescue in Raleigh, with mowing heights of 1”, 2”, 3” and 4” resulting in 95%, 48%, 13%, and 0% crabgrass cover, respectively, by early-September. While the Jackson Springs location contained 79%, 74%, 31%, and 0% crabgrass cover, respectively, with mowing heights of 1”, 2”, 3” or 4”. This shows that the growth habitat of tall fescue can be used to help suppress large crabgrass by implementing the correct mowing height.

Evaluated herbicides included single or split applications of Barricade 65WG - prodiamine (0.75 or 0.5 fb 0.25 lb ai/a) , Dimension Ultra 40WP – dithiopyr (0.5 or 0.25 fb 0.25 lb ai/a), Ronstar 2G – oxadiazon (3 or 1.5 fb 1.5 lb ai/a), Pendulum AquaCap 3.8CS - pendimethalin (3 or 1.5 fb 1.5 lb ai/a), Surflan 4FL – oryzalin (3 or 1.5 fb 1.5 lb ai/a), and Team Pro 0.86G – benefin + trifluralin (3 or 1.5 fb 1.5 lb ai/a). Visual estimates of percent large crabgrass control were collected in September. Statistics prevented pooling of data across locations. Both locations showed significant differences between the different herbicides. Split applications at the Jackson Springs location by Team Pro, Surflan, Pendulum AquaCap, Ronstar, Dimension Ultra, and Barricade resulted in 75%, 100%, 100%, 76%, 83% and 99% control large crabgrass, respectively. Single applications at the same location resulted in 85%, 99%, 99%, 85%, 93%, and 99% control large crabgrass, respectively. Regardless of split or single applications, Team Pro and Ronstar did not control large crabgrass as well as the other herbicide treatments. Split applications at the Raleigh location by the same preemergence herbicides resulted in 97%, 97%, 99%, 99%, 99%, and 99% control large crabgrass, respectively. Single applications resulted in 95%, 84%, 97%, 95%, 95%, and 100% control large crabgrass, respectively. Surflan at the Raleigh location showed a major decline in crabgrass control from split to single applications. At both locations, single applications performed equal to or better than split applications for the herbicides evaluated. Overall, the major differences occurred between the two locations, each preemergence herbicide, and between single and split applications.

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COMPARSION OF TWO SMUTGRASS (*SPOROBOLUS*) SPECIES COMMON TO FLORIDA PASTURES. B.J. Wilder, B.A. Sellers, and J.A. Ferrell. University of Florida-IFAS Agronomy Dept., Gainesville, FL; University of Florida-IFAS Range Cattle Research and Education Center and Agronomy Dept., Ona, FL; University of Florida-IFAS Agronomy Dept., Gainesville, FL.

ABSTRACT

Multiple, concurrent field experiments were conducted to determine if adjuvants improved hexazinone efficacy on giant smutgrass. The experiment contained two parts. The first segment investigated the effects of varying amounts of the non-ionic surfactant, Optima, while the second segment investigated a variety of other adjuvants and their effect on hexazinone efficacy. The Optima experiment was initiated on June 28 and August 2 in 2005 and 2006, respectively. Optima was applied at rates of: 0%, 0.125%, 0.25%, 0.5%, 0.75%, and 1% v/v. Dyne-Amic was applied as an industry standard at a rate of 0.5% v/v. All treatments received hexazinone at a rate of 1.12 kg/ha. Smutgrass control was visually estimated at 1, 3, 6, and 12 month intervals after herbicide application. After 1 year following application, all treatments provided at least 90% control with no statistical difference among treatments. Other adjuvants were also investigated on July 31, 2006 with hexazinone at 1.1 kg/ha. These included: 1 pt of methylated seed oil, 0.5 % v/v Optima, 0.1% v/v Kinetic, 0.5% v/v Dyne-Amic, 0.25% v/v Induce. Hexazinone at 1.1 kg/ha was also applied without an adjuvant as a control. Smutgrass control was visually estimated at 1, 3, 6, and 12 month intervals after herbicide application. After 1 year, all treatments provided at least 90% control with no statistical difference among treatments. Therefore it can be concluded that adjuvants do not improve hexazinone efficacy on smutgrass control. An additional experiment was conducted to determine the optimum hexazinone rate for control of two smutgrass biotypes: giant smutgrass and small smutgrass. The small smutgrass field experiments were conducted at the University of Florida Beef Research Unit and in Alachua, FL on July 25 2006. The giant smutgrass experiments were initiated on July 31 2006 in Ona Florida. At both locations hexazinone was applied at rates of 0.28 kg/ha, 0.56 kg/ha, 0.81 kg/ha, 1.12 kg ai/ha, and 1.68 kg/ha. Smutgrass control was visually estimated at 1, 3, 6, and 12 month intervals after herbicide application. Using regression analysis, the optimum hexazinone rate for 90% control of giant smutgrass was 1.11 kg ai/ha. For small smutgrass optimum hexazinone rate for 90% control was 1.16 kg ai/ha. This indicates that although these two smutgrass biotypes vary greatly in size, no differences in hexazinone sensitivity were observed.

PASTURE HERBICIDES IMPACT ON NITRATE ACCUMULATION IN ORCHARDGRASS. D.M. Fryman and W.W. Witt, University of Kentucky, Lexington, KY.

ABSTRACT

Nitrate accumulation in orchardgrass (*Dactylis glomerata L*.) due to pasture herbicides was evaluated on an established stand in 2007 near Lexington, KY. Herbicides screened were 2,4-D amine and 2,4-D ester (1 qt/A), dicamba (Banvel 1 pt/A), aminopyralid (Milestone 7 oz/A), metsulfuron (Cimarron 0.2 oz/A) and triclopyr (Remedy 12 oz/A). Herbicides were applied on October 16, 2007 at 20 gpa to orchardgrass that was about 8 inches in height. Plots were fertilized using triple 19 at a rate of 200 lb/A one month prior to application, and 40 lb/A of ammonium nitrate two days prior to application. Treatments were arranged as a randomized complete block with four replications. Orchardgrass clippings were harvested before herbicide application and at 1, 2, 3, 7, 14, and 45 days after treatment. Samples were dried for 72 hours in a crop dryer and then ground to pass a 1millimeter screen. Nitrate concentration was determine colormetrically as nitrite on water extracts using a cadmium reduction technique and reported in parts per million. Data were analyzed for significance using an analysis of variance and means separated by an LSD at a p-value = 0.05. Nitrate concentrations reached a maximum concentration 7 DAT, except 2,4-D amine, and ranged from 1600-2410 ppm. Peak nitrate concentration in the 2,4-D treatment occurred 3 DAT and averaged 1642 ppm. By 45 DAT, nitrate concentration ranged from 370-520 ppm and there were no differences among treatments. Nitrate concentration in the forage before treatment ranged from 573-864 ppm for all treatments. No differences in nitrate concentration between the untreated or treatments were detected. Two days after application the untreated was significantly higher than all other treatments and 2,4-D amine was significantly less from all other treatments.

CRITICAL PERIOD OF AMERICAN BLACK NIGHTSHADE IN SEEDLESS WATERMELON. J.I. Adkins, W.M. Stall, B.M. Santos, S.M. Olson, and J.A. Ferrell, Horticultural Sciences Department, University of Florida, Gainesville, FL.

ABSTRACT

Studies were conducted to determine the critical period of American black nightshade competition in triploid (seedless) watermelon grown on polyethylene-mulched beds. Trials were located at the Plant Science Research and Education Unit in Citra, FL (PSREU) and the North Florida Research and Education Center in Live Oak, FL (NFREC). In the spring of 2007, American black nightshade was established at 0, 1, 2, 3, 4, and 5 weeks after watermelon transplanting and remained until watermelon harvest (plant back study) or was established at watermelon transplanting and removed at 0, 1, 2, 3, 4, and 5 weeks after planting (removal study).

There was no significant interaction between locations and treatments concerning marketable yield. Therefore, marketable yield data was combined from PSREU and NFREC. Regression analysis was conducted to test the effect of treatment on data expressed as percentage of weed-free control. The regression model for the plant back study was a rectangular hyperbola with an R^2 value of 0.92. For the removal study, the regression model was linear with an R^2 value of 0.88. The models were used to predict the minimum weed-free period and the maximum period of competition for a 10% yield loss. The minimum weed-free period and maximum period of competition was predicted to be 3.3 and 6.0 weeks, respectively. Therefore, in order to avoid watermelon yield loss greater than 10 percent, nightshade establishment should be delayed for at least 3.3 weeks after transplanting or nightshade removal should take place by 6 weeks after transplanting.

FALLOWING SYSTEMS IN FLORIDA VEGETABLE CROPS. T.P. McAvoy, W.M. Stall, B.M. Santos and G.E. MacDonald, Horticultural Sciences Department, University of Florida, Gainesville.

ABSTRACT

In response to the methyl bromide phase out, alternatives must be found for weed control in Florida vegetable production. One feasible alternative is to implement weed control methods during the fallow period before crop production. Fallow treatments can be both cultural and chemical. The purpose of this study was to reduce the population of weed species before planting, especially purple and yellow nutsedge. Field studies were conducted at the North Florida Research and Education Center in Live Oak, Florida during the fallow periods of 2006 and 2007. This was a factorial experiment arranged in a randomized complete block design with four replications. The two factors being investigated were tillage and herbicides. Tillage treatments had two levels which included disking and no disking. Herbicide treatments had three levels; no herbicide, glyphosate, and glyphosate plus halosulfuron-methyl. All herbicides were mixed with a non-ionic surfactant. Each treatment was applied twice each season for two consecutive fallow seasons. The plots were permanently marked with metal stakes; therefore each treatment was applied to the same exact spot every time. Two representative weed counts were taken per plot before and after each treatment.

Although there was a wide variety of weed species in the field during the experiment, only the data for three species are presented. Purple nutsedge, Florida pusley and crabgrass were chosen as model species because they were the dominate sedge, broadleaf, and grass species respectively. Disking alone significantly increased nutsedge emergence. Both herbicides significantly reduced nutsedge compared to the untreated control regardless of disking regiment. After the first application, disking plus herbicides significantly reduced Florida pusley counts compared to the other treatments. At the end of the experiment disking alone significantly reduced Florida pusley. In addition, all treatments that used herbicides had significantly fewer Florida pusley counts than disking alone. All fallow treatments had significantly fewer crabgrass counts than the untreated control after the first application. At the end of the experiment disking alone had significantly higher crabgrass counts. Furthermore, no disking plus herbicide treatments had significantly fewer crabgrass counts than the untreated control.

EFFECT OF PHOTOPERIOD AND TEMPERATURE ON PERENNIAL RYEGRASS RESPONSE TO MESOTRIONE. J.M. McCurdy, J.S. McElroy, D.A. Kopsell, and C.E. Sams, The Univiersity of Tennessee, Knoxville, TN.

ABSTRACT

Mesotrione, a carotenoid biosynthesis inhibitor, is currently being evaluated for its use in turfgrass. Mesotrione has been reported to injure perennial ryegrass (*Lolium perenne* L.). Variation in efficacy due to environmental conditions has been reported in other species. Understanding the effects of environmental conditions upon mesotrione efficacy may allow turfgrass managers to more effectively control weeds while minimizing injury to perennial ryegrass turf. A two by three by three factorial treatment arrangement was conducted to investigate the effects of light intensity and temperature on perennial ryegrass carotenoid composition following mesotrione application. Perennial ryegrass was treated with mesotrione (0.28 kg ai/ha plus a 0.25% v/v non ionic surfactant) and subsequently placed in an environmental growth chamber at 600, 1100, or 1600 µmol/m/s^2 irradiance and 18, 26, or 34ºC with a 16 hour photoperiod. Leaf tissue was harvested 3, 7, and 21 days after treatment (DAT). Percent bleaching and foliar-weight were recorded as an indication of mesotrione efficacy. Photochemical efficiency was measured using a modulated fluorometer as an indication of overall plant health. Carotenoids were quantified using HPLC analysis. All data were subject to ANOVA ($P = 0.05$). Irradiance levels did not affect mesotrione efficacy in perennial ryegrass. The highest amount of bleaching (18%) was observed in treated plants grown at 26 ºC 3 DAT. High temperatures resulted in decreased foliar weights for both treated and non-treated perennial ryegrass, and treatment with mesotrione resulted in increased perennial ryegrass foliar weights. Treated plants displayed a lower photochemical efficiency than non-treated plants; although, plants grown at 18 and 26 ºC recovered to the levels of the non-treated by 21 DAT. At no time did treated plants grown at 34 ºC recover to the level of photochemical efficiency observed in non-treated plants grown at the corresponding temperature. Therefore, mesotrione should not be applied to perennial ryegrass during excess heat stress due to the potential for decreased photochemical efficiency and possible bleaching. Phytoene levels were undetectable in non-treated plants regardless of temperature level but increased to 1.9 mg/100g fresh weight in plants treated with mesotrione. Chlorophyll A, β-carotene, lutein, and violaxanthin levels decreased due to treatment with mesotrione. Despite carotenoid biosynthesis inhibition by mesotrione, the photoprotectant carotenoids antheraxanthin and zeaxanthin increased in mesotrione treated plants. These data indicate that mesotrione efficacy does not vary between the tested irradiance levels; however variation influenced by temperature does occur.

PCR-BASED ASSAY FOR RAPID DETECTION OF MUTATIONS ASSOCIATED WITH DINITROANILINE RESISTANT ANNUAL BLUEGRASS. M.A. Cutulle, J.S. McElroy, C.N. Stewart Jr. and J.S. Yuan, Department of Plant Science, The University of Tennessee, Knoxville, TN.

ABSTRACT

A suspected dinitroaniline herbicide-resistant annual bluegrass ecotype (Poa annua L.) was harvested from Eagle Bluff golf course in Chattanooga, TN. Herbicide Bioassays compared the growth response of the Chattanooga population with a sensitive control population. Growth response curves indicated that the Chattanooga population was resistant to dinitroanilines. Bioassays usually require mature seed and can be very labor intensive. Nucleic acid based screens do not require living tissue and the diagnosis time is short. Therefore, elucidation of the mutation conferring resistance to dinitroanilines in the Chattanooga annual bluegrass should be obtained. Subsequently, a PCR assay which selects for the mutation may be performed for a quick diagnosis.

A single base pair mutation in the α-tubulin gene changing threonine to isoleucine has been shown to confer resistance to dinitroanilines in multiple weeds. Genomic DNA was extracted from the Chattanooga population and the sensitive control. The α-tubulin gene was sequenced from both populations. Sequences from both populations were aligned with the α-tubulin from a dinitroaniline resistant green foxtail (Setaria viridais). Alignment revealed that a C-T point mutation changing threonine to isoleucine is present in both dinitroaniline resistant green foxtail and the Chattanooga population. An allele specific reverse primer designed complementary to the C-T point mutation and a forward primer primary which was specific to α-tubulin from both ecotypes were utilized as primers for a PCR reaction. An annealing temperature of 65 C allowed for preferential selection of the dinitroaniline resistant ecotype template.

BIOLOGY OF MARYLAND MEADOWBEAUTY (*RHEXIA MARIANA* L.) IN BLUEBERRY (*VACCINIUM CORYMBOSUM* L.). M.M. Coneybeer-Roberts, K.M. Jennings, D.W. Monks, Department of Horticultural Science, North Carolina State University, Raleigh, NC.

ABSTRACT

Studies were conducted in 2007 to determine seed viability and dormancy, optimum temperatures for seed germination, and reproductive potential by seed of *Rhexia mariana*. Seeds and seed capsules were collected from three grower locations in southeastern North Carolina. On average, 65% of seeds were viable and 30% were not viable. Average number of unfertilized seed differed by location and was 4, 5 and 16% over the three locations. Maximum seed germination was observed at day/night temperatures of 20/35C. The number of seed capsules produced per infested 0.093 m^2 was different among locations and was 500, 697 and 1125 per 0.093m^2. Across locations, seed capsules produced an average of 74 seeds each.

POTENTIAL HERBICIDES FOR SWEET SORGHUM IN ARKANSAS. N.R. Burgos, J. Kelly, M.R. McClelland, V.K. Shivrain, M.A. Sales, and F. Lamego; University of Arkansas, Fayetteville.

ABSTRACT

Sweet sorghum (*Sorghum bicolor* L.) is a minor use crop grown in the southern U.S. for syrup. Early-season weed control is a problem because there are no chemical options for weed control in this crop and the seedlings are small. Experiments were conducted at the Main Agricultural Research and Extension Center, Fayetteville, AR in June to October 2007 to determine the response of sweet sorghum to various combinations of mesotrione and metolachlor, with and without irrigation. The mesotrione rates were 0, 0.11, and 0.42 kg/ha while the metolachlor rates were 0, 0.54, 1.08, 1.60, and 2.13 kg/ha. A low rate of atrazine, 0.56 kg/ha, was also applied preemergence (PRE), to the whole field to reduce weed pressure on the nontreated check and keep the treated plots generally weed-free throughout the season. The soil type was a Taloka Silt Loam with 1.88% organic matter and pH of 5.81. Experimental units were arranged in a randomized complete block design, with a factorial combination of mesotrione and metolachlor rates, replicated four times. The crop was planted at 13 to 16 seeds/m on rows 1.0 m apart. Plots were 6.1 m long. The whole experiment was blanket-sprayed with 0.62 kg ai/ha atrazine to control weeds that are tolerant to metolachlor and mesotrione. Two identical experiments were set up in one large block; one was irrigated, the other was not. Crop stand, visual crop injury (stunting or bleaching), and fresh biomass yield were recorded. There was no interaction between metolachlor and mesotrione rates on crop injury, crop stand, and fresh biomass yield in the irrigated and non-irrigated experiments. Sweet sorghum was stunted up to 30% with 2 kg ai metolachlor, but the rate effect was not significant. Mesotrione caused more bleaching, about 30%, at the high rate (0.42 kg ai) than at the low rate (0.1 kg ai). Sweet sorghum stand was not affected by metolachlor and mesotrione, with or without irrigation. Observed injury from metolachlor did not result in biomass yield reduction; however, the high rate of mesotrione produced less biomass than the low rate, averaged over metolachlor rates. Overall, Dale produced 63 mt/ha biomass with irrigation; biomass yield was reduced 24% in non-irrigated plots.

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RESPONSE OF WHEAT TO LOW RATES OF GLUFOSINATE. B.M. Davis*, R. C. Scott, J. K. Norsworthy, University of Arkansas, Little Rock, AR.

ABSTRACT

A study was conducted to assess the injury caused by low rates of glufosinate and glyphosate on wheat. The experiment was conducted near Lonoke, AR in 2006-2007. AGS 2000, Agro Coker Berretta, and Delta King 9410 wheat varieties were grown using conventional tillage practices. Herbicide treatments consisted of glyphosate applied at 0 lb ae/A, 0.05 lb ae/A, and 0.1 lb ae/A. Glufosinate was applied at 0 lb ai/a, 0.025 lb ai/A, and 0.05 lb ai/A. These represent 0x, 1/10x, and 1/20x rates, respectively. Treatments were applied at the 3-4 lf, ¼ inch panicle initiation (PI), and boot stages using Roundup Weathermax® (glyphosate) and Ignite280® (glufosinate). Applications were made using a pressurized CO_2 backpack sprayer with a four-nozzle boom delivering a spray volume of 10 gallons per acre. The study design was a randomized complete block with four replications. Visual injury, canopy heights (cm) (taken at boot and heading), heading dates, and maturity dates were recorded for all treatments. Yields were obtained using a small plot combine and adjusted to 12.5% moisture.

Visual injury from the 3-4 lf timing for both glyphosate and glufosinate ranged from 0% to 7% with few statistical differences. At the ¼ inch PI timing, AGS 2000 was injured from 20-48% at the 0.1 lb ae/A glyphosate rate, while injury of Delta King 9410 and Berretta was generally 20% less up to 3 weeks after treatment (WAT). Glufosinate applied at 0.05 lb ai/A caused the most visual injury when applied at boot (2WAT) with injury ranging from 20-40% nercrosis across varieties. Glufosinate injury consisted of nercotic leaf burn as far as the herbicide penetrated the canopy on the plant. By comparison glyphosate caused 10-15% less visual injury at the boot timings than glufosinate.

Canopy height was reduced by 0.1 lb ae/A of glyphosate on AGS 2000 and Delta King 9410 when applied at ¼ PI timing. Glufosinate did not reduce canopy height at any timing when measured at boot. Canopy height was not affected by either herbicide when applied at 3-4 lf at any rate when measured at heading. Canopy height was reduced up to 28 cm when glyphosate was applied at ¼ PI and boot at both rates. Glufosinate (0.025 lb ai/A) reduced canopy height of AGS 2000 up to 6 cm when applied at ¼ PI at and Berretta by 6 cm when applied at 0.05 lb ai/A. Glufosinate applied at boot reduced canopy height of AGS 2000 at both 0.05 lb ai/A and 0.025 lb ai/A and Delta King 9410 when applied at 0.05 lb ai/A by about 9 cm. In general, glyphosate decreased canopy heights more than glufosinate.

Flag leaf length was not affected by either herbicide when applied at the 3-4lf timing. Glyphosate reduced flag leaf length by 10 cm when applied at ¼ PI at both rates. Glufosinate (0.05 lb ai/A) reduced flag leaf length by 2 cm when applied at ¼ PI on AGS 2000. When glufosinate was applied at boot at 0.025 lb ai/A a reduction in flag leaf length on AGS 2000 was also documented, however other varieties were not affected.

Glufosinate applied at 0.05 lb ai/A reduced the yield of DK 9410 when applied at the 3-4 lf timing by 10 bu/A. All other treatments did not affect wheat yields when applied at this timing. Glyphosate at 0.10 lb ae/A significantly reduced yield of all varieties by 10 to 20 bu/A when applied at either the ¼ inch PI or boot timings. However, glufosinate 0.05 lb ai/A reduced yields of all three varieties when applied at boot from 10 to 16 bu/A. Germination of harvested grain was not affected by either glyphosate or glufosinate at any timing or rate.

WINTER ANNUAL GRASS CONTROL IN WINTER CANOLA.
J.A. Bushong, M.C. Boyles and T.F. Peeper, Department of Plant and Soil Sciences, Oklahoma State University, Stillwater, OK.

ABSTRACT

Controling winter annual grass species in winter wheat can be difficult. Winter wheat producers in the southern Great Plains are experiencing increasing problems with feral rye (*Secale cereale*), Italian ryegrass (*Lolium multiflorum*) and jointed goatgrass (*Aegilops cylindrica*). Growing winter canola in rotation with winter wheat increases herbicide options for controlling these winter annual grass species. However, in winter canola, volunteer wheat (*Triticum aestivum*) can become a weed. Registered herbicides were evaluated for control of these species in glyphosate tolerant winter canola.

Four experiments were conducted during the 2006-2007 growing season, three near Stillwater, Oklahoma and one near Perkins, Oklahoma. The experimental design at each site was a randomized complete block. Plot size was 1.2 by 7.6 m with four replicates. Herbicide treatments were applied using a CO2- pressurized backpack sprayer. Trifluralin at 1120 g ai/ha was applied in 187 L/ha of water carrier and incorporated immediately before planting. Postemergence treatments were applied at labeled rates in 93.5 L/ha of water carrier plus recommended adjuvants in the fall or sequentially in the fall and late winter. Plots were harvested with a small-plot combine. Sub-samples were extracted from each harvested canola sample and weed seed was separated by species and weighed. Canola yields were corrected for weed seed content.

All herbicides reduced weed seed content in harvested canola, but differences were found in efficacy of the different herbicide treatments on the various species. Ryegrass was the most difficult grass to control, with no treatment controlling it over 97%. Delaying the planting date of canola from mid September to early October appeared to decrease interference from the winter annual grass species. At the mid September seeded sites all treatments except trifuralin PPI and quizalofop applied in February increased canola yields. Sequential herbicide applications appeared more effective on ryegrass than any single treatment. All treatments were effective on volunteer wheat except trifluralin alone.

EFFICACY OF BLEACHING HERBICIDES IN CORN. A.T. Ellis[1], L.E. Steckel[2], and T.C. Mueller[1], University of Tennessee, Knoxville, TN and University of Tennessee, West Tennessee Research and Education Center, Jackson, TN.

ABSTRACT

Several studies were conducted in 2006 and 2007 observing the efficacy of mesotrione, topramezone, and tembotrione on control of common cocklebur, pitted morningglory, broadleaf signalgrass, and johnsongrass. Treatments including topramezone or tembotrione were applied alone, with glyphosate, or with atrazine plus glyphosate. Mesotrione was applied with glyphosate or with atrazine plus glyphosate. All treatments were applied EPOST to weed sizes ranging from 2- 4 in tall. Common cocklebur control at 7 days after treatment (DAT) was greater than 90% with all treatments except with tembotrione alone and with glyphosate. Residual control (>80%) of common cocklebur at 48 DAT was observed with all treatments that included atrazine. Pitted morningglory control at 7 DAT was best (>80%) with all topramezone treatments and tembotrione plus atrazine plus glyphosate. At 48 DAT control decreased to 80% or less with all treatments. Broadleaf signalgrass control at 7 DAT was excellent with all topramezone treatments and with tembotrione applied with glyphosate or atrazine plus glyphosate. Control of broadleaf signalgrass increased at 48 DAT with all treatments except for tembotrione alone. Only treatments including mesotrione and tembotrione were applied to johnsongrass plots. Control of johnsongrass with mesotrione treatments ranged from 65 to 75%. Control of johnsongrass at 7 DAT was 90% with Tembotrione plus glyphosate and tembotrione plus atrazine plus glyphosate, but control (75%) decreased at 48 DAT. Control of all weeds increased when the bleaching herbicides were combined with atrazine or glyphosate. The addition of atrazine provided residual control of common cocklebur, pitted morningglory, and broadleaf signalgrass. This research has shown that the addition of a bleaching herbicide can benefit a glyphosate tolerant corn program by adding another mode of action which is an important part of resistance management.

WEED CONTROL IN SUGARCANE WITH MESOTRIONE. C.R. Rainbolt and S. Chandramohan, University of Florida, Belle Glade.

ABSTRACT

In south Florida, sugarcane is produced on approximately 400,000 acres in the Everglades Agricultural Area. Mesotrione has been registered for use in corn, but little information is available on its use in sugarcane. The objective of this research was to evaluate mesotrione applied early post (EPOST) and postemergence (POST) for crop safety and weed control in sugarcane. Two trials, one in plant cane and one in ratoon cane, were initiated to evaluate mesotrione applied EPOST. In ratoon cane, ametryn at 1 lb ai/A + mesotrione at 0.094 lb ai/A controlled fall panicum 95% compared to 98% with the grower standard treatment of atrazine at 3 lb/A + ametryn at 1 lb/A 3 week after treatment (WAT). Fall panicum control was 52% with atrazine alone at 4 lb/A 3 WAT. Crop injury was not visible in the ratoon trial. EPOST control of fall panicum in the plant cane trial was similar to the ratoon trial. However, 1 WAT phytotoxicity was 5% with ametryn at 1 lb ai/A + mesotrione at 0.094 lb/A, but was no longer visible 3 WAT. Two trials were established in ratoon cane to evaluate POST applications of mesotrione. At 3 WAT, control of fall panicum was 55% with mesotrione at 0.094 lb/A + atrazine at 1 lb/A compared to 90% with mesotrione at 0.094 lb/A + atrazine at 1 lb/A + trifloxysulfuron at 0.014 lb/A. All treatments containing mesotrione (0.094 to 0.188 lb/A) caused 4 to 5% crop injury 1 WAT, but injury was 0% at 3 WAT. At the rates and combinations tested, control of fall panicum with mesotrione + atrazine was not acceptable. However, sugarcane was relatively tolerant to mesotrione which may allow for further testing at higher use rates.

DOVEWEED CONTROL WITH PREEMERGENCE AND POSTEMERGENCE HERBICIDES IN FALLOWED SUGARCANE. C. D. Dalley and E. P. Richard, Jr; USDA-ARS, Sugarcane Research Laboratory, Houma, LA 70360.

ABSTRACT

Doveweed infestation of fallowed sugarcane is becoming a management concern for Louisiana's sugarcane growers. Doveweed is poorly controlled with glyphosate and this allows it to establish dense infestations across formed rows which can impede planting practices. The objectives of this research were to compare herbicide treatments that could be applied preemergence (PRE) to prevent establishment of doveweed and to evaluate postemergence (POST) activity of herbicide treatments on established doveweed that could be applied as a burndown prior to planting. In the PRE experiment, atrazine (1, 2, and 3 lbs ai/A), metribuzin (1 and 2 lbs ai/A), sulfentrazone (0.19, 0.25, and 0.31 lbs ai/A), flumioxazin (0.064, 0.13, and 0.26 lbs ai/A), diuron (1.6 and 3.2 lbs ai/A), diuron plus hexazinone (1.2 plus 0.35 and 1.9 plus 0.53 lbs ai/A), mesotrione (0.19 and 0.25 lbs ai/A), terbacil (0.8 lbs ai/A), and pendimethalin (0.95 and 1.4 lbs ai/A) were evaluated for their PRE activity on doveweed at two locations. Prior to their application, 0.75 lbs ai/A of paraquat was applied to all plots to control any emerged doveweed. At one location, treatments were evaluated only at 4 and 5 weeks after treatment (WAT) as the field was planted at 6 WAT, while at the other location treatments were evaluated weekly starting at 4 WAT and continuing until 10 WAT. At 4 WAT, doveweed control was greater than 90% with the application of metribuzin, diuron plus hexazinone, flumioxazin, and mesotrione, regardless of rate used. Control was 77% with diuron at 3.2 lbs/A and 73% with terbacil. All other treatments gave poor or no control of doveweed. At 7 WAT, doveweed control continued to be greater than 90% when metribuzin, diuron plus hexazinone, flumioxazin at 0.26 lbs/A, or terbacil were applied with mesotrione at both rates providing 83 to 86% control. At 10 WAT, the only treatments that controlled doveweed 80% or more were metribuzin (85 to 90%), diuron plus hexazinone (91 to 95%), flumioxazin at 0.26 lbs/A (83%), and terbacil (84%). For fields with a known history of doveweed, these herbicides could be applied PRE following row formation to prevent doveweed infestation.

In the POST experiment, glyphosate (1.7 lbs ae/A) application was compared to flumioxazin (0.064 and 0.096 lbs/A), flumioxazin plus atrazine (0.064 plus 1 and 0.064 plus 2 lbs/A), atrazine (2, 3, and 4 lbs/A), metribuzin (0.75, 1.12, and 1.5 lbs/A), metribuzin plus dicamba plus 2,4-D (0.75 lbs + 0.19 lbs + 0.54 lbs ai/A), paraquat (0.5 and 0.75 lbs/A), and paraquat plus atrazine (0.5 plus 1 and 0.5 plus 2 lbs/A). All treatments were applied with NIS at 0.5% v/v, except glyphosate, as the formulation used already contained a surfactant. Visual ratings of doveweed control were taken at two locations with weekly ratings taken for 3 weeks at one location and for 10 weeks at the other. Ratings were discontinued at 4 WAT at the first location to allow for planting of sugarcane. At 1 WAT, the combinations of paraquat plus atrazine were the only treatments providing greater than 90% control. Paraquat alone controlled doveweed at 80 and 86%, respectively. At both 2 and 3 WAT, the treatments exceeding 90% control included paraquat plus atrazine, metribuzin, metribuzin plus dicamba plus 2,4-D, and atrazine at 4 lbs/A. Paraquat alone (0.5 and 0.75 lbs/A) controlled doveweed at 69 and 87%, respectively, at 2 WAT and 72 and 80% at 3 WAT. Control declined with time in nearly all treatments, however, at 10 WAT, metribuzin at 1.12 and 1.5 lbs/A continued to control doveweed at 94% although the 0.75 lbs/A rate fell to 74% control. Paraquat plus atrazine controlled doveweed at 76 and 81%, respectively, while paraquat alone provided only 31 and 41% control. Doveweed control with glyphosate peaked at 54% at 3 WAT and was 28% at 10 WAT. Flumioxazin controlled doveweed at 40 to 50% at 1 WAT, but control did not improve at later rating dates and at 4 WAT and beyond treatments were no better than the non-treated control. Paraquat plus atrazine provided the greatest control at 1 WAT, however if residual control is needed then metribuzin would be a better alternative as it had both good POST activity as well as continued PRE residual activity on controlling doveweed.

CREEPING RIVERGRASS: A NEW RICE WEED. S.L. Bottoms, E.P. Webster, and J.B. Hensley, School of Plant, Environmental, and Soil Sciences, Louisiana State University AgCenter, Baton Rouge.

ABSTRACT

Creeping rivergrass [*Echinochloa polystachya* (Knuth) Hitch.], an invasive aquatic perennial grass native to South America, infests 3,000 to 5,000 ha of rice (*Oryza sativa*) and crawfish production in south Louisiana. The climate of this region and management practices associated with rice and crawfish production are conducive to the spread of creeping rivergrass. Several studies were conducted to evaluate the effect of temperature, rice density, and herbicides on creeping rivergrass growth and reproduction.

To evaluate the effect of temperature on the growth and reproductive capabilities of creeping rivergrass, stolon segments containing one node were exposed to constant temperatures of 11, 15, 19, 23, 27, and 31 C in a growth chamber. The environmental conditions consisted of a 12:12 light:dark regime with humidity at 60 ± 10%. Germination was assessed at 5, 10, and 14 d.

Temperatures from 23 to 11 C reduced vegetative germination 23 to 97%. Optimal rice seeding in south Louisiana ranges from February 16 to March 28. However, on average only 50% of rice is seeded by April 9. The average daily temperature in this region for March 8 and April 8 is 15 and 19 C, respectively. Creeping rivergrass vegetative emergence at 15 C is 50% of that at 19 C. Seeding rice during the optimal planting dates would allow rice to have a competitive advantage over creeping rivergrass.

A study was conducted to evaluate the growth response of creeping rivergrass to rice density. Clearfield 'CL 161' rice was drill-seeded at seeding rates of 0, 23, 45, 67, 90, and 112 kg/ha. Creeping rivergrass stem segments were planted at a density of one segment/m^2 14 days after rice was planted and were allowed to compete with the rice for the entire season.

Creeping rivergrass biomass and node production were reduced 40 and 50%, respectively, at rice seeding rates ≥ 45 kg/ha. Growth rate was reduced from 18 cm/day with no rice planted to 10 cm/day at seeding rates ≥ 23 kg/ha. By reducing the number of nodes produced by nearly 50%, the infestation and competitiveness of the weed would greatly be reduced because the plant primarily establishes from nodes.

A study was conducted to evaluate the effect of herbicides on creeping rivergrass growth and reproduction. The experimental design was a 6 by 2 factorial with four replications. Factor A consisted of : no herbicide, glyphosate at 1.12 kg ai/ha, penoxsulam at 490 g ai/ha, imazethapyr at 105 g ai/ha, cyhalofop at 320 g ai/ha, and quinclorac at 560 g ai/ha. Factor B was replant timings of 14 and 28 DAT. Plants were treated at the 2-3 leaf stage. Plant biomass, shoot production and node production were evaluated. After evaluating herbicide activity, nodes produced from treated plants were harvested and re-planted at 14 and 28 d after treatment. Germination was evaluated at 10 and 14 d after planting treated stolon segments.

Glyphosate and cyhalofop reduced biomass, shoot production and node production 90, 80, and 90%, respectively, and imazethapyr reduced the same parameters 50 to 90%. Penoxsulam only reduced those parameters ≤ 50%. Quinclorac resulted in production similar to the nontreated. Germination of nodes from treated plants 14 and 28 d after treatment was reduced 100% with glyphosate and cyhalofop and 70% with imazethapyr. By using glyphosate preplant and imazethapyr and cyhalofop postemergence, shoot and node production would be reduced and the ability to germinate after being treated with one of these herbicides would decrease future infestations.

Based on these results, creeping rivergrass can be managed using an IPM approach. The rice-crawfish rotation must be disrupted by fallowing the field at least one year. Previous research has shown that during the fallow period, tillage should be used frequently. Glyphosate should be used as a burndown treatment in a Clearfield production system. Optimizing rice seeding rate and date of planting would also reduce the competitiveness and potential regrowth of creeping rivergrass.

EVALUATION OF V-10142 FOR WEED MANAGEMENT IN DRILL-SEEDED RICE. R.K. Godara, B.J. Williams and A.B. Burns, Louisiana State University Agcenter, Baton Rouge, LA.

ABSTRACT

V-10142 (Imazosulfuron), an ALS inhibitor, is being developed by Valent for use in drill- and water-seeded rice. It is reported to provide good post-emergence control of several important broadleaf weeds and sedge. It also suppresses annual grasses and demonstrates excellent selectivity in rice. Field experiments were conducted at LSU AgCenter's Northeast Research Station near St. Joseph, La on a Sharkey Clay soil in 2005, 2006 and 2007 to evaluate preemergence and postemergence activity of V-10142 against annual weeds in drill-seeded rice. 'Cocodrie' rice was drill-seeded at 100 kg/ha to plots measuring 2 by 4.5 m. 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. A randomized complete block (RCB) design with three replications was used for all the experiments. Herbicide treatments were applied in 140 L/ha of water using a CO2 pressurized backpack sprayer. V-10142 showed good preemergence activity on hemp sesbania (*Sesbania herbacea*) and Texasweed (*Caperonia palustris*). V-10142 at 224 g/ha provided above 80% control of both the weeds at 4 weeks after application. EPOST applications of V-10142 alone at 224 g/ha provided around 90% control of broadleaf weeds. Bispyribac-sodium at 17.6 g/ha provided good control of hemp sesbania but did not control Texasweed. Tank mixing bispyribac-sodium with V-10142 at 112 g/ha provided 90% or better control of broadleaf weeds. LPOST applications of V-10142, bispyribac-sodium and their tank mixtures provided good hemp sesbania control. Texasweed control was not satisfactory with alone applications of the two herbicides. Tank mixtures of bispyribac-sodium and V-10142 provided good Texasweed control; but, higher rates of V-10142 were required as compared to EPOST timings. Three days prior to flood (3DPF) applications of V-10142 and bispyribac-sodium provided excellent hemp sesbania control but not Texasweed. Texasweed control was improved with tank mixtures. At 4 weeks after application, EPOST application of V-10142 at 224 g/ha provided 42% and 92% control of barnyardgrass and Texasweed, respectively; whereas the respective control of these two weeds with bispyribac-sodium applied at 23.5 g/ha was 83% and 76%. Barnyardgrass and Texasweed control with tank mixture of V-10142 at 112 g/ha and bispyribac-sodium at 23.5 g/ha was 81% and 93%, respectively. PRE or EPOST applications of V-10142 are more effective against broadleaf weeds than LPOST or 3DPF applications. Tank mixtures of V-10142 and bispyribac-sodium provide better control of both annual grasses and broadleaf weeds in drill-seeded rice compared to alone applications of these herbicides.

VOLUNTEER GLYPHOSATE-RESISTANT SOYBEAN MANAGEMENT IN RICE. J.A. Bond, T.W. Walker, and L.C. Vaughn, Mississippi State University, Delta Research and Extension Center, Stoneville, MS

ABSTRACT

Glyphosate resistance is a growing problem in Midsouth row crop production and is now beginning to impact rice production in the region. Volunteer glyphosate-resistant soybean (*Glycine max*) has been a problem in Mississippi rice production for a number of years, and this weed is becoming increasingly troublesome. A number of factors have contributed to the prevalence of volunteer glyphosate-resistant soybean as a weed in Mississippi rice production. The majority of rice in Mississippi is grown in rotation with glyphosate-resistant soybean, predisposing rice to problems with volunteers whose seed over-wintered from the previous year's soybean crop. Mild, dry conditions during the winter months stimulate early spring emergence of volunteer glyphosate-resistant soybean. Finally, there are a limited amount of burndown herbicide options for use in rice. Research was initiated in 2007 at the Mississippi State University Delta Research and Extension Center in Stoneville to (1) evaluate volunteer glyphosate-resistant soybean control and rice tolerance to herbicides applied at planting and (2) determine the efficacy of in-season rice herbicides against volunteer glyphosate-resistant soybean.

At-planting treatments targeting volunteer glyphosate-resistant soybean included the maximum labeled rate and one-half the labeled rate of three burndown herbicides. Paraquat (Gramoxone Inteon) at 0.94 and 0.47 lb ai/A, glufosinate (Ignite) at 0.53 and 0.27 lb ai/A, and thifensulfuron plus tribenuron (Harmony Extra) at 0.028 and 0.014 lb ai/A were applied to volunteer glyphosate-resistant soybean in the V3 growth stage the day of rice planting. Glufosinate is not currently labeled for burndown in rice, and thifensulfuron plus tribenuron received labeling allowing application at planting in 2007. Rice injury and volunteer glyphosate-resistant soybean control were visually estimated at 7, 14, 21, 28, and 56 days after treatment (DAT). Both rates of paraquat and glufosinate at 0.53 lb/A controlled volunteer glyphosate-resistant soybean >94% at all evaluations. Control with glufosinate at 0.53 lb/A was greater than that with glufosinate at 0.27 lb/A at 7, 14, 21, and 28 DAT. Both rates of thifensulfuron plus tribenuron were less effective than paraquat and glufosinate at all evaluations. Furthermore, thifensulfuron plus tribenuron applications caused rice injury at all evaluations and delayed rice maturity. Rice yields following both rates of thifensulfuron plus tribenuron were lower than rice yields following both rates of paraquat and glufosinate at 0.53 lb/A.

In-season herbicides targeting volunteer glyphosate-resistant soybean were also applied at the maximum labeled rate and one-half the labeled rate. Treatments included propanil (SuperWham) at 4 and 2 lb ai/A, bispyribac (Regiment) at 0.034 and 0.017 lb ai/A, penoxsulam (Grasp) at 0.044 and 0.022 lb ai/A, halosulfuron (Permit) at 0.063 and 0.031 lb ai/A, and triclopyr (Grandstand) at 0.38 and 0.19 lb ai/A applied to volunteer glyphosate-resistant soybean in the V4 growth stage. Control was visually estimated at 7, 14, 28, and 56 DAT. At 14 DAT, the higher rates of all herbicides provided greater control than half rates. With the exception of halosulfuron, all herbicides controlled volunteer glyphosate-resistant soybean at least 81% 14 DAT when applied at the maximum labeled rate. By 28 DAT, control with both rates of bispyribac, penoxsulam, halosulfuron, and triclopyr was at least 97%. Propanil at 4 and 2 lb/A controlled volunteer glyphosate-resistant soybean 88 and 73%, respectively, 28 DAT. By season's end, rice yields following all treatments were equivalent and ranged from 6,990 to 7,830 lb/A.

Results from 2007 indicate that volunteer glyphosate-resistant soybean can be effectively managed with at-planting or in-season herbicide applications. Among herbicides currently labeled for application at rice planting, paraquat would be preferred over thifensulfuron plus tribenuron for optimizing volunteer glyphosate-resistant soybean control and rice yield. For in-season applications, bispyribac, penoxsulam, and triclopyr are the best options for season-long volunteer glyphosate-resistant soybean control.

PREEMERGENCE AND POSTEMERGENCE CONTROL OF GOOSEGRASS (*Eleusine indica*) IN BERMUDAGRASS TURF. R.L. Blanton, A.G. Estes, and L.B. McCarty, Department of Horticulture, Clemson University, Clemson, SC 29634.

ABSTRACT

Goosegrass is a clumpy summer annual with a whitish/silver center, and is found in all turf situations. It is able to survive in wet or dry compacted soils, and can withstand close mowing heights which makes control difficult. The purpose of this research was to evaluate various preemergence and postemergence herbicides for goosegrass control in bermudagrass turf.

In the summer of 2007, two studies were conducted to evaluate the efficacy of several preemergent and postemergent herbicides for goosegrass control. The studies, located in Pickens County, SC at “The Rock at Jocassee” golf course, were conducted on a common bermudagrass fairway with a previous history of heavy goosegrass infestation. Plot size measured 2.0 m by 3.0 m, replicated three times. Treatments were applied using a CO_2 backpack sprayer calibrated at 20 GPA, at 30 p.s.i., with 8003 flat fan spray tips. Preemergence treatments for study one included: Outlook 6L (dimethenamid) at 1.5 lb ai/A (Initial); Outlook at 1.5 lb ai/A + Pendulum 3.8 CS (pendimethalin) at 2 lb ai/A (Int.); Ronstar 2G (oxadiazon) at 3 lb ai/A (Int.); Ronstar at 2 lb ai/A (Int.) followed by Ronstar at 1 lb ai/A (8 WAIT); Ronstar at 1.5 lb ai/A (Int.) fb Ronstar at 1.5 lb ai/A (8 WAIT); Ronstar at 2 lb ai/A (Int.); Pendulum at 3 lb ai/A (Int.); Dimension 2 SC (dithiopyr) at 1 lb ai/A (Int.); and Barricade 4L (prodiamine) at 1 lb ai/A (Int.). Initial preemergence applications for study one were applied March 28, 2007 with sequential treatments 8 weeks later. Postemergence treatments for study two included: MSMA 6.6 L (Monosodium Acid Methanearsonate) at 2.0 lb ai/A + Sencor 75 DF (Metribuzin) at 0.25 lb ai/A (Int. & 3 WAIT); Dismiss 4L (Foramsulfuron) at 0.25 lb ai/A (Int. & 3 WAIT); Dismiss at 0.375 lb ai/A (Int. & 3 WAIT); Dismiss at 0.375 lb ai/A + Sencor at 0.25 lb ai/A (Int. & 3 WAIT); Sencor at 0.25 lb ai/A (Int. & 3 WAIT); Revolver 0.19 SC (Foramsulfuron) at 0.04 lb ai/A (Int. & 3 WAIT); Dismiss at 0.375 lb ai/A + Revolver at 0.04 lb ai/A (Int. 3 WAIT); Illoxan 3L (Diclofop) at 1.0 lb ai/A (Int. & 3 WAIT); and Dismiss at 0.375 lb ai/A + Illoxan at 1.0 lb ai/A (Int. & 3 WAIT). Initial postemergence treatments were applied on July 16, 2007 with a sequential application on August 7, 2007, 3 weeks after the initial treatment. All treatments in study 2 received a non-ionic surfactant at 0.25% V/V.

Ratings taken throughout the studies included goosegrass control on a 0 to 100% scale, where 0 = no control and 100 = complete control. Common bermudagrass phytotoxicity was rated on a 0 to 100% scale, where 0 = no injury and 100 = dead turf. Thirty percent was deemed the maximum tolerable level of turf injury.

With the preemergent study, on September 11, 2007 (163 DAIT), Ronstar at 3.0 lb ai/A and Ronstar at 2.0 lb ai/ A followed by Ronstar at 1.0 lb ai/A 8 WAIT provided > 70% goosegrass control. Ronstar at 1.5 lb ai/A followed by Ronstar at 1.5 lb ai/A 8 WAIT provided > 50% goosegrass control, while all other treatments provided < 50 % goosegrass control. With the postemergent study after two applications 3 weeks apart, MSMA + Sencor, Dismiss + Sencor, Sencor, Revolver, and Dismiss + Revolver all provided > 80% control on September 11, 2007 (53 DAIT). Although bermudagrass injury was evaluated throughout the study, it never exceeded our maximum level of 30% injury.

Future research at Clemson University will be to evaluate new and existing herbicides for preemergence and postemergence goosegrass control. We will also evaluate various herbicide combinations, rates, and timings for improved goosegrass efficacy.

THE USE OF RESPONDUS AND WEBCT IN TEACHING WEED SCIENCE. D.B. Reynolds, Mississippi State University.

ABSTRACT

Many new technologies are becoming available to facilitate classroom instruction. These technologies range from the use of PowerPoint presentations with a projection unit to facilities equipped with Polycom units capable of transmitting presentations live over the internet to other locations with equivalent equipment. These facilities are often equipped with SmartBoards that allow information written on the board to be transmitted to remote locations. In Mississippi all of the regional Research and Extension Centers are equipped with full Polycom units that facilitate interaction with all other units and various campus units. These facilities are utilized for committee meetings, graduate student committee meetings, seminars, and classroom instruction. Many research associates located at the branch research stations are also pursuing an advanced degree while working. In many instances, these locations are several hours from the main campus. Many professors have now agreed to utilize these technology enhanced classrooms while teaching their class to enable student participation from off-campus locations. This allows many students to enrol in classes that they otherwise would be unable to take.

In order to disseminate classroom study material as well as homework assignments we utilize Respondus in conjunction with WebCT. WebCT was recently purchased and will be replaced by Blackboard. This part of the system is the web interface that allows instructors to make study materials available, to deliver grades to individual students, and to deliver quiz and tests. The instructor can program the system to make specific homework assignments become available on the system between specified dates and times and then to grade themselves and post the results to the individual student accounts. The development of these homework materials require considerable time on the front end of the process but more than makeup for it on the backend of the process during the grading phase. Although the time return may not be as good on the first endeavour, the fact that they can be utilized in subsequent years and that libraries of similar questions can be established over time adds tremendous value to the system. Once libraries are developed, the instructor can program the system to assign random questions to each student.

Respondus is a test and quiz editor that will publish its questions directly into WebCT. Respondus supports up to 15 question types, including calculated and algorithmic formats. Questions formatted as essays still have to be graded by the instructor while many forms such as true/false, multiple choice, matching, and calculated answers may be self graded. Calculated questions are highly utilized for calibration questions. A question can be entered algebraically which in turns allows each student to be given a unique question. For example, the question might ask how much product should be placed in a tank if the desired rate is “P” pints/acre with a delivery volume of “GPA” gallons per acre with a sprayer equipped with a tank that is “G” gallons in size. The instructor can say that the rate could be from 1 to 3 pints, the delivery volume can vary between 10 and 20 gallons per acre and that the tank may be from 100 to 400 gallons in size. The instructor then tells the system how much rounding error is allowable say (3%) and then it will generate unique questions for each student. Once a student enters their answer the system will check to see if it falls within the allowable error and if so it will mark it correct otherwise it is wrong. This allows for rapid feedback to students regarding their understanding of calibration, lifts a tremendous burden from the instructor, while also facilitating off-campus student participation. These new technologies are not necessarily better than older more traditional technologies. A poor instructor will still provide poor instruction but with different technologies. The bottom line is that these technologies offer some great opportunities for facilitating off-campus participation in classroom instruction and they also allow for more efficient use of time for on-campus instruction. In order to be effectively utilized, the instruction must still be of high quality and the new technologies have to be properly utilized otherwise the level of instruction may actually be decreased.

PRELIMINARY EVALUATION OF OPTIMUM® GAT® CORN. Irby, J.T., B.J. Varner, and D.B. Reynolds, Mississippi State University.

ABSTRACT

Growers have rapidly adopted the use of transgenic crops because of their simplicity, effectiveness, and lower input costs. New transgenic technologies are being developed that may offer additional options for producers. Once such option is the Optimum® GAT® technology being developed by Pioneer and DuPont. This technology could offer more options for weed control by allowing the use of multiple herbicides with different modes of action. This could allow growers to continue using a simple method of weed control while increasing the number of modes of action and herbicides that could be utilized.

In 2007, an experiment was conducted at the Black Belt Branch Experiment Station in Brooksville, MS to evaluate the tolerance of Optimum GAT corn to various glyphosate and ALS herbicide treatments. The experimental area contained 2 row plots with 3 replications in a randomized complete block design. The following treatments were evaluated: Bicep II Magnum® at 2.0 quarts/acre, Resolve™ DF at 0.375 oz ai/acre, Classic® DG at 0.5 oz ai/ acre, Dual II Magnum® at 1 pint/acre, AAtrex® 4L at 1.25 lb ai/acre, Balance Pro® at 1.5 fl oz./acre, Touchdown® HiTech at 20.0 fl oz/acre, Touchdown® HiTech at 80.0 fl oz/acre, Harmony® TSG at 0.125 oz ai/acre, Express® TSG at 0.125 oz ai/acre, Harmony® TSG at 0.5 oz ai/acre, Express® TSG at 0.5 oz ai/acre, Callisto® at 1.0 fl oz/acre, Resolve™ DF at 0.25 oz ai/acre, and AAtrex® 4L at 2.0 lb ai/acre. Applications were made using a backpack sprayer propelled by CO_2 with a 2 row handheld boom. The output rate was 15 gallons per acre. Visual ratings were recorded in order to assess crop tolerance to over the top applications of glyphosate and ALS herbicides as well as overall weed control from the treatment combinations. The weed species rated were pitted morningglory (*Ipomoea lacunosa* L.), Entireleaf morningglory (*Ipomoea hederacea* var. *integriuscula*), large crabgrass (*Digitaria sanguinalis* (L.) Scop.), and barnyardgrass *Echinochloa crus-galli* (L.) Beauv.

Visual ratings were recorded and analyzed as percent weed control as well as crop tolerance at each rating interval. No visual injury was observed for any treatment. The treatment consisting of Dual II Magnum+Resolve DF followed by Touchdown HiTech, Harmony TSG, and Express TSG showed greater than 88% control of all observed weed species. Further research will be conducted in order to observe the overall crop tolerance of the Optimum GAT technology as well as to determine suitable herbicide options and rates to maximize weed control.

EFFECT OF ZINC ON GLYPHOSATE EFFICACY. D.M. Scroggs[1], A.M. Stewart[1], D.K. Miller[2], B.R. Leonard[3], J.L. Griffin[4], and D.C. Blouin[4], LSU AgCenter, Alexandria[1], St. Joseph[2], Winsboro[3], and Baton Rouge[4], LA.

ABSTRACT

Research was conducted in 2007 at the Dean Lee Research and Extension Center in Alexandria, La, to evaluate co-application effects on weed control of glyphosate and zinc. Treatments were arranged as a 3 X 3 factorial and included three formulations of glyphosate: (isoproplyamine salt @ 0.75 ae/A, potassium salt @ 0.75 ae/A, and diammonium salt @ 0.75 ae/A) and three zinc options: (no zinc, RSA® 7% $ZnSO_4$ @ 2 qt/A, and TraFix® 10% $ZnSO_4$ @ 2 qt/A). Treatments were applied to barnyardgrass (*Echinochloa crus-galli*), browntop millet (*Urochloa ramosa*), johnsongrass (*Sorghum halepense*), ivyleaf morningglory (*Ipomoea hederacea*), and redroot pigweed (*Amaranthus retroflexus*) when weeds were between 3 to 5 leaf and 3 to 6 inches. A nontreated control was included. Weeds were planted in trade gallon nursery containers (17 x 16.5 cm) three per pot and thinned to one plant per pot prior to treatment. Treatments were applied with a tractor mounted compressed air sprayer at 15 GPA. Experimental design was a randomized complete block replicated four times and the entire experiment was conducted two times in 2007. Visual assessment of weed control was conducted 7 and 14 d after treatment (DAT). At 14 DAT, plants were clipped at the soil line and fresh weight was determined and converted to fresh weight reduction from the non treated control. Data from the nontreated control was used for visual reference of control ratings and for conversion of fresh weight to a percent reduction from the control, but was not included in the statistical analysis. Visual control and fresh weight reduction data were analyzed as a randomized complete block with a factorial arrangement of treatments. Data analysis allowed for the combination of studies (study 1 and study 2) and rating intervals (7 and 14 DAT) for visual weed control data. Data analysis allowed for the combination of studies (study 1 and study 2) for fresh weight reduction data. All data analysis was conducted using PROC MIXED and means were separated using Tukey's HSD at the 0.05 level of probability.

For all parameters measured, a significant glyphosate by zinc interaction was not observed. Averaged across zinc options, no weed control differences among glyphosate formulations were observed and control of barnyardgrass, browntop millet, johnsongrass, ivyleaf morningglory, and redroot pigweed ranged from 47 to 48, 50 to 53, 60 to 63, 43 to 48, and 68 to 71%, respectively. Averaged across glyphosate formulations, weed control differences among zinc options were observed. Control of weeds evaluated was greatest when no zinc was chosen and weed control for all weeds ranged from 82 to 98%. Control of barnyardgrass and johnsongrass was 35 and 48%, respectively, from co-application with RSA®, which was higher than co-application with TraFix® (23 and 39%, respectively). For browntop millet, ivyleaf morningglory, and redroot pigweed, control between RSA® and TraFix® was not different, with resulting control ranging from 30 to 35, 26 to 29, and 54 to 56%, respectively.

When averaged across zinc options, fresh weight reduction among glyphosate formulations was similar for all weeds and reduction ranged from 41 to 74%. When averaged across glyphosate formulations, differences among zinc options were once again noted. When no zinc was chosen, barnyardgrass, browntop millet, johnsongrass, ivyleaf morningglory, and redroot pigweed were reduced in biomass by 91, 96, 95, 88, and 94%, respectively, which was greater than choosing RSA® and TraFix®. No differences between RSA® and TraFix® were detected, and biomass reduction for barnyardgrass was 32 and 18%, browntop millet 45 and 39%, johnsongrass 50 and 38%, ivyleaf morningglory 34 and 38%, and redroot pigweed 58 and 58%, for RSA® and TraFix®, respectively.

When co-applied with any glyphosate formulation used in this study, both RSA® and TraFix® zinc products applied at 2 qt/A greatly compromised weed control. Growers should be aware of this antagonism and these co-applications should not be recommended.

ALTERNATIVES TO GLYPHOSATE FOR PALMER AMARANTH CONTROL IN SOYBEAN. J.R. Whitaker, A.C. York, and W.J. Everman, Department of Crop Science, North Carolina State University.

ABSTRACT

Glyphosate-resistant Palmer amaranth (AMAPA) is now present in at least five states. Extension personnel are actively promoting resistance management strategies for all crops to reduce selection pressure and to control resistant weeds where they already occur. A key component of a glyphosate resistance management strategy is use of multiple modes of herbicide action or alternative herbicides. ALS-inhibiting herbicides typically control Palmer amaranth well, but resistance to that mode of action is now common in the Southeast. The objective of our study was to evaluate management systems for AMAPA in soybean that did not rely on glyphosate or ALS-inhibiting herbicides.

This experiment was conducted in North Carolina at three locations in 2006 and four locations in 2007. Soybean was planted in 15-inch rows in mid-May. Treatments consisted of a factorial arrangement of two preemergence (PRE) “grass” herbicides (Prowl H_2O 30 fl oz/A, Dual Magnum 16 fl oz/A), four PRE “broadleaf” herbicides (none, Canopy 6 oz/A, Reflex 16 fl oz/A, Valor SX 2 oz/A) and two postemergence (POST) herbicides (none, Flexstar 24 fl oz/A). One additional treatment consisted of Roundup Weathermax 22 fl oz/A applied POST. AMAPA densities varied from 30 to 150 plants per square yard, depending upon location. One location in 2006 and two locations in 2007 had glyphosate-resistant AMAPA. The experimental design was a randomized complete block with four replications. Visual estimates of AMAPA control and soybean injury were arcsine square root transformed and subjected to analysis of variance with partitioning appropriate for the factorial treatment arrangement. Yields of harvestable plots were recorded; unharvestable plots were assumed to yield zero. Comparisons of glyphosate and non-glyphosate programs were made using Dunnett’s Procedure.

Averaged over PRE “broadleaf” herbicides, POST herbicides, and environments, Dual Magnum was 7% more effective than Prowl H_2O at 30 days after POST application. The PRE “broadleaf” herbicides none, Canopy, Reflex, and Valor controlled AMAPA 55, 76, 78, and 84%, respectively. Flexstar applied POST increased control by an average of 39%. Treatments that included Dual Magnum or Prowl H_2O plus Canopy, Reflex, or Valor followed by Flexstar were as effective as glyphosate at locations with glyphosate-susceptible AMAPA. At locations with glyphosate-resistant AMAPA, all non-glyphosate treatments were more effective than glyphosate alone.

Soybean injury by PRE herbicides was relatively minor. Averaged over environments, soybean was injured only 1 to 3% by combinations of Dual Magnum or Prowl H_2O plus Canopy or Reflex. Prowl H_2O plus Valor injured soybean 3% compared with 7% by Dual Magnum plus Valor. Flexstar applied POST injured soybean 5% at 7 days after application.

Yield from treatments that included Dual Magnum was 6% greater than from Prowl H_2O. All PRE “broadleaf” herbicides increased yields from 26 to 27%. Flexstar POST increased yields in all but one environment. Among environments with glyphosate-susceptible AMAPA, treatments that included Prowl H_2O and either Canopy, Reflex, or Valor followed by Flexstar yielded similarly to glyphosate-only plots. Yields also were similar to glyphosate treatments in plots that received Dual Magnum plus Canopy or Valor with or without Flexstar and plots that received Dual Magnum with no PRE “broadleaf” herbicide or Reflex PRE followed by Flexstar POST. In the environments with resistant AMAPA, yields were greater with all treatments that included Dual Magnum or Prowl H_2O plus any of the PRE “broadleaf” herbicides followed Flexstar compared with glyphosate-only treatments.

This experiment demonstrates that AMAPA can be effectively controlled in soybean without relying on glyphosate or ALS-inhibiting herbicides although herbicide-intensive (and expensive) programs are necessary for acceptable control. Use of these non-glyphosate programs, or integration of some of the herbicides evaluated into a glyphosate-based program, could help deter further selection for resistance.

EFFECT OF GLYPHOSATE-RESISTANT CROPPING SYSTEMS ON TILLAGE PROGRAMS. W.A. Givens, D.R. Shaw, J.W. Weirich, and J.A. Huff, Mississippi State University, Mississippi State, MS; W.G. Johnson, and S.C. Weller, Purdue University, West Lafayette, IN; B.G. Young, Southern Illinois University, Carbondale, IL; R.G. Wilson, University of Nebraska, Scotts Bluff, NE; M.D.K. Owen, Iowa State University, Ames, IA; D. Jordan, North Carolina State University, Raleigh, NC.

ABSTRACT

A survey was conducted by phone to 1,195 growers in six states (Illinois, Indiana, Iowa, Mississippi, Nebraska, and North Carolina). The survey measured producers' cropping history, perception of glyphosate-resistant weeds, past and present weed pressure, tillage practices, and herbicide use as affected by the adoption of glyphosate-resistant (GR) crops. This paper describes the changes in tillage practice due to adoption of GR cropping systems.

GR cropping systems substantially increased the percentage of growers using no-till and reduced-till systems. Twenty five percent of growers in reduced-till systems changed to no-till systems after the adoption of a GR crop. Of the growers who used conventional tillage, 24 and 31% changed to no-till and reduced-till systems, respectively, after the adoption of a GR crop. The adoption of a GR cropping system also had a significant effect on growers' tillage system.

Analysis of tillage shifts by crop rotation indicated that in continuous GR cotton and continuous GR soybean, a significant impact was noted with respect to the change in tillage. No difference was found among the other crop rotations. Among continuous GR cotton producers, there was a 26% increase in the number of growers using a no-till system after adoption of GR cotton. Among continuous GR soybean producers, there was a 21 and 24% increase in the number of growers using a no-till and reduced-till systems, respectively, after adoption of GR soybean.

Analysis of tillage shifts by state indicated a significant effect of state with respect to tillage shifts after the implementation of a GR cropping system. The largest and most significant shift occurred in Nebraska as 22% of growers shifted from conventional and reduced-till systems to no-till systems. The lowest shifts toward more conservative tillage systems came from the states of Illinois and Iowa, as only 11% of the growers shifted from conventional and reduced-till systems to no-till systems.

Analysis of tillage shifts by farm size indicated smaller (less than 220 ha) farms had a significant difference with respect to changes in tillage. Twenty five percent of growers with small farms shifted from conventional tillage systems to reduced- and no-till systems. Medium (220-440 ha) and large (over 440 ha) farms were not different from each other with respect to change in tillage after adoption of a GR cropping system. Nineteen and seventeen percent of growers with medium and large sized farms shifted from conventional tillage to reduced- and no-till systems, respectively.

INTER-AND INTRA- SPECIFIC COMPETITION AND CONTROL OF COMMON SUNFLOWER (*Helianthus annuus* L.) IN FIELD CORN (*Zea mays*). N.R. Falkenberg, J.M. Chandler and S.A. Senseman, Department of Soil and Crop Sciences, Texas AgriLife Research, Texas A&M University, College Station, Texas 77843.

ABSTRACT

Common sunflower (*Helianthus annuus* L.) is a stout annual dicot weed that is commonly seen in disturbed areas, along roadsides, and on dry prairies. Common sunflower is a troublesome weed in much of the north-central United States, Canada, and Mexico due to its morphological variability. Common sunflower is a competitive weed species but published research is deficient on the interference and competitive ability in field corn. Since ALS resistance has been found in common sunflower alternative management practices need to be established to ensure the control of common sunflower and prevent resistance to herbicides that are crucial for weed and crop management. Studies were conducted at the Texas AgriLife Research Facility, Agronomy Field Laboratory in Burleson County, near College Station, TX, in 2006 and 2007. The objectives where to define the density-dependent effects of common sunflower competition with corn, determine the critical period of common sunflower competition in corn, and evaluate common sunflower control with corn herbicides. All studies were established as a randomized complete block design with 4 replications and DLP 69-71 Roundup Ready corn was planted at 59,300 plants per hectare. Weed control ratings were done on a visual basis from 0 to 100%.

Native common sunflower densities were established at 0, 1, 2, 3, 4, 6, and 8 plants per 6-meter (m) of crop row when evaluating the density-dependent effects of common sunflower competition in corn. Common sunflower densities were maintained until harvest. Corn grain yields were significantly decreased when common sunflower densities reached 8 plants per 6-m of crop row. The critical period of common sunflower in corn was evaluated as weed-infested and weed-free periods. Common sunflowers were removed in the weed-infested plots at 0, 2, 4, 6, 8, 12, and 20 weeks after crop emergence, while in the weed-free plots common sunflower was planted at 0, 1, 2, 4, 6, 8 and 12 weeks after crop emergence with a 1-row vegetable planter. The critical period for common sunflower removal is 2 to 4 weeks and corn yields were significantly reduced after the critical period. When evaluating common sunflower control with various herbicides all preemergence (PRE) treatments with atrazine followed by (fb) a postemergence (POST) application provided above 95% control and had increased corn yields for both seasons. Glyphosate as a stand alone or used in combination with PRE's showed excellent control of common sunflower. Halosulfuron alone or in a tank-mix with nicosulfuron provided above 92% control of common sunflower. The premix for atrazine + s-metolachlor (PRE), atrazine in a 30-cm band (PRE), and nicosulfuron didn't adequately control common sunflower and reduced corn yields.

In summary, the critical period of common sunflower competition can be a useful tool for determining timing of herbicide applications to prevent corn yield losses. Atrazine applied PRE fb different POST applications provided the best control, while maintaining corn yields. The data illustrates that there are multiple herbicide practices to prevent resistance issues from occurring in corn.

SIMULATED GLYHPHOSATE AND IMAZETHAPYR DRIFT ON RICE. J.B. Hensley, E.P. Webster, S.L. Bottoms, D.L. Harrell and J.S. Atwal, Louisiana State University AgCenter, Baton Rouge, LA 70803.

ABSTRACT

Two studies were conducted at the LSU AgCenter Rice Research Station near Crowley, Louisiana in 2005, 2006 and 2007 to evaluate the effects of simulated herbicide drift on ‘Cocodrie’ rice. The experimental design for each study was a randomized complete block with four replications in an augmented two-factor factorial arrangement of treatments. A nontreated was added for comparison. Factor A consisted of herbicide rate. The herbicides were applied at drift rates of 12.5 and 6.3% of the labeled usage rate of glyphosate as 22 oz/A of Roundup WeatherMax, 2.8 and 1.4 oz/A, respectively, and imazethapyr as 4 oz/A of Newpath, 0.5 and 0.25 oz/A, respectively. Each application was made with the carrier volume varying proportionally to herbicide dosage based on a carrier volume rate of 25 gallons per acre (GPA). The 12.5% herbicide rate was applied with a carrier volume of 3.1 GPA and the 6.3% herbicide rate was applied with a carrier volume of 1.6 GPA. Each application was made with a compressed air tractor driven sprayer calibrated to deliver a constant carrier volume. Speed was adjusted to vary application rate. Factor B consisted of application timings at different growth stages: one-tiller, panicle differentiation (PD), boot, and physiological maturity. Each herbicide was evaluated in a separate study. Rice plant height at harvest and rough rice yield for the primary, ratoon, and total crop were obtained. Total crop yield was calculated as a combination of primary and ratoon crop yields. Rice plant height and primary, ratoon, and total crop rough rice yield data are presented as percent of the nontreated.

For the Roundup WeatherMax study, nontreated rice plant height at harvest and primary, ratoon, and total crop rough rice yield was 37 inches and 6240, 1160, and 7400 lbs/acre, respectively. Rice plant height at harvest was 88 to 90% of the nontreated when the 1.4 oz/A rate of Roundup WeatherMax was applied at PD and the 1.4 and 2.8 oz/A rates were applied at boot. The 2.8 oz/A rate applied at PD and either rate applied at 1-tiller resulted in a rice plant height 84 to 85% of the nontreated. A primary crop yield response was observed. Roundup WeatherMax applications at 1-tiller, PD, and boot resulted in reduced primary crop yields with the greatest reductions from 2.8 oz/A at the 1-tiller and boot timings yielding 34 to 36% of the nontreated. A yield response was also observed with the ratoon crop. A PD application at 1.4 oz/A and a 1-tiller application, regardless of rate, resulted in ratoon yields 57 to 66% of the nontreated. Rice treated with Roundup WeatherMax at boot, regardless of rate, resulted in an increased ratoon yield 147 to 149% of the nontreated. Roundup WeatherMax applied at this timing resulted in excess tiller production which did not produce a panicle in the primary crop; however, a panicle was produced on the excess tillers in the ratoon crop causing a yield increase. However, even with an increased ratoon crop yield, the 1-tiller, PD and boot applications all resulted in reduced total crop yields, compared to the nontreated. Total crop yield was 70% of the nontreated for rice treated with 1.4 oz/A of Roundup WeatherMax at PD. Either rate at boot and the 2.8 oz/A rate at PD resulted in total crop yields 43 to 57% of the nontreated. Roundup WeatherMax applied at 1-tiller resulted in a total crop yield 9 to 11% of the nontreated, regardless of rate. Roundup WeatherMax applications at maturity had no effect on plant height or yield.

For the Newpath study, rice plant height at harvest and nontreated primary, ratoon, and total crop rough rice yields were 38 inches and 6100, 1180, and 7280 lbs/acre, respectively. Rice plant height at harvest was 88 to 91% of the nontreated when 0.25 and 0.5 oz/A Newpath were applied at boot and 1-tiller and 0.5 oz/A was applied at PD. A primary crop yield response was observed. Newpath applications at 1-tiller, PD, and boot all resulted in reduced primary crop yields with the greatest reductions resulting from applications at both rates at the 1-tiller and boot timings resulting in a yield 31 to 48% of the nontreated. Ratoon crop yields were reduced to 62 to 77% of the nontreated when Newpath was applied at 0.5 oz/A at 1-tiller and PD. Similar to the Roundup WeatherMax study, a boot application of Newpath, regardless of rate, resulted in an increased ratoon crop yield 131 to 137% of the nontreated. Even with this yield increase, the 1-tiller, PD, and boot application timings resulted in total crop yields lower than the nontreated, with the 1-tiller application resulting in the greatest yield reduction, 13 to 23% of the nontreated. Newpath applications at maturity had no effect on plant height or yield.

With the possibility existing for herbicide drift to occur to rice in the 1-tiller, PD and boot stages, applicators should use caution when applying Roundup WeatherMax and Newpath near susceptible rice crops. In both studies, the greatest yield reductions occur from simulated drift applications applied at the 1-tiller and boot timings and applications at the maturity timing resulted in little or no effect on plant height at harvest or yield.

IMPROVED SILVERY-THREAD MOSS CONTROL IN BENTGRASS PUTTING GREENS WITH CARFENTRAZONE PLUS CULTURAL PRACTICES. S.M. Borst[1], J.S. McElroy[1], G.K. Breeden[1], [1]The University of Tennessee, Knoxville, TN

ABSTRACT

Carfentrazone is a protoporphyrinogen oxidase inhibiting herbicide utilized for broadleaf weed species control in turf. It has been labeled for silvery thread moss (*Bryum argenteum* Hedw.) control in creeping bentgrass (*Agrostis stolonifera*) putting greens. Carfentrazone controls *Bryum argenteum* when applied sequentially however, moss can reoccur and infestations can increase. Mancozeb + copper hydroxide (mancozeb) is also utilized for the control of *Bryum argenteum*, but control is inconsistent. Golf course cultural practices such as nitrogen applications and topdressing could potentially increase carfentrazone efficacy. Field studies were initiated in 2006 and 2007 to evaluate carfentrazone, mancozeb, and carfentrazone plus cultural practices.

Research was conducted at The Crossing Golf Club (CC), Jonesborough, TN and The Honors Course (HC), Ooltewah, TN. Applications were conducted on established creeping bentgrass putting greens. Treatments were replicated three times and arranged in a randomized complete block design. Nine treatments; carfentrazone (0.1 kg ai/ha) applied alone, carfentrazone + topdressing (9800 kg/ha), topdressing alone, carfentrazone + nitrogen (11.9 kg/ha) + topdressing, carfentrazone + nitrogen, nitrogen alone, mancozeb (1.8 kg ai/ha), and topdressing + nitrogen. All treatments were applied two weeks apart. Mancozeb and cultural treatments were continued for 8 weeks after carfentrazone applications. Two applications of carfentrazone and mancozeb treatments were applied sequentially two weeks apart. Herbicides were applied in a water carrier volume of 280 L/ha with a CO_2 pressurized sprayer equipped with 8002XR flat fan nozzles. Moss control and injury was evaluated visually using a 0 (no control) to 100 (complete moss control) % scale weekly. Moss reduction was calculated utilizing grid counts before treatments were applied and after study completion. Grid counts were made utilizing a meter x meter grid with 100 intersecting points. If moss was present in a grid intersecting point it would be counted and moss coverage would be assessed. For simplicity only visual ratings for 21 and 70 days after initial treatment (DAIT) and grid counts will be discussed.

No bentgrass injury was observed with any treatment. At CC 21 DAIT all carfentrazone applications controlled *Bryum argenteum* 95%. Carfentrazone applied alone 70 DAIT controlled *Bryum argenteum* > 35%. Nitrogen and topdressing alone at CC reduced moss populations by 41 and 47% respectively. Carfentrazone + nitrogen reduced moss populations by 77%. All treatments at CC observed a reduction in *Bryum argenteum* populations. At HC 21 DAIT all carfentrazone applications controlled *Bryum argenteum* > 40%. Mancozeb increased *Bryum argenteum* populations by 78%. For both locations, 70 DAIT all treatments that included carfentrazone + nitrogen controlled *Bryum argenteum* >88%. Mancozeb at both locations controlled *Bryum argenteum* < 23% at both timings. Carfentrazone + topdressing reduced *Bryum argenteum* populations by 72 % at both locations. Carfentrazone applied with cultural practices reduced *Bryum argenteum* populations greater than carfentrazone applied alone.

CROPPING SYSTEM BIODIVERSITY FOR MANAGING WEEDS IN ORGANIC VEGETABLE PRODUCTION.1 M. Bhan, C.A. Chase, R. McSorley, O.E. Liburd, D.D. Treadwell, and W.P. Cropper, Jr., University of Florida, Gainesville

ABSTRACT

The effect of increasing organic cropping system biodiversity with cover crops, living mulches, and intercropping on weed population and vegetable yield was evaluated. Cropping systems were initiated in summer 2006. The experimental design was a randomized complete block with four replications. Treatments are two-year rotation systems. Year 1 of each cropping system consisted of summer fallow-fall yellow squash-spring bell pepper and in year 2 summer fallow was followed by fall broccoli and spring sweet corn. The first and second year of the rotations were established concurrently. The simplest system included a weedy fallow each summer prior to cash crop monocultures in fall and spring. Intermediate systems alternated grass cover crops–pearl millet (*Pennisetum glaucum*) and sorghum-sudangrass (*Sorghum bicolor* x *S. sudanense*), or legume species–sunn hemp (*Crotalaria juncea*), velvet bean (*Mucuna pruriens*) during the summer prior to cash crop monocultures. The complex system utilized cover crop mixtures in summer–pearl millet-sunn hemp and sorghum-sudangrass-velvet bean. In the complex cropping system row middles of squash and broccoli were planted with rye-hairy vetch (*Secale cereale-Vicia villosa*) and crimson clover (*Trifolium incanatum*) living mulches, respectively. In spring, bell pepper and sweet corn were intercropped with bush beans (*Phaseolus vulgaris*). During the summer fallow period, grass cover crops suppressed weed density and biomass more effectively than the legume cover crops, the pearl millet monocrop, and pearl millet-sunn hemp mixture gave the best weed suppression.

Results are reported for weed counts done within the vegetable rows in squash at 4 and 10 weeks after planting (WAP), broccoli at 3 and 9 WAP, sweet corn and bell pepper at 2 and 9 WAP.

In squash, at 4 and 10 WAP grass weed density did not differ with cropping system except for the sunn hemp monocrop intermediate system, which had the highest grass density at 4 WAP. Only the intermediate velvetbean and the sunn hemp-pearl millet complex system had lower densities of broadleaf weeds than the simple cropping system at 4 WAP. However, by 10 WAP this difference was no longer apparent. Neither sedge densities nor total weed biomass of intermediate and complex systems differed from those of the simple system at 10 WAP.

In broccoli, grass weed densities in intermediate and complex systems did not differ from that of the simple cropping system at 3 and 9 WAP. Only sunn hemp-velvet bean complex cropping system at 9 WAP suppressed the broadleaf weed population to a lower density than the simple system. No difference among treatments in sedge population was observed in simple and intermediate systems; however, complex systems resulted in the lowest sedge populations in broccoli at 9 WAP. Cropping systems did not differ in total weed biomass at 9 WAP.

In spring-grown sweet corn and bell pepper neither the grass, broadleaf, nor sedge weed densities of intermediate and complex systems were significantly lower than those of the simple system. Whereas total weed biomass at 9 WAP did not differ with cropping system in sweet corn; in bell pepper, only the complex cropping systems had lower total weed biomass than the simple system.

In fall there was no difference in weed species richness in squash. However, in broccoli the intermediate and simple systems did not differ in weed species richness, the complex cropping systems had fewer weed species than the simple system. In spring, neither intermediate nor complex systems differed from the simple system in weed species richness in bell pepper and sweet corn.

Only the pearl millet intermediate system produced a higher squash and sweet corn marketable yields than the simple system. There was no difference among systems in marketable yield of broccoli and bell pepper.

[1] This material is based upon work supported by the Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture, under Award No. 2006-51300-03481.

MUTATIONS IN THE ACETOLACTATE SYNTHASE GENE OF IMAZETHAPYR-TOLERANT RED RICE. M.A. Sales, N.R. Burgos, V.K. Shivrain, and Y. I. Kuk, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72701.

ABSTRACT

Control of red rice (*Oryza sativa* L.), an important weed in rice production areas in the southern U. S., has been complicated by its genetic similarity to the crop. The introduction of imazethapyr-resistant Clearfield™ rice, however, has made it possible to use imazethapyr in eradicating red rice without harming rice. We hypothesized that imazethapyr-resistant red rice populations can evolve due to intensive herbicide selection pressure. To test this hypothesis, a large-scale testing of red rice accessions in Arkansas was done in a previous experiment and a follow-up study was conducted to: 1) identify polymorphisms in the full-length sequence of the acetolactate synthase (ALS) gene in tolerant red rice accessions relative to the susceptible ones; and 2) determine whether these polymorphisms confer tolerance to imazethapyr.

Two out of 136 red rice accessions collected from different geographical regions in Arkansas were found tolerant to the commercial rate of imazethapyr in greenhouse and laboratory bioassays. These imazethapyr-tolerant red rice accessions are from two different locations in Arkansas that have not been planted to Clearfield™ rice. These accessions also tested negative for hybridization. The full-length sequences of the *ALS* in these tolerant accessions and in two susceptible ones were amplified by PCR. Three independent replications of the amplification were performed for each accession. The gene sequences were analyzed using Sequencher® 4.7 and aligned in BioEdit with the sequences of 'Bengal' rice as susceptible check, and of imazethapyr-resistant rice and ALS-resistant *Arabidopsis* as resistant checks.

The full-length *ALS* in the red rice accessions has a coding sequence of 1935 bp, similar to that in rice. Analyses of the nucleotide sequence alignments revealed six base polymorphisms in tolerant red rice relative to Bengal rice. Three base changes resulted in amino acid substitutions. Two of these substitutions confer tolerance to imazethapyr based on the *Arabidopsis ALS* sequence. One amino acid substitution, $Gly^{654}Glu$, involves a residue required for imazethapyr-binding to the ALS enzyme. This mutation is found in one of the parent lines used in developing imazethapyr-resistant rice. The other substitution, $Val^{669}Met$, implies conformational changes in the ALS structure which enhances binding of thiamine diphosphate, an ALS cofactor, and consequently stabilizes the enzyme, as documented in the *Arabidopsis* ALS. These findings support our hypothesis on the possible evolution of herbicide-resistant red rice populations when subjected to intensive selection pressure, and stress the need for integrated management of red rice in Clearfield™ rice production systems as well as strict adherence to stewardship guidelines if the Clearfield™ rice technology is to be sustainable.

PLANT FACTORS AFFECTING OUTCROSSING RATE BETWEEN RED RICE AND CL^{TM} RICE.
V.K. Shivrain[1], N.R. Burgos[1], D.R. Gealy[2], H.L. Black[2], and K.L. Smith[1], [1]Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72701; [2]USDA-ARS, Stuttgart, AR 72160.

ABSTRACT

Imazethapyr-resistant, Clearfield^{TM} (CL) rice (Oryza sativa L.) offers an excellent option for red rice (RR) control. Red rice is a noxious weed in rice production in the southern states. However, CL technology accentuates the risk of transferring imazethapyr-resistant gene from CL rice to RR. For sustainable red rice management using gene-based technology, understanding the plant factors which affect outcrossing rate is necessary. These factors include: morphology, flowering behavior, and genetic compatibility of CL rice and RR biotypes. Thus, we aimed to determine the effect of: 1) CL cultivars and 2) RR biotypes on the rate of gene transfer. To further understand rice and red rice effects on gene transfer, we also aimed to determine the relative contributions of flowering time of CL rice and RR biotypes and the genetic compatibility of CL rice and RR biotypes on the rate of gene transfer.

Field experiments were conducted at the Rice Research and Extension Center, Stuttgart and Southeast Research and Extension Center, Rohwer, AR from 2005 to 2007. Experimental design was a split plot with 3-4 replications. Treatment factors were: CL cultivar (main plot with 2 treatments: CL161 and CL hybrid); RR biotype (subplot with 12 treatments: 7 strawhull, 3 blackhull, and 2 brownhull). RR was planted in the middle row, flanked by four CL161/CL hybrid rice on each side. Emergence, flowering, and plant height of RR and CL rice were recorded. RR seed was harvested at maturity and a 100 g sub-sample was planted in the field in subsequent years. RR seedlings were sprayed twice with imazethapyr at 0.14 kg ai ha^{-1}. Plants which survived imazethapyr applications were counted and confirmed as outcrosses by DNA analysis using SSR primers RM 234 and 253. In the summer of 2007, manual crosses were performed between all 12 RR biotypes and CL161 to determine their compatibility, using three biological replicates. Seed set on red rice from rice pollen was used to evaluate compatibility between RR biotypes and CL161.

Flowering initiation of RR biotypes and CL rice cultivars varied from 71 to 128 and 90 to 95 d after planting, respectively. All RR biotypes had protracted flowering ranging from 8 to 14 d after initiation, in contrast to the 3- to 5-d flowering duration in CL cultivars. Synchronization in flowering between different RR biotypes and CL cultivars ranged from 20 to 100%. The year effect was not significant on outcrossing rate in field experiments so data were combined across years. There was no interaction between CL cultivars and RR types for outcrossing rate ($p<0.05$), implying that the same RR biotypes had higher outcrossing rates than others regardless of CL cultivars. On average, outcrossing rate between CL hybrid and RR biotypes was 0.25% compared with 0.07% in CL161. The outcrossing rate in different RR biotypes varied from 0 to 0.7%. Differences in flowering time of RR biotypes contributed significantly to variation in outcrossing rate. Based on hull color, the highest outcrossing rate was generally observed in brownhull followed by blackhull and strawhull types. In controlled crosses, seed set in various RR biotypes ranged from 49 to 100%. This demonstrates that, under optimum conditions for cross-pollination, the outcrossing rate between RR biotypes with CL161 still differ, indicating a significant difference in genetic compatibility between RR biotypes with rice. On average, brownhull, blackhull, and strawhull had 91, 78, and 71% seed set, respectively. These experiments provide evidence that outcrossing rate is influenced by CL cultivars and RR biotypes. Plant morphology, phenology, and genetic compatibility contributed to this influence. Among red rice biotypes, brownhull infests the least acreage in Arkansas but the rapid evolution of red rice types necessitates measures to counter their proliferation in CL rice production systems.

PROPANIL EFFECTS ON ABSORPTION, TRANSLOCATION AND ACTIVITY OF PENOXSULAM IN ALLIGATORWEED (*Alternanthera philoxeroides*). S.D. Willingham, G.N. McCauley, and J.M. Chandler, Dept. of Soil and Crop Sciences, Texas A&M University, College Station, Texas 77843.

ABSTRACT

Alligatorweed is a tropical perennial dicot weed that commonly infests waterways in the south and has spread into rice production systems of Texas. Penoxsulam is a new sulfonamide herbicide labeled for use in rice in 2005 for broad spectrum weed control. Previous studies conducted in the field showed adequate control of alligatorweed however variable each year. When tank mixed with propanil, a commonly used herbicide in rice, control declined considerably. Studies conducted in growth chambers evaluated the effects of propanil on penoxsulam control of alligatorweed under three temperature regimes. Percent biomass reduction of alligatorweed at 42 DAT compared to non-treated was greatest at 21/11 C (day/night) compared to 27/18 C and 30/25 C for all treatments. Propanil + penoxsulam provided less biomass reduction compared to penoxsulam alone independent of temperature.

Because interaction between penoxsulam and propanil occurred in both the field and growth chambers, the objective of our study was to examine the effect of propanil on the absorption and translocation of penoxsulam in alligatorweed. Plants were grown to 20 to 25cm in growth chambers at 30/25 C. Treatments included penoxsulam at 0.034 kg ha^{-1} and penoxsulam + propanil at 3.36 kg ha^{-1}. Three, 1µL aliquat of ^{14}C labeled penoxsulam was applied to each leaf of the 4th leaf pair from apex for a total of 140,000 DPM radioactivity per plant immediately following broadcast herbicide applications. Plants were sampled at 1, 24, and 48 h after treatment (HAT). Treated leaves were washed in 3 ml of water and methanol then partitioned into treated leaf, above treated leaf, below treated leaf and roots. Radioactivity was detected by combusting plant parts in a biological oxidizer, trapping CO_2, and quantifying with liquid scintillation spectrometry. Recovery ranged from 90 to 95% of total applied. At 1 HAT, 90 to 94% ^{14}C penoxsulam remained on leaf surface. By 24 HAT, 63% remained on leaf surface with the addition of propanil compared to 57% from penoxsulam alone. Addition of propanil reduced the amount of ^{14}C penoxsulam absorbed into the treated leaf compared to penoxsulam alone at 8 and 14%, respectively. By 48 HAT, differences between treatments increased with more ^{14}C penoxsulam absorbed into the treated leaf (29%) compared to the addition of propanil (18%). Less than 5% was translocated to parts above or below the treated leaf.

This research indicates tank mixing penoxsulam and propanil has an antagonistic effect on alligatorweed control in rice. When tank mixed, propanil reduces the amount of penoxsulam absorbed into plant possibly due to the caustic nature of propanil rapidly degrading cells.

EFFECT OF DIQUAT IN IRRIGATION WATER ON GERMINATION AND VEGETATIVE GROWTH OF RICE. T.F. Chiconela[1], W.T. Haller[1] and T.J. Koschnick[2], [1]University of Florida, Gainesville, FL; [2]SePRO Corporation, Carmel, IN.

ABSTRACT

Submersed aquatic weed control in irrigation canals, including waters used to irrigate rice in the US and elsewhere, is commonly accomplished with acrolein. This broad-spectrum herbicide is generally applied every 2-3 weeks as a drip treatment in flowing canals at 75-150 L/m^3 of water flow, depending upon weed density and species present. Acrolein is volatile, flammable and toxic to fish, mammals and other non-target organisms. Alternative herbicides are being sought to reduce or replace acrolein use in irrigation canals. Diquat was tested in this study as a candidate for acrolein replacement due to its short half-life (48 h) in water and its short minimum water use restriction (a 5-day interval) between diquat application at the highest rate (0.37 mg L^{-1}) for aquatic weed control and use of treated water for irrigation. Although diquat lacks persistence in water, previous studies indicate that it can affect plant growth at concentrations much lower than the maximum aquatic labeled rate, implying that crop plants irrigated with diquat-treated water may be adversely affected. Therefore, this study was conducted to evaluate the phytotoxicity of diquat on rice at germination and more mature stages.

Two greenhouse experiments were conducted at the University of Florida's Center for Aquatic and Invasive Plants, Gainesville, Florida. Ten seeds of rice (*Oryza sativa* L. 'Cheniere') were germinated in 0.5 L plastic cups containing 200 ml of deionized water (DI) with 0, 0.05, 0.1, 0.2, 0.4, 0.8, 1.0, 1.5 and 2.0 mg L^{-1} a.i. of diquat. Percent germination, root and shoot length were recorded 14 days after treatment to determine the effect of diquat on germination. The irrigation study used ten seedlings planted in 3 L pots filled with builder's sand. Each pot was amended with 2.6 g (1 g/kg dry sand) of 15-9-12 controlled release Osmocote® and all pots were maintained under flooded conditions with unchlorinated tap water until harvest. Three growth stages seedling (3-4 leaf stage), tillering and mature (before seed head setting) were exposed to a single application of diquat in irrigation water. Diquat solutions were applied directly onto the sand to simulate flood irrigation. Seedling and tillering plants were irrigated with diquat concentrations of 0, 0.1, 0.5, 1.0, 2.5, 5.0, 10.0, 25.0, 50.0, 75.0, and 100.0 mg L^{-1} a.i., and mature plants were irrigated at same concentrations plus 200 mg L^{-1} a.i.

Roots of germinating rice were most sensitive to diquat. Concentrations resulting in 10% reduction in a seedling dry weight compared to control plants were 0.016 mg L^{-1} for shoots and 0.004 mg L^{-1} for roots, respectively. Concentrations greater than 0.2 mg L^{-1} inhibited root growth and concentrations of 0.4 mg L^{-1} reduced shoot growth. Plants grown in sand and treated at seedling, tillering and mature vegetative stages were more tolerant of diquat in irrigation water. Diquat concentrations required to reduce dry weights of rice plants at immature, tillering and mature stages by 10% were 1.67, 1.11 and 2.89 mg L^{-1}, respectively. Plant growth was inhibited at concentrations greater than 25.0 mg L^{-1} across all growth stages. Depending on application rate, irrigation of newly seeded rice fields with diquat-treated water should be delayed until plants reach a minimum of 3-4 leaf stage to avoid potential inhibition of germinating seeds.

RESPONSE OF SELECTED SOYBEAN VARIETIES TO HALOSULFURON-METHYL. V.K. Nandula[1], K.N. Reddy[2], D.H. Poston[1], T.W. Eubank[1], J.B. Blessitt[1] and K. Whiting[2], Delta Research and Extension Center, Mississippi State University, Stoneville[1], Southern Weed Science Research Unit, USDA-ARS, Stoneville[2], Delta and Pineland Company, Scott[3].

ABSTRACT

Recently, halosulfuron injury in soybean through off-target movement of halosulfuron when applied to rice fields has been reported. Sulfonylurea-tolerant (ST) soybean varieties have enhanced tolerance for sulfonylurea herbicides and might provide an option of mitigating injury to soybean from halosulfuron drift. Experiments were conducted to evaluate the effect of halosulfuron on growth and yield of selected soybean varieties with ST trait alone and stacked with glyphosate resistance trait. Soybean plants were treated with halosulfuron at 0, 0.0043, 0.0087, 0.017, 0.034, and 0.069 kg ai/ha rate at the V3 growth stage in the greenhouse and at 0.034 kg/ha rate (label use rate in rice) in the field studies. All soybean varieties containing the ST trait exhibited some halosulfuron injury, but survived the halosulfuron application in the greenhouse. In a field studies, a single POST application of halosulfuron at 0.034 kg/ha to soybean at three-trifoliolate leaf stage or at full bloom stage resulted in halosulfuron injury to certain extent regardless of ST trait. Halosulfuron did not have a significant effect on yield of ST varieties compared to their respective nontreated controls. Severe halosulfuron injury in two non-ST varieties resulted in yield loss.

BENEFITS OF WINTER CANOLA IN OKLAHOMA CROP ROTATIONS. C.A. Massey, B.H. Sanders, M.C. Boyles, and T.F. Peeper, Oklahoma State University, Stillwater, OK.

ABSTRACT

Winter canola (Brassica napus L.) has been recently introduced into the Southern Great Plains as a rotational crop to provide additional weed management options for farmers who have traditionally grown continuous hard red winter wheat.

Experiments were conducted at four locations in north central Oklahoma. One at the North Central Research Station, Lahoma, OK. One at a private cooperator near Carrier, OK. And two at the Cimarron Valley Research Station, Perkins, OK. to determine the agronomic benefits of a winter canola - hard red winter wheat rotation on winter wheat growth and grain yields of both crops. Sequences consisted of continuous wheat, continuous canola, canola followed by (fb) wheat (fb) canola, and wheat (fb) canola (fb) wheat. The experimental design was a randomized complete block with 30ft X 30ft plots. Conventional tillage was used at all sites. All treatments were replicated four times. Fertilizer was applied to both crops to satisfy the requirements for a 3000lb/acre yield goal for canola. Weeds were controlled during the fallow season with tillage and glyphosate. Volunteer wheat was controlled in the canola by a broadcast application of glyphosate, at labeled rates. All plots were harvested with a small plot combine in June of each year. Harvested samples from each plot were cleaned and yields were adjusted to 10% moisture for canola and 12% moisture for wheat. In 2005 ½ $meter^2$ of wheat forage was harvested, dried, and weighed and tillers were counted in three meters of row in each wheat plot.

The results indicate that winter wheat may grow more vigorously in a canola – wheat rotation than when wheat follows wheat. However, in these studies we were unable to detect significant increases in yield due to rotation. In the Great Plains were rainfall is frequently limiting, abundant forage growth may consume resources needed for grain production. Thus, revisions in management practices may be necessary to optimize potential benefits of a crop rotation. To further define benefits of crop rotations seven additional winter wheat – winter canola - corn rotation experiments were initiated in the fall of 2006. Initial data will be available summer 2008.

EFFECT OF FURROW DIKING ON HERBICIDE EFFICACY IN THE SOUTHEASTERN USA. W.H. Faircloth and R.C. Nuti, USDA/ARS, National Peanut Research Laboratory, Dawson, GA 39842.

ABSTRACT

Furrow diking has not been utilized in the Southeastern USA where rainfall is abundant, but is a typical practice in more arid agricultural areas of the Southwest. The Southeast receives an average annual rainfall of 50 inches, but unfortunately this rainfall can be sporadic and often of high intensity. Furrow diking is a tillage operation that creates a series of basins and dams in the furrow between crop rows to help capture water. The equipment necessary for furrow diking is not expensive and can be attached to common cultivation equipment. Research at the USDA-ARS National Peanut Research Laboratory in Dawson, GA has shown increased water savings, yield, and economic returns in peanut, corn, and cotton by using furrow dikes. One concern with furrow diking is the disturbance of preemergence (PRE) or preplant incorporated herbicides (PPI). Additionally, since the process of furrow diking includes mechanical cultivation, does the need for preemergence herbicides still exist? A two year study was performed in peanuts, corn, and cotton to examine the effect of furrow dikes on common weed control scenarios.

<u>Corn Study</u>. Treatments were a factorial arrangement of preemergence herbicide (with and without) by postemergence herbicide (4) with a non-treated check and 3 replications. Plots were 6 rows by 50 ft. Glyphosate-resistant corn (DK 6972R) was planted in March of 2005 and 2006 and plots managed for maximum yield with regard to fertility and pest management other than weed control. Plots were non-irrigated. Furrow diking occurred at V3 growth stage and prior to application of POST herbicides. Weed control ratings were taken prior to application of POST herbicides (~ 30 dap) and again near 60 dap. Corn was mechanically harvested and grain yield reported. Weed control and yield data were combined over year as ANOVA revealed no differences between 2005 and 2006. Broadleaf weed control was not affected by PRE or POST herbicide options, nor their interaction. Control of common bermudagrass (*Cynodon dactylon*) was increased 25% by PRE application of atrazine+metolachlor versus no PRE, however control was not acceptable in any treatment. Neither POST herbicide nor the interaction of PRE x POST showed significant differences in common bermudagrass control. Likewise, yellow nutsedge (*Cyperus esculentus*) control increased 38% with a PRE application of atrazine+metolachlor versus none. Although differences in weed control were observed with and without PRE herbicide, corn yield showed no significant difference for any factor or interaction. In this series of dryland studies, the cultivation occurring during furrow diking resulted in equivalent yields to the use PRE herbicide.

<u>Peanut Study</u>. Treatments were a factorial arrangement of preplant herbicide (pendimethalin or pendimethalin+diclosulam) by application method (PPI or PRE) by dike timing (EPOST or LPOST) with a non-treated check and 3 replications. AP-3 peanut was planted in single row pattern in May of 2005 and June of 2006. EPOST furrow diking occurred at 3 wk after planting and just prior to an application of paraquat+bentazon; LPOST furrow diking occurred at 45 dap and just prior to a LPOST application of imazapic. Weed control ratings were taken prior to application of EPOST herbicides and again near 60 dap. Peanut was mechanically harvested and farmer stock yield reported. Factorial ANOVA revealed no significant differences between pendimethalin alone or pendimethalin+diclosulam. No differences were found between application method, whether applied PPI or PRE. Furrow dike timing was not found to be significant. Thus, data were analyzed by individual treatment combinations using Duncan's MRT (0.05). Pendimethalin alone PRE followed by EPOST furrow diking resulted in less control of common bermudagrass and lower peanut yield versus other treatment combinations. Blanket applications of paraquat and imazapic controlled most other weed species near 100%, thus common bermudagrass was the only weed present in significant numbers at either rating period. Furrow diking as performed in this series of peanut studies appeared to have no effect on the efficacy of PPI or PRE herbicides.

<u>Cotton Study</u>. Treatments were a factorial arrangement of preplant herbicide (pendimethalin or pendimethalin+fluometuron) by dike timing (EPOST or LPOST) by layby herbicide (glyphosate or glyphosate+diuron) with a non-treated check and 3 replications. EPOST furrow diking occurred when cotton reached the 8-leaf stage; LPOST furrow diking just prior to layby herbicide applications. Glyphosate was broadcast-applied to all plots when cotton reached 3-4 leaf stage. Weed control ratings were taken prior to application of EPOST glphosate and again in late June. Cotton was mechanically harvested and lint yields reported based on plot gin turnout. Factorial ANOVA showed significant difference for dike timing in weed control, but not cotton yield. The main effects of PRE herbicide and layby herbicide were not significant for either weed control or cotton yield. Cotton yields are presented by individual treatment combination for each year common bermudagrass control was 40% less when furrow dikes were created at layby. This did not translate to yield decrease. Smallflower morningglory (*Jaquemontia tamnifolia*) control was also decreased with delayed furrow diking. Cotton yields were not different in 2005, but differences occurred in the much drier year 2006. Pendimethalin applied alone followed by furrow diking at layby resulted in yields equal to the nontreated.

PEANUT RESPONSE TO DIFFERENT APPLICATION TIMINGS OF PARAQUAT DICHLORIDE AND S-METOLACHLOR TANK MIX COMBINATIONS. L.V. Gilbert, P.A. Dotray, W.J. Grichar, and T.A. Baughman; Texas AgriLife Research, Lubbock and Beeville; Texas Tech University, Lubbock; and Texas AgriLife Extension Service, Lubbock and Vernon.

ABSTRACT

Gramoxone Inteon is a relatively new formulation of paraquat dichloride. It contains 2 pounds of paraquat ion per gallon compared to 3 pounds per gallon of the Gramoxone Max formulation. The Gramoxone Inteon formulation reduces oral toxicity while maintaining the key benefits of paraquat (good weed control, rapid activity, cost effective, easy to use). Gramoxone Inteon may be applied from 8 to 16 ounces per acre from ground-crack to 28 days after ground-crack, and up to 2 applications may be made per year. For ground-crack use, Gramoxone Inteon may be tank mixed with Dual Magnum for residual weed control. The objective of this research was to examine peanut response to Gramoxone Inteon plus Dual Magnum in tank mix combinations when applied at ground crack (AC) and up to 28 days after crack (DAC). Field trials were conducted in 2006 and 2007 in peanut producing regions of the Texas High Plains (Dawson Co.). Similar studies were conducted in south Texas (Dewitt Co.), but are not reported here. Plots were 2 rows by 30 feet with three replications and applications were made at a carrier volume of 10 gallons per acre (GPA) using a CO2-pressurized backpack sprayer containing 110015 TurboTee spray tips. Peanut injury (0-100%) observations were recorded throughout the growing season. Plots were kept weed free during the course of the growing season to ensure that any visible injury and yield loss could be attributed to the herbicide treatments. Peanuts were dug based on maturity of untreated control plots, allowed to field dry for 5 to 7 days, and were harvested with a small plot combine. When averaged across Gramoxone Inteon and Dual Magnum treatments at various application timings, peanut injury 7 days after treatment (DAT) ranged from 3 (AC) to 29% (7 DAC). There was no difference in peanut injury (approximately 18%) following applications made at 14, 21, and 28 DAC. When averaged across application timings for the various Gramoxone Inteon and Dual Magnum treatments, peanut injury 7 DAT ranged from 12 to 23%. Gramoxone Inteon at 8 and 16 oz injured peanut 12 and 18%, respectively. The addition of Dual Magnum at 16 oz to Gramoxone Inteon at 8 or 16 oz did not increase peanut injury. The elimination of NIS (non-ionic surfactant) to the Gramoxone Inteon plus Dual Magnum tank mixture did not reduce peanut injury. When Dual Magnum rate increased from 16 to 24 oz, no increase in peanut injury was observed. When averaged across Gramoxone Inteon and Dual Magnum treatments at various application timings, peanut injury 14 DAT ranged from 2 (AC) to 16% (21 DAC). The least degree of peanut injury was observed in the AC applications, followed by (fb) applications made 7 and 14 DAC fb applications made 21 and 28 DAC. When averaged across application timings for the various Gramoxone Inteon and Dual Magnum treatments, peanut injury 14 DAT ranged from 6 to 15%. Gramoxone Inteon at 8 and 16 oz injured peanut 6 and 12%, respectively. The addition of Dual Magnum at 16 oz did not increase peanut injury. The elimination of NIS to the Gramoxone Inteon plus Dual Magnum tank mixture did not reduce peanut injury. When Dual Magnum rate increased from 16 to 24 oz, no increase in peanut injury was observed. Peanut yield decreased following applications made AC to 28 DAC when averaged across Gramoxone Inteon and Dual Magnum treatments at various application timings. Peanut yield ranged from 5053 lb/A (28 DAC) to 5391 lb/A (AC). When averaged across application timings, peanut yield ranged from 5063 to 5529 lb/A. The addition of Dual Magnum or NIS had no adverse affects on peanut yield. In a Virginia tolerance test, Gramoxone Inteon at 8 oz (plus NIS) injured peanut 10 and 5% when rated 7 and 14 DAT. The addition of Dual Magnum at 24 oz (plus NIS) injured peanut 13 and 8% when rated 7 and 14 DAT, respectively. No difference in peanut yield was observed following Gramoxone Inteon applied in tank mixture with Dual Magnum relative to Gramoxone Inteon applied alone. Peanut yield ranged from 4641 to 4680 lb/A. Similarly, in a runner peanut market type (Flavorrunner 458), no enhanced peanut injury nor yield reduction was observed when Dual Magnum was added in a tank mix combination with Gramoxone Inteon compared to Gramoxone Inteon applied alone (data not shown). Dual Magnum at 16 oz appears to be a safe tank mix partner with Gramoxone Inteon at 8 or 16 oz. Early applications (AC or 7 DAC) appear to be the safest timing. The elimination of NIS to the Gramoxone Inteon plus Dual Magnum tank mixture did not reduce peanut injury.

GLYPHOSATE-RESISTANT HORSEWEED (CONYZA CANADENSIS) IN MISSOURI: A THREE YEAR SUMMARY. Chad L. Smith, James W. Heiser, and J. Andrew Kendig*, University of Missouri-Delta Center, Portageville, MO, 63873 and *Monsanto Company, St. Louis, MO, 63071.

ABSTRACT

Glyphosate-resistant horseweed (*Conyza canadensis*) was found in Pemiscot County Missouri in 2002. It has developed into significant weed in cotton, especially in fields utilizing reduced tillage programs. Problems still exist as to the most effective spring application (burndown) timing to maximize control. Questions still remain regarding the efficacy of herbicides applied in the fall and spring to provide residual control to prevent any future germination of horseweed seed.

Two studies were implemented in 2005, one evaluating the proper application timing of growth regulator herbicides and one evaluating the effectiveness of fall and spring applied preplant herbicides. There was a mixed population of both glyphosate resistant and susceptible horseweeds in these studies. The preplant study was a factorial combination of three application times (November, January and March) and seven herbicide treatments, pendamethalin at 1.68 kg ai/ha, simazine at 1.12 kg ai/ha, fluometuron at 1.12 kg ai/ha, linuron at 1.12 kg ai/ha, diuron at 1.12 kg ai/ha, oxyfluorfen at 0.28 kg ai/ha, flumioxazin at 0.07 kg ai/ha and an untreated check. The residual herbicides and control were all applied with glyphosate at 0.83 ae/ha and 2,4-D at 1.12 kg ai/ha.

In the fall of 2006, a second study evaluating the efficacy of the new residual herbicide trifloxysulfuron-sodium was incorporated. The design was factorial with three rates (0.0026, 0.0039, and 0.0052 kg ai/ha) of trifloxysulfuron-sodium in conjunction with four burndown herbicides, paraquat 0.7 kg ai/ha, dicamba at 0.28 kg ai/ha, 2,4-D at1.12 kg ai/ha, and glyphosate at 0.83 kg ae/ha across a single application timing in December. In both preplant studies, horseweed control was evaluated at the time of cotton planting in mid-May and after cotton emergence to evaluate crop injury.

The third study evaluated horseweed control and cotton injury with growth regulator burndown herbicides at seven biweekly application timings between February 15th and May 4th. It was a factorial design using 2,4-D and dicamba, with 3 different rates of each herbicide: 0.5, 1, and 2 times the labelled rate for each. Horseweed stands were determined before cotton planting. Cotton was evaluated for growth-regulator type symptoms and harvested to determine yield differences if any.

Data were subjected to analysis of variance and means separated using Fisher's LSD aț =0.05. Plot size was 2.2m by 7.6 m and the study was conducted using standard small plot weed science methodology, including CO2-pressurized backpack sprayers and XR8001 flat fan nozzles set at an application volume of 93 L/ha.

In the residual efficacy studies, most fall residual herbicide treatments resulted in <70% control at the time of planting. Trifloxysulfuron-sodium however provided good to excellent residual horseweed control from fall applications. In the first study, there were no observed increase in horseweed control between spring burndown applications with residuals and those without. Cotton yield was not affected by preplant treatments.

In the burndown timing study, both early April and late April application timings for all 3 years resulted in no horseweed populations at the time of planting, indicating optimum timing for horseweed control. Early season burndown timings allowed for emergence later in spring. There were no statistical differences in horseweed control between 2,4-D and dicamba when used for burndown. With cotton planted in mid-May, growth regulator type crop injury was only found from burndown applications made in early May.

PRELIMINARY STUDIES OF PALMER AMARANTH POLLEN DISPERSAL. A.M. Stark[1], M.G. Burton[1], L. Wang[2], and S.T. Hoyle[1]; NC State University, Raleigh, NC, [1]Crop Science Department, [2]Biological and Agricultural Engineering Department.

ABSTRACT

Glyphosate resistant Palmer amaranth (*Amaranthus palmeri*) is now found in various locations in several southern states. Cotton, soybean, vegetable growers, and weed scientists are concerned that the resistant germplasm could spread significantly. While control methods and phytosanitary measures may prevent small to large scale dispersal of resistant Palmer amaranth seeds, investigation of gene flow through long-range pollen dispersal has only begun recently. Pollen dispersal may potentially transport herbicide resistance genes over long distances via convective currents and laminar air flow in the atmosphere. The objective of this study was to test the validity of the default BREEZE ISC GIS PRO dispersion model in predicting settling trap capture on Palmer amaranth pollen grains. In Edgecomb county, NC, a 400m diameter area of a cotton field was cleared of male Palmer amaranth with the exception of several males in the one meter diameter point source area. Pollen traps were arranged in a compass rose array surrounding the point source at distances of 0m (center of point source), 1m, 2m, or 10m. Pollen traps were placed at heights of 0.75m (cotton canopy height), 1.75m, and 2.75m. Traps captured settling pollen on greased microscope slides from 8 to 10 am on September 5, 6, and 7, 2007, and were transported to the NCSU Weed Ecology laboratory to be counted. Four randomly selected 1.06mm^2 areas on the sample slide were chosen and Palmer amaranth pollen grains in those areas were counted using a reference grid. These counts were used to determine the average density of Palmer amaranth pollen grains settling at each trap. Pollen emission rates were calculated using pollen settling densities assuming 20% deposition at the point source and a 30 µm particle size. Dispersal vectors were constructed from CHRONOS weather data collected at the SCONC Rocky Mount 8 ESE station (317400). Palmer amaranth pollen was observed in samples at all trap heights (cotton canopy height to two meters above canopy) and at distances as far as 10m down wind (the maximum extent of pollen traps) from the point source. Predicted pollen settling rates modeled with the unmodified BREEZE software followed the general shape of a three dimensional aerosol plume. However, the model overestimated pollen deposition when compared to our empirical field data. In subsequent experiments, we plan to redistribute pollen traps to increase trap number and distance from the point source in the down-wind direction. Empirical estimates of the rate and time of pollen release and pollen settling rate are needed to better parameterize the BREEZE model and increase modeling accuracy. Additional data is needed on viability of pollen when exposed to various temperatures and humidity levels while airborne. Finally, continuous on-site monitoring of air speed, direction, temperature, and humidity are also needed for real-time corrections of modeling parameters.

SURVEYING LATE SEASON WEED SURVIVAL AND EMERGENCE IN COTTON. M.G. Burton, S.T. Hoyle , A.S. King, A.C. York, North Carolina State University, Raleigh, NC.

ABSTRACT

In recent years, cotton farmers in North Carolina have observed weeds above their cotton canopies late in the season and have expressed concern over the potential for yield and quality loss due to the presence of these weeds. They have also raised questions about whether the weeds survived layby control tactics or emerged after layby. Weeds escaping early management have been shown to affect cotton yield. While seedlings emerging late in the season have generally been observed to have little effect on yield, the rapid growth or herbicide-resistance of some species (e.g. Palmer amaranth (*Amaranthus palmeri*)) warranted sufficient concern to survey weedy escapes. Similarly, seedling emergence after layby may not cause crop yield loss, but these seedlings can mature to contribute large numbers of propagules to the weed seed bank. Effects of grower-selected management were of particular interest because of the wide variability in weed communities seen in the cotton producing regions of North Carolina. Consequently, this study only examined on-farm situations without offering recommendations. Subsequent to the initiation of this study, (March 2007) Cotton , Inc. conducted a survey of growers in the Southeastern Region. Ninety-nine percent of the 466 respondentsi indicated that they use glyphosate-resistant cotton varieties , and >70% inicated that they "never" or "seldom" rotate herbicide mode of action. The objectives of this study were to quantify layby escapes by species in cotton and characterize populations of late-emerging species prior to defoliation within treatment groups and soil types, however, only results for treatment groups are presented here. In 2005 and 2006 a total of fifty seven uniform 10m x 10m plots in seven North Carolina soil systems were surveyed after layby and before defoliation. Each plot was intensively surveyed 10 to 14 d after layby herbicide applications. During this post-layby survey, surviving weeds were identified by species, and growth stage and height, as was weed distance from the cotton row. Each weed was geo-referenced and staked. A database of late-season weeds was created and plot maps were generated. Within one week of defoliation, plots were surveyed once more. Staked weeds from the post-layby survey were re-assessed for survival, growth stage, and height. In addition, whole plot estimates of weed numbers were made by species and average and range of growth stage and height were noted for each species. In the analysis, weeds were grouped by species, as well as by the categories of annual grasses, morningglory species, pigweed species, and competitive vs. non-competitive species. Competitive weeds were considered to be those species indexed at ≥0.20 in the HADSS database for NC cotton. Weed density and species ranged widely across plots. Eight plots had no weeds at either survey in both 2005 and 2006, while one plot had 736 weeds or patches of weeds at post-layby count (2005). Wide species diversity was observed as well. On average, 142 weeds were found per plot after layby, and 47 weeds were found per plot before defoliation. Thirty–five different weed species were observed in after layby counts, with twenty-six species in the later counts. Ten different weed species were observed in the most diverse plots. Nine different herbicide programs were used by growers for layby applications. Where multiple formulations were used, active ingredient is listed. Weeds were grouped according to similar characteristics and analyzed to determine differences across treatments. Categories presented here include competitive weeds, annual grasses, and pigweed species. Many weeds that appeared to survive layby later died. Differences were observed only in the pigweed species category, in both years. Some groups lacked replication and huge variability also existed in pigweed density among plots. Pigweeds have always been competitive, but increased concern now exists since glyphosate resistant pigweed species have been found in multiple Southeastern states. Many weeds that survived layby eventually died due to slower than anticipated herbicide death, unfavorable environmental conditions, crop competition, or a combination of the three. Many species emerged following layby applications, including Palmer amaranth, morningglory species, goosegrass, large crabgrass, and dayflower species. Wide variability existed among plots in species and in density. In addition, an apparent effect of canopy closure on weed emergence was observed throughout the experiment. This may have been an effect of unusually dry weather in parts of the Southeast during the 2005 season. In plots without a closed canopy at (or near) layby, a total of 24 species was observed in 2005 and 12 species in 2006. Species diversity was higher in plots with a closed canopy in both years, with more fall emerging winter annuals present. To reduce variability, more data would be needed. Future research also includes examining the effects of residual herbicides at layby, as well as correlating late-season weeds with use of residual herbicide such as Staple or Dual with post over-the-top or directed layby applications of herbicide.

EFFECT OF MESOTRIONE TANK-MIXTURES ON CENTIPEDEGRASS INJURY AND BROADLEAF WEED CONTROL. J.D. McCurdy, J.S. McElroy, and G.K. Breeden, the University of Tennessee, Knoxville, TN.

ABSTRACT

Mesotrione is a carotenoid biosynthesis inhibitor which controls many common turfgrass weeds and is safe on centipedegrass [*Eremochloa ophiuroides* (Munro) Hack.]. It has been reported that multiple applications of mesotrione are required for the complete control of white clover (*Trifolium repens* L.). Previous research has shown that tank-mixtures containing mesotrione are more effective at controlling certain weeds due to a synergistic effect. Tank-mixtures of mesotrione and common postemergence broadleaf herbicides were evaluated for their ability to control white clover and prostrate knotweed (*Polygonum aviculare* L.). Mesotrione and mesotrione tank-mixtures were evaluated in two separate experiments. The first experiment was applied to established "TifBlair" centipedegrass contaminated with white clover beginning 1 May at the East Tennessee Research and Education Center-Plant Science Unit in Knoxville, TN. The second experiment was applied to a naturalized stand of prostrate knotweed with little turfgrass infestation beginning 26 May at Whittle Springs Golf Course in Knoxville, TN. Identical treatment schemes were utilized in each experiment. Treatments included mesotrione alone (0.18 and 0.28 kg ai/ha) applied at initiation and again 3 weeks after initial treatment, or one of the following applied at initiation only: dicamba (0.56 kg/ha) plus mesotrione (0.18 and 0.28 kg/ha), simazine (0.56 kg/ha) plus mesotrione (0.18 and 0.28 kg/ha), atrazine (0.56 kg/ha) plus mesotrione (0.18 and 0.28 kg/ha), fluroxypyr (0.56 kg/ha) plus mesotrione (0.18 and 0.28 kg/ha), sulfentrazone (0.28 kg/ha) plus mesotrione (0.18 and 0.28 kg/ha). All treatments included 0.25% v/v non ionic surfactant. Following herbicide application centipedegrass injury was visually estimated 7 and 14 days after treatment (DAT) on a 0 (no turfgrass injury) to 100 (complete turfgrass death)% scale relative to the non-treated check. White clover and prostrate knotweed control were visually rated weekly on a 0 (no weed control) to 100 (complete weed control) % scale relative to the non-treated. Data was subjected to ANOVA ($P = 0.05$). Means were separated by Fisher's protected LSD ($P = 0.05$).

Centipedegrass injury was greater than 40% for tank-mixes containing sulfentrazone when visually rated 7 DAT. Symptoms were yellowing of turf followed by necrosis. Injury decreased to 0% by 21 DAT. No visual injury was observed due to any other treatments. Only atrazine plus mesotrione (0.56 plus 0.28 kg/ha) controlled prostrate knotweed greater than the non-treated check 7 DAT. Dicamba and fluroxypyr tank-mixed with both rates of mesotrione controlled white clover greater than 85% 56 DAT. Dicamba and fluroxypyr tank-mixed with mesotrione controlled prostrate knotweed greater than 83% 56 DAT. Due to the potential for turf injury and the lack of white clover and prostrate knotweed control, sulfentrazone tank-mixed with mesotrione is not a suitable means of controlling broadleaf weeds in centipedegrass turf. Dicamba and fluroxypyr tank-mixed with mesotrione provided the most control of both prostrate knotweed and white clover 56 DAT.

PHYTOPATHOGENIC ALGAE RESPONSE TO COMMON TURFGRASS PESTICIDE MICRONUTRIENTS. S.M. Borst[1], J.S. McElroy[1] and S.W. Wilhelm[1], The University of Tennessee, Knoxville, TN.

ABSTRACT

Phytopathogenic algae (filamentous cyanobacteria) encroachment is a persistent weed/pathogen problem on golf course putting green. Algae disrupt water infiltration and can compete for light by covering the leaf surface. Chlorothalonil + zinc and mancozeb + copper hydroxide are labeled for the control of cyanobacteria on golf course putting greens. Both chemistries include turfgrass micronutrients for added pesticide efficacy. Copper sulfate is also utilized as an algaecide in aquatic environments such as catch basins and golf course water retention ponds. Individual cyanobacteria species have different tolerances for micronutrients such as Cu and Zn. Research was initiated to isolate and identify common cyanobacteria species to golf course putting greens and evaluate response to Cu and Zn.

Research was conducted in Knoxville, TN. Cyanobacteria cultures were taken from Gettysview Country Club, The University of Tennessee golf practice facility, and the East Tennessee Research and Education Center, all located in Knoxville, TN. Isolates were cultured in BG-11 standard growth media. Single species were isolated via plate streaking and separation. Single filamentous isolates were identified via 16s rRNA gene sequencing with specific 16S cyanobacterial primers. 1148 base pair fragments were amplified. Basic Local Alignment Search Tool (BLAST) was utilized to compare sequences. An *in vitro* response screen utilizing six different concentrations of $ZnSO_4$ (Zn) and $CuSO_4$ (Cu) (0, 0.63, 3.15, 6.3, 9.45, 12.6 µM) were administered to TN algal isolates. Each concentration was added to 30ml of BG-11 liquid media and inoculated with TN algal filaments. Triplicates of each concentration were then harvested at (0, 3, 5, 7, 10) days after inoculation (DAI) utilizing 0.2µm filters. Cells were lysed and chlorophyll levels (µg/L) were measured with a Turner 10AU Fluorimeter. Isolates were grown in 1000 µE of light and 26°C. For simplicity only concentration levels (0, 0.63, 3.15) will be discussed because exceeding levels were similar to 3.15.

BLAST search revealed TN algal isolate had a 97% match to and uncultured California grassland cyanobacteria. TN algal isolate had a 94% match to *Phormidium murrayi*, an arctic filamentous mat forming cyanobacteria. Sequence and taxonomic traits of TN algal isolate relate to *Phormidium* spp. cyanobacteria. Micronutrient screens identified that both Zn and Cu at 3.14 µM were lethal 10DAI. Both micronutrients at 0.63µM had an increase in growth at 7 and 10DAI. At 0.63µM, Zn isolates contained 0.04µg/L and Cu isolates contained 0.02 µg/L of chlorophyll 10 DAI. Research indicates that TN algal isolates are controlled by both micronutrients at 3.15 µM. Past research has indicated that chlorothalonil + Zn controls creeping bentgrass algae greater than chlorothalonil alone. Further research is needed to determine soil persistence of Cu and Zn in sand-based putting green root zones, tolerance of creeping bentgrass, and consistency of field control with these micronutrients.

THE EFFECT OF SPRAY ADJUVANTS ON THE EFFICACY OF FORAMSULFURON FOR DALLISGRASS CONTROL. G.M. Henry, Texas Tech University, Lubbock, TX 79409.

ABSTRACT

Field experiments were conducted at Lake Ridge Country Club in Lubbock, TX in the summer of 2007 to quantify the efficacy of foramsulfuron with various spray adjuvants to control dallisgrass. Studies were located on established infestations of dallisgrass present in a common bermudagrass rough cut to a height of 5.0 cm. Plots measured 1.5 x 1.5 m and were arranged in a randomized complete block design, with four replications of treatments. Treatments were applied using a CO_2 backpack sprayer equipped with XR8004VS nozzle tips and calibrated to deliver 304 L/ha at 220 kPa. Treatments were initiated on June 22 and consisted of foramsulfuron (0.15 kg ai/ha) applied alone or in combination with methylated seed oil (1.0% v/v), crop oil concentrate (1.0% v/v), non-ionic surfactant (0.25% v/v), or each of the three plus urea ammonium nitrate (UAN) (2.5% v/v). Sequential applications for each treatment were made 1 WAIT (week after initial treatment). Visual estimates of percent dallisgrass control and bermudagrass phytotoxicity were taken 1, 2, 4, and 6 WAIT. Data were subjected to analysis of variance (ANOVA) and means were separated using Fisher's Protected LSD at the 0.05 significance level. Bermudagrass phytotoxicity (< 5%) was recorded 2 WAIT regardless of treatment, but recovery was observed by 3 WAIT. Treatments containing COC or NIS exhibited greater dallisgrass control 6 WAIT (43 to 55%) compared to foramsulfuron applied alone (38%). The addition of UAN resulted in a biological increase in dallisgrass control 6 WAIT compared to treatments without UAN. All treatments resulted in dallisgrass re-growth from rhizomes 8 WAIT. This experiment will be replicated in time and additional foramsulfuron application timings will be investigated.

IMPROVING QUALITY OF BERMUDAGRASS POST DORMANCY TRANSITION USING PARTIAL RYEGRASS CONTROL TECHNIQUES. T.L Mittlesteadt, J.B Willis, M.J.R. Goddard, J.J Jester, and S.D Askew, Virginia Tech, Blacksburg.

ABSTRACT

Removing perennial ryegrass (*Lolium perenne*) (PR) during spring transition of overseeded bermudagrass (*Cynodon dactylon*) often leads to thin turf with poor aesthetics. Efforts using low herbicide rates for PR control were not effective at improving turfgrass aesthetics. To improve turfgrass playing conditions during spring transition, we have developed a process that partially controls PR, stimulating bermudagrass growth. By applying selective herbicides with specially designed equipment, we control a minimal percentage of perennial ryegrass with little disruption to playing conditions or aesthetics. The resulting perennial ryegrass canopy disruption is scarcely noticeable to the average golfer or other client. These openings in the PR canopy stimulate bermudagrass to grow and increase bermudagrass cover in advance of the normal transition time.

A randomized complete block trial with three replications was conducted at Farmington Country Club near Charlottesville, VA in 2006, and on the Virginia Tech golf course in 2007. Research studies included three herbicide application methods: drip, sponge, and strip. Treatments included two transition herbicides, foramsulfuron (Revolver at 29 g ai/ha) and trifloxysulfuron (Monument at 23 g ai/ha)**.** The drip boom and sponge applicator were calibrated to kill 6-cm diameter circles on 10-cm centers. Calibrations were unique for each device and resulted in a solution delivery rate of 1,635 L/ha for drip, 1,402 L/ha for sponge, and 280 L/ha for strips. A factorial treatment arrangement evaluated four scenarios of each method: foramsulfuron at 30% coverage applied early, trifloxysulfuron at 30% coverage applied early, foramsulfuron at 30% coverage applied early and late, and foramsulfuron at 20% coverage applied early and late. A comparison treatment that did not receive partial control treatment was also included. For the 2006 study, partial control treatments were applied on April 26 (early) and May 18 (late) prior to a broadcast application of foramsulfuron at 29 g ai/ha on July 7. For the 2007 study, partial control treatments were applied on May 9 (early) and May 30 (late) prior to a broadcast application of foramsulfuron at 29 g ai/ha on July 10. Ratings included percent bermudagrass cover, and turfgrass quality at 0 degrees and 90 degrees on 1-9 scale.

Data from the 2006 and 2007 studies show that partial control treatments increased bermudagrass cover at all rating times. In 2006 Sponge and drip treatments maintained at least a 7 color rating for the duration of the study. Plots that did not receive partial control had color slightly below acceptable (4.8) two weeks after the broadcast treatment of foramsulfuron. Bermudagrass cover at this timing was 68% in plots that did not receive partial control treatments and 82 to 95% in plots that did receive partial control treatments. In 2007 plots that did not receive partial control treatments contained 40% bermudagrass cover 1 week after the broadcast treatment of foramsulfuron. Plots that did receive partial control treatments ranged from 45 to 70% bermudagrass cover. Partial control appears to be an effective way to stimulate bermudagrass growth while having minimal impact on overall turfgrass quality. Future research will refine application equipment and determine optimal timing and percent partial control needed for best aesthetics during transition.

ASSESSMENT OF MESOTRIONE LATERAL RELOCATION VIA MOWER TIRES. J.B. Willis, M.J. Goddard, and S.D. Askew, Virginia Tech, Blacksburg, VA; and R.J. Keese; Syngenta Professional Products, Greensboro, NC.

ABSTRACT

Mesotrione will be the first HPPD inhibitor registered in turfgrass, and has several positive attributes for use in cool season turf. Mesotrione is active on creeping bentgrass, bermudagrass, and several other weeds. Mesotrione applications to labeled cool-season turf species can potentially injure sensitive species when mowers traverse the treated area and then sensitive turfgrass. This is called tracking. The ability of herbicides to dislodge is increased with the presence of dew. Since golf courses often use cool season grasses in close proximity to desirable creeping bentgrass and bermudagrass, off target movement and lateral relocation is a concern. The objectives of this research are to determine potential of mesotrione to injure creeping bentgrass and bermudagrass when laterally relocated via mower tires and to determine effects of tracking timing and dew presence on injury from tracked mesotrione

Four field studies were conducted in Blacksburg, VA in 2006 and 2007. Experimental design was randomized complete block, with three replications for each trial. Mesotrione at 0, 4, or 8 fl oz/A was applied to cool-season turf adjacent to creeping bentgrass and common bermudagrass. The plots were tracked at 3 timings; 1, 3, and 24 HAT (hours after treatment). Six by six ft perennial ryegrass plots were treated, and at the specified time, a triplex-greens mower was driven through the treated plot and across a 6 by 12 ft plot of bentgrass or bermudagrass. The 1 hr tracking timing was preformed with unirrigated turfgrass while the 3 and 24 HAT 0.2 inch of irrigation were applied to treated plots immediately prior to tracking.

Results from trials conducted in 2006 found that tracked mesotrione did not injure creeping bentgrass regardless of mesotrione rate, tracking timing, or presence of dew. These trials were initiated in early and late August, respectively, and weather conditions at that time were hot and dry. Supplemental irrigation was used to maintain high turf quality, but growing conditions for creeping bentgrass was not optimal. These results and other experiments at Virginia Tech indicate that injury to creeping bentgrass from tracked mesotrione is more likely during optimal growing conditions. In 2007, mesotrione applications at 8 fl oz/A tracked 1 HAT and 3 HAT with 0.2 inches of irrigation significantly injured bentgrass between 12 and 13%, respectively, 3 ft from the treated plot and injury decreased in severity as the mower moved away from the plot. While injury levels in tracks are low, the contrasting differences in turf color is unacceptable, reducing turf color between 1 and 2 points on a 1-9 scale. Another trial was conducted with bermudagrass fairway turf, unfortunately a significant thundershower caused the trial data to be unusable.

Mesotrione has potential to dislodge, laterally relocate, and injure sensitive species. Injury from tracked mesotrione is dependent on several factors. We believe that the following factors positively influence tracking injury from mesotrione; optimal growing conditions of susceptible turfgrass species, presence of dew, higher mesotrione application rates, and tracking soon after mesotrione application. Limiting traffic and irrigating after application but before traffic would likely reduce potential for mesotrione to track and injure susceptible turf species.

WEED CONTROL WITH COMMON BROADLEAF HERBICIDES AND REDUCED TURFGRASS INJURY WITH FERROMEC. M.L. Flessner, J.S. McElroy and G.K. Breeden, University of Tennessee, Knoxville, TN.

ABSTRACT

Combination products including quinclorac, sulfentrazone, and/or traditional broadleaf herbicides (2, 4-D, dicamba, MCPP) have recently become available for weed control in turfgrass. Such products include Q-4 (quinclorac, sulfentrazone, 2, 4-D, and dicamba; PBI Gordon, St. Louis, MO) and Surge (sulfentrazone, 2, 4-D, MCPP, and dicamba; PBI Gordon, St. Louis, MO). Combination herbicides could be beneficial because they may conceivably control crabgrass (quinclorac), sedges (sulfentrazone), and broadleaf weeds (traditional broadleaf weed control products) with a single herbicide product. When applied alone, these herbicides are safe on bermudagrass (*Cynodon dactylon*). However, injury has been observed from these combination products. Research was conducted to evaluate Ferromec (PBI Gordon, St. Louis, MO), a liquid nitrogen fertilizer containing iron and sulfur, as a potential safening agent when applying combination products such as Q-4 and Surge. Research was also conducted to evaluate long term weed control of selected combination herbicides including Speedzone (carfentrazone, 2, 4-D, mecoprop, dicamba; PBI Gordon, St. Louis, MO), Speedzone Southern (carfentrazone, 2, 4-D, mecoprop, dicamba; PBI Gordon, St. Louis, MO), Confront (triclopyr, clopyralid; Dow AgroSciences, Indianapolis, IN), and Trimec Classic (2, 4-D, mecoprop, dicamba; PBI Gordon, St. Louis, MO).

Research was conducted at the East Tennessee Research and Education Center - Plant Sciences Unit in Knoxville, TN. Four bermudagrass cultivars, “Tifway” (*C. dactylon* x *C. transvaalensis*), “Yukon” (*C. dactylon*), “Riviera” (*C. dactylon*), and “LaPaloma” (*C. dactylon*) were evaluated for tolerance to herbicide treatments during August 2007. Treatments included Q-4 at 1.7 kg ai/ha (8 pt/a) and 3.5 kg/ha (16 pt/a), Q-4 at 1.7 kg/ha (8 pt/a) plus Ferromec at 2.93 kg/ha (13.6 pt/a), quinclorac (Drive; BASF, Florham Park, NJ) at 1.12 kg/ha (1 lb/a) plus methylated seed oil at 1.8 L/ha (1.5 pt/a), Surge at 1.2 kg/ha (4 pt/a), and Surge at 1.2 kg/ha (4 pt/a) plus Ferromec at 2.9 kg/ha (13.6 pt/a). Each treatment was replicated 3 times in a randomized complete block design. Experimental units were 1.52 by 1.52 meters (5 by 5 feet). An additional trial was conducted to evaluate long term control of buckhorn plantain (*Plantago lanceolata*) and common dandelion (*Taxacum officinale*) with selected combination herbicides with applications made on March 7, 2006. Treatments included Speedzone at 1.23 kg/ha (4 pt/a), Surge at 1.22 kg/ha (4 pt/a), Speedzone Southern at 0.57 kg/ha (5 pt/a), Confront at 0.84 kg/ha (2 pt/a), and Trimec Classic at 0.67 kg/ha (1.75 pt/a). Each treatment was replicated 3 times in a randomized complete block design. Experimental units were 1.52 by 3.05 meters (5 by 10 feet). Herbicides were applied in a water carrier volume of 280 L/ha (30 GPA) with a CO_2 pressurized sprayer and a 101.6 cm (40 inch) boom with a pressure of 125 kPa (18 PSI) and 8002 flat fan nozzles. Turf injury and weed control were evaluated visually on a scale of 0 to 100% (0 = no turfgrass injury or weed control; 100 = complete plant death). Injury ≥20% and weed control <80% was deemed unacceptable.

Q-4 (1.7 kg/ha) injured all bermudagrass cultivars ≤22% 7 days after treatment (DAT). The addition of Ferromec (2.9 kg/ ha) to Q-4 did not reduce injury to Yukon and Tifway, but did reduce injury to LaPaloma and Riviera to ≤8%. Surge (1.2 kg/ha) injured all bermudagrass cultivars ≤20% 7 DAT. Ferromec did not reduce Surge injury except to LaPaloma 7 DAT. Q-4 plus Ferromec reduced injury to the Riviera, LaPaloma, and Yukon cultivars compared to Q-4 alone 14 DAT. However, there was no reduced bermudagrass cultivar injury due to Surge plus Ferromec compared to Surge alone 14 DAT. No injury was observed 21 DAT for any treatment and/or cultivar. These data indicate Ferromec can reduce injury from Q-4 and Surge to some bermudagrass cultivars. However, injury reduction was not consistent across cultivars; and it is likely that environmental conditions such as temperature, humidity, and soil moisture affect injury development. Future research could evaluate additional nitrogen, iron, and sulfur combinations and the potential benefit of other micronutrients. All combination herbicides controlled buckhorn plantain ≥88% 184 DAT. Surge and Confront controlled common dandelion ≥66% 345 DAT, but control was ≤26% with all other treatments. These data indicate all evaluated combination products provide acceptable long-term control of buckhorn plantain; however, Surge and Confront provided greater long-term control of common dandelion.

WEED CONTROL IN COTTON IN STRIP-TILLAGE, NO-TILLAGE, AND CONVENTIONAL TILLAGE SYSTEMS IN THE TEXAS HIGH PLAINS. P.A. Dotray, J.W. Keeling, B. Bean, and L.V. Gilbert, Texas Tech University, Lubbock; Texas AgriLife Research, Lubbock and Amarillo; and Texas AgriLife Extension Service, Lubbock and Amarillo.

ABSTRACT

The number of production acres that have been converted to strip-till or no-till have increased in the Texas South Plains and Texas Panhandle over the past five years. This acreage will likely continue to increase as producers search for ways to reduce inputs due to high energy costs. Reduced tillage also offers a way to conserve rainfall and irrigation water. In order for any cropping system to be profitable, weed control must be achieved. No-till and strip-tillage offer some unique weed control challenges since a dinitroaniline herbicide is not broadcast incorporated. Reduced tillage generally means more reliance on postemergence herbicides. If there is a high selection pressure with few herbicide modes of action, the potential for weed resistance will increase. These challenges must be addressed in order for producers to realize the full benefit of these reduced tillage systems. Not only must weed control options be effective, they must also be economical and sustainable. Strip-tillage provides a means of conserving soil water while providing an effective way to apply fertilizer, establish an excellent seedbed for planting, and protect young cotton seedlings from wind damage. The overall objective was to examine control options in different tillage systems for effective weed management using Roundup Ready Flex cotton. Studies were conducted at the Texas AgriLife Research Center near Halfway, TX. Soil type was an Olton clay loam, with a pH of 7.8 and organic matter less than 2%. The study was conducted using an overhead sprinkler irrigation system and followed corn that was planted in 2006. Sixteen treatments were established in each tillage system using various degrees of soil residual herbicides. Prowl H20 (pendimethalin) at 1.0 lb ai/A was applied to designated plots on April 11 (conventional tillage) or April 26 (strip-tillage and no-tillage). A Krause disk was used to incorporate the Prowl H20 in the conventional tillage plots and a strip-tillage implement was used to incorporate the herbicide and prepare a seedbed. The entire test area was irrigated with 0.75 inches of water on April 26 to incorporate the herbicides in the no-till and inter-row areas of the strip-till areas. ST4554B2F was planted on May 14 using a John Deere MaxEmerge vacuum planter. Caparol (prometryn) at 1.2 lb ai/A was applied broadcast in designated plots on May 14. No tillage by treatment interaction was observed for cotton stand; therefore tillage main effects were examined. Cotton stand was greatest in the conventional tillage plots (2.47 plants per foot) followed by (fb) strip-tillage (2.2 plants per foot) fb no-tillage (1.35 plants per foot). Roundup WeatherMax (glyphosate) at 0.75 lb ae/A was used alone or in tank mix combination with Staple (pyrithiobac) in designated plots on June 8. Control of Palmer amaranth (*Amaranthus palmeri*) was greatest in plots that contained Roundup WeatherMax plus Staple compared to Roundup WeatherMax alone at 14 days after the first POST treatments. A second POST application was made on July 12 to plots where Palmer amaranth was not controlled at least 90%. All plots received this second POST application by August 2. A layby application was made to designated plots on August 15. This treatment consisted of Direx (diuron) alone or in tank mix with glyphosate (glyphosate was added if Palmer amaranth control was less than 95%). End of season Palmer amaranth control in conventional tillage and strip-tillage plots was at least 90% regardless of plots that received several residual herbicides (Prowl H20 fb Caparol fb Roundup WeatherMax plus Staple fb Roundup fb Direx) compared to no residual herbicides (Roundup WeatherMax fb Roundup WeatherMax). When averaged across tillage systems, Palmer amaranth control was greatest in the conventional tillage (94%) and strip-tillage (93%) systems compared to the no-tillage (83%) system. When averaged across tillage systems, lint yield was greatest in the conventional and strip-tillage system (1334 to 1374 lb/A) compared to the no-till system (1134 lb/A). Lint yield in the strip-tillage system ranged from 1196 to 1426 lb/A. Gross returns per treatment in the strip-tillage system ranged from $694 to $827 per acre. Herbicide and application costs were determined per treatment in each tillage system and ranged from $24.64 to $69.53 per acre. Net returns above weed control costs were calculated per treatment in the strip-tillage system and ranged from $644.52 to $784.87. In summary, cotton stand and yield was greater in conventional tillage compared to no-tillage. Cotton stand and yield in strip-tillage was similar to the conventional tillage system and superior to the no-till system. Although different amounts of residual herbicides were used across treatments in all tillage systems, end of season weed control following two applications of glyphosate (Roundup WeatherMax) was at least 90% in all treatments in the conventional and strip-tillage systems and in most of the no-tillage systems. Although the benefit of a residual herbicide was not apparent in this study, the concern of weed resistance must be considered when developing effective long-term weed management strategies.

TOLERANCE OF SEEDLING TURFGRASS SPECIES TO ALS INHIBITING HERBICIDES. S.K. Carter, D.W.Williams, C.H. Slack and W.W. Witt, Department of Plant and Soil Sciences, University of Kentucky, Lexington.

ABSTRACT

Acetolactate synthase (ALS) inhibiting herbicides are commonly used to eliminate weeds from mature turfgrasses. Field trials were conducted from 2004-2006, testing ALS herbicides for preemergence and early postemergence activity on newly seeded turfgrasses, using four species: 'Riviera' bermuda, 'Zenith' and 'Companion' zoysia, 'L-93' creeping bentgrass, and Poa annua L. Data collected were phytotoxicity and percent turf cover. Bermuda and zoysia herbicides were metsulfuron-methyl (42 g ha-1), trifloxysulfuron (29 g ha-1), flazasulfuron (53 g ha-1), foramsulfuron (30 g ha-1), bispyribac-sodium (112 g ha-1), and rimsulfuron (35 g ha-1). Treatments occurred the day of seeding and two-three weeks after seeding. Flazasulfuron, trifloxysulfuron and bispyribac-sodium caused significant damage in all treatments. Data suggests that bermuda and zoysia are tolerant of seedling treatments of foramsulfuron, rimsulfuron, and metsulfuron-methyl at these rates. Bentgrass and P. annua herbicides were foramsulfuron (15 and 30 g ha-1), siduron (2803 g ha-1), bispyribac-sodium (49 g ha-1), and paclobutrazol (281 g ha-1). Treatments occurred the day of seeding, two and four weeks after seeding. Foramsulfuron at 15 and 30 g ha-1 caused significant damage regardless of when it was applied. Data suggests that bentgrass and P. annua are tolerant of seedling treatments of siduron, paclobutrazol, and bispyribac-sodium at these rates.

KEYWORDS: Acetolactate synthase, phytotoxicity, newly seeded turfgrass, preemergence, early postemergence

YELLOW NUTSEDGE (*CYPERUS ESCULENTUS*) CONTROL IN BERMUDAGRASS (*CYNODON* SPP.) TURF. F.C. Waltz Jr. and T.R. Murphy, The University of Georgia, Griffin, GA 30223.

ABSTRACT

Yellow nutsedge (*Cyperus esculentus*) is a perennial grass like herb with three-ranked basal leaves. It forms round, hairless, belowground tubers at ends of whitish rhizomes. Tubers can remain viable for ten or more years. Yellow nutsedge occurs in moist to dry disturbed environments and is widespread throughout the U.S. Because of its yellowish-green leaves and rapid spreading characteristics, yellow nutsedge can become a problematic weed in turfgrass stands. The objective of these studies was to evaluate various herbicides for preemergence and postemergence control in turfgrass.

Three studies were used to investigate herbicide application timing, rate, and reapplication interval. For all studies, herbicides were applied to a 20 year old stand of common bermudagrass (*Cynodon* spp.) infested with yellow nutsedge and mowed at 2 inches. A CO_2 backpack sprayer set to deliver a spray volume of 25 gpa was used to apply all herbicide treatments. All treatments were visually evaluated for nutsedges control and turfgrass injury (data not presented).

Study 1: Herbicides used in Study 1 include Dismiss (sulfentrazone) applied at 0.25 and 0.375 lbs A/A, Echelon (sulfentrazone + prodiamine) at 0.75 and 1.25 lbs A/A, and Pennant (s-metolachlor) applied at 2.5 lbs A/A. A nontreated control was included. All treatments were applied to separate plots on March 9, 2007 (A application) and April 10, 2007 (B application). Both application dates were prior to observable yellow nutsedge emergence and 0% and 35% bermudagrass green-up, respectively.

Study 2: Dismiss was the only herbicide used in Study 2. It was applied at three rates (0.125, 0.188, and 0.25 lbs A/A) and included three reapplication timings with the initial application on June 25, 2007 (A application). Plots were retreated at intervals of four weeks (July 23, B application), five weeks (July 30, C application), or six weeks (August 8, D application) after the initial application.

Study 3: Study 3 evaluated two rates of Dismiss at 0.25 and 0.375 lbs A/A, Monument (trifloxysulfuron) at 0.016 and 0.025 lbs A/A, and Certainty (sulfosulfuron) at 0.035 and 0.059 lbs A/A. Each herbicide and rate was applied as a single treatment only or included a sequential application four weeks after the initial application. Plots were initially treated on July 7, 2007 (A application) and sequential applications were made on August 8 (B application).

From Study 1, it was determined that the herbicides and rates used did not provide acceptable season-long preemergence control of yellow nutsedge when applied to dormant or greening bermudagrass. Echelon at 1.125 lbs A/A had greater than 90% control three months after the March application (June rating), but fell below 70% control, minimally acceptable, by 4 months (July rating). No treatment had better than 80% control two months after the April application, and control diminished for all treatments and rates thereafter.

In Studies 2 and 3, it was determined that effective season-long postemergence control can be achieved with Dismiss, Monument and Certainty. Herbicide rates and reapplication timing can affect longevity of control. From Study 2, when Dismiss was reapplied 28 days after the initial application, greater than 87% control was achieved for an additional 46 days – yellow nutsedge was controlled for 74 days with a sequential application at 4 weeks. Control diminished for the same time interval as sequential applications were extended to five and six weeks after the initial application. Study 3 had similar results for Dismiss, Monument and Certainty. When a sequential application was applied 32 days after the initial, greater than 90% control was observed for all treatments for an additional 31 days. By 73 days after the sequential application, yellow nutsedge control exceeded 80% for all treatments except Certainty at 0.035 lbs A/A.

EFFICACY OF CLEANWAVE (FLUROXYPYR + AMINOPYRALID) FOR DOGFENNEL CONTROL IN FLORIDA PASTURES. M.H. Dobrow, B.A. Sellers, J.A. Ferrell and C.R. Rainbolt, University of Florida-IFAS Agronomy Dept., Gainesville, FL; University of Florida-IFAS Range Cattle Research and Education Center and Agronomy Dept., Ona, FL; University of Florida-IFAS Agronomy Dept., Gainesville, FL; University of Florida-IFAS Everglades Research and Education Center and Agronomy Dept., Belle Glade, FL.

ABSTRACT

Dogfennel (*Eupatorium capillifolium*) is one of the most common pasture weeds in Florida. The standard chemical to control dogfennel is Weedmaster (dicamba + 2, 4-D) at 2.2 kg/ha. Cleanwave (fluroxypyr) is a product that has recently been registered in Florida for dogfennel control in pastures. It is important to determine if Cleanwave will provide consistent control of dogfennel, relative to Weedmaster. Three field experiments were conducted to evaluate Cleanwave as an alternative to Weedmaster for controlling dogfennel in Florida pastures. The first experiment was conducted near Ona, FL in the summer of 2007 to observe if aminopyralid had any effect when tank-mixed with fluroxypyr to control dogfennel (91 cm tall). Fluroxypyr applied alone at 0.28 kg/ha provided 94% control of dogfennel. The addition of aminopyralid at rates ranging from 0.06 to 0.12 kg/ha did not improve dogfennel control compared to fluroxypyr alone. The second experiment was conducted near Ona, Fl in fall to determine the effect of different rates of Cleanwave on dogfennel (155 cm tall) control versus Weedmaster. It was observed that Cleanwave at the rate of 0.40 kg/ha and Weedmaster at 2.2 kg/ha provided 88% and 83% dogfennel control, respectively. The third experiment was conducted near Gainesville, FL in the summer of 2007 to observe if Cleanwave at lower rates coupled with 2, 4-D would give better or the same control as Weedmaster. Cleanwave at 0.15 kg/ha+ 2, 4-D at 2.5 kg/ha and Weedmaster at 2.2 kg/ha 90% control dogfennel. These results indicate that Cleanwave tank-mixed with 2, 4-D are equally as effective on dogfennel as the herbicide Weedmaster.

ARROWLEAF SIDA (*Sida rhombifolia*) CONTROL WITH PASTURE HERBICIDES. T.R. Murphy, Crop and Soil Sciences, The University of Georgia, Griffin.

ABSTRACT

Arrowleaf sida has increasingly become a problem weed in Georgia pastures and hay fields. Although this species has been referred to as a summer annual, it is a tap-rooted perennial. With the onset of frost, this semi woody plant dies back to the ground level. Survival in the United States has been reported as far north as Tennessee. Arrowleaf sida reproduces by seed and regrowth from the taproot. Seed germination and shoot regrowth from the taproot occurs as soil temperatures warm in the mid-spring to early summer months.

The objective of this study was to determine the response of arrowleaf sida to labeled rates of commonly used pasture herbicides

The experimental site was a cattle paddock located at the Central Georgia Research & Education Center in Eatonton, Georgia. The site contained no perennial forage grasses and consisted of crabgrass (*Digitaria* sp.) and arrowleaf sida plants that ranged from 2 to 16 in tall. The taller plants were in the bloom growth stage and appeared to have perennated. Fluazifop-P at 0.25 lbs. ai/a + 0.25% v/v nonionic surfactant was applied to the site 2 wks before the study was initiated to suppress crabgrass growth. The site was not grazed until 8 wks after application (WAA). Selected herbicides were applied to August 2, 2007. Arrowleaf sida density averaged 22% in the untreated check plots. Herbicides were applied with a tractor-mounted sprayer equipped with 8003VS tips and calibrated at 25 gpa. A nonionic surfactant (Activator 90) at 0.25% v/v was added to all herbicides. Plot size was 6 by 30 ft. with a 4 ft untreated buffer located between each plot. Herbicide treatments were arranged in a RCBD with 4 replications. Arrowleaf sida control was visually assessed at 2, 4, 7 and 11 WAA. Data were subjected to ANOVA, and LSD at 0.05 level was used to separate treatment means.

Arrowleaf sida control slowly occurred over time. At 2 WAA, arrowleaf sida control with all herbicides was < 50%. By 4 WAA control with all herbicides was < 70%. Milestone at 7.0 fl. oz/a, Forefront at 2.0 and 2.6 pt/a and Weedar 64 at 2.0 pt/a effectively controlled (> 80%) arrowleaf sida at 7 and 11 WAA. Milestone at 5.0 fl. oz/a provided significantly less control than the previously mentioned herbicides at 11 WAA. Grazon P+D at 2.0 and 3.0 pt/a, WeedMaster at 2.0 and 3.0 pt/a and Weedar 64 at 2.0 pt/a provided better control of arrowleaf sida than Clarity at 1.0 pt/a at all evaluations. Control with Clarity never exceeded 40% at any evaluation. In contrast, control with Grazon P+D, WeedMaster and Weedar 64 was > 90% at 11 WAA. Remedy Ultra at 1.0 (0.5 lb. ae/a) and 2.0 pt/a (1.0 lb ae/a) was not effective for the control of arrowleaf sida . Control was < 50% for both rates of this herbicide at 11 WAA. However, PastureGard at 2.0 pt/acre which contains 0.375 lb ae/a of triclopyr + 0.125 lb ae/a of fluroxypyr provided 85% arrowleaf sida control at 11 WAA. Surmount at 1.5 and 2.0 pt/a and Cimarron Plus at 0.5 and 1.0 oz/a controlled arrowleaf sida > 85% at 11 WAA.

EFFICACY AND BERMUDAGRASS RESPONSE TO NICOSULFURON AND DIURON COMBINATIONS. A.N. Brewe, C.R. Medlin, R.N. Rupp, E.P. Castner; Oklahoma State University, Stillwater, OK, and DuPont Crop Protection, Wilmington, DE.

ABSTRACT

Summer grassy weeds are a major issue in bermudagrass hay pastures. In Oklahoma and Texas, bahiagrass (*Paspalum notatum*), johnsongrass (*Sorghum halepense*), and field sandbur (*Cenchrus incertus*) are among the most common and/or troublesome weeds. Nicosulfuron controls Paspalum sp., Cenchrus sp., Sorghum sp. and other grassy weeds, but has shown issues of crop response in bermudagrass. Yet further research is needed to determine the level of response. Therefore, experiments were established in May 2005, 2006, and 2007 to evaluate weed control efficacy, bermudagrass response, and yield results in bermudagrass using nicosulfuron, metsulfuron, and diuron combinations. Eight locations throughout Oklahoma and Texas were used to evaluate weed efficacy and one weed-free bermudagrass variety trial was used to evaluate bermudagrass response. Treatments included nicosulfuron+metsulfuron (0.623+0.1 or 0.938+0.15 oz/A) applied alone or with diuron (12.8 oz/A), imazapic+glyphosate (0.56+1.125 oz/A), and an untreated check. Sandbur was controlled 85 to 95% at four weeks after treatment with all treatments, but by ten weeks after treatment control ranged from 55 to 80%. At four and ten weeks after treatment a trend of improved sandbur control was apparent when diuron was tank-mixed with nicosulfuron and metsulfuron. At four weeks after application all treatments controlled bahiagrass at least 90%, but by ten weeks after application only the combinations of nicosulfuron+metsulfuron with or without diuron maintained control above 80%. The addition of diuron to nicosulfuron+metsulfuron reduced herbicidal efficacy of johnsongrass 15 to 25% regardless of rate or evaluation date. In the weed-free yield trials, the nicosulfuron+metsulfuron+diuron combination caused more chlorosis one week after treatment, but less bermudagrass stunting by three weeks after treatment than all other treatments. Bermudagrass treated with nicosulfuron+metsulfuron+diuron yielded more biomass than nicosulfuron+metsulfuron or imazapic+glyphosate. Cultivars exhibited differences in sensitivity to all treatments applied.

EVALUATION OF DIFFERENT MULTIMEDIA OUTLETS FOR EXENTSION OUTREACH ON TROPICAL SODA APPLE. J. Mullahey and J. Ferrell, University of Florida, Milton and Gainesville, FL.

ABSTRACT

Tropical soda apple (Solanum viarum Dunal.) is an invasive weed that continues to cause economic losses to the cattle industry, seed and hay producers, and sod farmers. Best management practices (BMP's) have been developed by the University of Florida to control tropical soda apple (TSA) and prevent the spread of this weed. Traditional extension outreach methods such as publications (fact sheets), rancher meetings, popular press articles, and posters were utilized to disseminate the TSA BMP's. Adoption of the BMP's is lacking in some areas partially because the target audience is not educated about the BMP's. Information outreach through extension needs to be evaluated to determine the most effective method(s) for educating land owners. Traditional and non-traditional methods of disseminating information were utilized to determine the most effective method(s) for educating the target audience (ranchers, public land managers, seed producers, sod farmers, etc). Non-traditional outreach methods included the internet, podcasts, streaming video, and radio spots. Extension publications (fact sheets) were listed on the UF IFAS website (http://edis/.ifas.ufl.edu) and in 2007 these publications were viewed over 9200 times. Articles for trade magazines were published addressing the TSA BMP's. Two TSA posters were distributed to educate land owners about controlling and preventing the spread of TSA. Extension specialists presented BMP information during county extension meetings. These efforts successfully reached the audiences associated with those outlet markets. However, the message was not reaching all of the target audience (small and medium size producers, public land managers, non members of the Florida Cattleman's Association, etc). A TSA website (www.tsa.ifas.ufl.edu) was developed to serve as a comprehensive library of information about TSA. This site is viewed over 5500 times per month. Podcasts (1-5 minute) on TSA control were posted on the website along with streaming video about TSA biology, ecology, and control. Podcasts reach a small audience but they can be effective for internet users. Radio broadcasts (30 seconds – 2 minutes) were produced to deliver BMP information. Over 100 radio spots were played throughout Florida annually and the broadcasts covered the counties responsible for about 90% of the total cattle production (1.6 million head of cattle) in Florida. Radio broadcasts were an effective media outlet for disseminating educational information to a broader audience. To reach a diverse audience associated with TSA, different multimedia outlets are necessary for extending educational information on TSA. Multimedia approaches can be costly so extension funding is necessary.

Acknowledgement- USDA-APHIS-PPQ for funding the outreach program.

CULTURAL CONTROL OF YELLOW NUTSEDGE (*CYPERUS ESCULENTUS*) IN TRANSPLANTED CANTALOUPE BY VARYING APPLICATION TIMING AND TYPE OF THIN-FILM MULCHES. **W.C. Johnson, III, USDA-ARS,** Coastal Plain Experiment Station, Tifton, GA.

ABSTRACT

Perennial nutsedges are among the most common and troublesome weeds of cucurbit crops in the southeastern U. S. Both species reduce yield of cucurbit crops and are costly to control. Many cantaloupe and watermelon growers in the southeastern U. S. use a system of hybrid transplants on narrow (40 cm wide) thin-film mulch covered seedbeds, overhead irrigation, and use the seedbeds for only one crop in the growing season. The major objective of weed control in this modified system is to simply prevent yield loss from weeds, with little concern in maintaining the integrity of the thin-film mulch. Cucurbits are aggressive crops that offer the potential to be effective competitors with shade-sensitive perennial nutsedges. Furthermore, transplanting crops creates an artificial size differential that beneficially alters the competitive relationship between crops and weeds. The aggressive growth habit of transplanted cucurbits could be capitalized to suppress emergence of perennial nutsedges through the thin-film mulch.

Irrigated field trials were conducted from 2004 to 2006 at the Coastal Plain Experiment Station Ponder Farm near Tifton, GA. These sites had heavy natural infestation of yellow nutsedge (<75 plants/m2). Treatments evaluated included all possible combinations of four thin-film mulch application times (3-wk pre-transplant, 2-wk pre-transplant, 1-wk pre-transplant, and day of transplanting) and four types of thin-film mulching material (clear LDPE, black LDPE, white on black LDPE, and bareground). Neither fumigants nor herbicides for yellow nutsedge control were applied in this study.

Yellow nutsedge emergence in transplanted cantaloupe was suppressed by the combined effects of a physical barrier provided by thin-film mulches and competitive size differential provided by using cantaloupe transplants. All of the thin-film mulches applied to freshly prepared seedbeds either the day of transplanting or 1-wk before transplanting effectively suppressed yellow nutsedge, without the need for fumigants or herbicides. Yellow nutsedge suppression in bareground seedbeds freshly prepared within 1-wk of transplanting was nearly as effective as suppression from thin-film mulches. Seedbed preparation and applying thin-film mulch 2-wk or 3-wk before transplanting did not effectively suppress yellow nutsedge and cantaloupe yields were reduced by weed competition.

In production systems that feature seedbeds used for only a single crop and the integrity of the thin-film mulch is not overly important, this system of cultural weed control offers potential without having to use fumigants or herbicides. Compressing the crop production events such that seedbed preparation, mulch application, and transplanting are in rapid sequence will alter the competitive relationship between cucurbit crops and perennial nutsedges. This practice is consistent with the principles of weed management in organic cropping systems and can be easily implemented.

CONTROLLING GREENBRIER (*SMILAX SPP.)* WITH HERBICIDES IN RABBITEYE BLUEBERRIES (*VACCINIUM ASHEI*). M. A. Czarnota, Department of Horticulture, University of Georgia, Griffin, GA 30223.

ABSTRACT

There are approximately 15,000 acres of blueberries (*Vaccinium* spp.) grown in the state of Georgia. With many blueberry orchards being established in clear cut forests, the perennial vine known as Smilax or Greenbrier (*Smilax spp.*) can become problematic (Figure 1). Smilax species are mostly evergreen vines with extensive underground rhizome tuber systems (Figure 2), and have been known to be difficult to control with herbicides. Virtually no published information exists on controlling Smilax, and only glyphosate (Roundup®) and hexazinone (Velpar®) are labeled to control Smilax in blueberries. Many growers, because of damage issues, have concerns about using the high rates of glyphosate required to control Smilax in blueberries. Moreover, the potential to damage blueberry plants in the Southeast with hexazinone is high because of low organic matter soils. In the spring and summer of 2007 two experiments were conducted to evaluate herbicides for control of Smilax and safety to Brightwell rabbiteye blueberry (*Vaccinium ashei 'Brightwell'*). In the first experiment several herbicides were evaluated for control of Smilax, and only glyphosate (Roundup®), imazethapyr (Pursuit®), and triclopyr (Garlon®) were providing > 90% control of Smilax 16 weeks after treatment (WAT). A second experiment was conducted to evaluate a dose response of imazethapyr on the control of Smilax and the safety to Brightwell rabbiteye blueberries. At 19 WAT, all rates of imazethapyr tested were providing ≥ 90% control of Smilax, and no injury to blueberries was observed.

PREEMERGENCE HERBICIDE PROGRAMS FOR CONTAINER GROWN LIRIOPE. R.E. Strahan, Y. Chen, and J.S. Beasley, LSU Agricultural Center, Louisiana State University, Baton Rouge.

ABSTRACT

A field study was conducted in late summer 2007 to determine the most effective preemergence programs to manage late season spurge emergence in container liriope production. The study was located at the Green Hills Group Nursery in Glenmora, LA. Liriope were transplanted into 4 inch pots containing a potting mixture of pine bark and rice hulls on August 9. Each treatment consisted of 120 pots placed in plastic trays. Potting media had a natural population of spurge. Herbicides treatments were applied on August 10 and October 12 (8 weeks after initial application (WAI)). Granular herbicides were applied using a shaker jar constructed from a 1000 ml plastic Nalgene container. Liquid herbicides were applied with a CO_2 pressurized backpack sprayer equipped with 8003 XR flat fan nozzles that delivered 25 GPA at 23 psi. Herbicides were incorporated with overhead sprinkler irrigation within 24 hours after application. Visual ratings of spurge control and liriope injury were conducted at 30 day intervals following the initial herbicide application. The experiment was conducted as a randomized complete block with 4 replications. Data were subjected to analysis of variance (P=0.05) and means were separated using Fisher's LSD.

Preemergence herbicide failures in nursery production are often related to the application frequency and time interval between applications. Spurge species are usually among the first weeds to emerge as preemergence herbicides break down (usually 4 to 6 weeks after treatment). In the trial, all treatments provided at least 90% spurge control 8 weeks after treatment. Sequential herbicides were applied 8 weeks after initial treatment (WAI). Again, no significant differences were observed among the herbicide treatments 16 WAI. However, there was a trend of increased spurge control with liquid applications over granular applications. Although herbicides performed well in the trial, periodic hand weeding would have been necessary to maintain spurge free conditions with the exception of Gallery + Pennant treatment. Two applications of Gallery + Pennant maintained 100% spurge control for the duration of the study (August 10 – December 11).

PERENNIAL LANDSCAPE PLANT TOLERANCE TO OVERHEAD APPLICATIONS OF SULFOSULFURON. R.E. Strahan, Y. Chen, and J.S. Beasley, LSU Agricultural Center, Louisiana State University, Baton Rouge.

ABSTRACT

A field study was conducted in 2007 at the Hammond Research Station in Hammond, LA to evaluate the tolerance of landscape plants to over-the-top applications of sulfosulfuron and imazaquin (Image). Container grown plants were transplanted into simulated landscape beds and allowed to establish approximately one month prior to herbicide applications. Treatments were applied on May 27. Herbicides were applied at 2X the labeled rate with a CO_2 pressurized backpack sprayer equipped with three 8005 flat fan nozzles that delivered 60 GPA at 30 psi. Visual injury ratings, plant heights and widths were collected at 7 day intervals following the herbicide applications. The experiment was conducted as a randomized complete block with 4 replications. Data were subjected to analysis of variance (P=0.10) and means were separated using Fisher's LSD.

Four weeks after application, sulfosulfuron caused significant azalea injury when compared to the untreated check. However, symptoms caused by the herbicide were not unacceptable (>15% injury). Imazaquin caused unacceptable azalea injury (38%). Foliar injury symptoms observed were chlorosis and distorted growing points. Effects on flowering were not evaluated in the study.

Injury caused by sulfosulfuron was marginally acceptable for Dwarf Indian Hawthorn (15%). However, hawthorn were severely injured by imazaquin (48%).

Both herbicide treatments significantly injured blue rug juniper when compared to the untreated check. However, sulfosulfuron caused only 4% injury. Injury caused by imazaquin was marginally acceptable.

Dwarf burford holly, variegated and big blue liriope, mondograss, and Asian jasmine were extremely tolerant of sulfosulfuron and imazaquin. Ajuga was intolerant of both sulfosulfuron and imazaquin.

PALMER AMARANTH CONTROL SYSTEMS IN SWEETPOTATO. S.L. Meyers, K.M. Jennings, J.R. Schultheis, D.W. Monks, North Carolina State University, Raleigh, NC, 27695.

ABSTRACT

In 2007 two trials were conducted in Clinton, NC with ‘Beauregard’ sweetpotato (*Ipomoea batatas*) to evaluate flumioxazin and *S*-metolachlor for Palmer Amaranth (*Amaranthus palmeri*) control and sweetpotato crop response. Treatments included flumioxazin preplant at 0, 2.5, or 3.0 oz per acre followed by *S*-metolachlor applied PRE immediately after transplanting or 13 d after transplanting at rates of 0.75, 1.0, or 1.25 pt per acre. Visual crop injury and *A. palmeri* control were rated 3, 4, 9, and 13 wk after application of *S*-metolachlor on a scale of 0 (no injury or no control) to 100% (plant death or complete control). Sweetpotato roots were harvested and graded into jumbo, number ones, and canners. No differences were observed in crop injury among treatments, with injury being less than 6% at harvest. *A. palmeri* control at harvest ranged from 91 to 100% for treatments including flumioxazin at 2.5 or 3.0 oz per acre regardless of *S*-metolachlor rate. When *S*-metolachlor was applied at 1.0 or 1.25 pt per acre alone immediately after transplanting, *A. palmeri* control was 80 and 93%, respectively. Delaying application of *S*-metolachlor at 1.0 or 1.25 pt per acre to 13 d after transplanting reduced control to 35 and 13%, respectively. Yield of number one sweetpotatoes ranged from 35 to 237 Cwt per acre. Yield was similar among treatments of flumioxazin at 2.5 or 3.0 oz per acre (152 to 196 Cwt per acre). When applied alone, *S*-metolachlor applied immediately after transplanting resulted in greater yields than when the same rates were applied 13 d after transplanting. This same trend was observed with *A. palmeri* control.

EVALUATION OF PURPLE NUTSEDGE (CYPERUS ROTUNDUS) MANAGEMENT SYSTEMS IN PEACH ORCHARDS WITH HALOSULFURON, IMAZOSULFURON, SULFENTRAZONE, TERBACIL, AND NORFLURAZON. W. G. Henderson, W. E. Mitchem, and K. M. Jennings; Clemson University, Edgefield, SC, N. C. State University, Fletcher, NC, and N. C. State University, Raleigh, NC.

ABSTRACT

Currently there are no herbicides registered for use in peach orchards that effectively control nutsedge species. Terbacil and norflurazon provide suppression but neither provide adequate control given the currently registered use pattern. Research conducted in North Carolina in 2006 indicated that sequential applications of terbacil may provide good residual control of yellow nutsedge. The manufacturers of halosulfuron, imazosulfuron, and sulfentrazone have expressed interest in developing uses in orchards and these herbicides are known to have activity on *Cyperus* species. Additionally sulfentrazone has provided good control of other common orchard weeds in trials conducted in NC and SC. A test was designed to evaluate these herbicides as part of system approach to managing *Cyperus* species as well as other common orchard weeds.

A trial was conducted in Monetta, SC on peach trees established one year. The peach tree variety was “Topaz” grafted on “Guardian” rootstock. Herbicides were applied using a CO2 pressurized backpack sprayer fitted with 8002 DG TeeJet flat fan nozzles calibrated to deliver 20 GPA at 40 PSI. Treatments consisted of sulfentrazone at 0.25 lb ai A^{-1} + norflurazon at 2.4 lb ai A^{-1} + paraquat, sulfentrazone at 0.19 lb ai A^{-1} + norflurazon at 1.2 lb ai A^{-1} + paraquat applied sequentially, flumioxazin at 0.375 lb ai A^{-1} + paraquat fb halosulfuron at 0.047 lb ai A^{-1}, flumioxazin at 0.375 lb ai A^{-1} + halosulfuron at 0.035 lb ai A^{-1} + paraquat fb halosulfuron at 0.035 lb ai A^{-1}, terbacil at 0.8 lb ai A^{-1} + paraquat applied sequentially, flumioxazin at 0.375 lb ai A^{-1} + paraquat fb imazosulfuron at 0.2 or 0.25 lb ai A^{-1}. The use rate for paraquat was 1 lb ai A^{-1} and X-77 surfactant was used with paraquat, halosulfuron, and imazosulfuron at a rate of 0.25 % v/v. A nontreated check was included for comparison. Herbicide treatments were initiated on May 22, 2007.

Both yellow and purple nutsedge was present at the test site however purple nutsedge was the predominant species (90+ %). Purple nutsedge efficacy was estimated visually as percent control relative to the nontreated check. Peach tree injury was also assessed visually on a scale of 1 to 5 where 1 indicated no visual injury and 5 indicated severe injury with potential for tree death.

The effectiveness of these herbicides varied in their activity on purple nutsedge. On July 10th, sulfentrazone at 0.19 lb A^{-1} + norflurazon at 1.2 lb A^{-1} + paraquat applied sequentially, flumioxazin + paraquat fb halosulfuron at 0.047 lb A^{-1}, and terbacil at 0.8 lb A^{-1} + paraquat applied sequentially controlled purple nutsedge 89, 88, and 93 %, respectively. The remaining treatments controlled purple nutsedge less than 36 %. On August 21, 2007 flumioxazin + paraquat fb halosulfuron at 0.047 lb A^{-1} was still providing 84 % control of purple nutsedge. Control with sulfentrazone at 0.19 lb A^{-1} + norflurazon at 1.2 lb A^{-1} + paraquat applied sequentially provided similar control (60 %). Purple nutsedge control with terbacil + paraquat applied sequentially and flumioxazin + paraquat + halosulfuron at 0.037 lb A^{-1} fb halosulfuron at 0.037 lb A^{-1} provided 56 % and 47 % control, respectively, which was similar to the 60% control provided by sulfentrazone at 0.19 lb A^{-1} + norflurazon at 1.2 lb A^{-1} + paraquat applied sequentially. The single application of sulfentrazone + norflurazon + paraquat and the flumioxazin + paraquat fb imazosulfuron treatments provided 23 % or less purple nutsedge control on August 21, 2007.

The only treatment causing significant tree injury was flumioxazin + paraquat fb halosulfuron at 0.047 lb A^{-1}. Significant chlorosis followed by subsequent defoliation of injured branches was observed on June 26, 2007. The trees began to recover by the August 21, 2007 observation. The injury occurred only on certain limbs. No injury was noted with the other halosulfuron treatment. Although we have no specific explanation for the injury it was obviously related to halosulfuron at 0.047 lb A^{-1}.

The treatments that provided the most effective control while taking into account peach tree injury were sulfentrazone at 0.19 lb ai A^{-1} + norflurazon at 1.2 lb ai A^{-1} + paraquat applied sequentially or flumioxazin + paraquat + halosulfuron at 0.037 lb A^{-1} fb halosulfuron at 0.037 lb A^{-1}.

EFFECT OF AMMONIUM SULFATE AND OTHER ADJUVANTS AS TANK MIX ON THE EFFICACY OF GLYPHOSATE. M. Singh and S.D. Sharma, University of Florida, Lake Alfred, FL.

ABSTRACT

Different adjuvant may vary in their effectiveness for controlling weeds. Inclusion of ammonium sulfate (AMS) may influence the effectiveness of adjuvant system in glyphosate. The addition of AMS to the spray tank overcame the antagonistic effect of the calcium ion and restored glyphosate efficacy. Therefore the study was conducted to examine the effect of AMS on different adjuvant types to improving glyphosate efficacy. Herbicide treatments were applied to broadleaf weeds- Brazil pusley (*Richardia brasiliensis*), Spanishneedles (*Bidens pilosa*), Florida beggarweed (*Desmodium tortuosum*) and pigweed (*Amaranthus retroflexus*), and grassy weeds- guineagrass (*Panicum maximum*), johnsongrass (*Sorghum halepense*) and crowfoot grass (*Dactyloctenium aegyptium*). The percent control values of both weeds were significantly higher with the incorporation of either AMS or adjuvant or adjuvant plus AMS to 370 g a.i./ha glyphosate over no adjuvant or AMS. Percent control of grassy weeds with the addition of either adjuvant achieved 100% control except with glyphosate + L-77 where percent control of guineagrass and Johnsongrass was only 82% and 85%, respectively 1 WAT. Brazil pusley plants were started recovering from the phytotoxic effects at 3 WAT. Percent control of Brazil pusley was significantly reduced at 3 WAT with glyphosate + adjuvant, and glyphosate + adjuvant + AMS. Although percent control of Brazil pusley was reduced with all the treatments but when glyphosate + AMS was applied, the reduction in percent control was very less as compared to other treatments. Percent control of Spanishneedles was increased with time and was highest at 3 WAT. At 3 WAT, complete control of Florida beggarweed, pigweed and that of all grasses, was achieved under all the treatments. Study showed the additional beneficial effect of adding AMS to glyphosate + adjuvant application.

Acknowledgement: Authors thank Gary Test for helping in preparing samples.

EFFECTS OF ACCELERATED AGING ON ITALIAN RYEGRASS (*LOLIUM MULTIFLORUM*) SEED GERMINATION. R. D. Williams and P. W. Bartholomew, USDA-ARS-GRL, Langston University, Langston, OK 73050.

ABSTRACT

Italian ryegrass (*Lolium multiflorum*) is a productive, high quality cool-season forage that is overseeded in warm-season pastures for winter and early spring grazing. However, in some pastures and croplands it can be a serious weed. Italian ryegrass does not form an extensive seed bank and the seed persists less than 3 years when seed are on or near the soil surface. For Italian ryegrass to be persistent in a pasture it must successfully reseed itself, or rely on an ephemeral seed bank with aging seed. The question arises as to the germinability and seedling vigor of aged seed, and the subsequent effect on reestablishment of an annual grass. Seed in the soil or on the soil surface may go through several hydration-dehydration cycles before seed germination occurs. Even dormant seed will imbibe water when available and dry as the soil becomes drier. Earlier we have shown that this hydration-dehydration cycle "ages" seed affecting subsequent germination and/or vigor. This conditioning of seed can also be achieved through 'accelerated aging.' Accelerated aging (subjecting seed to high temperature (41 °C) and high humidity (100%)) reduces germination and seedling vigor. Germination of unaged ryegrass seed and of seed aged for 3 days was between 80 and 95%, whereas the germination of seed aged for 5 day was 60%. Accelerated aging also reduced germination of ryegrass seed subjected to moisture stress. After 7 days, seed germination at -8 bars for control, 3-day and 5-day aged seed was 80%, 40% and 0%, respectively. Accelerated aging for 3 or 5 days reduced seedling growth at 3 and 6 weeks after planting. After 6 weeks total seedling dry weight was reduced by 24% with 5 days of accelerated aging. These results indicated that seed artificially aged lose viability and vigor, have delayed or reduced germination, and the seedlings have less vigor than non-aged seed. Further work is necessary to related accelerated aging of seed to the natural aging of seed under field conditions.

EFFECT OF THE ADJUVANT ACCUQUEST® WM ON THE EFFICACY, SPRAY PATTERNS, AND DROPLET SIZE OF THE HERBICIDES ROUNDUP ORIGINAL MAX® AND HM 0705. E.J. Jones[1], T.W. Eubank[1], J.B. Blessitt[1], D.H. Poston[1], B.W. Alford[2], and R.E. Mack[2], [1]Delta Research and Extension Center, Stoneville, MS, and [2]Helena Chemical Co., Memphis, TN.

ABSTRACT

Field and laboratory studies were conducted to determine the effects of the adjuvant AccuQuest WM at 0.5 % v/v on the efficacy, spray droplet size, and spray patterns of glyphosate formulated as Roundup Original Max® and as HM 0705 when applied with the TeeJet® Extended Range 11002VS spray nozzle. The description of the glyphosate formulations, the adjuvant and the rates applied are shown in Table 1. In the field study, glyphosate was applied in water at the rate of 0.75 to 0.77 lb ai in 15 gallons per acre, which is less than the recommended rate of 1 lb ai/A, in order to detect any increase or decrease in efficacy due to the addition of the adjuvant. Each glyphosate formulation was applied alone and with the adjuvant using a tractor-mounted sprayer at 38 psi with eight nozzles spaced 20 inches apart along the boom. Field applications were over-the-top to four rows each of Roundup Ready® soybeans [*Glycine max* (L.) Merr.] spaced 30 inches apart, 40 feet long with a natural infestation of 1-to 4-inch-tall barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.], 1-to 3-inch-tall pitted morningglory (*Ipomoea lacunosa* L.), 1-to 4-inch-tall hemp sesbania [*Sesbania exaltata* (Raf.) Rydb. ex A.W. Hill], 2-to 4-leaf prickly sida (*Sida spinosa* L.), and 1-to 4-inch-tall pigweed (*Amaranthus sp.*). Treatments were 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 weed control. In the laboratory study, droplet size was determined at the rate of 0.75 to 0.77 lb ai glyphosate in 15 gallons of water for each spray mixture using an Insitec Measurement Systems® laser particle analyzer at 39 psi. Droplet size was determined as the percentage of the spray volume resulting in fine highly driftable droplets less than 144 microns (<144 µ) in diameter. Droplet size determinations were replicated three times in a randomized complete block design. Spray patterns were determined by using a single nozzle centered in a stationary position at 17 inches above a slanted sheet of corrugated metal. Spray mixtures were applied in 600-ml volumes at 39 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 for each position to show a symmetrical spray pattern for each mixture. Glyphosate was applied at the rate of 0.75 to 0.77 lb ai in 15 gallons of water as was used in the field efficacy test. Data were subjected to analyses of variance. Means were separated using Fisher's Protected Least Significant Difference (LSD) at P = 0.05.

In the field study at 2 WAT, percent weed control of the five weedy species in this study using Roundup Original Max with no added adjuvant was 93 to 100% and with the addition of AccuQuest WM was 90 to 100%. Using HM 0705, the percent weed control without added adjuvant was 88 to 100% and with the addition of AccuQuest WM was 89 to 100%. In the laboratory study, the percent of the spray volume in fine highly driftable spray droplets (<144 µ) at 39 psi with Roundup Original Max alone was 41%, plus AccuQuest WM was 34%; and with HM 0705 alone was 35%, plus AccuQuest WM was 31%. The width of the spray patterns with glyphosate, as Roundup Original Max or HM 0705, applied with or without the addition of AccuQuest WM was 50 inches. Results showed with Roundup Original Max that the addition of the adjuvant AccuQuest WM reduced the percent spray volume in fine droplets (<144µ) by 17% and as applied with HM 0705 the addition of AccuQuest WM reduced the volume of fine droplets by 11%. The glyphosate formulation HM 0705 was found to work as well in the field efficacy trials as the formulation of Roundup Original Max and the addition of the adjuvant AccuQuest WM had no effect on the efficacy of these two glyphosate formulations. The spray pattern for each glyphosate mixture was adequate to provide uniform applications with the spray nozzles positioned 20 inches apart along the boom.

Table 1.

AccuQuest WM	Proprietary blend of polyhydroxycarboxylic acids, sulfates, and polymeric deposition agents, Helena Chemical Company. (0.5 % v/v)
HM 0705	Glyphosate, N-(phosphonomethyl) glycine, in the form of its isopropylamine salt, Helena Chemical Company. (0.75 lb ai/A)
Roundup Original Max	Glyphosate, N-(phosphonomethyl) glycine, in the form of its potassium salt, Monsanto Company. (0.77 lb ai/A)

RICE HYBRID RESPONSE TO IMAZAMOX. J.A. Bond, T.W. Walker, and L.C. Vaughn, Mississippi State University, Delta Research and Extension Center, Stoneville, MS.

ABSTRACT

New Clearfield (imidazolinone-tolerant) rice cultivars (‘CL161’, ‘CL131’, and ‘CL171AR’) with enhanced tolerance to imidazolinone herbicides have been released in recent years. The enhanced tolerance of these Clearfield cultivars over their predecessors (‘CL121’ and ‘CL141’) has contributed to a tremendous increase in hectarage planted to Clearfield cultivars in the Midsouth. Hybrid Clearfield rice cultivars, however, exhibit somewhat lower tolerance to imidazolinone herbicides than the newer inbred Clearfield cultivars. Because of the differences in tolerance, the maximum allowable imazethapyr (Newpath) rate is lower for hybrid Clearfield cultivars than for inbred Clearfield cultivars. Imazamox (Beyond) is currently labeled for application to Clearfield rice following two imazethapyr applications to control escaped red rice (*Oryza sativa*). Imazamox can be applied to inbred Clearfield cultivars as late as 14 days after panicle initiation (PI+14 d), but applications to hybrid Clearfield cultivars are restricted to PI. Research was initiated in 2007 at the Mississippi State University Delta Research and Extension Center in Stoneville to compare the response of one inbred and three hybrid Clearfield cultivars to application rates and timings of imazamox.

The hybrid Clearfield cultivars ‘CLXL729’, ‘CLXL730’, and ‘CLXP745’, and the inbred Clearfield cultivar CL161 were drill-seeded on May 1, 2007, at rates of 39 kg/ha for hybrids and 89 kg/ha for CL161. The experimental design was a randomized complete block with four replications. Imazethapyr at 71 g ai/ha was applied to all cultivars in sequential applications when rice reached the one- to two-leaf stage and the one- to two-tiller stage. Treatments included imazamox at 44 and 87 g ai/ha applied at PI and PI+14 d and imazamox at 44 g/ha applied at mid-boot. Crop oil concentrate at 1% v/v was included with all imazethapyr and imazamox applications. Treatments were applied when a majority of plots in the experiment reached the designated growth stage. A nontreated control (no imazethapyr or imazamox applications) was included for each cultivar. Rice injury was visually estimated on a scale of 0 to 100% (0 = no injury and 100 = total plant death) at 14 and 28 days after each imazamox application. The number of days to 50% heading was recorded as an estimate of rice maturity. Rough rice yields were adjusted to 12% moisture content, and whole and total milled rice yields were determined from a subsample of rough rice collected at harvest. Yield data were converted to a percent of the nontreated control for the respective cultivar in each replication by dividing data from the treated plot by that in the nontreated plot and multiplying by 100. Data were subjected to ANOVA with means separated by Fisher’s Protected LSD test at P = 0.05.

Visual injury was <3% for all cultivars at each evaluation. No differences in the number of days to 50% heading were detected among imazamox treatments for CL161. Maturity of the three hybrid Clearfield cultivars varied with imazamox application rate and timing. Compared with the nontreated controls for each cultivar, maturity of CLXL729 was delayed 8 d following imazamox at 44 g/ha applied at mid-boot and 6 d following imazamox at 87 g/ha applied at PI+14 d. The same application rates and timings of imaxamox delayed maturity of CLXL730 and CLXP745 4 and 3 d, respectively. Rough rice yield of CL161 was not negatively impacted by imazamox applications. Rough rice yield was reduced 21 and 33% for CLXL729 following imazamox at 44 g/ha applied at mid-boot and 87 g/ha applied at PI+14 d, respectively. All treatments except PI applications of imazamox at 44 and 87 g/ha reduced rough rice yield of CLXL730. Rough rice yield of CLXP745 was reduced 11 to 31% by all treatments. Rough rice yield, expressed as a percentage of the nontreated control, was lower for CLXP745 compared with CL161 following all imazamox treatments. Imazamox treatments did not affect total milled rice yield of CL161 or the hybrid Clearfield cultivars. Whole milled rice yield was at least 100% of the nontreated control for all cultivars and imazamox treatments except for CLXL729 and CLXP745 following imazamox at 44 g/ha applied at mid-boot. Although this represented a significant reduction in whole milled rice yield compared with other imazamox treatments for the same cultivars, the differences were considered negligible.

Hybrid Clearfield cultivars were less tolerant to imazamox than CL161, and the response to imazamox applications varied among hybrid cultivars. Current labeling only allows imazamox at 44 g/ha to be applied at PI to hybrid Clearfield cultivars. However, in commercial fields, variability in growth stages and irregularities in imazamox application may occur that would make treatments in the current research possible under some circumstances. Consequently, red rice populations should be carefully considered when planning where to plant hybrid Clearfield cultivars. Based on these data, inbred Clearfield cultivars should be planted where red rice densities are high and an imazamox application will likely be required.

PHRAGMITES [*PHRAGMITES AUSTRALIS* (CAV.) TRIN. EX STEUD.] CONTROL WITH AQUATIC HERBICIDES. S.L. True[1], P.L. Hipkins[2], R.J. Richardson[1], and A.P. Gardner[1], [1]Department of Crop Science, North Carolina State University, Raleigh; [2]Department of Plant Pathology, Physiology, and Weed Science, Virginia Tech, Blacksburg.

ABSTRACT

Phragmites is an extremely invasive perennial grass that forms dense monocultures in many aquatic areas of the United States and outcompetes other vegetation including a native Phragmites biotype. Research was conducted in North Carolina and Virginia in 2006 and 2007 to determine the response of invasive Phragmites to selected aquatic herbicides. North Carolina treatments included imazapyr (1.25 and 3.75% v/v), glyphosate (1.66 and 6.64% v/v), triclopyr (5 and 15% v/v), penoxsulam (0.06 and 0.22% v/v), imazapyr (1.25% v/v) plus glyphosate (1.66% v/v), and glyphosate (1.66% v/v) plus penoxsulam (0.06% v/v). Treatments were applied by boat on June 6, 2006 at 285 L/ha spray volume and included 0.25% NIS. Virginia treatments included imazapyr (0.56 and 1.68 kg ai/ha), glyphosate (1.12 and 4.48 kg ai/ha), triclopyr (3.36 and 10 kg ai/ha), penoxsulam (0.06 and 0.24 kg ai/ha), imazapyr (0.56 kg/ha) plus glyphosate (1.68 kg/ha), and glyphosate (1.68 kg/ha) plus penoxsulam (0.06 kg/ha). Treatments were broadcast on June 6, 2006 to unmowed Phragmites at 3 to 4 ft height and on July 6, 2006 to previously mowed Phragmites at 2 to 3 ft height. All Virginia treatments included 0.5% NIS. All trials were visually rated on a scale from 0 to 100, with 0 equal to no control and 100 equal to complete plant death. The North Carolina trial was rated at 8, 16, and 66 weeks after treatment (WAT), while Virginia trials were rated at 8, 12 or 16, and 50 or 54 WAT. All data was subjected to analysis of variance and Fisher's Protected LSD ($P<0.05$) was used for mean separation. In North Carolina at 8 WAT, Phragmites control was greatest at 91 to 100% with both triclopyr rates and 6.64% v/v glyphosate. Control with treatments containing imazapyr ranged 50 to 80%. At 16 WAT, control with all imazapyr, glyphosate, and triclopyr treatments was at least 87%. Control at 66 WAT was at least 97% with imazapyr alone, glyphosate alone, or imazapyr plus glyphosate. Control with other treatments did not exceed 10%. Phragmites was not controlled at any rating interval with the penoxsulam rates evaluated. In the unmowed Virginia trial, control at 8 and 16 WAT was 80% with 10 kg ai/ha triclopyr, but did not exceed 67% with other treatments. At 54 WAT, control was 73% with 4.48 kg ai/ha glyphosate and less than 38% with other treatments. In the mowed trial, control was 73% or less with all treatments at 8 WAT. At 12 WAT, control was 73 to 87% with imazapyr, 4.48 kg ai/ha glyphosate, and imazapyr plus glyphosate. Other treatments controlled Phragmites 60% or lower. Control at 50 WAT was 57 to 63% with 1.68 kg/ha imazapyr, 4.48 kg/ha glyphosate, and imazapyr plus glyphosate. Penoxsulam also did not control Phragmites in either Virginia trial. In summary, Phragmites control was variable across trials. This variability may be attributed to mowing vs. not mowing (i.e. spray interception by standing dead tissue), Phragmites size at application, application method, or presence of standing water in the trial. Additional research is needed to determine the potential impacts of each of these factors on Phragmites control.

PROPAZINE/GLYPHOSATE POSTEMERGENCE COMBINATIONS IN ROUNDUP READY FLEX COTTON. J. W. Keeling, K. S. Verett, J. D. Everitt, and P. A. Dotray, Texas AgriLife Research, Lubbock.

ABSTRACT

Roundup Ready and Roundup Ready Flex cultivars were planted on more than 70% of the cotton acres in the Texas Southern High Plains in 2007. Glyphosate-resistant Palmer amaranth populations have not been identified in this region, but the use of additional herbicide modes of action is essential to avoid weed resistance development. Although not currently registered for use in cotton, propazine could be an effective tank-mix partner with glyphosate due to its efficacy for residual control of a broad range of broadleaf annual weeds, including Palmer amaranth and ivyleaf morningglory.

The objectives of this study were to evaluate postemergence (POST) applications of glyphosate alone or in combination with propazine for improved Palmer amaranth and ivyleaf morningglory control, compare POST application timings and propazine rates in combination with glyphosate in Roundup Ready Flex cotton, and determine the effects of propazine alone and in combination with glyphosate on cotton and yield under weed-free conditions. Glyphosate was applied alone or in combination with propazine at early and mid-POST timings. Propazine rates included 0.5, 0.75, 1.0 lb ai/A and glyphosate was applied at 0.75 lbs ae/A. The test area was treated with trifluralin preplant incorporated (PPI) at 0.75 lbs ai/A and incorporated prior to bedding. Weed control and cotton injury were evaluated 7, 14, and 28 days after treatment (DAT), and end-of-season.

Trifluralin PPI followed by (fb) glyphosate POST improved Palmer amaranth control compared to trifluralin alone. The addition of propazine to glyphosate controlled this weed similarly to glyphosate alone. No difference in Palmer amaranth control was observed between early- and mid-POST timings. Ivyleaf morningglory control was reduced when glyphosate application was delayed to the mid-POST timing. There was a trend to improved ivyleaf morningglory control with propazine/glyphosate POST compared to glyphosate alone. End-of-season ivyleaf morningglory control ranged from 85 to 96 %, and treatments were not as effective as compared to Palmer amaranth control. Although slight (5 to 10 %) cotton injury was observed when propazine was tank-mixed with glyphosate, cotton quickly recovered and no injury was observed 28 DAT. Propazine treatments did not affect cotton yield at any rate or timing.

WEED SUPRESSION IN ROUNDUP READY FLEX COTTON USING CEREAL AND BRASSICACEAE COVER CROPS. G.M. Griffith, J.K. Norsworthy, and S.K. Bangarwa, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

ABSTRACT

Conservation-tillage practices have become increasingly useful in agricultural production systems as a tool for efficient time management and for reducing degradation of natural resources such as soil and air quality. Conventional-tillage systems require increased use of equipment, fuel, and labor and may reduce soil organic matter content, increase water and nutrient run-off, and increase greenhouse gas emissions by increasing fuel use. However, conservation-tillage systems often require intensive herbicide use for weed control because cultivation is minimized in these systems. Alternatives to tillage and intensive herbicide use for weed control may offer economic and environmental benefits and reduce resistance selection from overuse of a single herbicide or herbicide mode of action.

Cover crops may be used in conservation-tillage systems to reduce wind and soil erosion, to reduce run-off and nutrient loss, or to act as physical or allelopathic weed suppressants. The objective of this study was to determine the weed control benefits of cereal and mustard cover crops in Roundup Ready Flex cotton. Our hypothesis was that a fall-seeded cover crop in a Roundup Ready Flex cotton system would reduce the need for an early-season herbicide application, allowing postponement of the first postemergence application.

An experiment was conducted at the Lonn Mann Research Station at Marianna, AR, beginning in the fall of 2006. The experimental design was a split-plot with four replications. Main plot was cover crop [no cover, wheat, turnip, white and brown mustard (Caleinte), and rye]. Subplot was herbicide program [(1) Dual Magnum + Cotoran, PRE followed by (fb) Roundup Weathermax + Staple LX at 4-node cotton fb Roundup Weathermax at 8-node cotton fb Valor + MSMA + Induce postdirected at layby, (2) Roundup Weathermax at 1-node cotton fb Roundup Weathermax + Staple LX at 4-node cotton fb Roundup Weathermax at 8-node cotton fb Valor + MSMA + Induce postdirected at layby (3) Roundup Weathermax + Staple LX at 4-node cotton fb Roundup Weathermax at 8-node cotton fb Valor + MSMA + Induce postdirected at layby, and (4) Roundup Weathermax + Dual Magnum at 1-node cotton fb Roundup Weathermax at 8-node cotton fb Valor + MSMA + Induce postdirected at layby]. Cover crops were planted October 24, 2006. The cotton cultivar ST4554 B2RF was planted May 9, 2007. Weed control and crop injury were visually evaluated throughout the growing season. Seedcotton was harvested at crop maturity. Data were subjected to analysis of variance appropriate for a split-plot design, and means were separated using Fisher's protected LSD (0.05).

Suppression of Palmer amaranth at the 4-node stage of cotton growth was approximately 30% from cover crops alone. The infestation was extremely high, but regardless of cover crop, Palmer amaranth control was 99% at 4-node cotton with Roundup Weathermax alone or mixed with Dual Magnum applied at the 1-node cotton stage, with Roundup Weathermax + Dual Magnum providing 99% control of Palmer amaranth through 8-node cotton compared to 89% control for the same herbicide program without a cover crop. Although cover crops alone failed to control Palmer amaranth later in the season, end-of-season control was 100% with all herbicide programs.

At the 4-node cotton stage, the rye cover crop had suppressed pitted morningglory up to 50% and goosegrass up to 60%. Control with Roundup Weathermax applied at 1-node cotton was 81 to 99% for pitted morningglory and 94 to 100% for goosegrass. Pitted morningglory end-of-season control was 100%, and goosegrass control was at least 95% with all herbicide programs. Visual cotton injury did not differ among cover crops or herbicide programs. Seedcotton yield was not affected by an interaction of cover crops and herbicide programs. However, seedcotton yield was reduced by as much as 490 lb/A by not applying a preemergence herbicide and delaying glyphosate application until the 4-node cotton stage.

In summary, although the cover crops, particularly rye, provided early-season weed suppression, cover crops did not provide adequate weed control to delay herbicide application until 4-node cotton. Therefore, we reject our hypothesis for this one year of data under conditions of very high weed infestations. The experiment will be repeated in 2008.

WEED CONTROL IN TWIN-ROW COTTON. D.O. Stephenson, IV and B.J. Brecke, University of Arkansas, Keiser, and University of Florida, Milton.

ABSTRACT

Research was conducted at the West Florida Research and Education Center near Jay, FL in 2004 through 2007 comparing weed control and cotton lint yield in single- versus twin-row cotton production systems using various plant densities and weed management programs. Single-row (76-cm) and twin-row (spaced 19-cm apart with each set separated by 76-cm) cotton planting patterns were utilized. Plant densities of 3.3, 6.6, and 13.2 plants/row-m were accomplished by hand-thinning 2 wk after emergence (WAE). Weed management programs were 1) One application - glyphosate + *S*-metolachlor (1 + 1.1 kg ai/ha) postemergence 4-lf cotton (POT), 2) Two applications - glyphosate + *S*-metolachlor POT followed by (fb) glyphosate (1 kg ai/ha) early post-directed 6-8 leaf cotton (EPD), 3) Three applications - glyphosate + *S*-metolachlor POT fb glyphosate EPD fb MSMA + prometryn (2.2 + 1.4 kg ai/ha) late post-directed 10-12 leaf cotton (LPD). Herbicides application dates, POT: 2 wk after emergence (WAE); EPD: 5 WAE; LPD: 8 WAE. All treatments were applied with a tractor-mounted compressed-air sprayer equipped with regular flat-fan spray nozzles set to deliver 20 GPA. Deltapine 555 BG/RR was planted. Weeds rated include: Benghal dayflower (*Commelina benghalensis*), browntop millet (*Urochloa ramosa*), Florida beggarweed (*Desmodium tortuosum*), sicklepod (*Senna obtusifolia*), and smallflower morningglory (*Jacquemontia tamnifolia*). Only late-season weed control ratings (18 WAE) are presented. Cotton was mechanically harvested approximately 24 WAE in each year.

Control of Benghal dayflower with twin-rows was greater then single-row for 3.3 plants/m only. No differences were observed for 6.6- or 13.2-plants/m. Two or more herbicide applications were required for 97% or more control. Two or three herbicide applications were needed to provide excellent Benghal dayflower control. Following one herbicide application, Benghal dayflower control was greater in twin-row compared to single-row cotton. Browntop millet control with twin-rows was greater than single-row. Two or more herbicide applications were needed for > 90% control. Florida beggarweed control was 98% or greater regardless of planting pattern, plant density, or number of herbicide applications. Similar to Benghal dayflower, control of smallflower morningglory with twin-rows was greater then single-row for 3.3 plant/m only. No differences were observed for 6.6- or 13.2-plants/m. Two or more herbicide applications were needed for 99-100% control. Sicklepod control was 95% or greater in cotton planted in twin-rows at 3.3 plants/m and for both planting patterns with 6.6- or 13.2-plants/m. Two or more herbicide applications were needed for 99-100% control. Analysis of cotton lint yield indicated that 2004, 2005, and 2007 data could be combined. Twin-row cotton yielded greater than single-row cotton when a plant density of 3.3 plants/m was utilized; however, single-row > twin-row for 6.6 plants/m and no difference was observed for 13.2 plants/m. In 2006, twin-row cotton yielded greater than single-row cotton. Regardless of year, cotton yield was equal among all herbicide applications and all were greater than the nontreated. Control data indicates that excellent control can be expected in a twin-row cotton production system if 3.3 planst/m is utilized. If 6.6 or more plants/m are present, then there is little difference between planting patterns. Also, twin-row cotton is feasible if only one herbicide application is used; however, if more than one is applied, then there is no advantage of twin-row cotton. Cotton lint yield followed a similar pattern as weed control. Twin-row cotton is feasible if low cotton plant densities are utilized. Data indicates that weed control and cotton yield when twin-rows are utilized in a cotton production system can be equal to the results observed if single-rows are used.

EFFECTS OF IMAZAMOX AND GLUFOSINATE DRIFT ON RICE. J.B. Hensley, E.P. Webster, T.P. Carlson, S.L. Bottoms, D.L. Harrell, R.J. Levy Jr., and J.S. Atwal, Louisiana State University AgCenter, Baton Rouge.

ABSTRACT

Two studies were conducted at the LSU AgCenter Rice Research Station near Crowley, Louisiana in 2005 and 2006 to evaluate the effects of simulated herbicide drift on 'Cocodrie' rice. The experimental design for each study was a randomized complete block with four replications in an augmented two-factor factorial arrangement of treatments. A nontreated was added for comparison. Factor A consisted of herbicide rate. The herbicides were applied at drift rates of 12.5 and 6.3% of the labeled usage rate of glufosinate as 24 oz/A of Ignite, 3 and 1.5 oz/A, respectively, and imazamox as 5 oz/A of Beyond, 0.63 and 0.31 oz/A, respectively. Each application was made with the carrier volume varying proportionally to herbicide dosage based on a carrier volume rate of 25 gallons per acre (GPA). The 12.5% herbicide rate was applied with a carrier volume of 3.1 GPA and the 6.3% herbicide rate was applied with a carrier volume of 1.6 GPA. Each application was made with a compressed air tractor driven sprayer calibrated to deliver a constant carrier volume. Speed was adjusted to vary application rate. Factor B consisted of application timings at different growth stages: one-tiller, panicle differentiation (PD), boot, and physiological maturity. Each herbicide was evaluated in a separate study. Rice plant height at harvest and rough rice yield for the primary, ratoon, and total crop were obtained. Total crop yield was calculated as a combination of primary and ratoon crop yields. Rice plant height and primary, ratoon, and total crop rough rice yield data are presented as percent of the nontreated.

Averaged across rates, rice treated with Ignite at PD and boot resulted in a lower plant height at harvest than rice treated at 1-tiller and maturity. Compared with the nontreated, an Ignite application at boot, regardless of rate, reduced primary crop yield. An application of Ignite at 1-tiller, PD, and maturity resulted in little or no difference in primary crop yield, compared with the nontreated. A ratoon crop yield reduction resulted from an application of 3 oz/A of Ignite to rice at 1-tiller and maturity. Averaged across rates, rice treated with Ignite at 1-tiller and boot resulted in lower total crop yield than rice treated at PD and maturity.

Rice plant height at harvest was reduced, compared with the nontreated, when Beyond was applied at 0.63 and 0.31 oz/A at 1-tiller and boot and 0.63 oz/A at PD. Compared with the nontreated, primary crop yield was reduced when Beyond was applied at 0.63 and 0.31 oz/A at 1-tiller and boot and 0.63 oz/A at PD. Ratoon crop yield was 78% of the nontreated when Beyond was applied at 0.63 oz/A at 1-tiller. Rice treated with Beyond at boot, regardless of rate, resulted in an increased ratoon yield of 135 to 156% of the nontreated. Beyond applied at this timing resulted in excess tiller production which did not produce a panicle in the primary crop; however, a panicle was produced on the excess tillers in the ratoon crop causing a yield increase. However, total crop yield was reduced, compared with the nontreated, when Beyond was applied at 0.63 and 0.31 oz/A at 1-tiller and boot and 0.63 oz/A at PD.

This research indicates that drift of either herbicide evaluated in these studies can be detrimental to rice. The primary crop yield was reduced in both studies when a drift event occurred at the boot growth stage. However, in both studies, total crop yield was reduced when a drift event occurred at the 1-tiller and boot growth stages. A drift event to rice at physiological maturity was not detrimental in either study. Applicators should be aware of environmental conditions such as high winds and temperature inversions before applying these herbicides near a susceptible rice crop, especially when the rice is in the 1-tiller and boot stages.

GENOME-WIDE ANALYSIS OF THE NITROGEN STRESS TRANSCRIPTOME OF RED RICE *(ORYZA SATIVA).* M. A. Sales[1], N. R. Burgos[1], B. G. de los Reyes[2], V. K. Shivrain[1], and K. Y. Yun[2, 1]Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72701 and School of Biology and Ecology, University of Maine, Orono, ME.

ABSTRACT

Red rice, a prevalent weed in rice production, competes with cultivated rice for important resources such as nitrogen, the most growth-limiting nutrient in rice production systems. Red rice uptake of even just half of the N requirement of rice would be enough to drastically reduce rice yields and lower economic returns from fertilizer application. In the field, red rice is more efficient in accumulating fertilizer N and translating it into biomass production when compared to cultivated rice. We hypothesize that red rice will accumulate more N and produce higher biomass than rice under greenhouse conditions because of adaptive molecular mechanisms that are absent in rice. To test this hypothesis, this study was conducted to: 1) compare the morphological and physiological responses of red rice and 'Wells' rice under optimum N conditions; and 2) determine the differential expression of genes in red rice under different N conditions by microarray analysis.

Greenhouse experiments were conducted from August to September 2006 and from April to May 2007. The experimental design was a split plot: main plot was a randomized complete block with rice type (Wells cultivar and Stuttgart strawhull red rice) as factor; split plot factor was the N treatment [T_1 (Full N); T_2 (N starvation); T_3 (early N supplementation after N starvation); and T_4 (late N supplementation)]. Plants were hydroponically grown in Yoshida nutrient solution until panicle initiation (R0) when the N stress treatments were implemented. Nitrogen stress was defined as an N sufficiency index (NSI) <95% calculated from chlorophyll meter readings. Starvation and supplementation were the removal and addition, respectively, of NH_4NO_3 in the nutrient solution. Morphological responses including height, tiller number, biomass, and root characteristics such as length, surface area, and number of tips, were determined. Shoot tissue concentrations of N, other essential elements, and total soluble sugars were analyzed to determine physiological response. Total RNA extracted and amplified from shoots was hybridized to a rice microarray of 60-mer oligonucleotides representing ~45,000 rice genes. Greenhouse data were subjected to analysis of variance and means were separated by Student's t-test (α=0.05). For microarray analysis, image analysis and signal quantification were performed using the GenePix Pro® 5.1 software. Transcript regulation was expressed as the ratio of signal intensities between control and stress treatments (T1 vs. T2) and between stress and recovery treatments (T2 vs. T3 or T4).

Red rice was significantly taller, had more tillers and root tips, accumulated higher shoot N, and produced more biomass than Wells rice in both years. Moreover, total soluble sugars, particularly sucrose, were more responsive to varying N levels in red rice than in rice, with the highest accumulation observed when tissue N concentration was at its lowest. The findings suggest a differential response to N stress, which implies the role of soluble sugars as signaling molecules. Differential N metabolism could be reflected in sucrose dynamics. Preliminary genomic analysis exploring these signaling pathways revealed that genes involved in plant defense, sucrose/starch synthesis, the pentose-phosphate pathway, chlorophyll synthesis, and ammonia assimilation were differentially expressed in response to the different N conditions. Functional classification of the responsive genes is ongoing.

MOBILITY OF FIVE HERBICIDES IN SOIL COLUMNS UNDER SIMULATED RAINFALL CONDITIONS. A.C. Hixson, J.B. Weber, and F.H. Yelverton, Crop Science Department, North Carolina State University, Raleigh, NC 27695.

ABSTRACT

Understanding herbicide mobility in soils is necessary to prevent ground water contamination and ascertain efficacy and tolerance of crops and weeds planted at various soil depths. We studied the mass balance distribution of five herbicides (atrazine, flumioxazin, isoxaflutole, mesotrione, and oxyfluorfen) in Candor loamy sand following addition of one pore volume of water to treated hand-packed soil column lysimeters. Our objective was to examine and measure the leaching patterns of atrazine, flumioxazin, isoxaflutole, mesotrione, and oxyfluorfen in Candor loamy sand under unsaturated conditions. Application of each herbicide was made uniformly onto the soil in a cross-hatch pattern in 6 mL of water using a pipette. Simulated rainfall was applied four hours following herbicide application using an apparatus with twelve individual water reservoirs suspended above each soil column each equipped with thirty-five medical needles and air pressure to regulate rainfall intensity. Twenty-four hours later, soil columns were split into halves using a wire, and bioassay analyses with canola (*Brassica napus* L.) were made for each soil depth increment. Canola plants were harvested at each 2.5 cm depth increment 18 days after planting, and compared to nontreated soil columns to calculate percent inhibition values. From these inhibition values, percent of herbicide-applied values were calculated by comparison to a standard curve performed simultaneously. For each soil column, a mobility index (MI = $\sum D \times F$, where D = depth in cm and F = fraction of chemical present) was calculated from the distribution of total chemical detected in the soil profile, normalized to 100% recovered for comparisons. A higher MI indicated more herbicide movement through the soil column. When herbicide mobility, as indicated by the mobility index (MI) where MI_{max} = 27.5, was compared in Candor loamy sand, mesotrione (MI = 5.8) was the most mobile herbicide, followed by, atrazine (MI = 3.0), isoxaflutole (MI = 2.8), flumioxazin (MI = 1.4), and oxyfluorfen (MI = 1.3). As expected, low water solubility resulted in low mobility indicated by flumioxazin and oxyfluorfen movement through soil columns. The amount of time a herbicide has to adsorb to soil particles is an important factor in a herbicide's leaching potential, and because one pore volume was added to soil columns in 8 to 10 hours, our research primarily only allowed rapid sorption.

AMMONIUM PELARGONATE AS A POTENTIAL ORGANIC HERBICDE. C.L. Webber III, L. P. Brandenberger, J.W. Shrefler, L.K. Wells, and K. Shannon, USDA, ARS, SCARL, Lane, OK, Oklahoma State University, Lane and Stillwater, OK, and University of Missouri, Columbia, MO.

ABSTRACT

Weed control is a serious concern for commercial vegetable producers because of the limited number of herbicides available for this group of minor crops and the potential for crop injury. Organic producers of vegetables have an even greater challenge since their weed control tools are limited to cultural methods exclusively. Racer (40% ammonium pelargonate/ammonium nonanoate) is labeled for non-food use and efforts are currently underway to label it as a bio-herbicide for organically grown food crops. The main component of Racer is ammonium pelargonate which occurs in nature and is primarily formed from biodegradation of higher fatty acids. The objective of this study was to investigate impact of application rates and volumes on the weed control efficacy of Racer on endemic weed populations. The field experiment was conducted on fine sandy loam at Lane, OK. The experiment consisted of 9 weed control treatments, which included 2 herbicide rates (7.2 and 10.8 kg/ha) applied at 4 application volumes (164, 327, 655, and 982 L/ha), plus an untreated weedy-check. Racer was applied as a broadcast application using a tractor mounted CO_2 sprayer equipped with four extended range, stainless steel, 1.14 L/min nozzles, on 0.5-m spacings at a spraying height of 0.5 m. To maintain the same spray pattern for each weed control treatment, nozzle pressure was held constant and tractor speed adjusted to achieve the different overall application rates (164, 327, 655, and 982 L/ha). At the time of spraying tumble (*Amaranthus albus* L.) and spiny (*Amaranthus spinosus* L.) pigweed were 2.5 – 3.8 cm tall, carpetweeds (*Mollugo verticillata* L.) were 2.5 cm across, and grasses, goosegrass (*Eleusine indica* L. Gaertn.) and smooth crabgrass [Digitaria isahaemum (Schreb. ex Schweig) Schreb. Ex Muhl.] leaves were 5.1 – 7.6 cm long. Weeds were rated 6 days after treatment for percent weed control. In general, application of Racer produced greater weed control for the broadleaf weed species (tumble pigweed, spiny pigweed, and carpetweed) than the grass weeds (goosegrass and smooth crabgrass). Although all Racer applications produced significantly greater weed control for all weed species compared to the weedy-check, there were no significant differences among Racer applications for grass weed control. Grass weed control ranged from 30 to 52.5% for goosegrass and 22.5 to 52.50% for smooth crabgrass. The range and magnitude of the broadleaf weed control was much greater than the grass weed control. The best weed control for both pigweed species occurred at the 10.8 kg/ha rate applied at 655 L/ha. Carpetweed was very sensitive to Racer, producing 65% weed control at the lowest application rate and volume, and most application rates and volumes producing at least 85% control. The factorial analysis determined that there were no significant differences among application volumes when averaged across the herbicide application rates. Although not significantly different, there was a tendency for pigweed control to be maximized at the 655 L/ha application volume. Weed control for all weed species was significantly greater for the 10.8 kg/ha application rate compared to the 7.2 kg/ha. Whether comparing the impact of application volume (164, 327, 655, and 982 L/ha) or application rates (7.2 and 10.8 kg/ha), weed control was the greatest for carpetweed compared to either the pigweeds or grass weeds. These results indicate that Racer has an excellent potential as an effective organic herbicide if it achieves the proper clearance. As with other contact herbicides, organic and non-organic, Racer provided greater weed control for broadleaf weeds than grass weeds. It is also important to note that Racer provided consistent control across a large range of application volumes[1].

[1] Acknowlegements: The authors thank Falcon Lab, LLC, 1103 Norbee Drive, Wilmington, DE 19803 for provide Racer material for field trials and appreciate Buddy Faulkenberry for maintaining the field experiments and data collection.

REVERSE GENE FLOW FROM RED RICE TO RICE.

V.K. Shivrain[1], N.R. Burgos[1], D.R. Gealy[2], H.L. Black[2], and K.L. Smith[1], [1]Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72701; [2]USDA-ARS, Stuttgart, AR 72160.

ABSTRACT

Little is known about the outcrossing rate and consequences due to gene transfer from wild or weedy relatives to cultivated crops. Gene transfer from weeds to crops could produce weedy individuals that can impact the evolutionary dynamics of weedy populations. Our objectives were to quantify the outcrossing rate from red rice to cultivated rice and evaluate the morphology and fitness of resulting F1 plants. Field experiments were conducted at the Rice Research and Extension Center, Stuttgart and Southeast Research and Extension Center, Rohwer, AR, during 2006 and 2007. Twelve red rice biotypes and Clearfield™ rice 'CL161' were used. Twenty five red rice seeds were planted in the middle of 9-row plot, flanked with four rows of CL161 rice on both sides. Flowering times of red rice biotypes and CL161 rice were documented. CL161 rice seed were harvested at maturity. A sub-sample was planted in field and tested for hybrids. Hybrids were confirmed by DNA analysis. The phenology, morphology, and fitness of F1s were evaluated. Generally, outcrossing rate was highest with brownhull red rice types and lowest with strawhull types. F1 hybrids of CL161 x red rice were uniform in height and flowered 2 - 3 wk later than CL161, regardless of the red rice. Seventy percent of outcrosses produced seeds equal to the RR parent and 40 - 50 % higher than the CL161 rice parent. Seeds of all outcrosses were red, pubescent, shattered at maturity, and germinated >90 %. Gene flow from weedy rice to cultivated rice occurred at similar rates as from cultivated rice to weedy rice. Gene flow rate varied by the type of weedy rice and can produce plants with higher fitness than cultivated rice. Should a transgene escape from a crop to a weedy relative, the transgene can move to a non-transgenic crop via weedy plants harboring the transgene. Therefore, strategies for gene flow mitigation should consider the presence of weedy relatives in the production system during and after the season when herbicide-resistant or other transgenic rice was grown.

MOLECULAR BASIS OF RESISTANCE TO ALS-INHIBITORS IN HAIRY BEGGARTICKS (*Bidens subalternans*). F.P. Lamego, N.R. Burgos, R.A. Vidal, M.A. Sales, and V.K. Shivrain, Federal University at Rio Grande do Sul/CNPq, Brazil; Crop, Soil and Environmental Sciences, University of Arkansas, Fayetteville, AR.

ABSTRACT

Acetolactate synthase (ALS) inhibitor herbicides are widely used worldwide. Consequently, several cases of resistant weeds have been reported. Most cases of resistance to these herbicides involve a modified ALS enzyme with reduced herbicide-binding properties. The *ALS* gene has five highly conserved domains namely C, A, D, B and E. Mutations generating amino acids substitutions at Ala122, Pro197, Val205, Asp376, Trp574 and Ser653 in these domains have been responsible for ALS resistance in several weeds. Beggarticks (*Bidens subalternans*) is one of the most important weeds in soybean fields in Brazil causing yield losses of 30%. Since 1996, beggarticks has been reported as resistant to ALS herbicides. Recent surveys have indicated that herbicide-resistant beggarticks is widespread. The *ALS* gene sequence in beggarticks and mutations associated with resistance to ALS herbicides have not been reported to date. Thus, the objective of this study was to investigate the molecular basis of resistance to ALS inhibitors in beggarticks. Seeds of resistant (R) beggarticks were collected from soybean fields in Goias, Brazil. These fields have been sprayed with ALS inhibitors for at least, 10 consecutive years. The susceptible (S) seeds were collected from a field that has never been sprayed with ALS herbicides, in Rio Grande do Sul, Brazil. Seeds were planted in trays, filled with commercial potting medium, in a greenhouse at the University of Arkansas, Fayetteville, in 2007. Day/night temperatures were generally 30/25 C with a 14/10 h day/night regime. The cross-resistance pattern of R biotype to various ALS inhibitors was evaluated in a separate experiment. Young leaves from confirmed R and S biotypes were collected and total genomic DNA was extracted from individual plants using a modified CTAB protocol. Primer pairs were designed to amplify the ALS gene in three segments: region 1 (C, A and D domains); region 2: (middle region) and region 3 (B and E domains). PCR products were purified using a QiaQuick PCR Products Kit and cloned using TOPO TA Cloning Kit. Colonies with the gene insert were selected, the plasmid was extracted, and the insert PCR-fragment was isolated, and sequenced. The sequences were assembled, aligned and analyzed for the presence of mutations using Sequencher version 4.8 and ClustalW2. The primer pairs used to amplify the first, second and third regions of the *ALS* gene amplified fragments of 700 bp, 550 bp, and 490 bp, respectively. The cloned sequences were compared with ALS sequences in the GenBank, which confirmed that all fragments were part of the *ALS* gene. Beggarticks harbors, possibly, three alleles of the *ALS* gene which agrees with the polyploid nature of this specie. A guanine to thymine mutation encoded the $Trp_{574}Leu$ substitution in one allele of *ALS* in beggarticks. This amino acid substitution has previously been reported in several ALS-resistant weeds. Substitutions of Trp_{574} resulted in high levels of resistance to sulfonylureas, imidazolinones, triazolopyrimidine sulfonanilides and pyrimidinyl thiobenzoates. The resistance known to be conferred by this mutation concurred with the resistance level previously observed at the whole-plant level and in enzyme assays of beggarticks. We conclude that a modified ALS enzyme, with reduced herbicide-binding properties, is responsible for cross-resistance to ALS inhibitor herbicides in R biotype of beggarticks from Goias, Brazil.

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ALLIGATORWEED CONTROL WITH AQUATIC HERBICIDES. A.M. West, R.J. Richardson, A.P. Gardner, and C.W. Batten, Department of Crop Science, North Carolina State University, Raleigh.

ABSTRACT

Alligatorweed [*Alternanthera philoxeroides* (Mart.) Griseb.] is an invasive member of Amaranthaceae that is extremely problematic in many aquatic areas of the southeastern United States. Research was conducted in North Carolina to determine alligatorweed response to selected aquatic herbicides. In field trials, treatments included glyphosate (1% v/v), imazapyr (0.5% v/v), triclopyr (1.5, 3, and 4.5% v/v), imazamox (0.1% v/v), penoxsulam (0.05% v/v), imazapyr plus glyphosate, imazapyr plus triclopyr (1.5% v/v), and triclopyr (1.5% v/v) plus 2,4-D (1.2 % v/v). Treatments included 0.25% NIS, were completely randomized, and were replicated three times. In greenhouse trials, imazamox and penoxsulam were applied to 14 cm alligatorweed at five rates of 35 to 560 g ai/ha and 14 to 196 g ai/ha, respectively. Greenhouse treatments included 0.25% v/v NIS and were replicated 4 times. All trials were visually rated on a scale from 0 to 100, with 0 equal to no control and 100 equal to complete plant death. Field trials were rated at 2, 5, 9, and 56 weeks after treatment (WAT), while greenhouse trials were rated at 4 WAT and harvested for dry weight determination. All data was subjected to analysis of variance and Fisher's Protected LSD ($P<0.05$) was used for mean separation in field trials. Regression analysis with the logistic equation $y=a/1+(x/x_o)^b$ was used with greenhouse results. In field trials at 9 WAT, alligatorweed control was at least 86% with imazapyr, triclopyr, imazapyr plus glyphosate, and imazapyr plus triclopyr. Triclopyr plus 2,4-D controlled alligatorweed 77%, which was similar to other treatments containing triclopyr. Control with other treatments was 35% or less. At 56 WAT, alligatorweed control with imazapyr, imazapyr plus glyphosate, and imazapyr plus triclopyr did not significantly differ and was 88, 65, and 71%, respectively. Control with other treatments did not exceed 30%. In greenhouse trials, control at 4 WAT was at least 90% with 140 to 560 g/ha imazamox and 105 to 196 g/ha penoxsulam indicating that field rates of these herbicides were too low and that alligatorweed does have sensitivity to both.

MESOSULFURON-RESISTANT ITALIAN RYEGRASS IN NORTH CAROLINA. A.C. York, J.B. Beam, and T.G. Pegram, North Carolina State University, Raleigh; L.M. Sosnoskie, University of Georgia, Athens.

ABSTRACT

Diclofop, an ACCase inhibitor, was once the standard for Italian ryegrass control in wheat, but resistance evolved after several years of extensive use. Growers then resorted to use of the commercial premixture of chlorsulfuron + metsulfuron (ALS inhibitors), which typically only suppressed ryegrass. Mesosulfuron, an ALS inhibitor, was registered in 2003 for use in wheat and has since been widely used. Ryegrass control by mesosulfuron has normally been excellent, but control failures were noted in some fields in Lincoln and Union counties of North Carolina in the spring of 2007. Examination of the fields indicated possible resistance. Each field had a history of annual applications of mesosulfuron or chlorsufuron + metsulfuron for several years.

Seed from Italian ryegrass suspected of being resistant to mesosufuron were collected from two farms in Lincoln County and five farms in Union County in the spring of 2007. Seed also were collected from an area in Edgecombe County that had not been exposed to wheat herbicides for over 20 years. Each ryegrass population was examined for response to mesosulfuron, diclofop, and pinoxaden (a recently registered ACCase inhibitor). Each herbicide was applied at rates ranging from 0.25 to 32 times the field use rate in a greenhouse study conducted during the fall of 2007. Seed were planted in excess in plastic pots containing potting mixture and thinned to eight plants per pot shortly after emergence. Herbicides were applied in a spray chamber delivering 24.5 GPA at 30 PSI. Plants averaged 4 inches tall with two tillers when treated. Shoot fresh weights were recorded 21 days after treatment. Treatments were replicated three times, and the experiment was repeated. The range of herbicide rates was insufficient for developing traditional dose-response curves as 50% reduction was not obtained with some populations. Differences between the susceptible check and the suspect populations at the 0.25, 1, 4, and 16X rates for each herbicide were evaluated by comparing 95% confidence intervals around the population means and by performing non-parametric Mann-Whitney tests.

The six suspect populations were much less susceptible to mesosulfuron than the susceptible check. Mesosulfuron at the 1X rate reduced fresh weight of the check population 92% compared with 8 to 60% reduction of the suspect populations. With four populations, mesosulfuron at the 16X rate reduced fresh weight only 34 to 63%. Diclofop at the 16X rate reduced fresh weights of five of the six populations 34% or less compared with 86% reduction of the check population by the 1X rate. Fresh weight of the sixth population was reduced 49 and 97% by diclofop at 1X and 16X rates, respectively. Five of the six populations were also less susceptible to pinoxaden. Fresh weight reduction of the population least resistant to diclofop did not differ from fresh weight reduction of the check. However, pinoxaden at the 1X rate reduced fresh weight of the other five populations only 22 to 53% compared with 98% reduction of the check. In a separate experiment, each population was found to also be resistant to imazamox. These results indicate multiple resistance to ALS inhibitors and ACCase inhibitors.

WINTER ANNUAL WEED DISTRIBUTION AND GROWTH IN NORTH CAROLINA CROPPING SYSTEMS. W.J. Everman, S.B. Clewis, D.L. Jordan, and J.W. Wilcut, North Carolina State University, Raleigh.

ABSTRACT

Winter annual weeds have become more prevalent in North Carolina. Mild winters provide the opportunity for year round growth and production practices in North Carolina allow a long period of un-interrupted weed growth after harvest. Cover crops for weed suppression are not common in most areas of the state. Soil and weather properties create distinct areas within the state, Northeast, Southeast, Southwest, and Northwest. The increased adoption of conservation tillage has made winter annual weed control more important in recent years. The objectives of this study were to survey winter weed density and growth in corn, cotton, peanut, soybean and tobacco fields as well as to determine if winter weed density and growth is determined by crop or geography. Fields in 4 geographic regions were identified for use in the survey. Fields following corn, cotton, peanut, soybean, and tobacco were used. Measurements were recorded every two weeks from November through February. Measurements consisted of weed density, leaf number, height or diameter, and dry weight. Measurements were taken in one meter square areas at nine points distributed throughout the field. Data presented are averaged over location, counting date, and point within a location. Weed species varied in geographical distribution within a crop. Cudweed and horseweed were generally greater following a corn crop than following any other crop. Annual bluegrass density was greatest in number in 4 of the 5 crops. Leaf number varied due to geography within a crop, with the least number of leaves generally occurring in the Northwest region of the state. Weed numbers were lowest (excluding annual bluegrass) in tobacco. Weed size was greater for most species in tobacco. In peanut, annual bluegrass was most prevalent in the Southeast region while henbit and common chickweed were most common in the Northeast. Winter annual weed density and growth is greatly affected by geography and crop. Weed densities were generally greatest following cotton, and lowest following soybeans. Annual bluegrass, henbit, and common chickweed were present in the greatest densities regardless of crop. Winter annual weed sizes were most variable in cotton and showed the most consistency following corn and tobacco. These trends may be due to the harvest timing of the crop. In North Carolina tobacco and corn are harvested by the end of August, while cotton is generally harvested by the end of October.

BROWN FLATSEDGE (*CYPERUS FUSCUS*): A POTENTIAL RICE WEED. C.T. Bryson and R. Carter, USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS 38776 and Department of Biology, Valdosta State University, Valdosta, GA 31698.

ABSTRACT

Brown flatsedge (*Cyperus fuscus* L.) is native to Europe, Asia, Indian subcontinent, and the Mediterranean Region of Northern Africa, from Greenland and Iceland to China, south to Spain, Iran, Egypt, Algeria, and northern India. It was apparently introduced into North America in ballast or around wharfs and was first discovered in the U.S.A. in 1877. Since that time, brown flatsedge has been discovered in Canada and several states of the U.S.A., including Arkansas, California, Connecticut, Kansas, Maryland, Mississippi, Missouri, Nebraska, Nevada, New Jersey, Pennsylvania, South Dakota, and Virginia. In addition to the association with ballast and wharfs, dispersal of brown flatsedge seeds has been attributed to waterfowl and human activities, including construction equipment. Brown flatsedge was reported as a weed in semitropical areas of the old world where it is a significant weed in rice. Because bownscale sedge was recently detected in the rice production areas of the Delta Region, research was initiated at Stoneville, Mississippi to study the basic biology and ecology of brown flatsedge. Field observations were made at three sites, Chicot County, Arkansas and Pearl River and Washington counties, Mississippi. Observations were made from early spring until frost from 2003 through 2007. Experiments were established in the greenhouse to determine growth parameters and the reproductive potential of brown flatsedge. Brown flatsedge seed were collected form Washington County, Mississippi during the fall of 2006 and planted during the summer of 2007. Plants were grown in the greenhouse for 10 weeks and plant height, diameter, and number of leaves per plant, and days to first flower were recorded. All plants were harvested and dry weights were recorded for roots, leaves, culms, bracts, and inflorescences. Field observations at the three sites in Arkansas and Mississippi, determined that brown flatsedge was highly dependent on persistently moist soil or shallow standing water for establishment, growth, and seed production. Over a five-year period under natural field conditions, brown flatsedge plants germinated from late March and early April until frost. Inflorescences were observed as early as May and seed production continued until frost. In greenhouse experiments, ten-week old brown flatsedge plants were30.2 cm tall and 63.9 cm in diameter and dry weights were 1.4, 2.0, 1.0, 0.5, 1.9 g for roots, leaves, culms, bracts, and inflorescences, respectively. The first brown flatsedge culm appeared at week five and all plants were producing seed by week nine. Brown flatsedge seems to be in the lag phase and could pose a threat to rice agriculture in Arkansas, California, Louisiana, Mississippi, Missouri, Tennessee, and Texas. Additional research is needed to determine the ecological range potential and to develop control methods for brown flatsedge.

EVALUATION OF METOLACHLOR AND MESOTRIONE IN SWEET SORGHUM. W. K. Vencill and J. G. Masabni; University of Georgia, Athens and University of Kentucky, Princeton.

ABSTRACT

Sweet sorghum is a minor-use crop with potential for biofuel production in many areas in the U.S. Very few herbicides are currently labeled for use in sweet sorghum due to the reluctance of pesticide companies to register chemicals. Field studies were initiated to examine the tolerance of sweet sorghum to mesotrione and metolachlor combinations in sweet sorghum in a paired trial in Princeton, KY, Athens and Blairsville, GA.

In Kentucky, the experimental design consisted of a randomized complete block with three replications. Mesotrione was applied alone at three rates (105, 210, and 420 g ai/ha) and in combination with s-metolachlor applied at 1390 g ai/ha two weeks prior to planting (PRPL) and PRE at planting. Concep III-treated sweet sorghum cultivars, 'Dale' and 'M81-E', were seeded immediately after PRE herbicide application. In Kentucky, one row of 'Dale' and one row of 'M81-E' was planted in each plot. 'M81-E' was planted throughout the study at both Georgia locations. At harvest, plants were cut at ground level and whole plant fresh weight was measured for each cultivar separately at all locations. Data was analyzed via SAS using standard ANOVA. Treatment means were analyzed using orthogonal contrasts of mesotrione application (PRPL vs. PRE), mesotrione plus s-metolachlor application (PRPL vs. PRE), and overall application timing (PRPL vs. PRE) in addition to Fisher's Protected LSD at the 0.05 level.

In Kentucky, at 22 days after PRPL, sweet sorghum was 3.8 to 5 cm tall. At this date, visual injury ratings were taken for both cultivars combined. No stunting was observed in any treatment at 22 days after PRPL. The highest bleaching counts were found with mesotrione 420 g ai/ha applied PRE alone or tank-mixed with s-metolachlor. Bleaching ranged from 15-22%. No significant bleaching levels were observed with the lowest rate of mesotrione tank-mixed with s-metolachlor . In general, more bleaching instances were observed in the PRE timing than with the PRPL timing. Overall, there was significantly more sweet sorghum plants per plot, greater height, and less visual injury from mesotrione applied PRPL versus a PRE application. There were no significant varietal differences observed. It appears that sweet sorghum totally recovered from any initial injury whether treatments were applied PRPL or PRE. At 29 DAT, sweet sorghum cultivars were at the 3 to 4 leaf stage and 25.4-35.6 cm tall. No bleaching or stunting was evident in any plot at this date either. None of the herbicide treatments applied on either date resulted in significant yield reduction compared to the handweeded control. However, sweet sorghum treated with mesotrione applied PRPL resulted in higher yields than mesotrione applied PRE. Sweet sorghum yields of the two cultivars were similar and ranged from 48 to 65 kg/plot for 'Dale' and 45 to 65 kg/plot for 'M81-E'.

There was no treatment by location interaction for the two Georgia locations so crop injury and yield data were combined. In both Georgia locations, crop injury was <20% 8 WAP for except for the 420 g/ha mesotrione rate where injury was 20-25%. There was no statistical difference in visual injury or yield from mesotrione application timing. At both Georgia locations, weed control increased with mesotrione rate. Large crabgrass, sicklepod, and tall morningglory control ranged was >80% late-season (71 DAP) from both the 210 and 420 g/ha rate of mesotrione when applied alone and with s-metolachlor. Metolachlor improved weed control from the 105 g/ha rate of mesotrione, but not the 210 and 420 g/ha mesotrione rates.

This study indicated that mesotrione and s-metolachlor applied alone or in tank mixes are safe herbicides for use in sweet sorghum. The sweet sorghum displayed generally good tolerance to mesotrione although visual injury was present for several weeks at the highest rate.

WEED SUPPRESSION CHARACTERISTICS OF A PRE-BREEDING U.S. RICE LINE (4484-1693) DERIVED FROM CHINESE INDICA GERMPLASM. D. R. Gealy and W. Yan, USDA-ARS, Dale Bumpers-National Rice Research Center, Stuttgart, AR.

ABSTRACT

High-yielding long-grain indica germplasm introduced from China is being improved at the Dale Bumpers National Rice Research Center through mutation breeding techniques. This paper reports a number of desirable agronomic and weed-suppression characteristics of the line 4484-1693 under drill-seeded irrigated rice production conditions in the southern U.S. Seed of the Chinese indica line 4484 (P1 615022) was mutated with gamma rays (30 kR). In 2004, line 4484-1693 was selected from the M4 generation. It is a semi-dwarf plant type (~100 cm in height) with reduced lodging potential. Cooking quality (amylose content ~24%) is similar to that of Dixibelle and Sabine. In Uniform Rice Research Nursery tests in Arkansas, Louisiana, Missouri, Mississippi, and Texas in 2006 and 2007, rough rice yields of 4484-1693, coded RU0603075 in those tests, were similar to other elite U.S. cultivars. Tolerance to blast and other major rice diseases, however, was usually superior to that found in the U.S. cultivars. Field tests in Arkansas in 2007 have shown that both 4484 and 4484-1693 suppress barnyardgrass (*Echinochloa crus-galli*) nearly as well as do the most weed-suppressive allelopathic or hybrid rice cultivars. The combination of high yield potential, broad resistance to rice blast disease, and good to excellent weed suppression characteristics suggests that this mutated indica germplasm line will be useful to the U.S. rice industry. Release of 4484-1693 as a commercial cultivar is anticipated in 2008.

RESPONSE OF WATERHYACINTH TO TRICLOPYR.K.A. Langeland, K.M. Vollmer, J.A. Ferrell, University of Florida, Gainesville, FL.

ABSTRACT

Waterhyacinth is detrimental to aquatic environments and hinders the use of water resources. Control of this species is essential to Florida's aquatic resources. Diquat and 2,4-D are the primary herbicides used for wateryhacinth control. However, triclopyr-amine is registered for use in aquatics as Renovate. The objective of this research was to determine if triclopyr-amine could be applied at low enough rates to be both efficacious and cost competitive with diquat and 2,4-D. Diquat was applied at rates of 0.25, 0.50, 1.00, and 2.00 lbs./A; 2,4-D was applied at 0.39, 0.78, 1.56, and 3.12 lbs./A; ad triclopyr-amine was applied at 0.37, 0.75, 1.50, and 3.00 lbs./A. Herbicide efficacy was visually rated at 7, 14, 21, 28, and 35 days after application. A scale of 0 to 100% was used to rate each plot, 0 being no control and 100 being total control. All three herbicides reduced the growth of waterhyacinth, but the best results were obtained at higher rates. Diquat applied at a rate of 0.5 lbs./A, 2,4-D at 1.56 lbs./A, and triclopyr-amine at 1.5 lbs./A provided >90% waterhyacinth control 35 days after treatment. Triclopyr applications provided excellent waterhyacinth control, but were no more effective at lower rates when compared to diquat and 2,4-D. At costs of about $14/gal for 2,4-D and $100/gal for diquat and triclopyr-amine, results show that triclopyr-amine is not more cost effective.

GLYPHOSATE RESISTANT HORSEWEED CONTROL IN DICAMBA-GLYPHOSATE RESISTANT SOYBEANS. R.M. Hayes, L.E. Steckel, M.A. Thompson, The University of Tennessee, Jackson, TN and R.F. Montgomery, Monsanto, Union City, TN.

ABSTRACT

Glyphosate resistant horseweed control was evaluated at two locations in Tennessee during 2008. One location was at Agricenter International, Memphis, TN and the other was near Union City, TN. At Agricenter, glyphosate as Roundup WeatherMax at 32 oz/ac plus dicamba as Clarity at 8 oz/ac was applied on PRE on June 8 and POST on July 7, 16, and 26. GR horseweed was controlled ≥94% throughout the season. Slight (≤10%) soybean leaf burn, typical of surfactant injury. was observed 8 DAT, but declined rapidly. At Union City, no soybean injury was observed at any application, including a single application of Clarity at 48 oz/ac or a total Clarity rate of 56 oz/ac. There was no crop injury typical of synthetic auxin herbicides at either location. There was no advantage in GR horseweed control for increasing Clarity rate above 16 oz/ac. Including Clarity at 8 oz/ac with the Roundup WeatherMax improved GR horseweed control from 68 to 89%. Clarity included in early- and late-POST treatments improved GR horseweed control over a mid- and late-POST treatment with Clarity. Because the planting at Union City was delayed until June, when the horseweed were 18 inches tall and the density was >20 m^{-2} , multiple application were required to achieve season long control, and even then control was not more than 95%. There was no advantage to the addition of Authority First PRE prior to Roundup plus Clarity POST over treatments with Roundup plus dicamba POST at 16 oz/ac. Clearly, the broader application window for glyphosate plus dicamba with dicamba-glyphosate resistant soybeans is advantageous in managing glyphosate resistant horseweed, and potentially other weeds.

GLYPHOSATE-RESISTANT HORSEWEED CONTROL IN SOYBEAN UTILIZING FALL- AND SPRING-APPLIED PROGRAMS. J.B. Blessitt, D.H. Poston, T.E. Eubank, V.K. Nandula, Mississippi State University, Delta Research and Extension Center, Stoneville, MS 38776.

ABSTRACT

Field trials were initiated at Elizabeth, MS in 2005 and 2006 to evaluate fall applications of preemergence (PRE) herbicides for control of horseweed (Conyza canadensis) relative to the standard spring burndown recommendation of 0.867 kg ae ha-1 glyphosate + 0.841 kg ai ha-1 2, 4-D + 0.072 kg ai ha-1 Valor. The selected site was a silt loam with a dense population of glyphosate-tolerant horseweed. Plots were 3m by 10m and planted to MG IV soybean on 38cm rows in mid-April of 2006 and 2007. Spartan 4F, Command 3ME, Prowl H2O 3.8SL, Python 80WP, Sencor 75DF, Valor 51DF, Canopy 75DF, and FirstRate 84WG were applied late-October to mid-November the year prior and the spring burndown standard was applied late February both years. Horseweed control was visually rated on a percent basis in February and March. Horseweed biomass was recorded from two 1m2 areas within each plot in April of each year. Plots were harvested with a small plot combine and weights were adjusted to 13% moisture. Horseweed control in February ranged from 0 to 99% and was similar across fall PRE treatments with the exception of Prowl H2O, which provided only 74% control. Control ratings in March showed control by Valor was exhausted as well. Biomass quantification at planting proved soybean in Prowl and Valor plots had greater horseweed competition than plots treated with other fall PREs. Soybean yields in 2006 were highest in plots which received the spring burndown. Fall PREs were not similar to one another; yields in plots which received Prowl H2O and Valor were lower than other fall PRE treatments. Soybean yields in 2007 were similar between the spring burndown application and plots treated in the fall with Python, FirstRate, and Canopy herbicides. The trials illustrate potential of fall-applied PREs in areas where the standard spring burndown is risky or coverage is hindered by dense populations.

CONTROL OPTIONS FOR GLYPHOSATE-TOLERANT ITALIAN RYEGRASS IN SOYBEAN. D.H. Poston, C.H. Koger, T.E. Eubank, J.B. Blessitt, V.K. Nandula, and R.C. Bond, Delta Research and Extension Center, Mississippi State University, Stoneville, MS 38776.

ABSTRACT

Several populations of Italian ryegrass (*Lolium multiflorum* Lam.) have been identified in the Mississippi delta that can no longer be effectively controlled with glyphosate. Glyphosate-tolerant (GT) Italian ryegrass populations could limit the use of affordable glyphosate-based burndown programs and complicate pre-plant weed control decisions.

Field studies were initiated in fall 2005 and fall 2006 near Stoneville, MS to evaluate the potential of using fall-applied residual herbicides to control glyphosate-tolerant (GT) Italian ryegrass in soybean. The site was disked and chisel plowed in early fall 2005 and disked and field cultivated in early fall 2006 prior to conducting the study. Herbicide treatments were applied in mid-November both years. Residual herbicides were applied in combination with 0.53 lb ai/a glufosinate to remove any vegetation that had emerged in the test area following early fall tillage. Residual herbicide treatments in 2005 were 0.19 and 0.25 lb ai/a sulfentrazone, 1 lb ai/a clomazone, 0.15 and 0.23 lb ai/a KIH-485, 1.24 lb ai/a pendimethalin, 0.067 lb ai/a flumetsulam, 0.125 lb ai/a imazaquin, 0.5 lb ai/a metribuzin, 0.064 and 0.08 lb ai/a flumioxazin, 0.12 lb/a sulfentrazone + 0.024 lb ai/a chlorimuron, 0.032 lb/a metribuzin + 0.054 lb/a chlorimuron, 0.032 lb ai/a diclosulam, 1 lb ai/a linuron, 0.04 lb ai/a cloransulam, 1.6 lb ai/a s-metolachlor, 1.5 lb ai/a norflurazon, and 0.2 lb ai/a oxyfluorfen. Residual herbicide treatments in 2006 were 1 and 1.5 lb ai/A trifluralin applied PPI; 0.95 and 1.42 lb/A pendimethalin applied PPI and PRE; 0.95, 1.27, and 1.6 lb/A s-metolachlor applied PRE; 0.5, 0.75, and 1 lb/A clomazone applied PRE; 0.031, 0.044, and 0.147 lb/A KIH-485 applied PRE; and 0.063 lb/A flumioxazin applied PRE. Glyphosate at 1.13 and 2.25 lb ae/A; glyphosate at 0.77 lb ae/A + 0.125 lb ai/A clethodim; paraquat at 0.75 and 1.0 lb ai/A + 0.25% v/v NIS; and 0.53 lb/A glufosinate were also applied in mid-February for postemergence comparisons in 2007. A nontreated control was also included both years. Tillage alone and glufosinate alone applied in fall were also evaluated in 2007. Paraquat at 1.0 lb/A + 1% COC was applied to the entire test area just prior to planting each year. Planting could not have been achieved in many plots without this treatment. This treatment facilitated planting, but Italian ryegrass generally recovered several weeks after planting both years and competed vigorously with the soybean crop.

Italian ryegrass control in mid- to late-March each year was 90% or greater with 1.0 lb /A clomazone, 0.95 lb/A or higher s-metolachlor, and 0.147 lb/A or higher KIH-485. Italian ryegrass control with 0.063 lb/A flumioxazin was 63 and 45% in mid-March 2006 and 2007, respectively. All other treatments evaluated in 2006 except metribuzin + chlorimuron (89%) provided 75% or less Italian ryegrass control. Italian ryegrass control in mid-March 2007 was 94% with 1.5 lb/A trifluralin applied PPI. Control in mid-March with fall-applied tillage or glufosinate alone was 43 and 38%, respectively. Italian ryegrass control in mid-March with the postemergence treatments evaluated in 2007 ranged from 30% with 1.13 lb ae/A glyphosate to 88% with 1 lb ai/A paraquat + 1% COC. Despite good levels of initial control with paraquat, ryegrass recovered quickly to compete with soybean. Maximum soybean yields were achieved both years with clomazone, s-metolachlor, and KIH-485 applied in the fall. The only other treatment to produce similar yields was 1.5 lb/A trifluralin applied PPI in fall 2007. Soybean yields with these programs were 5 to 11 bu/A higher than with the best February-applied postemergence program suggesting that GT Italian ryegrass may be most effectively controlled in the fall with residual herbicides. Additionally, trifluralin PPI in conjunction with fall tillage may represent one of the most cost-efficient methods of controlling GT Italian ryegrass.

GLYPHOSATE-RESISTANT HORSEWEED CONTROL IN COTTON PRODUCTION SYSTEMS USING FALL- AND SPRING-APPLIED HERBICIDE PROGRAMS. T.W. Eubank[1], D.H. Poston[1], C.H. Koger[1], V.K, Nandula[1], J.B. Blessitt[1], and R.C. Bond[1, 1]Delta Research and Extension Center, Mississippi State University, Stoneville, MS 38776.

ABSTRACT

Weeds present at emergence detrimentally affect cotton (*Gossypium hirsutum*) yield. Producers typically apply non-selective herbicides for the control of these weeds prior to planting. Glyphosate-resistant weeds, such as horseweed (*Conyza canadensis*), have complicated control options for producers attempting to manage these weeds. In the event of herbicide failure, at planting options are limited for the control of glyphosate-resistant horseweed due to plant back restrictions. Glufosinate at planting and fall-applied cotton herbicides may give producers an alternative option for the control of horseweed.

Studies were conducted from 2006 – 2007 near the Delta Research and Extension Center in Stoneville, MS on a Dundee very fine sandy loam with a pH of 6.1 and organic matter content of 1.2%. Investigations were made to evaluate the efficacy of spring burndown tank-mixes versus at planting applications with glufosinate for the management of glyphosate-resistant horseweed. Early preplant (EPP) burndowns for the control of horseweed were evaluated using glyphosate (0.9 kg ae/ha), and paraquat (0.7 kg ai/ha) alone and in tank-mix combinations with either dicamba (0.28 kg/ha), flumioxazin (0.07 kg/ha), prometryn (2.24 kg/ha), or diuron (0.84 kg/ha) and glyphosate (0.9 kg ae/ha) + dicamba (0.28 kg/ha) + flumioxazin (0.07 kg/ha), in a split plot arrangement with EPP treatments as main plot and glufosinate (0.6 kg/ha) at planting as subplot with four replications. Glyphosate and paraquat alone gave poor control of horseweed at 59% and 53% 14 days after treatment (DAT), respectively; however, the addition of dicamba significantly improved control to 90% and 87% (28 DAT), respectively and were comparable to glyphosate + dicamba + flumioxazin 93%. The addition of glufosinate at planting significantly improved horseweed control (28 DAT) and cotton yields across all treatments compared to treatments without glufosinate at planting with the exception of glyphosate + dicamba and glyphosate + dicamba + flumioxazin.

Separate studies were conducted at the same location and during the same time interval to evaluate the use of fall-applied preemergence cotton herbicides for horseweed control. Residual herbicides were applied on November 2, 2005 and October 24, 2006. Treatments were tank-mixed with 0.6 kg/ha glufosinate to remove existing vegetation at the time of application. Visual control ratings taken at planting the following spring showed all treatments were significantly better than the nontreated with trifloxysulfuron (0.01 kg/ha), trifloxysulfuron (0.01 kg/ha) + prometryn (1.12 kg/ha), and clomazone (1.12 kg/ha) giving 100% control of horseweed. These treatments were not significantly better than flumioxazin (0.07 kg/ha), fluometuron (1.68 kg/ha), diuron (1.12 kg/ha), norflurazon (1.68 kg/ha), s-metolachlor (1.79 kg/ha), prometryn (1.12 kg/ha), trifluralin (1.12 kg/ha) preplant incorporated (PPI), oxyfluorfen (0.45 kg/ha), pendimethalin (1.38 kg/ha) PPI, or linuron (1.12 kg/ha). However, horseweed continued to emerge throughout the spring in all plots except those treated with trifloxysulfuron which provided season-long horseweed control and had the highest cotton yields among all other treatments.

WEED CONTROL IN ROUNDUP READY FLEX COTTON WITH RESIDUAL PRE, POST, AND LAYBY HERBICIDE OPTIONS. T.H. Koger, L.E. Steckel, S. Culpepper, R.C. Bond, T.W. Eubank, V.K. Nandula, J.B. Blessitt, and D.H. Poston. Delta Research and Extension Center, Mississippi State University, Stoneville, MS; University of Tennessee, Jackson, TN; University of Georgia, Tifton, GA.

ABSTRACT

In the U.S. in 2007 alone, Roundup Ready crops were grown on 120 million acres. Over 92% of cotton acreage in the southern US region was planted to glyphosate-resistant varieties in 2007. Nearly 30% of the 2007 midsouth US cotton acreage was grown to “Flex” varieties, allowing over-the-top glyphosate application past the fourth-true leaf. Weed biotypes resistant to glyphosate in six broadleaf and two grass weed species have been confirmed in the U.S. alone. The primary tool to manage glyphosate-resistant weeds will be existing herbicide chemistries until new transgenic technologies and herbicide modes-of-actions are available commercially. The research objectives was to develop efficacious and economical weed programs utilizing preemergence (PRE), postemergence (MPOST), and layby (LAYBY) programs in Roundup Ready Flex cotton. Small plot trials were conducted at Stoneville, MS (silt loam soil, conv.-till); Jackson, TN (silt loam soil, no-till); and TyTy, GA (sandy loam, strip-till) in 2007. The cotton varieties ST4554 B2RF, PHY 485WRF, and DPL 555 BR were planted in late-April to early-May in MS, TN, and GA, respectively. Trials were arranged in a factorial arrangement of treatments with four replications. Factors included PRE, POST, and LAYBY programs. PRE treatments included Prowl H2O (3.8 lb pendimethalin/gal) at 1 Qt/acre, Prowl H2O at 1 Qt/acre + Cotoran (4 lb fluometuron/gal) at 1 Qt/acre, or Prowl H2O at 1 Qt/acre + Reflex (2 lb fomesafen/gal) at 0.5 Qt/acre. A no PRE factor was included in GA. POST treatments included Roundup Weathermax (4.5 lb glyphosate/gal) at 22 Fl oz/acre, Sequence (2 lb glyphosate/gal +3 lb *S*-metolachlor/gal), or Roundup Weathermax at 22 Fl oz/acre + Prowl H2O at 1 Qt/acre. LAYBY treatments included Valor (51WG) at 2 oz/acre + MSMA at 2 lb ai/acre or Roundup Weathermax at 22 Fl oz/acre. MPOST treatments were applied to 1- to 10-inch-tall Palmer amaranth (*Amaranthus palmerii*) at densities of 0.3- to 2-plants/sq. ft. LAYBY treatments were applied to 1- to 6-inch-tall Palmer amaranth at densities of 0.3 to 1 plants/sq. ft. Visual weed control ratings were recorded 2- to 3-weeks after treatment (WAT). Plots were picker harvested and lint yields determined according to presumed 38% turnout. Prowl H2O + Reflex resulted in 30% cotton injury at 2 WAT in MS. This injury was attributed to rainfall received soon after cotton emergence and the conv.-till field setting. No cotton injury was observed in GA or TN. Prowl H2O + Cotoran and Prowl H2O + Reflex PRE provide 5 to 30% better Palmer amaranth control compared to Prowl H2O PRE alone. Sequence and Prowl H2O provided similar levels of residual control (>80%) of Palmer amaranth at all locations by 4 WA MPOST. Little difference in Palmer amaranth control by 2 WA LAYBY was observed between Valor + MSMA or Roundup Weathermax. Little difference in cotton yields across factors occurred in MS and TN due to low overall weed pressure and extremely dry conditions. In GA, Prowl H2O + Cotoran or Prowl H2O + Reflex PRE and Sequence MPOST provided excellent residual control of Palmer amaranth. A residual herbicide applied PRE and MPOST in GA resulted in $125/acre net return over the no PRE followed by (fb) Roundup Weathermax MPOST and LAYBY program. No residual PRE fb Sequence MPOST and Prowl H2O PRE fb Roundup Weathermax MPOST (Roundup Weathermax applied LAYBY in both programs) provided $80 and $40 net returns over No PRE fb Roundup Weathermax MPOST and LAYBY.

NEW DEVELOPMENTS WITH ENVOKE® IN COTTON. J. C. Holloway, Jr., J. C. Sanders, J. L. Glasgow, E. W. Palmer, B. D. Black, B. W. Minton, H. L. McLean, and S. H. Martin, Syngenta Crop Protection, Greensboro, NC.

ABSTRACT

Envoke is a post emergent cotton herbicide developed by Syngenta Crop Protection that can be applied early pre-plant, preemergence (EPP) or postemergence. Envoke can be applied postemergence, over the top (OTT) from the 5^{th} cotton leaf stage to 60 days before harvest. Envoke can also be post directed to the cotton crop with same pre-harvest interval. This flexible application timing allows applications later in the season when residual activity is needed to control weeds through harvest. Applied later in the season as a tankmix partner with glyphosate on Roundup Ready® Flex cotton, Envoke offers contact as well as residual control of tough weeds that are not controlled with glyphosate alone. This allows the grower the ease of a single application of two modes of action, providing broad spectrum and residual weed control. Residual control of redroot pigweed, common cocklebur, ivyleaf and pitted morningglory, common ragweed, henbit, carpetweed and large crabgrass can be expected for a minimum of 14 days. Following activation with at least 125 mm inches of rainfall or irrigation, residual control of Palmer amaranth, yellow nutsedge and horse purslane has also been observed.

In addition, a new feature for the herbicide market is that Envoke can provide growth regulator effect equivalent to that of 18.4 g ai/ha of mepiquat chloride. This effect would have previously been considered crop damage – we're now making growers aware of the benefit.

Envoke applied in the Fall, (November 1^{st} and later), up to no later than 90 days before planting cotton will provide residual control of most winter annual weeds, including glyphosate-resistant horseweed, henbit, cutleaf evening-primrose, shepherd's purse, annual bluegrass, mustard species and chickweed species.

Research also demonstrated that wheat, planted as a cover crop, is not affected by Envoke applied at 5.3 g ai/ha in the fall. Applying Envoke before wheat is top-sown caused the lowest crop response, while drilled wheat or rye can be planted when Envoke is applied preemergence at 5.3 g ai/ha with limited crop response noted. Envoke applied postemergence to 2-3 leaf wheat or rye will control troublesome weeds while leaving sufficient cover crop to prevent soil and wind erosion.

USING MODELS TO SIMULATE EVOLUTION AND MANAGEMENT OF GLYPHOSATE RESISISTANCE IN *AMARANTHUS PALMERI*. J.K. Norsworthy, P. Neve, K.L. Smith, C. Foresman, and I. Zelaya, University of Arkansas, Fayetteville, AR; Warwick HRI, University of Warwick, Wellesbourne, Warwickshire, United Kingdom; Syngenta Crop Protection, Greensboro, NC; Syngenta Crop Protection, Jealott's Hill International Research Centre, Bracknell, Berkshire, United Kingdom.

ABSTRACT

Palmer amaranth (*Amaranthus palmeri*) is one of the most troublesome weeds of crops in the southern United States because of its biological characteristics and resistance to herbicides, particularly acetolactate synthase-inhibiting herbicides and glyphosate. The evolution of glyphosate resistance in Palmer amaranth is of concern because of the almost sole reliance on glyphosate for weed control in glyphosate-resistant cotton in this region. Cotton is generally grown without rotation to other crops, and due to its slow growth and open canopy, there is tremendous selection for resistance when glyphosate is used continuously. Currently, as many as five in-crop glyphosate applications are being made each year. Simulation models are useful from a management standpoint for providing insight into the long-term impact of production practices on resistance evolution, allowing risk factors for resistance to be identified. Furthermore, extension personnel and producers can use simulation models as decision support aids, permitting direct comparison of management strategies. Additionally, simulation models can help scientists identify knowledge gaps in the biological characteristics of the modelled species and sensitivity analyses can be used to compare the importance of biological characteristics on resistance evolution. Because of the potential devastating impact of glyphosate-resistant Palmer amaranth on U.S. cotton production, a simulation model initially constructed for glyphosate-resistant rigid ryegrass (*Lolium rigidum*) in Australia was adapted to simulate the evolution of glyphosate resistance in Palmer amaranth populations in Arkansas cotton fields. The risks of glyphosate resistance under current management regimes and the effectiveness of alternative management options to reduce risks of glyphosate resistance are explored. Biological, genetic, and operational assumptions for the model are presented in a separate poster presentation (Neve et al. 2008). The model was run 250 times for a 30-year period, with each run representing a 60-ha production field. Resistance was assumed to be visible in the population when the density of resistant plants reached 2 plants m^{-2}. It was assumed that independent selection occurred within each production field (runs of the model); hence, no gene flow occurred among fields. Continuous sole reliance on five glyphosate applications per year led to rapid increase in the risk of resistance evolution after four years of glyphosate use. The risk of glyphosate resistance evolving in a glyphosate-only system was 67% after 11 years. Use of residual herbicides or alternate modes of action delayed resistance evolution 1 to 2 years. More importantly, residual herbicides reduced the risk of glyphosate resistance evolving (i.e., glyphosate-resistant Palmer amaranth was less likely to evolve in fields where residual herbicides were used). Fomesafen applied at preplant burndown reduced the risk of glyphosate resistance 2.2 fold compared with the glyphosate-only system. Residual herbicides applied early in the growing season were more effective than later timings in reducing the risk of glyphosate resistance because Palmer amaranth emergence mainly occurs shortly after cotton establishment. Integrating fomesafen at preplant burndown, *S*-metolachlor at early postemergence, and flumioxazin at layby into glyphosate-resistant cotton reduced the risks of glyphosate resistance 6.7 fold compared with the glyphosate-only system. Future simulation efforts will incorporate crop rotation, planting dates, and other management practices into the current model. Furthermore, this model will be used in educational efforts to a) make producers aware of the managerial factors that contribute to glyphosate resistance and b) encourage the use of proactive strategies to reduce the risks of glyphosate-resistant Palmer amaranth evolving on their farms.

DEVELOPING A MODELING APPROACH FOR PREVENTION AND MANAGEMENT OF GLYPHOSATE RESISTANCE IN COTTON. P. Neve, J.K. Norsworthy, K.L. Smith, C. Foresman, and I. Zelaya, Warwick HRI, University of Warwick, Wellesbourne, Warwickshire, United Kingdom; University of Arkansas, Fayetteville, AR; Syngenta Crop Protection, Greensboro, NC; Syngenta Crop Protection, Jealott's Hill International Research Centre, Bracknell, Berkshire, United Kingdom.

ABSTRACT

Evolved resistance to glyphosate was first reported in the US in 1998 in a population of *Lolium rigidum* (rigid ryegrass) growing in almonds in California. Since 2000, glyphosate resistance has been reported in a further five weed species in North America. All of these cases of resistance were from cropping systems with intensive use of glyphosate-resistant crops. The first glyphosate-resistant population of *Amaranthus palmeri* (Palmer amaranth) was confirmed in Georgia in 2005 and since then further resistant populations have been confirmed in Arkansas, South Carolina, North Carolina, and Tennessee. Palmer amaranth is a highly competitive species, exhibiting season-long emergence and very high seed production. It is a major weed of cotton in southern US states, and the widespread evolution of glyphosate resistance could have a devastating effect on the ability to control this species. Worldwide, the first reported cases of glyphosate resistance were in populations of rigid ryegrass from Australia. In response to this growing threat to Australian agriculture, a model was developed to simulate the evolution of glyphosate resistance in populations of rigid ryegrass. This model was used to explore the major risk factors and cropping practices associated with glyphosate resistance and to assess the effectiveness of a range of resistance management strategies. The model was published in 2003, and its results were communicated to growers and extension agents in a series of workshops to highlight management options to lower risks of glyphosate resistance. Management recommendations arising from the model formed a major part of an Australia-wide communication strategy to increase awareness of risks of, and solutions to, glyphosate-resistance. In 2006, a project was initiated to apply the same modeling principles to the evolution of glyphosate-resistance in weeds growing in US cropping systems. In the study reported by Norsworthy et al. (2008), a model is used to simulate the evolution and management of glyphosate resistance in Palmer amaranth growing in continuous cotton cultivation in cotton. This poster describes the development and parameterization of that model. The model structure is based on the life cycle of the annual, dioecious weed, Palmer amaranth. Assumptions and parameters for key life history stages such as germination, emergence, competition, seed production and seed bank dynamics are taken from published literature and some unpublished field-based studies. There have been no published studies on the genetics and inheritance of glyphosate resistance in Palmer amaranth. However, a number of studies in other species have shown that resistance is conferred by a single nuclear gene with incomplete dominance and this is assumed for Palmer amaranth in the model. The model includes a range of herbicide options for control of Palmer amaranth in cotton, with herbicide efficacies based on local expert opinion. The effectiveness of various of herbicide programs for delaying or reducing the risk of glyphosate resistance are discussed by Norsworthy et al. (2008). This model represents a novel tool for exploring the biology and management of glyphosate resistance in US cropping systems, and it is envisioned that current and future research will continue to refine the model and address important issues in glyphosate-resistance management.

CONTROL OF GLYPHOSTATE-TOLERANT ITALIAN RYEGRASS WITH SELECT MAX AND NONSELECTIVE HERBICIDES. R.C. Bond, C.H. Koger, T.W. Eubank, V.K. Nandula, J.B. Blessitt, and D.H. Poston, Mississippi State University, Delta Research and Extension Center, Stoneville, MS.

ABSTRACT

Glyphosate-resistant Italian ryegrass (*Lolium perenne* ssp. *multiflorium*) has been confirmed in Australia. A population of Italian ryegrass that is suspected to be glyphostate-tolerant has been identified in west-central Mississippi cotton (*Gossypium hirsutum*) production systems. Glyphosate-tolerant/resistant Italian ryegrass could compromise preplant burndown programs in cotton productions systems which utilize reduced tillage practices. Field studies were conducted in 2007 at an on-farm site located near Tribbett, Mississippi, to evaluate control programs targeting glyphosate-tolerant Italian ryegrass.

The first study was conducted to evaluate different rates of Select Max applied with and without Roundup Weathermax and/or ammonium sulfate for control of glyphosate-tolerant Italian ryegrass. Treatments were arranged as a three-factor factorial within a randomized complete block design with four replications. Factor 1 was Select Max rates including 0, 0.047, 0.07, and 0.094 lb ai/A. Factor 2 included Roundup Weathermax at 0 and 0.77 lb ae/A. Factor 3 was two rates of ammonium sulfate (0 and 17 lb/100 gallons of spray solution). Glyphosate-tolerant Italian ryegrass control was visually estimated 56 days after treatment (DAT). After visual evaluation, all glyphosate-tolerant Italian ryegrass from 1 m^2 was harvested from each plot to determine biomass. No treatment controlled glyphosate-tolerant Italian ryegrass >70%. Control was higher 8 WAT when Roundup Weathermax was tank-mixed with Select Max at 0.047 and 0.07 lb/A, but control was not improved with the addition of Roundup Weathermax to Select Max at 0.094 lb ai/A. Pooled across Select Max and Roundup Weathermax treatments, control was higher with AMS compared with no AMS at 8 WAT.

A second study evaluated the efficacy of sequential herbicide programs targeting glyphosate-tolerant Italian ryegrass. Treatments were arranged as a two-factor factorial within a randomized complete block design with four replications. The first factor included a nontreated, Roundup Weathermax at 0.77 lb/A alone and in combination with Select Max at 0.047 or 0.07 lb/A, and Gramoxone Inteon at 1 lb ai/A applied prior to Italian ryegrass anthesis. The second factor included a nontreated, Gramoxone Inteon at 1 lb/A, and Select Max at 0.047 or 0.07 lb/A applied after Italian ryegrass anthesis. Ammonium sulfate at 17 lb/100 gallons of spray solution was added to all Roundup Weathermax and Select Max applications, and a nonionic surfactant at 0.25% v/v was added to all Gramoxone Inteon applications. Glyphosate-tolerant Italian ryegrass control was visually estimated 14 d after pre-anthesis treatments and 8 and 35 d following post-anthesis treatments. Glyphosate-tolerant Italian ryegrass control 14 d after pre-anthesis applications was at least 93% following Gramoxone Inteon. No other treatment provided greater than 61% control. Only treatments containing Gramoxone Inteon as a pre- or post-anthesis treatment controlled glyphosate-tolerant Italian ryegrass ≥90% 8 d after post-anthesis applications. By 35 d after post-anthesis treatment, only Roundup Weathermax plus Select Max at 0.047 or 0.07 lb/A or Gramoxone Inteon followed by Select Max at 0.07 lb/A provided ≥88%.

In the fall of 2006, a third trial was initiated to evaluate glyphosate-tolerant Italian ryegrass control with fall-applied residual herbicides. The experimental design was a randomized complete block with four replications. Treatments included Command at 1 lb ai/A, Prowl H2O at 1.42 lb ai/A, Treflan at 1.5 lb ai/A, Dual Magnum at 1.6 lb ai/A, Valor at 0.064 lb ai/A, and KIH-485 at 0.15 lb ai/A. Glyphosate-tolerant Italian ryegrass control was visually estimated 130 DAT. Command, Treflan, Dual Magnum, and KIH-485 controlled glyphosate-Italian ryegrass at least 85% 130 DAT. In contrast, control with Prowl H2O was only 48% at the same evaluation.

Glyphosate-tolerant Italian ryegrass was not controlled by single-pass herbicide applications. Although sequential programs were better than single-pass applications, tank-mixtures of multiple herbicides were required as components of the sequential programs. Select Max or Gramoxone Inteon followed by Select Max and sequential Gramoxone Inteon applications were the best sequential spring programs for controlling glyphosate-tolerant Italian ryegrass. Fall applications of Command, Dual Magnum, Treflan, or KIH-485 provided greatest control, and programs targeting glyphosate-tolerant Italian ryegrass should be based on fall-applied residual herbicides.

COOL SEASON GRASS CONTROL IN BERMUDAGRASS HAYFIELDS. J.W. Boyd and B.L. Griffin, Department of Crop, Soil and Environmental Sciences, University of Arkansas, Little Rock, AR 72204.

ABSTRACT

Many farmers who grow quality bermudagrass hay consider ryegrass (*Lolium multiflorum*) and tall fescue (*Festuca arundinacea*) to be weeds. Our standard recommendation for control of these species is glyphosate applied while the bermudagrass is dormant. We conducted three trials during 2006 and 2007 to evaluate glyphosate and other herbicides for the control tall fescue and ryegrass. These trials were prompted, in part, by farmer reports that glyphosate, applied during late winter or early spring, is ineffective for ryegrass control. In our trials, glyphosate at 0.75 lb ae/A was the most effective treatment for ryegrass control. Control ranged from 93% for a January 10, 2006 application to 100% for glyphosate applied March 2, 2007. Glyphosate applied November 11, 2006 at 0.28 lb ae/A provided 90% ryegrass control. Diuron at 1.5, nicosulfuron at 0.063, metsulfuron at 0.19 and chlorsulfuron at 0.023 lb ai/A were ineffective for ryegrass control. Tank mixing nicosulfuron or diuron with glyphosate reduced ryegrass control significantly. Tank mixes with metsulfuron and chlorsulfuron did not reduce or enhance glyphosate performance.

The fescue control trial was conducted in dormant, common bermudagrass. Herbicides were sprayed on December 15, 2006 and evaluated on December 18, 2007. Treatments that provided 90% control or greater were glyphosate + imazapic + sulfometuron (0.38 + 0.19 + 0.023 lb ai/A), glyphosate + imazapic (0.75 + 0.19 lb ai/A), glyphosate + flazasulfuron (0.38 + .038 lb ai/A), and glyphosate + sulfometuron (0.38 + 0.094 lb ai/A). A tank mix of diuron plus glyphosate (0.38 + 1.5 lb ai/A) was completely ineffective for tall fescue control. Glyphosate + sulfometuron (0.38 + 0.047 lb ai/A) and glyphosate + sulfometuron (0.38 + 0.023 lb ai/A) resulted in 80 and 50% tall fescue control respectively.

DOGFENNEL COMPETITION IN BAHIAGRASS.
B.A. Sellers and J.A. Ferrell, Range Cattle Research and Education Center and Department of Agronomy, University of Florida, Ona and Gainesville.

ABSTRACT

Dogfennel (*Eupatorium capillifolium*) is the most widely encountered broadleaf weed in Florida pastures. It is a perennial plant that will often bolt as early as March in south Florida. Many ranchers do not realize the impact of dogfennel on bahiagrass (*Paspalum notatum*) production, because forage is not limited during the rainy season to warrant removal of this weed species. However, record drought has occurred throughout Florida during the past two growing seasons, making forage production limited. One way to overcome forage limitations is to remove dogfennel so that forage production is optimum. Most ranchers in Florida wait until late July or early August to initiate dogfennel control programs. However, it is likely that this waiting period is too long and bahiagrass production is limited when dogfennel is not removed prior to August. Therefore, the objective of this research was to evaluate the impact of dogfennel competition in bahiagrass pastures. Experiments were conducted near Ona, Florida in a bahiagrass pasture infested with dogfennel. Plots were established with dogfennel densities of 0, 25% cover, 50% cover, and $\geq$ 75% cover in April, 2007. Additionally, one-half of the plots were fertilized with 56 kg/ha nitrogen in April, 2007. Dogfennel and bahiagrass were removed monthly beginning in May, with bahiagrass being removed from plots every four weeks after the initial harvest. Monthly harvests continued through September. Biomass was dried at 60 ^{o}C for 4 days and plot totals recorded. The factorial arrangement of treatments was completely randomized in a split block design, with nitrogen fertilization as the block factor. Each density was replicated four times in each fertility regime. There was no density by fertility interaction for dogfennel or bahiagrass biomass at any harvest time. Dogfennel biomass increased over time at all densities. Dogfennel biomass at low densities increased 23-fold from May to September. A 10-fold increase in dogfennel biomass was observed at the medium density from May to September. At the high density, dogfennel biomass increased from 872 kg/ha to over 12,000 kg/ha in September, which was a 14-fold increase. Nitrogen fertilization was also significant for dogfennel, with dogfennel biomass from nitrogen-treated plots being at least 1.5 times greater at all harvests except during June. Monthly bahiagrass yield was at least 1.4- and 1.7-fold greater when dogfennel was not present compared to medium and high dogfennel densities, respectively. Bahiagrass biomass from low dogfennel densities was not different from plots without dogfennel except in August and September where bahiagrass biomass was 1.2 and 1.5 times lower, respectively. These data show that dogfennel is detrimental to bahiagrass production. When dogfennel ground cover is less than 25%, dogfennel should be removed prior to August to prevent significant yield reductions. In contrast, dogfennel should be removed if groundcover is greater than 25% as early as possible to prevent yield reductions. Additionally, the fact that dogfennel growth was higher when fertilized with nitrogen suggests that dogfennel competes with bahiagrass for nitrogen inputs. Therefore, a dogfennel-infested pasture should not be fertilized until dogfennel is removed.

EVALUATION OF HERBICIDES FOR GREENBRIER MANAGEMENT IN RANGELAND. J.M. Locke and E.R. Funderburg, Samuel Roberts Noble Foundation, Inc., Ardmore, OK.

ABSTRACT

Greenbrier (*Smilax bona-nox*) is a native, woody vine that may form dense thickets in open areas, fencerows and woodland edges. Stems are climbing with tendrils, tend to form tangled masses and are usually armed with sharp prickles. Greenbrier flowers from spring to early summer and produces small clusters of berries that turn a shiny black in the fall when mature. Large rhizomes, or "lignotubers" are produced that serve as underground storage organs. These may be up to 12 inches in diameter and extend 36 inches below the soil surface. Distribution occurs from the southeastern states to southeast Nebraska down to east Texas and Oklahoma. When the new shoots are young and vegetative, the fresh foliage is excellent forage for both wildlife and livestock with crude protein content up to 40%. During fall and winter, the berries are utilized by a variety of birds and small mammals. Unfortunately, the positive attributes are outweighed by the negative attributes in cattle production enterprises. Producers in The Noble Foundation's service area of southern Oklahoma and north Texas report significant reductions in forage production and livestock utilization of the forage that is produced. Herbicidal control measures have only been partially effective and control recommendations are inconsistent among sources. Mechanical control (mowing) and burning has provided good short-term greenbrier suppression and given livestock access to grazing. Regardless of control method, repetition has been required to keep the greenbrier at tolerable levels.

In the spring of 2007, two field trials were initiated in south central Oklahoma to evaluate several herbicides for control of greenbrier. Herbicides included were 1% Tordon 22K, 1.5% PastureGard, 0.25% Remedy + 0.5% Tordon 22K, 0.75% Weedmaster, 1% Surmount, 0.5% Remedy and 0.25% Remedy + 1.25 ounces per 100 gallons of Cimarron Plus. All treatments prepared on a volume per volume basis with 0.25% SurfKing non-ionic surfactant included. An untreated control was included and the treatments were replicated 3 times in a randomized complete block design. Applications were made with a CO_2 backpack sprayer using 11002XR flat fan spray tips and applied to simulate a foliar spot spray.

Trial 1 was conducted on The Noble Foundation Oswalt Road Ranch on a stand of mature greenbrier. The west half of each treatment was mowed and allowed to re-grow for 1 month until 12 inches tall. The east half of each treatment was 18-30 inches tall at treatment. The mowed and unmown portions of each treatment were evaluated and analyzed separately. Trial 2 was conducted on a Johnston County Oklahoma ranch on a stand of re-growth greenbrier after a winter 2006 burn. The greenbrier was 20-30 inches tall and in a succulent condition. Treatments were visually rated for percentage suppression as compared to the untreated control. Data were subjected to ANOVA and means separated by LSD at 5% level of significance.

In Trial 1 for the unmown treatments, the maximum suppression was 30% at 15 DAT, which improved to 47% by 42 DAT and to 67% by the 90 DAT evaluation. In the mowed treatments, the maximum suppression was 40% at 15 DAT, 57% at 42 DAT and had improved to 70% by 90 DAT. In Trial 2, the maximum suppression was between 50% and 53% for the duration of the trial. For both trials, the PastureGard and Remedy + Cimarron Plus treatments provided the highest and most consistent levels of suppression. In all herbicide and mowed treatments, increased grass production was visually noted although actual production and vegetative composition were not measured.

In summary, none of the herbicide treatments controlled greenbrier but a significant level of suppression was attained. The trend for all treatments was for the level of suppression to increase as the growing season progressed. One potential explanation for this increase is that suppression of greenbrier growth allowed the release of grasses that increased the level of competition with the greenbrier. Due to the large stored energy reserves in greenbrier's "lignotubers" it is unlikely that increased grass competition alone will provide adequate long-term suppression. Additional research is necessary to determine treatments that will control the top growth and suppress or stop the re-growth supported by these energy reserves.

TOLERANCE OF CHICORY TO HERBICIDES DURING ESTABLISHMENT. J.M. Taylor, J.D. Byrd Jr., and J.R. Parish, Mississippi State University. Missssissippi State, MS.

ABSTRACT

Experiments were conducted in 2006-2008 to evaluate forage chicory tolerance to various herbicides during establishment. Plot size in all experiments was 10 by 20 ft and all treatments were applied with a CO_2 backpack sprayer delivering 25 GPA. Experiment 1 was initiated April 25, 2006. The experimental area was disked, seedbed prepared with a Do-All and finally cultipacked. ‘Oasis’ chicory was planted at the rate of 7 lb/A with a 6 ft Tye drill with 7” spacing. Phosphorous, potassium and lime were applied according to the recommendations of the soil test and nitrogen was applied at 50 lb/A at planting. PRE applications were applied immediately after planting and POST treatments were applied June 08, 2006 to 6 to 8-lf chicory. PRE treatments were as follows: 0.5 or 1 lb ai/A pendimethalin (Prowl H_2O), 0.031 or 0.062 lb ai/A imazapic (Plateau), 0.031 or 0.062 lb ai/A sulfosulfuron (Maverick), 0.01 or 0.02 lb ai/A chlorsulfuron (Telar), 0.5 or 1 lb ai/A hexazinone (Velpar), 0.19 or 0.38 lb ai/A metribuzin (Sencor), or 0.5 or 1 lb ai/A diuron (Karmex). POST treatments were 0.05 or 0.09 lb ai/A imazapic, 0.031 or 0.062 lb ai/A sufosulfuron, 0.01 or 0.02 lb ai/A chlorsulfuron, 0.5 or 1 lb ai/A hexazinone, 0.19 or 0.38 lb ai/A metribuzin, 0.19 or 0.37 lb ai/A imazapic + glyphosate (Journey), 0.28 or 0.56 lb ae/A glyphosate (Roundup Pro). All POST treatments except glyphosate were applied with 0.25% v/v non-ionic surfactant. In Experiment 2, the treatments and planting methods were the same except hexazinone and diuron were not applied. Chicory was planted on October 11, 2007 and PRE’s were applied immediately after. POST treatments were applied on November 30, 2007 to 2 to 4-lf chicory. In Experiment 3 and 4 on October 3, 2006, the experimental area was rototilled with a tractor mounted rototiller, PPI’s were applied then rototilled again and cultipacked. ‘Oasis’ chicory was planted in the same method as all previous experiments and PRE’s were applied. On March 9, 2007 POST treatments were applied to flowering birdseye pearlwort and 8 to 12-lf cutleaf eveningprimrose. In Experiment 3, trifluralin (Treflan) was applied PPI at 0.5 lb ai/A. PRE treatments were 1 lb ai/A pronamide, 0.5 or 1.0 lb ai/A pendimethalin, 0.031 or 0.062 lb ai/A imazapic, 1 or 2 lb ai/A diuron, or 1.6 lb ai/A atrazine (Aatrex). POST treatments were 0.19 or 0.38 lb ai/A metribuzin, 0.19 or 0.37 lb ai/A imazapic + glyphosate, 0.05 or 0.09 lb ai/A imazapic, 0.09 lb ai/A imazethapyr (Pursuit), 0.027 lb ai/A imazamox (Raptor), or 0.031 or 0.062 lb ai/A sulfosulfuron. In Experiment 4, the entire plot area except the untreated was treated with 0.5 lb ai/A trifluralin and then followed by a POST treatment of no second herbicide, 0.125 lb ai/A imazaquin (Scepter), 0.027 lb ai/A imazamox, 0.19 lb ai/A metribuzin, 0.062 lb ai/A sulfosulfuron, 0.05 lb ai/A imazapic, 0.28 lb ae/A glyphosate, 0.5 lb ai/A pronamide, 0.37 lb ai/A imazapic + glyphosate, or 0.09 lb ai/A imazethapyr. All POST treatments in Experiment 3 and 4 were applied with 0.25% v/v non-ionic surfactant. At 78 DAIT and 43 DAPT (days after POST treatments), in Experiment 1, injury to chicory with pendimethalin or 0.031 lb/A imazapic was 30% or less while injury from 0.062 lb/A imazapic was 68%. Other PRE treatments had 75 to 100% injury. With the POST treatments, chicory injury with chlorsulfuron and hexazinone was 98 to 100%. Injury with 0.28 lb/A glyphosate was 28% and 60% with 0.56 lb/A. No injury was observed with 0.19 lb/A metribuzin and only 13% with 0.38 lb/A. No rate response was observed with imazapic + glyphosate (18 to 33%) or sulfosulfuron (5 to 13%) while 0.05 lb/A imazapic caused 8% injury and 0.09 lb/A imazapic injured chicory 30%. Approximately 1 year later (381 DAIT), establishment estimates with pendimethalin and 0.031 lb/A imazapic PRE indicated good establishment with 80 to 83% coverage of chicory. With 0.062 lb/A imazapic, coverage was 65% while other PRE’s had 28% or less coverage. Chlorsulfuron or hexazinone applied POST resulted in only 3 to 30% coverage. Glyphosate, metribuzin, imazapic + glyphosate, imazapic, and sulfosulfuron all resulted in 80 to 90% coverage. In Experiment 2, injury was typically higher with most treatments compared to Experiment 1. At 88 DAIT (50 DAPT), pendimethalin or imazapic applied PRE caused 45 to 65% injury to chicory and metribuzin resulted in 70 to 75% injury. Chicory, again did not exhibit tolerance to chlorsulfuron POST with 86 to 90% injury. Glyphosate which chicory, in the previous experiment, exhibited acceptable tolerance to at the 0.28 lb/A rate caused 80% injury. Metribuzin at 0.19 lb/A caused 45% injury and 70% with 0.38 lb/A. Imazapic + glyphosate resulted in 68 to 70% injury and imazapic and sulfosulfuron caused 25 to 43% injury. A good stand of chicory was not achieved in Experiment 3 or 4. This was most likely due to not having a firm enough seedbed due to excessive tillage with the rototiller. In Experiment 3 at 221 DAIT (33 DAPT), birdseye pearlwort was controlled 88 to 100% by trifluralin, 0.062 lb/A imazapic, 2 lb/A diuron, atrazine, .38 lb/A Metribuzin, or Imazapic + glyphosate. All the other treatments had 73% or less control. Trifluralin or pendimethalin controlled cutleaf eveningprimrose 0 to 5%, imazapic PRE or atrazine had 88 to 95% control. Diuron at 2 lb/A, 0.19 lb/A metribuzin and 0.031 lb/A sulfosulfuron provided 63 to 73% control while 0.38 lb/A metribuzin, imazapic + glyphosate, imazapic POST, imazethapyr, imazamox, and 0.062 lb/A sulfosulfuron controlled cutleaf eveningprimrose 85 to 100%. In Experiment 4 at 33 DAPT, all treatments completely controlled birdseye pearlwort. The only treatments that provided good control of cutleaf eveningprimrose were trifluralin followed by imazapic, imazapic + glyphosate, or imazethapyr with 95% control.

HYBRID BERMUDAGRASS [*CYNODON DACTYLON* (L.) PERS.] TOLERANCE AND WEED CONTROL USING TANK MIX COMBINATIONS OF DIFLUFENZOPYR (BAS 654). M.E. Matocha, P.A. Baumann, and F.T. Moore, Texas AgriLife Extension Service, College Station, TX.

ABSTRACT

Field studies were conducted during the 2003 and 2004 growing seasons to: 1) evaluate the control of silverleaf nightshade and western ragweed, and (2) assess the forage tolerance of Coastal and Tifton 85 bermudagrass hybrids using tank mix combinations of diflufenzopyr. Herbicides that were evaluated in each study included picloram, and multiple rates of picloram with diflufenzopyr. Visual ratings were taken on the weed control experiments approximately 30, 60 and 90 days after treatment. Phytotoxicity ratings were taken prior to each harvest of the Coastal and Tifton 85 varieties to determine influence of each herbicide treatment. Each bermudagrass variety was harvested twice during each growing season to determine dry matter yield and quality. Forage quality, including crude protein, acid detergent fiber, and neutral detergent fiber, was assessed using near infrared reflectance spectroscopy.

In general, picloram + diflufenzopyr and picloram applied alone provided the greatest control of both species at the highest rate of picloram. Increased efficacy was more evident from the addition of diflufenzopyr to picloram in 2004 on western ragweed.

Both forage varieties showed significant variability in phytotoxicity between years. Although observed levels of growth reduction were relatively high at the first harvest in 2003, no treatment exceeded a 10% growth reduction by the second harvest for either forage variety. The only significant reduction in dry matter yield of Coastal was observed at the first harvest from picloram + diflufenzopyr applied at the highest rate. In addition, Tifton 85 dry matter yields were reduced from higher rates of picloram + diflufenzopyr, but were not statistically different than the untreated.

EFFICACY OF PASTURE HERBICIDES ON WINTER ANNUAL WEEDS. P. L. Burch, E. S. Hagood, W. N. Kline, and T. R. Murphy, Dow AgroSciences LLC, Christiansburg, VA; Virginia Tech, Blacksburg, VA, Dow AgroSciences LLC, Duluth, GA, and University of Georgia, Griffin, GA.

ABSTRACT

Aminopyralid is a new systemic herbicide developed by Dow AgroSciences specifically for use on rangeland, pasture, rights-of-way, such as roadsides for vegetation management, Conservation Reserve Program acres, non-cropland, and natural areas. Formulations include Milestone® and ForeFront™ R&P herbicides. Milestone is formulated as a liquid containing, 2 lbs ae/gal of aminopyralid as a salt. ForeFront R&P is also formulated as a liquid containing 0.33 lbs ae aminopyralid + 2.67 lbs ae 2,4-D/gal. The herbicides have postemergence activity on established broadleaf plants and provide residual control of later emerging susceptible plants. The objective of this study is to determine the effectiveness of Milestone and ForeFront R&P on important weeds that are a problem in the late winter and early spring.

Often winter annual and fall germinating annual and perennial weeds are a problem following drought or during the renovation of cool-season grass pastures. The timing of control is often earlier than normal pasture weed control applications. Summer drought and overgrazing can thin grass cover in pastures opening sites up to fall germinating weeds. Similarly during the renovation of cool-season grass pastures sites are often burned down with a non-selective herbicide and replanted with desirable grasses. Before the perennial cool-season forage grasses can become well established opportunistic fall germinating weeds can establish and competitively suppress planted grasses.

Efficacy of Milestone and ForeFront R&P was compared on five sites located in Virginia, Florida and Georgia. Weed control was evaluated 4 to 6 weeks after application. Milestone and ForeFront R&P were compared to Grazon® P+D, Remedy® Ultra, Weedmaster, and 2,4-D ester herbicides. Aminopyralid controlled many problem weeds that invaded degraded grass pastures. Winter annual weeds controlled (83-100% control) included chickweed (STEME), Carolina geranium (GERCA), field pansy (VIORA), sheppard's purse (CAPBP), mouseear chickweed (CERVU), ivy-leaf speedwell (VERHE), primrose (OEOBI), and mugwort (ARTVU). Equivalent rates of aminopyralid in ForeFront R&P were more effective than Milestone. Aminopyralid-containing products (Milestone or ForeFront R&P) provided control of this complex of weeds that was superior to control with Grazon P+D, Remedy, Weedmaster and 2,4-D ester.

® ™ Trademark of Dow AgroSciences LLC
Grazon P+D is a federally Restricted Use Pesticide
State restrictions apply to the sale and use of Remedy Ultra. Consult the label before purchase or use for full details.
Always read and follow the label directions.

MILESTONE® AND FOREFRONT™ R&P EFFICACY IN PASTURES. P.L. Burch, W.N. Kline, V.B. Langston, B.B. Sleugh, M.B. Halstvedt, V.F. Peterson and R.A. Masters, Dow AgroSciences LLC, Indianapolis, IN.

ABSTRACT

Aminopyralid is a new systemic herbicide developed by Dow AgroSciences specifically for use on rangeland, pasture, rights-of-way, such as roadsides, Conservation Reserve Program acres, non-cropland, and natural areas. Formulations include Milestone® and ForeFront™ R&P herbicides. Milestone is formulated as a liquid containing, 2 lbs ae/gal of aminopyralid as a salt. ForeFront R&P is also formulated as a liquid containing 0.33 lbs ae aminopyralid + 2.67 lbs ae 2,4-D/gal. The herbicides have postemergence activity on established broadleaf plants and provide residual control of susceptible plants that emerge after application. In improved pastures, there are a large number of broadleaf weed species that limit forage production. Milestone and ForeFront R&P provide the broad spectrum control required to manage these weed species complexes in pastures. A primary objective of improved pasture management is to increase animal performance and pasture carrying capacity. This objective can be achieved by improving the pasture forage resource. Aminopyralid-containing products (Milestone and ForeFront R&P) are useful pasture renovation tools because they provide excellent broadleaf weed control and increase forage grass yield, availability, and utilization. Once broadleaf weeds are controlled with these herbicides forage legumes can be successfully established following appropriate plant-back guidelines.

Milestone alone controls many important primary weeds that invade improved pastures including musk thistle, plumeless thistle, horsenettle, common ragweed, and spiny amaranth. Aminopyralid-containing products also control weeds that emerge after the application. The value of the control of later emerging weeds results in improved access to forage by grazing animals. The addition of 2,4-D in the ForeFront R&P formulation broadens the spectrum of control to include (seasonal) field bindweed, wild carrot, buckhorn plantain, and (seasonal) dogfennel weed control. Legumes are an important part of the forage resource, but those that occur in degraded, weed-infested pastures are usually controlled along with the weeds when these herbicides are applied. In many cases improved varieties of forage legumes can be established after weeds are controlled by delaying planting to the growing season following a spring application. By increasing grass productivity and facilitating the establishment of improved forage legumes, Milestone® and ForeFront™ R&P herbicides are useful components of pasture renovation programs.

BLACKBERRY CONTROL IN COOL SEASON GRASS PASTURES. W.W. Witt, Department of Plant & Soil Sciences, University of Kentucky, Lexington.

ABSTRACT

Wild blackberry (*Rubrus fruticosus*) is a commonly occurring woody species of cool season grass pastures and fencerows utilized for beef production in Kentucky. The size and frequency of occurrence of wild blackberry varies widely. Pastures not mowed tend to have large, multiple branching plants that can reach a height of 3 to 4 feet. Mowed pastures tend to have smaller plants, generally about 2 ft in height, and have few stems. Wild blackberry plants in fencerows vary in size depending on the age of the plants. An additional challenge is steep terrain that limits tractor mounted sprayers. Experiments evaluating herbicide treatments applied broadcast with a tractor mounted sprayer at 15 gpa to wild blackberry foliage was established in 2004. PastureGard at 3 to 5 pt/A, Surmount at 5 pt/A, and Grazon P+D at 2 pt/A plus Remedy at 1 pt/A provided about 70% control one year after treatment. A low volume, backpack sprayer was used to evaluate herbicide treatments applied to the foliage of individual blackberry plants in 2004. Blackberry controlled averaged 60% eight months after application for PastureGard at 1 or 2 % v/v, Crossbow at 1% v/v, Surmount at 1.5% v/v, and Banvel at 1.5% v/v. Another experiment in 2004 evaluated the application of herbicides applied in basal oil to dormant blackberry stems. PastureGard at 25, 33, 50% v/v, Remedy at 25% v/v, and Banvel at 25% v/v applied in basal oil provided greater than 95% control ten months after treatments. Similarly, Pathfinder applied alone provided greater than 95% control ten months after treatment. These experiments demonstrate that wild blackberry can be controlled with foliar broadcast, low volume back pack, and basal dormant herbicide treatments.

CONTROL OF YELLOW AND PURPLE NUTSEDGE IN BERMUDAGRASS TURF WITH V-10142. G.M. Henry and B.S. Sladek, Texas Tech University, Lubbock, TX 79409.

ABSTRACT

Field experiments were conducted at Abilene Country Club in Abilene, TX in the summer of 2007 to quantify the efficacy of V-10142 to control yellow and purple nutsedge. Studies were located on established infestations of yellow and purple nutsedge present in a common bermudagrass rough cut to a height of 5.0 cm. Plots measured 1.5 x 1.5 m and were arranged in a randomized complete block design with four replications of treatments. Treatments were applied using a CO_2 backpack sprayer equipped with XR8004VS nozzle tips and calibrated to deliver 304 L/ha at 220 kPa. Treatments were initiated on July 10, 2007 and included an untreated check, V-10142 at 0.56 kg ai/ha followed by V-10142 at 0.56 kg ai/ha at various timing intervals (1, 2, 3, or 4 WAIT), V-10142 at 1.12 kg ai/ha, and trifloxysulfuron at 0.03 kg ai/ha for comparison. Each plot was assessed at the time of initial herbicide application for percent cover of yellow or purple nutsedge. Visual estimates of percent yellow and purple nutsedge control and bermudagrass phytotoxicity were taken 1, 2, 3, 4, 6, 8, and 12 WAIT. Data were subjected to analysis of variance (ANOVA) and means were separated using Fisher's Protected LSD at the 0.05 significance level. No bermudagrass phytotoxicity was recorded throughout the length of the study. Among the four sequential treatments, V-10142 followed by V-10142 3 WAIT provided the highest control (100%) of purple nutsedge 6 WAIT and control levels remained high (91%) 12 WAIT. V-10142 followed by V-10142 2 or 4 WAIT gave excellent control (97%) of purple nutsedge 6 WAIT, but control declined to 82% 12 WAIT. V-10142 at 1.12 kg ai/ha and sequential applications of V-10142 (0.56 kg ai/ha) 1 week apart gave good control (90 and 81%, respectively) 6 WAIT, but control declined to 71 and 42%, respectively, 12 WAIT. The standard, trifloxysulfuron, gave excellent control (99%) of purple nutsedge 6 WAIT, but control declined to 80% 12 WAIT. In the yellow nutsedge experiment, all treatments provided excellent control (100%) of yellow nutsedge 6 WAIT. This level of control was maintained by all treatments except V-10142 followed by V-10142 1 WAIT. Control following this treatment declined to 90% 12 WAIT.

POTENTIAL DALLISGRASS CONTROL OPTIONS. A.G. Estes & L.B. McCarty, Department of Horticulture, Clemson University, Clemson, SC.

ABSTRACT

Dallisgrass (*Paspalum dilatatum*) is a common perennial grass weed in turf. Dallisgrass is a clumping perennial that produces unsightly seedheads in summer and disrupts turf uniformity. The purpose of this research was to investigate potential postemergence dallisgrass control options with and without MSMA.

In the fall of 2006 and 2007, studies were conduced at Clemson University investigating dallisgrass control with various postemergence herbicides. Plot size for the each treatment measure 2.0 m by 3.0 m, replicated three times. Treatments were applied using a CO_2 backpack sprayer calibrated at 20 GPA, at 31 p.s.i., with 8003 flat fan spray tips. Initial treatments for Study 1 were applied on September 4, 2006 while, initial treatments for Study 2 were applied on September 20, 2007. Treatments for Study 1 included: MSMA (6.6L) at 1.5 lb ai/A (Int.) fb Revolver (0.19SC) at 0.06 lb ai/A (7 & 30 DAI); MSMA at 1.5 lb ai/A (Int.) fb Revolver + 21-0-0 at 0.06 lb ai/A + 0.85 lb ai/A (7 & 30 DAI); MSMA at 1.5 lb ai/A (Int.) fb Revolver + MSO at 0.06 lb ai/A + 1.0 % V/V (7 & 30 DAI); MSMA at 1.5 lb ai/A (Int.) fb Revolver + 21-0-0 + MSO at 0.06 lb ai/A + 0.85 lb ai/A + 1.0 %V/V (7 & 30 DAI). Treatments for Study 2 included: Revolver at 0.06 lb ai/A (Int. & 30 DAI); Revolver + Sencor (75DF) at 0.06 lb ai/A + 0.5 lb ai/A (Int. & 30 DAI); Dismiss (4L) at 0.25 lb ai/A (Int. & 30 DAI); Dismiss + Sencor at 0.25 lb ai/A + 0.5 lb ai/A (Int. & 30DAI); Certainty (75DF) at 0.06 lb ai/A (Int. & 30 DAI); Certainty + Sencor at 0.06 lb ai/A + 0.5 lb ai/A (Int. & 30 DAI).

Visual control ratings were taken throughout the study. Ratings for dallisgrass control were based on a scale of 0 – 100% with 0% representing no control and 100% representing complete control. Common Bermudagrass turf injury was evaluated on a 0 – 100% scale with 0 % representing no turf injury and 100% representing dead turf

Dallisgrass control for Study 1 on September 25, 2007 (386 Days after initial treatment, DAIT) all treatments containing MSMA at 1.5 lb ai/A followed by a Revolver application at 0.06 lb ai/A, 7 and 30 days after the initial treatment were providing greater than 95 percent control. With Study 2 treatments containing Revolver at 0.06 lb ai/A applied twice 30 days apart provided greater than 70 percent control on October 30, 2007 (40 DAIT). Study 2 will continue to be evaluated in 2008 for long-term residual dallisgrass control.

Future Research at Clemson University will be to investigate new and existing herbicides for dallisgrass control, which include adjusting rates and timings of treatments. Repeat current studies and evaluate the long-term residual control of these treatments for dallisgrass control.

ALTERNATIVE TIMINGS OF ALS HERBICIDES AND GLYPHOSATE FOR DALLISGRASS (*PASPALUM DILATATUM*) CONTROL. G.K. Breeden and J.S. McElroy, University of Tennessee, Knoxville.

ABSTRACT

Dallisgrass (*Paspalum dilatatum*) is one of the most difficult weds to control in turf. MSMA is the primary herbicide that has been utilized the most for dallisgrass control. EPA has decided to not re-register organic arsenicals, which include MSMA. Do to the potential loss of MSMA alternatives for dallisgrass control need to be researched. Field research was initiated in 2006 and 2007 to evaluate alternative timings of ALS herbicides and glyphosate as control options for dallisgrass in bermudagrass (*Cynodon dactylon*) turf.

Research was conducted in Knoxville, TN at the Plant Science Unit of the East Tennessee Research and Education Center and Alcoa, TN at Green Meadow Country Club. Weed control and turf injury were evaluated visually utilizing a 0 (no weed control or turf injury) to 100 (complete control of all weeds or turf) % scale. The experiments were replicated 4 times in a randomized complete block design. Experimental units were 5 by 10 feet. Herbicides were applied in a water carrier volume in Knoxville of approximately 200 GPA and in Alcoa of 30 GPA with a CO_2 pressurized sprayer. Research at Knoxville evaluated simulated fall spot applications of foramsulfuron utilizing a high volume broadcast application. Treatments included in the Knoxville research were foramsulfuron (0.148 lb ai/100 gal) followed by (f.b.) foramsulfuron (0.148 lb ai/100 gal), foramsulfuron (0.148 lb ai/100 gal) + ammonium sulfate (10 lb/100 gal) f.b. foramsulfuron (0.148 lb ai/100 gal) + ammonium sulfate (10 lb/100 gal), foramsulfuron (0.148 lb ai/100 gal) + methylated seed oil (MSO) (1 % v/v) f.b. foramsulfuron (0.148 lb ai/100 gal) + MSO (1 % v/v), and foramsulfuron (0.148 lb ai/100 gal) + ammonium sulfate (10 lb/100 gal) + MSO (1 % v/v) f.b. foramsulfuron (0.148 lb ai/100 gal) + ammonium sulfate (10 lb/100 gal) + MSO (1 % v/v). All treatments received an initial application of MSMA (1.5 lb ai/a). Minimal bermudagrass injury (< 5%) was observed at anytime by any herbicide treatment. No differences in bermudagrass green-up were also observed when compared to the non-treated check. All treatments controlled dallisgrass ≥ 98% at 4 weeks after the sequential application (WASA). Sequential applications of foramsulfuron controlled dallisgrass ≥ 83% at 36 WASA.

Research at Alcoa evaluated early winter applications of glyphosate followed by spring applications of sulfosulfuron. All treatments at Alcoa were applied with and without an early December application of glyphosate (2 lb ai/a). Treatments applied in the spring at Alcoa were MSMA (2 lb ai/a) f.b. MSMA (2 lb ai/a), metribuzin (0.5 lb ai/a) f.b. metribuzin (0.5 lb ai/a), sulfosulfuron (1.5 oz ai/a), sulfosulfuron (1.5 oz ai/a) f.b. sulfosulfuron (1.5 oz ai/a), sulfosulfuron (1.5 oz ai/a) + metribuzin (0.5 lb ai/a), and sulfosulfuron (1.5 oz ai/a) + metribuzin (0.5 lb ai/a) f.b. sulfosulfuron (1.5 oz ai/a) + metribuzin (0.5 lb ai/a). Minimal bermudagrass injury (< 5%) was observed at anytime by any herbicide treatment. No differences in bermudagrass green-up were also observed when compared to the non-treated check. All treatments with the early December application of glyphosate controlled dallisgrass ≥ 89% at 24 weeks after the initial treatment (WAIT). MSMA f.b. MSMA without glyphosate in early December controlled dallisgrass 78% at 24 WAIT. All other treatments controlled dallisgrass ≤ 11% at 24 WAIT. Treatments without the early December application of glyphosate controlled dallisgrass ≤ 66% at 30 WAIT. Glyphosate f.b. MSMA f.b. MSMA, glyphosate f.b. sulfosulfuron + metribuzin, and glyphosate f.b. sulfosulfuron + metribuzin f.b. sulfosulfuron + metribuzin controlled dallisgrass ≥ 89% at 30 WAIT. Glyphosate, glyphosate f.b. metribuzin f.b. metribuzin, glyphosate f.b. sulfosulfuron, and glyphosate f.b. sulfosulfuron f.b. sulfosulfuron controlled dallisgrass 76-80% at 30 WAIT. Fall applications of foramsulfuron and treatments with an early December application of glyphosate have promise for use as alternatives for dallisgrass control.

SAFENING OF ARYLOXYPHENOXYPROPIONATE HERBICIDES BY TRICLOPYR ON ZOYSIAGRASS. D.F. Lewis, J.S. McElroy, J.C. Sorochan, and G.K. Breeden, Department of Plant Science, University of Tennessee, Knoxville.

ABSTRACT

Bermudagrass (*Cynodon dactylon*) is a difficult weed to control in zoysiagrass (*Zoysia* spp.) fairways. Although it has been reported that bermudagrass can be suppressed by using aryloxyphenoxypropionate (AOPP), zoysiagrass injury can occur. Previous research indicates that tank-mixing AOPP herbicides, such as fluazifop and fenoxaprop, with triclopyr increased bermudagrass suppression and decreased zoysiagrass injury. Additional research of other AOPP herbicides tank-mixed with triclopyr could lead to improved selective herbicide programs for bermudagrass control in zoysiagrass turf.

Research was conducted in 2007 at The Little Course in Franklin, TN and the University of Tennessee East Tennessee Research and Education Center (ETREC)-Plant Science Unit in Knoxville, TN. Treatments included are: fluazifop (0.11 kg ai/ha); triclopyr (1.12 kg ai/ha); fluazifop plus triclopyr (0.11 kg ai/ha + 1.12 kg ai/ha); fenoxaprop (0.14 kg ai/ha); fenoxaprop plus triclopyr (0.14 kg ai/ha + 1.12 kg ai/ha); cyhalofop (0.32 kg ai/ha); cyhalofop plus triclopyr (0.32 kg ai/ha + 1.12 kg ai/ha); quizalofop (0.09 kg ai/ha); and quizalofop plus triclopyr (0.09 kg ai/ha + 1.12 kg ai/ha).. Treatments were initiated at The Little Course to ‘Palisade’ zoysiagrass [*Zoysia japonica* (L.) Merr.] on June 05, 2007 and at the ETREC-Plant Science Unit to ‘Zenith’ zoysiagrass (*Zoysia japonica*) on June 11, 2007. Sequential applications were made every 28 days for a total of three applications of each treatment. Turfgrass injury was visually rated every two weeks utilizing a 0-100% scale (0%=no visible turfgrass injury; 100%=complete turfgrass death). Digital images were taken every two weeks for each plot utilizing a 0.28 m^2 light box equipped with a Canon G5 digital camera. Images were analyzed for percent cover, hue, saturation, and brightness according to published methods. This trial was replicated four times in a randomized complete block design. Experimental units measured 1.5m x 3m^2. Herbicide applications were applied with a CO_2 pressurized sprayer calibrated at 280 L/ha.

Injury and cover reduction data to zoysiagrass turf from The Little Course and the ETREC-Plant Science Unit was taken ten weeks after initial treatment. At The Little Course, fluazifop alone injured zoysiagrass 30% and reduced cover to 71%; however, when tank-mixed with triclopyr 3% injury and 84% cover was observed. Fenoxaprop alone led to 35% injury with 75% cover, but with the addition of triclopyr was lowered to 21% injury and 81% cover. Cyhalofop alone injured 4% with 89% cover, but the addition of triclopyr injured 9% with 87% cover. Quizalofop injured zoysiagrass the greatest 58% and severely reduced cover to 37%; however, when tank-mixed with triclopyr, quizalofop injured zoysiagrass only 15% and retained 84% cover. Triclopyr alone caused no visual injury with 87% cover. Similar results were observed at the ETREC-Plant Science Unit. These data indicate that triclopyr safens the use of the four AOPP herbicides when applied to both ‘Palisade’ and ‘Zenith’ zoysiagrass turf.

TURFGRASS TOLERANCE TO SELECTED TRIKETONE HERBICIDES. J.B. Willis and S.D. Askew, Virginia Tech, Blacksburg, VA.

ABSTRACT

Mesotrione has been under development for the turfgrass industry and will be sold as Tenacity™ early this year. Mesotrione is a triketone herbicide which inhibits the HPPD enzyme and thus carotenoid biosynthesis. Tembotrione and topramezone are also triketones and preliminary work indicated that these two products may hold promise for use in turfgrass. To our knowledge, this research is among the first exploratory field work evaluating tembotrione and topramezone in turfgrass. Our objectives are to evaluate these two triketone herbicides for use in several turfgrass species and for weed efficacy.

Six trials were conducted this summer at the Glade Road Research Facility and at the Turfgrass Research Center in Blacksburg, VA. The same protocol was conducted with mature stands of bermudagrass, zoysiagrass, Kentucky bluegrass, creeping bentgrass, perennial ryegrass, and tall fescue. Treatments included tembotrione and topramezone applied at 0.75, 1.5, and 2.25 and 3, 6, and 8 fl oz/A, respectively, and mesotrione, at 8 fl oz/A. Mesotrione has been most effective with sequential applications at 3 week intervals in previous research, so all treatments were applied both once and twice at 3 week intervals.

Tembotrione and topramezone were safe (<30% injury) to Kentucky bluegrass and tall fescue. Tembotrione and topramezone injured bermudagrass, zoysiagrass, and bentgrass. However, injury to bentgrass from topramezone was only temporary and it recovered by 3 WAT. Tembotrione significantly injured perennial ryegrass, but significant recovery was observed by 3 WAT. Low levels of injury were observed from single applications of tembotrione to zoysiagrass, while sequential applications were significantly more injurious. Product rate and sequential application increases both turf injury and weed control. Much research is needed to optimize rates for each turf species. Differential selectivity should be better understood before recommending specific turf uses. The new products show broad-spectrum activity toward summer-annual grasses, bentgrass (tembotrione only), bermudagrass, and several broadleaf weeds. We believe that tembotrione and topramezone, once better understood, have much promise for the turf industry.

PREEMERGENCE SMOOTH CRABGRASS CONTROL IN BERMUDAGRASS. J.A. Atkinson, A.G. Estes, L.B. McCarty, Clemson University, Department of Horticulture, Clemson, SC 29634-0375.

ABSTRACT

Smooth Crabgrass (*Digitaria ischaemum)* is a widely distributed summer annual clumping weed. Smooth Crabgrass produces unsightly seed heads that disrupt the uniformity of the turf. The purpose of this research was to determine the efficacy of various preemergent herbicides in different formulations and rates for smooth crabgrass control.

In spring of 2007 two studies were conducted at Clemson University to investigate preemergent crabgrass control in bermudagrass. In the first study preemergent herbicides commonly used for preemergent crabgrass control were tested for their effectiveness. Plot size for each treatment measured 2 m by 2 m, replicated three times. All applications were made using a CO_2 backpack sprayer operating at 20 GPA with an 8003 flat fan nozzle. Initial preemergent applications were on March 19, 2007 with sequential applications applied on May 22, 2007. Treatments included Pendulum (Pendimethalin) (3.8 CS) at 1.5 lb ai/A fb Pendulum (Pendimethalin) (3.8 CS) at 1.5 lb ai/A 8 WAIT; Pendulum (Pendimethalin) (3.8 CS) 1.5 lb ai/A fb Drive (Quinclorac) (75 DF) at 0.75 lb ai/A + MSO (L) at 24 fl oz/A 8 WAIT; Drive (Quinclorac) (75 DF) at 0.75 lb ai/A + MSO (L) 24 fl oz/A; Barricade (Prodiamine) (4 L) at 0.75 lb ai/A fb Barricade (Prodiamine) (4 L) at 0.38 lb ai/A 8 WAIT. In a second study less commonly used herbicides for preemergent crabgrass control were tested for crabgrass control effectiveness. Plot size for each treatment measured 2 m by 2 m, replicated three times. All applications were made using a CO_2 backpack sprayer operating at 20 GPA with an 8003 flat fan nozzle. Initial preemergent applications were on March 19, 2007 with sequential applications applied on May 22, 2007. Treatments included Dismiss (Sulfentrazone) (4 FL) at 0.375 lb ai/A; Echelon (Prodiamine + Sulfentrazone) (4 SC) at 0.375 lb ai/A; Echelon (Prodiamine + Sulfentrazone) (4 SC) at 0.75 lb ai/A; Echelon (Prodiamine + Sulfentrazone) (4 SC) at 1.125 lb ai/A; Echelon (Prodiamine + Sulfentrazone) (4 SC) at 0.75 lb ai/A fb Echelon (Prodiamine + Sulfentrazone) (4 SC) 0.375 lb ai/A 8 WAIT; Echelon (Prodiamine + Sulfentrazone) (0.3 G) at 0.375 lb ai/A; Echelon (Prodiamine + Sulfentrazone) (0.3 G) at 0.75 lb ai/A; Echelon (Prodiamine + Sulfentrazone) (0.3 G) at 1.125 lb ai/A; Echelon (Prodiamine + Sulfentrazone) (0.3 G) at 0.75 lb ai/A fb Echelon (Prodiamine + Sulfentrazone) (0.3 G) at 0.375 lb ai/A 8 WAIT; Echelon (Prodiamine + Sulfentrazone) Fert. Carrier (0.3 G) at 0.375 lb ai/A; Echelon (Prodiamine + Sulfentrazone) Fert. Carrier (0.3 G) at 0.75 lb ai/A; Echelon (Prodiamine + Sulfentrazone) Fert. Carrier (0.3 G) at 1.125 lb ai/A; Echelon (Prodiamine + Sulfentrazone) Fert. Carrier (0.3 G) at 0.75 lb ai/A fb Echelon (Prodiamine + Sulfentrazone) Fert. Carrier (0.3 G) at 0.375 lb ai/A 8 WAIT; Barricade (Prodiamine) (4 L) at 0.5 lb ai/A; Pendulum (Pendimethalin) (3.8 CS) at 3 lb ai/A.

Visual crabgrass ratings were taken on August 22 and September 11, 2007. Ratings were based on a scale of 0-100% with 0% representing no control and 100% representing no crabgrass present.

In the final visual rating on September 11, 2007, excellent control (90%-100%) in bermudagrass resulted from all treatments. In the second study, excellent control (90%-100%) resulted from Echelon (Prodiamine + Sulfentrazone) (4 SC) at 0.75 lb ai/A; Echelon (Prodiamine + Sulfentrazone) (4 SC) at 1.125 lb ai/A; Echelon (Prodiamine + Sulfentrazone) (4 SC) at 0.75 lb ai/A fb Echelon (Prodiamine + Sulfentrazone) (4 SC) 0.375 lb ai/A 8 WAIT; Echelon (Prodiamine + Sulfentrazone) (0.3G) at 0.75 lb ai/A; Echelon (Prodiamine + Sulfentrazone) (0.3G) at 1.125 lb ai/A; Echelon (Prodiamine + Sulfentrazone) (0.3G) at 0.75 lb ai/A fb Echelon (Prodiamine + Sulfentrazone) (0.3G) at 0.375 lb ai/A 8 WAIT; Echelon (Prodiamine + Sulfentrazone) (0.3G) Fert. Carrier at 1.125 lb ai/A; Echelon (Prodiamine + Sulfentrazone) (0.3G) Fert. Carrier at 0.75 lb ai/A fb Echelon (Prodiamine + Sulfentrazone) (0.3G) Fert. Carrier at 0.375 lb ai/A 8 WAIT; Barricade (Prodiamine) (4 L) at 0.5 lb ai/A; Pendulum (Pendimethalin) (3.8 CS) at 3 lb ai/A. Good control (80%-89%) resulted from Echelon (Prodiamine + Sulfentrazone) (4 SC) at 0.375 lb ai/A; Echelon (Prodiamine + Sulfentrazone) (3 G) at 0.375 lb ai/A; Echelon (Prodiamine + Sulfentrazone) (3 G) Fert. Carrier at 0.375 lb ai/A; Echelon (Prodiamine + Sulfentrazone) (3 G) Fert. Carrier at 0.75 lb ai/A. All other treatments in the second study resulted in unacceptable control (<70%).

PERFORMANCE OF SMOOTH CRABGRASS PREEMERGENCE HERBICIDES DURING DROUGHT-STRICKENED GROWING SEASONS. L.S. Warren, F.H. Yelverton, and T.W. Gannon, Crop Science Department, North Carolina State University, Raleigh, NC 27695-7620.

ABSTRACT

When applying root-inhibiting herbicides for preemergence smooth crabgrass control in North Carolina, turfgrass managers are advised to make split (sequential) applications that total the full labeled rate approximately 8 weeks apart, instead of a single application consisting of the full labeled rate. However, rainfall patterns change dramatically from year to year, so research was conducted to see if these recommendations hold true in wet or dry growing seasons. Trials were conducted on a thin, nonirrigated, low-maintenance stand of tall fescue at Wesleyan College in Rocky Mt., NC from 2002 through 2007. The soil type was a Norfolk sandy loam. Rocky Mt. averages 46.62 inches of rainfall per year. In 2002, 2003 and 2006, rainfall amounts averaged 56.97 inches; while in 2004, 2005 and 2007, rainfall dropped to 39.29 inches. Each year, spray applications were made at 32.5 gpa and 32 psi with a 4-nozzle, 10-inch spacing boom containing XR 8002VS nozzles. Granular applications were spread in 2- to 3 directions with a shaker jar with holes punched in the lid. Plot size was 5 x 10 feet with 4 reps.

Treatments included Barricade 65WG and Barricade 4F applied at 0.75 lb ai/A or 0.5 lb ai/A followed by (fb) 0.25 lb ai/A; Team Pro 0.86G, Surflan 4AS and Pendulum 2G applied at 3.0 lb ai/A or 1.5 lb ai/A fb 1.5 lb ai/A; Dimension Ultra 40WP applied at 0.5 lb ai/A or 0.25 lb ai/A fb 0.25 lb ai/A. Rainfall occurrences and amounts after March and the sequential application date for each year follow: 2002 (2 days, 5 days); 2003 (6 days, 1 day); 2004 (3 days, 1 day); 2005 (4 days, 4 days); 2006 (14 days, 6 days); 2007 (1 day, 1 day). Smooth crabgrass control data are visual observations taken from final (September) evaluations of each growing season.

Pendulum 2G provided excellent smooth crabgrass control (96%), which was greater than any other herbicide tested except Barricade 65WG. Even though control was similar, their behavior on the soil surface are not very similar. Pendimethalin (Pendulum 2G) has a 44 day half-life (longer if incorporated), is moderately volatile and needs to get in the soil by 7 days. Prodiamine (Barricade 65WG) has a 120 day half-life and is slightly volatile if left exposed on the soil surface for prolonged periods. The success of Pendulum 2G is due to its active ingredient being encoated on a granule that offers protection until activating rainfall events can dissolve the granule and wash the product into the soil, thus increasing half-life. Barricade 65WG provided similar control (87%) as Barricade 4F and Team Pro 0.86G (85 and 80%, respectively), but greater control than Surflan 4AS (77%), which provided greater control than Dimension Ultra 40WP (61%). Dimension Ultra 40WP provided the lowest control of smooth crabgrass of the herbicides tested. This also can be explained by looking at its behavior in the soil. Dithiopyr (Dimension Ultra 40WP) has the shortest half-life of the herbicides tested (17 days), and is moderately to highly volatile (6 to 18% loss in 3 days, 12 to 40% loss in 30 days). Dimension Ultra 40WP needs to be watered in immediately after application to achieve maximum control. Waiting for rainfall events is not recommended when using this product. Split, or sequential applications of the herbicides tested resulted in 85% overall smooth crabgrass control as compared to 77% control when all applications were applied in March. Regardless of moisture regimes, it is beneficial to split-apply root-inhibiting herbicides such as Pendulum 2G, Barricade 65WG and 4F, Team Pro 0.86G, Surflan 4AS and Dimension Ultra 40WP instead of applying a single, full labeled rate. In a Norfolk sandy loam soil that averages 46.62 inches of rainfall per year, Surflan 4AS and Team Pro 0.86G provided 85 and 88%, respectively, smooth crabgrass control when rainfall amounts averaged 39.29 inches. Control dropped to 68 and 73%, respectively, when rainfall average 56.97 inches. Surflan 4AS and Team Pro 0.86G affected smooth crabgrass similarly, and can be explained by their similar behavior in soil. Benefin / trifluralin (Team Pro 0.86G) has a 40 to 45 day half-life, is photodegradable, has low volatility and also degrades by microbes in flooded anaerobic conditions. Oryzalin (Surflan 4AS) has a 20 to 128 day half-life, is photodegradable, has minimal volatilization and also degrades by microbes in flooded anaerobic conditions. Even though the test area was a Norfolk sandy loam, Team Pro 0.86G and Surflan 4AS may possibly breakdown quickly in short-term flooded anaerobic conditions caused by heavy showers.

In conclusion, in a nonirrigated Norfolk sandy loam soil, increased smooth crabgrass control can be achieved with split applications of Pendulum 2G, Barricade 65WG and 4F, Team Pro 0.86G, Surflan 4AS and Dimension Ultra 40WP, as compared to a single, full-labeled rate applied preemergence in early March. Also, smooth crabgrass control decreases with Team Pro 0.86G and Surflan 4AS as soil moisture increases, most likely due to breakdown caused by soil microbial activity. Pendulum 2G and Barricade 65WG provide excellent season-long smooth crabgrass control.

POSTEMERGENCE CRABGRASS CONTROL WITH NEW PRODUCTS IN TURFGRASS. M.J. Goddard, T.L. Mittlesteadt, and S.D. Askew, Virginia Tech, Blacksburg.

ABSTRACT

Crabgrass (Digitaria sp.) is arguably the most problematic weed in turfgrass. Many pre and postemergence herbicide control options are available, but few include broadleaf activity. In summer 2007, F7214 and F7651, experimental herbicides developed by FMC, were evaluated in turfgrass at Virginia Tech. Our objectives were to determine perennial ryegrass (Lolium perenne) and Kentucky bluegrass (Poa pratensis) tolerance, and smooth crabgrass (Digitaria ischaemum) and white clover (Trifolium repens) control by F7214 and F7651 compared to quinclorac.

Two trials were initiated on Kentucky bluegrass (KBG) and perennial ryegrass (PR) maintained at fairway height (2 cm). Smooth crabgrass plants ranged from 4 to 8 tillers at time of application. The trials were located at Virginia Tech's Glade Road Research Facility in Blacksburg, VA. Trials were established on July 26, 2007. Experiments were arranged in a RCBD with three replications, and 1.8 by 1.8 meter plots. Treatments included single applications of F7651 at 0.14, 0.28, and 0.42 kg ai/ha, F7214 at 0.56, 0.84, 1.12, 1.40, and 1.68 kg ai/ha plus 0.25% NIS, and quinclorac at 0.42, 0.84, and 1.12 kg ai/ha plus 0.25% NIS, and a nontreated check.

F7651 treatments alone did not control smooth crabgrass at either location, but resulted in 43 and 78% control of white clover at the 0.42 kg ai/ha rate in KBG and PR, respectively. F7214 treatments resulted in 76 to 98%, and 91 to 98% control of smooth crabgrass and 100% control of white clover in KBG and PR, respectively. Quinclorac resulted in 68 to 90%, and 61 to 93% control of smooth crabgrass, and 100% control of white clover in KBG and PR, respectively. None of the herbicide treatments caused injury to the turfgrass species tested. F7214 controlled smooth crabgrass and white clover better than F7651, and equivalent or better than the quinclorac comparison treatments.

TENACITY™ - A NEW WEED MANAGEMENT TOOL IN TURF. J.E. Driver, R.J. Keese, D.L. Cox, and D.K. Mosdell, Syngenta Crop Protection, Inc., Greensboro, NC

ABSTRACT

In December 2007, EPA granted Syngenta Crop Protection, Inc. registration for Tenacity, a new weed management tool for use in golf and sod turf. Over several years of research in turf this product has provided effective control of several important weed species and afforded excellent turf tolerance.

The active ingredient in Tenacity is mesotrione. A member of the triketone herbicide family, mesotrione, is derived from a naturally occurring compound with allelopathic properties. It was discovered around the base of the bottle brush plant (*Callistemon citrinus*). Absorbed by plant roots, shoots, and leaves, mesotrione is distributed within xylem and phloem throughout the plant within 24 hours. The mode of action belongs with the HPPD inhibitors (p-hydroxyphenylpyruvate dioxygenase) which blocks formation of plastoquinone and subsequent carotenoid production. Treated plants sensitive to mesotrione usually become bleached within 5-7 days followed by necrosis, and plant death. There are some plants that bleach but recover.

Tenacity is currently labelled for use on several turf species: St. Augustinegrass (grown for sod only), centipedegrass, Kentucky bluegrass, tall fescue, fine fescue, and perennial ryegrass. Tenacity may also be used on dormant bermudagrass. Use rates vary by species and range from 0.14 kg/ha to 0.28 kg/ha. At these rates preemergence and postemergence control of 34 dicot and 11 monocot species is attainable. A repeat application of Tenacity in 2-3 weeks may be required for adequate control of some weed species. Mesotrione is effective on several tough to control weeds such as yellow nutsedge, common dandelion, white clover, and tufted lovegrass. It also allows selective removal of bentgrass from cool season turf species. Two to three applications of Tenacity will effectively remove bentgrass from cool season turf species. Tufted lovegrass a common weed found in Centipedegrass and St. Augustinegrass sod production is effectively controlled with Tenacity. Multiple applications of mesotrione alone at 0.14 to 0.28 kg/ha during the season controls continuous flushes of lovegrass. Tenacity at 0.14 to 0.28 kg/ha tank mixed with atrazine at 0.28 kg/ha also provides excellent control of tufted lovegrass.

Another attribute of Tenacity is the ability to prevent weed competition when applied at seeding. Improved stands and turf quality have been obtained due to removal of the weed competition. Spring, early summer, or fall seeding can be accomplished with no reduction in turf stand or competition from emerging weeds.

TUFTED LOVEGRASS (*Eragrostis pectinacea*) CONTROL IN SOD. J.W. Boyd, Department of Crop, Soil and Environmental Sciences, University of Arkansas, Little Rock, AR 72204.

ABSTRACT

Tufted lovegrass is a weed problem for sod farmers because it is not controlled by MSMA, quinclorac, atrazine, simazine or any of the other herbicides used used for postmergence grass control in warm season grasses. The best treatment we have found for tufted lovegrass is glyphosate at 0.23 lb ae/A. However, this treatment is often inconsistent on tufted lovegrass and may cause unacceptable zoysiagrass injury. For these reasons, we conducted several trials during 2006 and 2007, on sod farms to evaluate mesotrione for control of tufted lovegrass in 'Meyer' zoysiagrass. One trial was conducted in common bermudagrass sod. Our results were generally consistent with those of Huckabay, Walker and Belcher. We found that two applications of mesotrione at 0.063 lb ai/A applied about two weeks apart provided 90 to 100% control of tufted lovegrass. Rates greater than 0.063 lb ai/A produced unacceptable zoysiagrass injury and were not necessary for control of lovegrass. Single applications of high rates (0.25 and 0.187 lb ai/A) of mesotrione were not as effective as two applications at lower rates. The interval between applications seemed to be important. Sequential treatments applied approximately 2 weeks apart were significantly more effective than those applied 4 weeks apart. Tank mixing atrazine with mesotrione improved control of lovegrass, especially at lower rates (0.031 lb ai/A). Increasing the atrazine rate from 0.125 lb ai/A to 1.0 lb ai/A did not improve lovegrass control. Under ideal conditions, it may be possible to reduce the rate of mesotrione to 0.031 lb ai/A if it is tank mixed with atrazine at 0.125 to 0.25 lb ai/A. During 2006-2007, a single application of glyphosate at 0.23 lb ae/A was not as consistent as two applications of mesotrione at 0.063 lb ai/A. Fenoxaprop at 0.09 or fluazifop at 0.063 lb ai/A tank mixed with triclopyr ester at 1.0 lb ai/A were ineffective for tufted lovegrass control. Further research needs to be done to determine the effect of mesotrione on the growth rate of zoysigrasses and the consistency of the 0.031 lb ai/A rate plus atrazine for tufted lovegrass control.

TORPEDOGRASS SUPPRESSION IN CENTIPEDEGRASS. D. Taverner, J.S. Beasley and R.E. Strahan, LSU Agricultural Center, Louisiana State University, Baton Rouge.

ABSTRACT

Herbicides are available for torpedograss control in bermudagrass and zoysiagrass. However, there are currently no herbicides labeled for torpedograss control in centipedegrass.

A field study was conducted in 2007 at LSU Campus Federal Credit Union in Baton Rouge in centipedegrass heavily infested with torpedograss. The study evaluated the efficacy of sethoxydim, clethodim, and quinclorac for torpedograss control and centipedegrass safety. Herbicide treatments included: sethoxydim at 1X (2.25 pt/A) and 2X (4.50 pt/A) rates, clethodim at 1X (17 oz/A) and 2X (34 oz/A) rates, and quinclorac at 1/2X (0.50 lb/A) rate. Herbicide treatments were applied as a single application or as sequential treatments for a total of 2 or 3 application times. All multiple applications were made on 28 day intervals. The study design was randomized complete block with four replicates. Plots were 5ft X 7 ft. Herbicides were applied with a CO_2 pressurized backpack sprayer equipped with three 8002 XR flat fan nozzles that delivered 25 GPA at 30 psi.

An initial evaluation of percent torpedograss coverage was obtained to provide a covariate. Parameters measured were percent torpedograss coverage and percent injury to both torpedograss and centipedegrass. Data were collected on two week intervals. Data will be subjected to analysis of variance (P=0.05) and means will be separated using Fisher's LSD.

Single applications of sethoxydim did not reduce torpedograss coverage to acceptable levels (<15%). Sethoxydim applied 2 or 3 times (28 day intervals) temporarily reduced torpedograss coverage to acceptable levels. However, coverage was unacceptable for all treatments 16 weeks after the initial application. These data indicate that more than three applications will be necessary to achieve acceptable torpedograss control.

Both sethoxydim and clethodim applied 3 times provided temporarily acceptable reduction in torpedograss coverage. However, clethodim appeared to cause greater visual injury to the centipedegrass. Quinclorac did not provide an acceptable reduction in torpedograss coverage.

EFFECT OF SIMULATED RAINFALL ON TALL FESCUE CONTROL WITH GLYPHOSATE. T.W. Gannon, F.H. Yelverton, and L.S. Warren, Department of Crop Science, North Carolina State University, Raleigh.

ABSTRACT

Glyphosate is a non-selective foliar applied herbicide widely used in agriculture. In turfgrass environments, glyphosate is commonly broadcast applied prior to renovation or in select dormant turfgrass species and depends on foliar absorption for desired efficacy as it possesses little, if any, soil activity. Postemergence herbicide applications carry the risk of reduced efficacy if rainfall occurs before adequate drying time has lapsed. Current labels for glyphosate including Roundup Original®, Roundup Pro®, and Roundup ProDry® only allude to rainfastness by stating "heavy rainfall soon after application may wash this product off of the foliage and a repeat application may be required for adequate control" and give no specific indication of rainfree period required for acceptable herbicide efficacy.

Field experiments were conducted to determine the effect of simulated rainfall after glyphosate application on tall fescue control. Three glyphosate formulations, three simulated rainfall amounts, two application rates, and three rainfree periods were evaluated. Evaluated glyphosate formulations included Roundup Original®, Roundup Pro®, and Roundup ProDry®. Herbicide-drying periods, or rainfree intervals, included 15, 30, or 60 minutes. Simulated rainfall amounts were 0, 0.1, or 0.25 in. Application rates of glyphosate were 4 or 8 lb ai/a. These data indicate glyphosate applied at 4 or 8 lb/a may be more rainfast on tall fescue than previous research or current labels suggest. These data suggest when 60 rainfree minutes were provided between glyphosate application and simulated rainfall, excellent (≥ 90%) tall fescue control was achieved. Additionally, when only 30 rainfree minutes were provided, good (≥ 80%) tall fescue control was achieved indicating critical rainfree periods may be less than current product labels suggest.

ANNUAL BLUEGRASS (*POA ANNUA*) CONTROL IN OVERSEEDED AND NON-OVERSEEDED BERMUDAGRASS TURF. J.R. Harrell, III, A.G. Estes, L.B. McCarty, Department of Horticulture, Clemson University, Clemson, SC 29634.

ABSTRACT

Annual Bluegrass is a native of Europe and is a particular problem in golf course greens and fairways in the United States. There are two types of Annual Bluegrass, Annual and Perennial (Annual is the focus of this study). It is able to germinate in late summer or early fall as soil temperatures fall below 70 degrees Fahrenheit. If it is unmowed, it can grow up to 6 to 8 inches tall. Leaf blades are crinkled part of the way down (1 to 3 inches), with the typical *Poa*, boat-shaped leaf tips. In 2006 and 2007, we conducted two studies in order to try and find herbicides that would have any kind of control over the Annual Bluegrass.

Treatments for the first study included: Barricade 4 L at .75 lb ai/a 60 DBO, Barricade 4 L at .5 lb ai/a 60 DBO, Barricade 4 L lb ai/a 60 DBO followed by Barricade 4 L .5 lb ai/a 102 DAO, Pendulum 3.8 CS 3.0 lb ai/a 45 DBO followed by Pendulum 3.8 CS 1.5 lb ai/a 102 DAO, Dimension 2 EW .5 lb ai/a 45 DBO followed by Dimension 2 EW .5 lb ai/a 102 DAO, Prograss 1.5 EC 1.0 lb ai/a 51 DAO followed by Prograss 1.5 EC 1.0 lb ai/a 86 DAO, Barricade 4 L .5 lb ai/a 60 DBO followed by Revolver .19 SC .028 lb ai/a 3 DBO, Barricade 4 L .5 lb ai/a 60 DBO followed by TranXit 25 DF .016 lb ai/a + NIS L .25% v/v 3 DBO, Barricade 4 L .5 lb ai/a 60 DBO followed by Katana 25 DF .023 lb ai/a 3 DBO, Barricade 4 L .5 lb ai/a 60 DBO followed by Monument 75 DF .014 lb ai/a + NIS L .25% v/v 3 DBO, Revolver .19 SC .028 lb ai/a 3 DBO, TranXit 25 DF .016 lb ai/a + NIS L .25% v/v 3 DBO, Katana 25 DF .023 lb ai/a + NIS L .25% v/v 3 DBO, Monument 75 DF .014 lb ai/a + NIS L .25% v/v 3 DBO. Ratings were taken throughout the study included Annual Bluegrass Control on a 0 to 100 % scale, where 0 is no control and 100 is complete control. In addition to control, we also took a Perennial Ryegrass density rating on a 0 to 100 % scale, where 0 was no coverage and 100 was complete coverage. The bermudagrass was overseeded by the golf course maintenance staff on October 2, 2006 at a rate of 350 lbs/A. The initial treatment was applied on August 7, 2006.

Annual Bluegrass control rates were taken on April 12, 2007 (242 DAO) and showed that Barricade .5 lb ai/a followed by Barricade .5 lb ai/a and Barricade .5 lb ai/a followed by Monument + NIS were both greater than 70 percent control. Perennial Ryegrass density rates were taken 149 and 190 DAO respectively. After 149 days, Pendulum followed by Pendulum and Dimension followed by Dimension showed the greatest coverage at 70 percent. After 190 days, Pendulum followed by Pendulum and Revolver by itself showed the greatest coverage at 70 percent.

Treatments in the second study included: Reward 2 L .04 lb ai/a + NIS L .25% v/v, Roundup Pro 4 L .5 lb ai/a, Quick Pro 76 DG 1.0 lb ai/a, Finale 1.0 SC 1.5 lb ai/a, TranXit 25 DF .031 lb ai/a + NIS L .25% v/v, Certainty 75 DG .06 lb ai/a + NIS L .25% v/v, Monument 75 DG .03 lb ai/a + NIS L .25% v/v, Katana 25 DG .047 lb ai/a + NIS L .25% v/v, Revolver .19 SC .025 lb ai/a + NIS L .25% v/v, Velocity 17.6 WDG .066 lb ai/a, Prograss 1.5 EC 1.0 lb ai/a, Princep 4 L 2 lb ai/a + NIS L .25% v/v, Kerb 50 WP 1.5 lb ai/a + NIS L .25% v/v. All treatments were applied on January 12, 2007. Rates were taken throughout the study were Annual Bluegrass Control was on a 0 to 100 % scale, where 0 was no control and 100 was complete control.

Annual Bluegrass control rates were taken on February 7, 2007 (26 DA-A) and on April 12, 2007 (90 DA-A). After 26 days, Finale alone showed greater than 90 percent control. After 90 days, Roundup Pro, Quick Pro, Finale, TranXit + NIS, Monument + NIS, and Revolver + NIS all showed greater than 90 percent control in Non-overseeded bermudagrass turf.

Future research at Clemson University will include continuing to research possible herbicides that will help control Annual Bluegrass, as well as keeping the density of the turf high. In addition, we will research application rates and timing methods to possibly improve the outcome of future studies.

WEED MANAGEMENT WITH MESOTRIONE IN WARM-SEASON TURFGRASS. B.J. Brecke, D. Partridge-Telenko, K.C. Hutto and J.B. Unruh, West Florida Research and Education Center, University of Florida, Jay, FL 32565.

ABSTRACT

Mesotrione was evaluated for warm-season turfgrass tolerance and weed control at the University of Florida, West Florida Research and Education Center, Jay, FL in 2002 - 2007. Mesotrione was applied postemergence at 0.125 to 0.50 lb a.i./A to actively growing turfgrass. Warm-season turfgrass injury and weed control were visually evaluated using a scale of 0 (no turfgrass injury or no weed control) to 100% (turfgrass death or complete weed control). Mesotrione caused less than 10% injury to centipedegrass when applied at 0.50 lb/A. In 2004 mesotrione caused less than 15% injury to St. Augustinegrass regardless of application rate. However, in 2005 injury was generally greater and exceeded 20% when applied at 0.25 or 0.50 lb/A. In both years, the St. Augustinegrass recovered from the injury by 3 wk after application. Hybrid bermudagrass was injured greater then St. Augustinegrass and took longer to recover from the mesotrione damage than did St. Augustinegrass. Mesotrione controlled southern crabgrass at rates as low as 0.125 lb/A. In one study, however, a sequential application was required to provide acceptable crabgrass control. Single applications of mesotrione controlled henbit while control of hop clover required a sequential treatment. Mesotrione did not provide adequate control of Carolina geranium or dollarweed (pennywort).

DEVELOPMENTAL AND IMPLEMENTATION OF THE OKLAHOMA DEPARTMENT OF TRANSPORTATION (ODOT) APPROVED HERBICIDE AND ADJUVANT LIST (AHAL): A QUALITY ASSURANCE PROGRAM. C.C. Evans, D.P. Montgomery, and D.L. Martin, Department of Horticulture and Landscape Architecture, Oklahoma State University, Stillwater, OK.

ABSTRACT

In 2004, the Oklahoma Department of Transportation (ODOT) adopted herbicide/adjuvant tank mix quality assurance guidelines. The guidelines were the culmination of a joint research, education and specification initiative developed in a cooperative project between ODOT and the Oklahoma State University Roadside Vegetation Management Program (OSU RVM). This initiative resulted in the creation of an initial Approved Herbicide and Adjuvant List (AHAL) with subsequent modifications as needed. Under the AHAL guidelines initially adopted by ODOT in 2004, and amended in 2005 and 2007, herbicide components must undergo weed control efficacy screening and herbicide/adjuvant combinations must undergo physical compatibility testing. Efficacy testing is required to insure comparable performance of generic formulations of previously patented compounds and newly released active ingredients. Data is required for all herbicides being submitted for inclusion in the AHAL and must be generated using product label information as well as modern standard weed control research equipment and methods. For an herbicide active ingredient that is currently represented on the ODOT AHAL (i.e. generic herbicides), supportive information must include a minimum of data from one growing season. For active ingredients that are not on the current ODOT AHAL, a minimum of 2 seasons (years) of suitable efficacy data from roadside weed control trials is required plus bermudagrass herbicide tolerance data. Supportive research must have included a minimum of three treatment replications. Efficacy data on specific weed problems include both winter and summer annual/biennial/perennial weeds. Phytotoxicity data on common bermudagrass must also be submitted. Evaluations are required 15, 30, and 60 days-after-application and are subjected to analysis of variance with treatment mean separation at the 90% confidence level. All efficacy testing includes comparison treatments using ODOT standard treatments (current OSU publication E-958: Suggested herbicides for roadside weed control). Compatibility testing is required to avoid unfavorable combinations that can cause settling or the formation of layers, globules or precipitants that would prevent the proper application of these mixtures. Use of incompatible mixtures can also cause poor weed control due to incorrect application rates of herbicides.

Compatibility testing of herbicide/adjuvant tank combinations continues as new brand name products are introduced into the utility /rights-of-way market. New formulations of active ingredients whose manufacturing and/or use patents have expired are being introduced as “generics” by additional formulators. While the active ingredients (a.i.) are known, the inert ingredients in these products often remain trade secrets and quality control may possibly vary. Therefore, research is needed to determine if tank mixes with these generic products results in incompatibility issues.

The OSU RVM program performed drift control product and herbicide compatibility testing for ODOT in 1995 using a protocol developed by adapting several industry standard jar test protocols for specific use with ODOT herbicide combinations and available drift control products. Several of those drift control products were found to have severe tank mix incompatibility when mixed with herbicides ODOT used. In 2004 compatibility research was initiated on 143 herbicide/adjuvant combinations and no severe or moderate incompatibilities were observed. In fall 2007 two new herbicides, one reformulated herbicide, and three generic herbicides were evaluated for efficacy and/or compatibility using AHAL approved drift control products and 2007 AHAL protocols. Herbicide efficacy ranged from good to excellent and no incompatibilities were observed. The OSU RVM Program will continue to propose compatibility research as a quality assurance initiative in future joint OSU/ODOT projects.

A FIRST-YEAR REVIEW OF MILESTONE VM® RESULTS FROM PRODUCTION TREATMENTS ALONG OKLAHOMA HIGHWAYS. D.P. Montgomery, C.C. Evans and D.L. Martin, Oklahoma State University, Stillwater.

ABSTRACT

A new herbicide was introduced into Oklahoma Department of Transportation (ODOT) herbicide programs in 2007 with good success. Milestone VM® treatment recommendations were developed for ODOT by Oklahoma State University Roadside Vegetation Management Project personnel and Dow AgroSciences researchers. During the 2003-2007 development trials it was found that 4 oz. product/acre of Milestone VM® applied alone, or as a tank-mix partner with traditional winter annual weed control treatments, could increase levels of postemergence control of cool season weeds and provide preemergence control of warm season broadleaf weeds. The addition of a residual preemergence summer broadleaf weed control component to ODOT herbicide programs should reduce the need for summer postemergence applications of hormone-type herbicides.

Oklahoma is divided into eight ODOT field divisions, each with individual control of their annual divisional herbicide program. In 2007 six of eight field divisions added Milestone VM® to their winter annual weed control programs treating 2,484 – 8,563 roadside acres using traditional boom-less roadside spray equipment. This acreage translates into approximately 820 – 2,862 lane miles of roadside. In 2007 ODOT treated a total of 34,532 acres of roadside with Milestone VM® statewide. Of the 80 maintenance facilities that were surveyed, 51 responded that they had used Milestone VM®. Out of the 51 Milestone VM® users, 41 reported broadleaf weed control benefits to their herbicide program when compared to previous years efforts. It should be noted that most of Oklahoma received record rainfall in 2007 which did not seem to shorten the window of weed control produced by Milestone VM®. Milestone VM® surveys indicate increased cool season weed control of musk thistle and sowthistle compared to traditional treatments of glyphosate or Campaign®. Milestone VM® surveys also indicated preemergence summer broadleaf weed control including marestail, annual ragweeds, coreopsis, and fleabane spp. Some of the surveyed shortcomings from the Milestone VM® production treatments were poor control of kochia, pigweed spp., field bindweed, and palmer amaranth control. Partial to poor control of these specific annual and perennial broadleaf weeds has been documented in Milestone VM® research trials. While not all summer annual broadleaf weed species were controlled with the addition of Milestone VM®, many were. This should reduce the need for summer postemergence applications of hormone-type herbicides that are prone to drift. Milestone VM® will add a safer broadleaf weed control option for ODOT roadside vegetation managers to select when weed control issues arise in crop production areas of Oklahoma. Many ODOT field divisions are planning on including Milestone VM® ($8.62/acre) in 2008 divisional herbicide programs as long as funding remains available.

EFFECTS OF DIFFERENT SURFACTANTS AND APPLICATION METHODS ON WOODY SPECIES CONTROL IN UTILITY RIGHTS-OF-WAY. A.W. Ezell, Mississippi State University, Starkville, MS.

ABSTRACT

Control of woody species is a major concern for rights-of-way managers. While mowing can be effective on herbaceous or shrubby species, control of tree species usually requires the use of herbicides and surfactants. Any use of herbicides is accompanied with a consideration for the potential impact on non-target species. Use of herbicides is an important option for T.V.A. area managers, and they must be responsive to both control efficacy and environmental safety needs. The U.S. Fish and Wildlife Service raised questions regarding the use of surfactants on T.V.A. rights-of-way, and this study was designed to address those questions. Specifically, any surfactant used in herbicide applications for T.V.A. must have a LC50 greater/or equal to 20 mg/L for *Daphnia* or bluegill. Thus, the objectives of this study were (1) evaluate the efficacy of treatments using different surfactants all of which exceeded the safety limitations for bluegill, (2) evaluate different herbicide tank mixtures for control of a variety of tree species, and (3) evaluate control efficacy as influenced by application method. Herbicide mixtures used in the study were (A) Accord Concentrate (5 qts/A) + Arsenal (16 oz/A) and (B) Krenite S (6 qts/A) + Arsenal (16 oz/A). Surfactants used in the study were Activate Plus, LI 700, and Droplet Landing Zone (DLZ). All surfactants were used at a rate of 2 quarts/A. Application methods included (A) aerial simulation, (B) backpack crew, and (C) high volume truck spraying. A total of 18 treatment/surfactant/application method combinations were replicated three times on rectangular plots 30 ft. x 100 ft. in a randomized complete block design. All treatments were applied September 19-20, 2006. All woody stems in sample areas (10 ft. x 80 ft. centered in treatment plot) were recorded pre-application and again on October 3, 2007. Control was based on the percent reduction between the two evaluations. Results demonstrated that Activate Plus provided significantly better control than the other surfactants. The Krenite mixtures provided better overall control of woody species, primarily due to better control of the pine on the site. Earlier application is recommended if glyphosate is to be used and pines are prevalent. Aerial simulation and backpack applications both produced very good and comparable control. Control from the high volume truck application was significantly less. The estimate of total spray volume per acre given by the operational truck spray crew is considered to have been inaccurate resulting in the poor control from the application.

ACCORD® XRT II, A NEW MORE EFFECTIVE GLYPHOSATE FORMULATION FROM DOW AGROSCIENCES. W. N. Kline, P. L. Burch, V. B. Langston, V. F. Peterson. Dow AgroSciences, LLC., Indianapolis, IN.

ABSTRACT

Accord® XRT II herbicide is a new improved “high-load” glyphosate formulation from Dow AgroSciences LLC. This new glyphosate offering is the result of years of research efforts to produce a superior formulation and proprietary surfactant package that is a high-load concentrated product aimed at professional vegetation managers in Utilities, Railroads & Highway Rights-of-way and Industrial Sites. Accord XRT II is a unique glyphosate DMA salt formulation of glyphosate. This DMA based amine is a high load 50.2% or 5.06 pound ai per gallon (39.6% or 4.00 lb ae/gallon) formulation that is more convenient for end users to manage, transport and dispense due to higher loading than most other competitive offerings – usually only 4 lb/gallon formulations. Accord XRT II is the same formulation and loading as Dow AgroSciences Glyphomax® XRT and Durango® herbicides.

Accord XRT II has significantly lower viscosity than Accord® XRT herbicide for improved handling, pouring, measuring and bulk/mini-bulk handling and pumping characteristics. It is also an excellent formulation for use in 2,4-D and other tank mixtures. Accord XRT II will be available for sale and use in early 2008.

Research was conducted in 2006 and 2007 to evaluate the performance of Accord XRT II vs Accord XRT, and to compare performance to competitive standards Razor Pro and Gly Star Plus. Field trials were conducted in grass and broadleaf weed field studies and in woody brush field studies.

Results from 2006 and 2007 field trials on broadleaf weeds and grasses – a total of 17 grass/weeds were evaluated in 2006 and 14 grass/weeds were evaluated in 2007 as part of the project for a total of 31 weeds in 10 field trials.

Based on 2006 field trials, the performance of Accord XRT II was generally equivalent to Accord® XRT herbicide on 8 species, however there was a slight trend (no sig diff) for better control with Accord XRT II vs Accord XRT at the 0.75 lb ae/acre rate on 7 species and there was a slight trend (no sig diff) for Accord XRT II to be less effective that Accord XRT on only 2 species. Results from 2007 field trials demonstrated that Accord® XRT II herbicide was equivalent to Accord XRT on 12 of the 14 species evaluated and performance differed only slightly (no sig diff) on 2 species.

Overall, results from 2 years of field research trials, no significant differences or trends were identified between Accord XRT II or Accord XRT vs the competitive standards – Razor Pro and Gly Star Plus on broadleaf weeds and grasses. Also, no differences in speed of brownup were noted in any of the trials between Accord XRT II or Accord® XRT herbicides vs the competitive standards.

Research findings from 2006 brush trials (evaluated in 2007) are showing differences between Accord XRT II vs Accord XRT and the competitive standards for pine control. These data are providing strong indications (sig diff, p=.05) that Accord XRT II is a better pine control product than Accord XRT and the competitive standards, Razor Pro and Gly Star Plus. Results from the 2006 Virginia trial demonstrated year after control of loblolly pine at the 2 lb ae/acre rate of Accord® XRT II herbicide averaged 95% control vs Accord XRT averaging 60%; compared to Razor Pro averaging 60% control and Gly Star Plus averaging 25% control. Results from the 2006 Georgia trial demonstrated year after control of loblolly pine at the 4 lb ae/acre rate of Accord XRT II averaged 80% control vs Accord XRT averaging 67%; compared to Razor Pro averaging 23% control and Gly Star Plus averaging 40% control of loblolly pine.

Hardwoods species evaluated in the Virginia and Georgia trials were Sweetgum (LIQST), Red Maple (ACRRB), Red Oak (QUEFC), Yellow Poplar (LIRTU), White Oak (QUEAL), Cherry (PRNSO), Elm (ULMSS), Persimmon (DOSVI) and Dogwood (CRWSS). In general, no significant differences or trends at any of the rates evaluated were noted between Accord XRT II vs Accord XRT, or when compared to the competitive standards Razor Pro and Gly Star Plus on any of the hardwood species evaluated in these trials.

Based on these data, performance of Accord® XRT II herbicide on hardwood brush was equal to Accord XRT and the competitive standards, Razor Pro and Gly Star Plus.

MILESTONE® VM PLUS: A NEW HERBICIDE FOR INDUSTRIAL VEGETATION MANAGEMENT.V.B. Langston, V.F. Peterson, P.L. Burch, W.N. Kline, B.B. Sleugh, M.B. Halstvedt and R.A. Masters, Dow AgroSciences LLC, Indianapolis, IN.

ABSTRACT

Milestone VM Plus is a new herbicide developed by Dow AgroSciences specifically for use on non-cropland areas including industrial sites, rights-of-way, such as roadsides and electrical utility lines, and non-irrigation ditchbanks, and also on Conservation Reserve Program areas, natural areas, rangeland and pasture. The herbicide is formulated as a liquid containing 0.1 lb/gal of aminopyralid and 1.0 lb/gal of triclopyr amine. Milestone VM Plus has a 'Caution' signal word and is a non-ester formulation. It provides postemergence and preemergence residual control of susceptible broadleaf plants and seedlings. Milestone VM Plus at 4 to 6 pints/acre controls over 70 species of annual, biennial, and perennial broadleaf weeds including *Acroptilon repens*, *Amaranthus spinosus*, *Ambrosia spp.*, *Artemisia absinthium*, *Carduus acanthoides*, *Carduus nutans*, *Centaurea diffusa*, *Centaurea maculosa*, *Centaurea solstitialis, Chrysanthemum leucantheum*, *Cirsium arvense, Cirsium vulgare, Dipsacus spp.*, *Lamium amplexicaule, Matricaria inodora*, *Ranunculus bulbosus*, *Rumex crispus*, *Solanum carolinense*, *Solanum viarum,* and *Xanthium strumarium.* Control of glyphosate resistant weeds such as *Conyza canadensis*, *C. bonariensis, and Ambrosia trifida* is excellent with Milestone VM Plus at 6 pints/acre for 3 to 4 months. Milestone VM Plus at 6 to 9 pints/acre controls woody species such as *Cytisus scoparius* and *Rubus discolor*. Most established warm- and cool-season grasses are tolerant to Milestone VM Plus applied at rates up to 9 pints/acre.

EfFECTIVE HERBICIDES FOR CONTROL OF MIMOSA (*ALBIZIA JULIBRISSIN*). R.S. Wright, and J.D. Byrd, Jr., Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Two experiments were conducted to evaluate mimosa control with various herbicides. Treatments were applied in one experiment on June 6, 2006 with a CO_2 pressurized backpack sprayer that delivered 25 gallons per acre (GPA) using a four nozzle boom. The plots in this experiment were 10 ft wide by 25 ft long, and mimosa trees were less than 5 ft tall. An all terrain vehicle (ATV) with a boominator nozzle that delivered 16 GPA was utilized in a second experiment to make herbicide applications on August 14, 2007. Mimosa trees in the second experiment were 12 to 20 ft tall. Evaluations were made with a visual rating scale that ranged from 0 to 90% (0=no control, and 90= complete visual plant death) for both experiments.

Treatments in the first experiment consisted of metsulfuron methyl at 0.18, 0.36, or 0.72 oz ai/A, fosamine at 4.0 or 8.0 lb ai/A, or triclopyr at 1.5 lb ae/A. All treatments were applied with a 90/10 non-ionic surfactant at 0.25% v/v. Triclopyr provided 70% mimosa control 1 or 3 months after treatment (MAT), and evaluations 12 MAT indicated 50% control. Metsulfuron methyl at 0.72 oz ai/A provided 75% mimosa control 2 MAT, and control was 90 and 88%, 3 and 12 MAT, respectively. Metsulfuron methyl at 0.36 oz ai/A provided 68, 80, or 75% control of mimosa 2, 3, or 12 MAT, which was statistically similar to metsulfuron methyl at 0.72 oz ai/A. Fosamine at 4.0 or 8.0 lb ai/A provided mimosa control less than 50% 1, 2, or 3 MAT, and only 8.0 lb ai/A of fosamine provided greater than 50% control (78%) 12 MAT.

The treatments for the second experiment consisted of flazasulfuron at 0.75, 1.5, or 2.25 oz ai/A, triclopyr at 3.0 lb ae/A, imazapyr at 0.5 lb ae/A, metsulfuron methyl at 0.6 oz ai/A, or aminopyralid at 0.075 lb ae/A + triclopyr at 0.75 lb ae/A. Flazasulfuron did not effectively control mimosa 1 or 2 MAT. Metsulfuron methyl or aminopyralid + triclopyr provided 87% mimosa control, and similar control (80%) was observed with triclopyr 1 MAT. Triclopyr or imazapyr provided 73% mimosa control, and metsulfuron methyl or aminopyralid + triclopyr provided 87 or 90% control, respectively, 2 MAT. Data will be collected for this experiment in 2008 to determine treatments longevity of effective control.

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HERBICIDE AND APPLICATION OPTIONS FOR AMUR (BUSH) HONEYSUCKLE. (*Lonicera maakii* L.).
M.P. Blair, Department of Plant and Soil Sciences, University of Kentucky, Lexington, KY 40546.

ABSTRACT

Amur honeysuckle is a non-native federally listed invasive woody species originally from Asia that has become extremely problematic in the Midwestern region of the United States. Several trials were installed in central and northern Kentucky during 2006 and 2007 to examine different herbicide and herbicide application techniques for amur honeysuckle control. The application techniques included a cut surface combined with a basal or foliar application, a cut surface alone application, a low volume foliar application, and a chemical side trimming application. The cut surface in combination with basal or foliar applications was installed to evaluate amur honeysuckle stems greater than one inch in diameter for cut surface treatments and stem less than one inch in diameter for basal or foliar applications. Although not statistically different than other treatments, Arsenal at 20 % v/v mixed with water resulted in 97 % control of stump sprouts for cut amur honeysuckle 1 YAT while other treatments ranged from 63 to 92 % control 1 YAT. As with stump sprouting evaluations, there were no significant differences among treatments when evaluating sapling control. Arsenal at 2 % v/v mixed in water as a foliar treatment and Garlon 4 @ 20 % v/v mixed in oil as a basal treatment resulted in greater than 90 % control of amur honeysuckle saplings. The cut surface alone trial evaluated several herbicides applied to amur honeysuckle stumps immediately after cutting in May of 2007. Garlon 4 at 20 % v/v + Ax-it Basal Oil, Stalker at 3 % v/v + Hy-Grade Basal Oil, Garlon 4 at 15 % v/v + Stalker at 3 % v/v + Ax-it Basal Oil, Tordon RTU, and Accord at 50 % v/v + water resulted in significantly higher control (all greater than 90 %) than Stalker at 3 % v/v + Ax-it Basal Oil and the cut with no herbicide application 109 DAT. A low volume foliar trial was installed in 2007 to evaluate Escort and Krenite for control of amur honeysuckle. Escort at 1, 2, and 3 oz per acre resulted in significantly higher defoliation (78 %, 63 %, and 70 %, respectively) than Krenite alone 128 fl oz and 256 fl oz per acre 86 DAT. Escort at 1 oz per acre + Krenite at 128 fl oz per acre resulted in 72 % defoliation 86 DAT, which was significantly higher than Krenite alone treatments but statistically similar to all Escort alone treatments. A chemical side trimming trial was installed in 2007 to evaluate several herbicides for their efficacy in chemically trimming amur honeysuckle. Krenite at 3 gl per acre + Escort at 1 oz per acre resulted in significantly higher defoliation (83 %) than all other treatments tested 86 DAT. The cut surface alone, low volume foliar, and chemical side trimming trials will be evaluated in 2008 to obtain 1 YAT data.

INTRODUCTION

Amur honeysuckle is a non-native federally listed woody invasive species that originally from Asia has become extremely problematic in the midwestern United States. In Kentucky, populations of this species are generally concentrated in the central part of the state, stretching from Fayette and surrounding counties north to Kenton and surrounding counties. Although not remarkably tall (plants rarely exceed 20 feet in height), amur honeysuckle can become problematic due to its prolific seed production and ability to repsrout from stumps when cut. Infestations usually become extremely dense and thus form monocultures by out competing other species.

Infestations occur in a variety of sites from roadside rights-of-way, waste areas, parks, and in the understory of a hardwood stand. Due to its ability to survive in a wide array of site conditions, there are several herbicide application techniques available for control. Several trials were installed in 2006 and 2007 to screen three different application methods and herbicide combinations for amur honeysuckle control. These include a cut surface combined with a basal or foliar application trial, a cut surface alone trial, a low volume foliar trial, and a chemical side trimming trial.

METHODS AND MATERIALS

<u>Cut surface applications in combination with basal or foliar treatments</u>
A trial was installed in the summer of 2006 to examine the efficacy of several cut surface herbicide treatments on amur honeysuckle. The site was located at the intersection of I-275 and Three Mile Road in Campbell County, KY. Slopes on the site ranged from 20 % to 45 %. Initial cutting occurred in late July 2006 at 4 to 8 inches to allow for a follow up cutting at herbicide application. After the initial cutting, it was realized that several young (< 1 year old and < 1 inch in diameter) amur honeysuckle saplings were left standing across the entire site. The treatment list was then altered to pair 6 cut surface treatments with different basal or foliar applications to treat the remaining saplings (Table 1). The trial was installed as a randomized complete block design with 6 treatments and 3 replications with plots measuring 15’ X 15’. Amur honeysuckle stumps were cut again August 19, 2006 and treated with cut surface

treatments. Young saplings were treated at the same time using a hand held sprayer. Basal treatments were applied to the lower 12 to 18 inches and foliar treatments were applied at operational standards. Efficacy was not measured in 2006 due to the application being so late in the growing season. Plots were evaluated in July 2007 for visual percent control of stump sprouting and percent control of saplings. Data were analyzed and treatment means were compared using Fisher's LSD at p = 0.05.

Cut surface alone trial

A trial was installed in the late spring of 2007 to examine cut surface applications on amur honeysuckle. The trial was located on the University of Kentucky Agricultural Experiment Station Spindletop Farm in Lexington, KY. The site is an approximately 4 acre woodlot dominated by hackberry (*Celtis occidentalis* L.), white oak (*Quercus alba* L.), and bur oak (*Quercus macrocarpa* Michx.) in the overstory and amur honeysuckle and wintercreeper in the understory. Plots were installed along the edge of the woodlot by cutting approximately 8 to 15 amur honeysuckle stems and marking stumps with pin flags. A buffer was left between plots to avoid cross contamination and plots were of variable dimensions. Seven treatments were evaluated in a randomized complete block design with 3 replications (Table 2). Plots were initially cut from April through May and the final cut and herbicide application were made on May 21, 2007. Amur honeysuckle stumps were cut at ground level and the outer cambium layer was treated with herbicide using a handheld sprayer. Plots were evaluated for sprouting 31 and 109 DAT. Data were analyzed and treatment means were compared using Fisher's LSD at p = 0.05.

Low volume foliar application trial

A trial was initiated in the summer of 2007 to examine the efficacy of Escort and Krenite, both alone and in combination, for amur honeysuckle control in a low volume foliar broadcast application. The site was located at River Hill Park which is owned and managed by the Lexington-Fayette Urban County Government Parks and Recreation. A dense stand of amur honeysuckle had been mowed 2 to 3 years prior and 21 plots were marked measuring 15' X 30'. Six herbicide treatments and 1 untreated check were installed in a randomized complete block design with 3 replications (Table 3). Plots were treated at 40 GPA on July 3, 2007 using a CO_2 powered sprayed and an adjustable cone nozzle handgun. Percent brownout and defoliation was evaluated 48 and 86 DAT. Data were analyzed and Fisher's LSD was used for treatment means separation at p = 0.05.

Chemical side trimming trial

Due to its propensity to occur along roadsides, a trial was installed in the summer of 2007 to examine the efficacy of several herbicides as a chemical side trim option for amur honeysuckle. The study was located at University of Kentucky Agricultural Experiment Station Spindletop Farm in Lexington, KY in an approximately 4 acre woodlot dominated by amur honeysuckle in the understory. Amur honeysuckle, ranging from 10 to 20 feet in height, dominated the understory along the perimeter of the woodlot which allowed for realistic side trim application. Seven herbicide treatments were evaluated in a randomized complete block design with 3 replications (Table 4). Plots were linear, measuring 50 feet in length, and were treated with a boomless tip mounted on an ATV with a 20' tall extension which allowed for a 15' effective spray swath (i.e. plots were effectively 50' X 15'). Plots were treated on July 3, 2007 at 30 GPA. Percent necrosis and defoliation were recorded 48 and 86 DAT for the area treated. Data were analyzed and Fisher's LSD for treatment means separation at p = 0.05.

RESULTS

Cut surface applications in combination with basal or foliar treatments

Arsenal at 20% v/v provided the highest level of control of stump sprouting of amur honeysuckle at 97% 325 DAT (Table 1). This was not statistically different than the lowest level of control of 63% of Roundup Pro at 25% v/v. A foliar application of Arsenal at 2% v/v after stumps were treated with the 20% Arsenal solution resulted in the highest level of control of amur honeysuckle saplings at 97%. This was not significantly higher than the lowest control levels resulting from no treatment of the saplings (treatments 1 and 6). A high degree of variability was noted in the results in this trial. Results indicated Tordon RTU and Arsenal at 20% v/v mixed in water were effective cut surface treatment options. It should be noted that herbicides mixed in water for cut surface applications are not effective in the winter months or when the air temperature is below freezing. Arsenal at 2% v/v mixed in water appears to be an effective foliar-applied option while Garlon 4 at 20% v/v mixed in oil may be a suitable basal alternative.

Cut surface alone trial

All herbicide treatments resulted in greater than 80% control of sprouting and there were no differences across herbicide treatments 31 DAT (Table 2). The Garlon 4 + Stalker tank mixture resulted in 100% control of sprouting

31 DAT and maintained these control levels through 109 DAT. Tordon RTU resulted in 100% control 109 DAT. Stalker at 3% v/v combined with Ax-it oil decreased in control between 31 and 109 DAT from 86 to 64% and was lower at 109 DAT than all other herbicide treatments. Accord at 50 % v/v mixed with water resulted in excellent control 109 DAT. This trial will be reevaluated in the summer of 2008 for one year after application data.

Low volume foliar application trial

All Escort alone treatments resulted in acceptable levels of brownout and defoliation 48 DAT and 86 DAT (Table 3). Krenite alone did not provide acceptable levels of brownout and both treatments were significantly lower than the Escort alone or the Escort / Krenite tank mix. This was to be expected because Krenite does not show visual symptomology in the same season as application on woody plants except pines. The trial will be reevaluated in the spring of 2008 to obtain 1 YAT ratings. Further testing is also needed in the rate response of amur honeysuckle to lower rates of Escort alone and in combination with other herbicides.

Chemical side trimming trial

Krenite in combination with Escort resulted in the highest level of brownout / defoliation 48 DAT with 90% (Table 4) and this was significantly higher than all other treatments. Escort alone resulted in 50 % burndown at 48 DAT which was significantly greater than Krenite alone, Arsenal alone, and Milestone. Escort alone maintained this level of control from 48 to 86 DAT. The results for Krenite alone were to be expected due to Krenite's lack of visual symptomology on hardwood species in the same growing season of application. This trial will be reevaluated in the spring of 2008 to obtain information of 1 YAT.

Table 1: Treatments and Results of Amur Honeysuckle Cut Surface Plus Basal or Foliar Trial

Treatment	Herbicide(s)	Rate	Application Method	325 DAT Percent control sprouts	Percent control saplings
1	Tordon RTU	100 % v/v	Cut surface	92 a	62 a
2	Roundup Pro	25 % v/v	Cut surface	63 a	83 a
	Roundup Pro	2 % v/v	Foliar		
3	Arsenal	20 % v/v	Cut surface	97 a	97 a
	Arsenal + NIS	2 % v/v	Foliar		
4	Garlon 4 + HyGrade	20 % v/v + 80 % v/v	Cut surface	73 a	93 a
	Garlon 4 + HyGrade	20 % v/v + 80 % v/v	Basal		
5	Tordon RTU	100 % v/v	Cut surface	79 a	72 a
	Garlon 3A + Escort + NIS	2 qt/ac + 0.5 oz/ac	Foliar		
6	Roundup Pro + Arsenal	49 % v/v + 1.5 % v/v	Cut surface	83 a	77 a

Note: Treatment means in the same column followed by the same letter are not significantly different using Fisher's LSD at p= 0.05. All mixes contain water except Tordon RTU or Garlon 4. Non-ionic surfactant (NIS) was used at 0.25% v/v.

Table 2: Treatments and Results of Amur Honeysuckle Cut Surface Trial

Treatment	Rate (v/v)	Percent Control 31 DAT	109 DAT
Garlon 4 + Ax-it Oil	15 % + 85 %	87 a	91 a
Stalker + Ax-it Oil	3 % + 97 %	86 a	64 b
Stalker + HyGrade Oil	3 % + 97 %	91 a	91 a
Garlon 4 + Stalker + Ax-it Oil	15 % + 3 % + 82 %	100 a	100 a
Tordon RTU	100 %	92 a	100 a
Accord + water	50 % + 50 %	91 a	98 a
Cut	n/a	4 b	24 c

Note: Treatments means in a column followed by the same letter are not significantly different using Fisher's LSD at p = 0.05.

Table 3: Treatments and Results for Amur Honeysuckle Foliar Trial

Treatment	Rate per acre	Percent Brownout / Defoliation 48 DAT	86 DAT
Escort	1 oz	77 a	78 a
Escort	2 oz	72 a	63 a
Escort	3 oz	83 a	70 a
Krenite	128 fl oz	12 b	12 b
Krenite	256 fl oz	7 b	18 b
Escort + Krenite	1 oz + 128 fl oz	80 a	72 a
Untreated	n/a	0	0

Note: Treatment means in a column followed by the same letter are not significantly different using Fisher's LSD at p = 0.05. All treatments included a NIS at 0.25%.

Table 4: Treatments and Results for the Amur Honeysuckle Chemical Side Trim Trial

Treatment	Rate per acre	Percent Necrosis / Defoliation 48 DAT	86 DAT
Krenite	3 gal	5 c	10 d
Krenite + Escort	3 gal + 1 oz	90 a	83 a
Krenite + Arsenal	3 gal + 12 fl oz	32 b	25 cd
Escort + Arsenal	1 oz + 12 fl oz	32 b	38 bc
Escort	1 oz	50 b	53 b
Arsenal	12 fl oz	3 c	12 d
Milestone	7 fl oz	0 c	5 d

Note: Treatment means in a column followed by the same letter are not significantly different using Fisher's LSD at p = 0.05. All treatments included a non-ionic surfactant at 0.25% v/v.

MOLECULAR AND GENETIC APPROACHES IN WEED SCIENCE: EXAMPLES USING *AMARANTHUS* SPECIES. P.J. Tranel, Department of Crop Sciences, University of Illinois, Urbana.

ABSTRACT

Investigations of evolved herbicide resistance in weed populations continue to be a popular pastime among weed scientists. The mechanisms conferring resistance have been difficult to elucidate in some of the more recent cases, particular in the case of glyphosate resistance in several species. Weed scientists are increasingly using genetic approaches and more sophisticated molecular techniques in studies of herbicide resistance. A thorough analysis of herbicide resistance requires traditional plant breeding approaches. Controlled crosses are conducted to obtain a uniform population so that resistance of the biotype can be accurately quantified and to facilitate studies on the resistance mechanism. Reciprocal crosses between resistant and sensitive biotypes are used to determine if resistance is nuclear or cytoplasmically inherited, and progeny of such crosses also are used to determine the degree of dominance of the resistance trait. Backcross and/or F_2 populations are created to determine, by analysis of segregation ratios, if one or multiple genes mediate resistance. The segregating populations also are powerful tools for testing the involvement of particular candidate resistance genes via co-segregation analysis. A prerequisite for such co-segregation analysis is sequence information of the candidate genes. Emerging genomic resources are helping to meet this prerequisite. For example, an amaranth bacterial artificial chromosome (BAC) library was recently constructed and demonstrated to contain herbicide target site genes. Other emerging genomic resources for *Amaranthus* spp. include microsatellite markers developed specifically for this genus and a database of several million nucleotides of waterhemp genomic sequence. Traditional genetic analysis combined with emerging genomic resources offers a powerful approach to elucidate mechanisms of evolved herbicide resistance in weeds.

SCREENING NEW HERBICIDES FOR ACTIVITY ON *HYDRILLA VERTICILLATA*. C.R. Mudge, W.T. Haller, A. Puri, and T.F. Chiconela, University of Florida, Agronomy Department, Center for Aquatic and Invasive Plants. P.O. Box 110610, Gainesville, FL 32611.

ABSTRACT

The discovery of fluridone resistant hydrilla (*Hydrilla verticillata*) in Florida has left aquatic weed managers with a limited number of herbicides to combat this submersed aquatic weed. Through a cooperative agreement with the Florida Department of Environmental Protection, The Center for Aquatic and Invasive Plants at The University of Florida began screening registered and experimental herbicides in 2004 for use on this weed. The criteria for these herbicides included low use rates, short half-lives and low toxicity to non-target plants and animals. According to the WSSA handbook, there are 28 modes of herbicide action of nearly 325 herbicides sold in the USA. Of these, we have tested over 100 herbicides or herbicide combinations for hydrilla efficacy. Three new modes of action including ALS-inhibiting (penoxsulam, imazamox, bispyribac-sodium), protox inhibitor (flumioxazin) and synthetic auxin (quinclorac) herbicides have received Section 3, 24(c), or Experimental Use Permit registration. There are likely additional submissions for 24(c) labels in the near future.

AQUATIC WEED CONTROL IN FLORIDA. W.T. Haller, C.R. Mudge, and A. Puri, Center for Aquatic and Invasive Plants, University of Florida, Gainesville, FL.

ABSTRACT

Florida has been controlling invasive aquatic weeds (water hyacinth) since 1900 when the US corps of Engineers was mandated to control and remove obstructions to river navigation. The use of sodium arsenate, cutter-boats, draglines and dredges were unable to keep up with the prolific growth of water hyacinth and 2, 4-D effectively joined the battle in the late 1940's. Additional exotic weeds such as torpedograss, alligatorweed, hydrilla and water lettuce replaced water hyacinth as the most serious aquatic weeds. By 2000, approximately $25 million a year was spent by Florida Department of Environmental Protection for aquatic weed management in public waters in Florida ($2-4 million for floating plants, $15-20 million for hydrilla control and $1-2 million for miscellaneous control efforts such as torpedograss, tussock removal, hygrophila, etc.). Fluridone was almost exclusively used for hydrilla control until the development of resistance in many large Florida lakes in 2000-2004. Currently, hydrilla management relies upon the use of contact herbicides such as endothall and diquat, the same products used before fluridone was registered in the early 1980's.

HALEX GT WEED CONTROL IN GLYPHOSATE TOLERANT CORN. Brett R. Miller, Ryan D. Lins, B. David Black and Gordon D. Vail, Syngenta Crop Protection, Greensboro, NC 27419.

ABSTRACT

Halex^{TM} GT is a new post-emergence corn herbicide specifically designed for glyphosate tolerant (GT) corn that provides the convenience of a one-pass, post-emergence glyphosate program plus residual weed control. It combines the active ingredients mesotrione, s-metolachlor and glyphosate into a unique product with excellent crop safety that controls tough grass and broadleaf weeds in corn. The target use rate of 2.21 to 2.46 kg ai/H (3.6 to 4 pt/acre) controls the most important weeds including those that have developed resistance to glyphosate, triazine or ALS-inhibiting herbicides. Halex GT will require the addition of a non-ionic surfactant (NIS) for optimal weed control. Halex GT can be tank mixed with atrazine for added broadleaf weed control or when glyphosate resistant broadleaf weeds are present or suspected. The mixture of active ingredients in Halex GT when tank mixed with atrazine provides an effective glyphosate resistance management strategy in GT corn.

REFLEX®: PERFORMANCE IN COTTON WEED CONTROL SYSTEMS. H.S. McLean* E.W. Palmer, J.C. Holloway Jr., S.H.Martin, B.D. Black, B.W. Minton, T.H. Beckett, and D.J. Porter, Syngenta Crop Protection, Greensboro, NC.

ABSTRACT

Early in the development of Reflex (fomesafen), cotton tolerance and weed control potential were identified. Fomesafen was developed and commercialized in soybean but development in cotton and other crop was halted because of FQPA risk cup limitations. The commercialization of glyphosate tolerant cotton greatly reduced the commercial interest in development of preemergence cotton herbicides. Reassessment of fomesafen toxicology and the subsequent favourable toxicological reclassification provided room in the risk cup for expanded registration into additional crops. At the same time, glyphosate resistant palmer amaranth (*Amaranthus palmeri*) was discovered in specific cotton production areas of the Southeast. These factors coincided and contributed to the registration of Reflex in cotton, snap beans, and dry beans in 2006. In the intervening years, there were many changes in the cotton production practices including expanded use of minimum tillage, strip tillage, and cover crop utilization. Reflex is currently registered in cotton for preemergence and post-directed application of 0.25 to 0.375 pounds ai. per acre. Preemergence application is limited to course soils (sandy loam, loamy sand, sandy clay loam) due to early observations of injury potential on medium and fine soil types. When applied preemergence, Reflex weed efficacy is optimum when activating rainfall or irrigation occurs prior to target weed emergence. A review of available data, regardless of weather conditions, when Reflex was applied preemergence alone in cotton was undertaken to clarify cotton injury potential and identify weed species potentially controlled, but not currently labeled. Initial observations of cotton injury <24 days after application of Reflex preemergence at 0.25 and 0.375 pounds ai/a averaged 5 and 7% across 42 and 50 locations, respectively. Assessments of crop injury 25 to 45 days after application of Reflex preemergence at 0.25 to 0.375 pounds ai/A averaged 2 and 3% across 48 and 69 locations, respectively. Reflex performance on palmer amaranth across 24 locations averaged 89 and 93% control at 25 to 45 days after applications when applied at 0.25 and 0.375 pounds ai/A. Similarly, Reflex applied preemergence at 0.25 and 0.375 pounds ai/A resulted in an average of 97 and 98% control of redroot pigweed (*Amaranthus retroflexus*) across five locations. Future research will evaluate the potential to reduce the cotton fomesafen preemergence soil type restrictions on medium to fine soils when conservation tillage conditions are met.

PREFIX™: A NEW STANDARD FOR RESIDUAL WEED CONTROL IN SOYBEAN. E.W Palmer*, J.C. Holloway, Jr., H.S. McLean, S.H. Martin, B.D. Black, B.W. Minton, D.E. Bruns, T.H. Beckett, and D.J. Porter. Syngenta Crop Protection, Inc. Greensboro, NC 27419.

ABSTRACT

Prefix™ is a formulated premix of *S*-metolachlor and fomesafen for preemergence (PRE) weed control in conventional and glyphosate-tolerant soybean. Prefix is an emulsifiable concentrate (EC) formulation that contains 4.34 lbs/gallon *S*-metolachlor and 0.95 lb/gallon fomesafen. Prefix may be applied at a rate of 2 pints per acre on all soil types up to 15 days before planting or preemergence (PRE).

Prefix provides two different modes-of-action that effectively control weeds. Field research conducted in 2006 and 2007 indicates that Prefix controlled numerous annual grass and broadleaf weeds like barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.] and tall waterhemp [*Amaranthus tuberculatus* (Moq.)J.D.Sauer] as well as glyphosate- and ALS-resistant *Amaranthus* and *Ambrosia* species. When applied PRE, Prefix reduces early season weed competition and provides a wider application window for in-crop glyphosate applications, thus improving full-season weed control and maximizing yield potential. Prefix received Federal registration for use on soybean in 2007.

SHIKIMATE ACCUMULATION CORRELATION TO WEED CONTROL IN SEVERAL WEEDS TYPICAL IN CITRUS GROVES. S.D. Sharma, M. Singh; University of Florida, Lake Alfred, FL, and T.C. Mueller; University of Tennessee, Knoxville, TN.

ABSTRACT

A study was conducted to identify the tolerant/resistant trait in weeds to plan sustainable weed management strategies using glyphosate. These weeds were examined to measure the amount of shikimate accumulation. The effect of glyphosate application on percent control and growth parameter (plant height) was also examined. Shikimate fluxes in different plant species were compared to glyphosate treated soybean and GR soybean to determine whether plants of test species have developed resistance to glyphosate. Our hypothesis was that shikimate accumulation would be directly correlated to whole plant activity of glyphosate. The mechanism of action of glyphosate causes shikimate to build up due to the blockage of the EPSPS (5-enolpyruvoylshikimate-3-phosphate synthase) enzyme, which is the active site of glyphosate. Four difficult-to-control weeds, viz. dayflower, Brazil pusley, ivyleaf morningglory, and Spanishneedles, were selected for examination to determine the changes in shikimate concentrations in plant shoots from 1 to 6 d after glyphosate application. The shikimate accumulation was compared with conventional soybean and Glyphosate Resistant (GR) soybean plants. With whole plant bioassays, shikimate accumulation data indicated that the application of glyphosate to dayflower, ivyleaf morningglory, and Brazil pusley may not have completely blocked the EPSPS enzyme activity. However, mechanism of glyphosate resistance in dayflower, Brazil pusley, and ivyleaf morningglory is not known. But from shikimate concentrations, either of the weed plants tested did not indicate any resistance to glyphosate application. In Spanishneedles, shikimate was linearly increasing until 6 days after treatment (DAT). Accumulation of shikimate recorded significantly lower values in treated plants than that of untreated soybean plants, which was 14000 µg/g at 6 DAT while the corresponding values in dayflower, ivyleaf morningglory, and Brazil pusley were <3000 µg/g of fresh plant tissue. As expected, there was no shikimate concentrations accumulated in GR soybean treated with glyphosate. Percent control values and increase in shikimate concentration indicated that Spanishneedles was more susceptible in comparison to other weed species tested. Although the fastest growing plants tended to have lower initial shikimate concentrations, there was no obvious correlation between untreated plant growth and shikimate concentration in treated plants. Glyphosate application on the test weed plants indicated that dayflower, Brazil pusley, and ivyleaf morningglory plants were either tolerant or these observations may be the earlier indications of glyphosate resistant development in these plants.

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DISTRIBUTION OF ^{14}C-GLYPHOSATE IN GLYPHOSATE-RESISTANT PALMER AMARANTH (*AMARANTHUS PALMERI*). T.L. Grey, L.M. Sosnoskie, A.M. Wise, University of Georgia, Crop and Soil Sciences Department, Tifton, GA 31794, and W.K. Vencill, University of Georgia, Crop and Soil Sciences Department, Athens, GA 30602.

ABSTRACT

The foliar retention, absorption, translocation, and diffusion of glyphosate in glyphosate resistant- and susceptible Palmer amaranthus were examined. When application of ^{14}C-glyphosate to a single leaf followed entire plant treatment with glyphosate, the distribution percentages were similar for glyphosate resistant and susceptible for the above and below treated leaves when harvested at 1, 6, 12, 24, and 48 hours after application. There were initially no differences between glyphosate resistant and susceptible Palmer amaranthus at 1 hour after treatment with an average of 8% absorption for both biotypes. However, data indicated that glyphosate absorption was more rapid for the glyphosate resistant Palmer amaranthus reaching 41% within 6 hours after application and was significantly different (P = 0.010) from the 28% absorbed by susceptible. Glyphosate resistant and susceptible Palmer amaranthus averaged 44% ^{14}C-glyphosate absorption by 24 hours after application. There were no differences for ^{14}C-glyphosate Bq/mg of plant tissue between glyphosate resistant and susceptible for the above the treated leaf and below the treated leaf portions of the plant at 1, 6, 12, 24, or 48 hours after application. However, root accumulation of ^{14}C-glyphosate in plant tissue was significantly greater by 12 hours after treatment for the roots of glyphosate resistant (1.21 Bq/mg) than for the susceptible (0.51 Bq/mg). Although not significantly different from the susceptible, glyphosate resistant Palmer amaranthus had greater accumulation of ^{14}C-glyphosate in the roots (0.61 vs. 1.03 Bq/mg, respectively). The treated leaf of the glyphosate resistant plants exhibited greater translocation of ^{14}C-glyphosate in Bq/mg of tissue than the susceptible over time.

SEED DORMANCY REGULATION IN PALMER AMARANTH. P. Jha, J.K. Norsworthy, M.B. Riley, and M.S. Malik, Clemson University, Clemson, SC; University of Arkansas, Fayetteville, AR.

ABSTRACT

Palmer amaranth, a dioecious summer annual, is one of the most problematic weeds in row crop production in the southeastern United States. Palmer amaranth is a prolific seed producer and exhibits seed dormancy, resulting in an extended period of in-crop emergence. Seed dormancy is a mechanism of survival and persistence of weed seeds in soil seed bank. Seed dormancy is regulated by endogenous levels of abscisic acid (ABA) and gibberellic acid (GA) present in seeds during maturation. Dormancy is a mechanism of shade avoidance in some weed species. Location of seeds on the mother plant can also influence dormancy due to differences in size, time of maturation, resource utilization, and development. The objectives of this research were to investigate 1) effects of shading, 2) location of seeds on the mother plant on differential seed dormancy of Palmer amaranth within a population, and 3) the role of endogenous levels of ABA and GA in seed dormancy.

Field experiments were initiated in June 2006 and the experiments were arranged in a completely random design with three replications per treatment. To testify objective 1, plants were grown beneath black shade cloths providing 47 and 87% shade and in full sunlight (no shading). To accomplish objective 2, at flowering, the main stem of female Palmer amaranth plants were tagged at three equally spaced vertical locations (top one-third, middle one-third, and bottom one-third). After harvest of the female inflorescence, seeds were stored dry at room temperature for 7 days. A portion of the seed lot was used for evaluating germination and rest of the seeds were stored at -80 C for ABA and GA quantification. Seeds for the germination test were placed between filter papers moistened with 5 ml of distilled water and incubated at 25 C for 14 days. Seeds with radicle protrusion of at least 1mm were considered germinated. Endogenous ABA and GA were quantified using GC/MS. Ions fragments were quantified by single ion monitoring (SIM) at m/z 162, 166 for native ABA, deuterated ABA and m/z 504, 506 for native GA_3, deuterated GA_3.

Palmer amaranth germination was not influenced by shading (P = 0.16) and ranged from 19 to 29%. Endogenous ABA levels were similar across 0, 47, and 87% shade treatments and varied from 10.6 to 16.8 ng/g seed. GA_3 content in seeds harvested from plants grown in 0% shade was 51.0 ng/g seed and was higher than that in the 47 and 87% shade. Palmer amaranth seed germination was influenced by location on the mother plant (P = 0.02). Germination of seeds harvested from the bottom one-third of the plant was 7% and was 54% average lower than those harvested from the top one-third and middle one-third of the plant. However, germination of seeds from the top and bottom one-third locations was similar. Consistent with germination, ABA content of the seeds was influenced by location on the mother plant (P = 0.0017). ABA content of seeds from the bottom one-third of the plant was 17.6 ng/g and was higher than the 10.3 and 10.8 ng/g in seeds from the top and middle one-third of the plant. GA_3 content of the seeds was similar across the three locations on the mother plant and ranged from 49.9 to 50.1 ng/g seed. In conclusion, Palmer amaranth seed dormancy was not influenced by shading up to 87%. Seeds from the bottom one-third of the mother plant were more dormant and had higher levels of ABA than the other two locations. Palmer amaranth seed dormancy was not influenced by the GA content of the seeds.

INFLUENCE OF BURIAL DEPTH AND TIME OF YEAR ON WILD RADISH (*RAPHANUS RAPHANISTRUM*) SEED DORMANCY. M.S. Malik, J.K. Norsworthy, M.B. Riley, and P. Jha, Department of Entomology, Soils, and Plant Sciences, Clemson University, Clemson, SC; Department of Crop, Soils, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

ABSTRACT

Wild radish is an indeterminate, facultative winter annual that emerges throughout the year and is a troublesome weed in small grain crops in the southeastern United States. The siliques containing seeds shatter following maturation and acts as a barrier for seed germination. However, decay of siliques during after-ripening process allows seed germination to occur under favorable environmental conditions. Laboratory experiments were conducted from 2005 through 2007, at Clemson, SC, to determine the influence of burial depth and time of year on wild radish seed dormancy. Wild radish siliques containing seeds were packed in nylon mesh bags and placed in to 50-cm diameter open ended pipes inserted in soil at a 15-cm depth. The bags were placed on the soil surface and at a 10-cm depth in those pipes. Surface and buried siliques were retrieved at 0 (freshly harvested), 3, 6, 9, and 12 months after placing them in the field. A portion of the siliques were cleaned and dried at room temperature and the seeds were removed from remaining siliques. Germination tests were performed by placing 50 seeds in between filter papers moistened with 10 ml of distilled water in 9-cm-diameter petri dishes. The petri dishes were placed in incubators maintained at constant temperatures of 0, 5, 10, 15, 20, 25, and 30 C and 12 h fluctuating temperatures (±7.5 C) of 10, 15, 20, 25, and 30 C. The experimental design was a completely random design with 5 retrieval dates occurring every 3 months and three replications per treatment. Germination data were subjected to ANOVA, and means were separated using Fisher's protected LSD at $\alpha = 0.05$.

At constant temperatures from 5 to 25 C, wild radish at the 0 timing had a germination of 3 to 15% and 3 to 12% during 2005-06 and 2006-07, respectively. At fluctuating temperatures from 10 to 25 C in 0 timing, wild radish seed germination ranged from 10 to 21% and 10 to 16% for 2005-06 and 2006-07, respectively. The germination of wild radish increased as the duration of after-ripening increased. Surface lying seeds retrieved after 3 months had germination of 7 to 33% and 12 to 24% during 2005-06 and 2006-07, respectively, at constant temperatures of 5 to 25 C. In both years, three months after retrieval, germination was 7 to 23% at fluctuating temperatures of 10 to 25 C. Wild radish seeds buried in soil for 3 months had germination ranging from 33 to 56% and 7 to 40% during 2005-06 and 2006-07, respectively, at constant temperature of 5 to 25 C. Germination of surface and buried seeds retrieved after 6 months was 3 to 31% at constant temperatures (5 to 25 C). At fluctuating temperatures of 10, 15, and 20C, germination was 3 to 27%. Percent germination of surface and buried seeds started declining at the 9 month retrieval period, with the highest germination being 11% for surface lying seeds at 15 and 20 C (constant) and 15% for buried seeds at 15 C (constant). The maximum percent germination for surface and buried seeds was 12% at the 12 month retrieval period. None of the seeds germinated at 0 C. No differences were found in the percent germination of seeds enclosed in siliques and the ones removed from siliques.

PREEMERGENCE HERBICIDES AFFECT CRITICAL PERIOD OF WEED CONTROL IN COTTON.
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ABSTRACT

Effective weed control systems must eliminate emerged weeds as well as account for subsequent weed emergence. Two common questions associated with herbicide control are: 1) how long can weeds compete with a crop for resources before yield is reduced and 2) when do weeds that emerge late in the season cease to affect crop yield? Studies that address both of these questions will determine the critical period of weed control (CPWC), in which crop yield losses will be minimized to a standard level (i.e. 5%). Field studies were conducted in 2003 and 2004 in Chula, GA to determine the influence of preemergence herbicides (PRE) with soil residual activity on the CPWC. Weed-free and weedy durations in 2-leaf intervals between 2- and 12-leaf cotton were evaluated with and without PRE treatments of pendimethalin + fluometuron. Plots were maintained weed-free using glyphosate. In the absence of PREs, maximum cotton yield loss from season-long interference was 78%. The CPWC was between planting and the 5- to 6-leaf stage, corresponding to the first four weeks of the season. Inclusion of PREs resulted in 37 to 61% yield loss from season-long interference. In 2003, the CPWC occurred between planting and the 3-leaf stage (first 3 weeks of the season). In 2004, a single control event between the 2- and 6-leaf stage of cotton minimized yield loss to 5%. The inclusion of PREs did reduce the CPWC, but effectiveness in other fields will be a function of weed spectrum and how that spectrum matches with the efficacy of the herbicides that are used PRE and POST.

SOYBEAN CANOPY SHADE TOLERANCE OF APPLE OF PERU, CUTLEAF GROUNDCHERRY, AND EASTERN BLACKNIGHTSHADE. A.M. Stark, M.G. Burton, and S.T. Hoyle, NC State University, Raleigh, NC.

ABSTRACT

Apple of Peru (*Nicandra physaloides*) and Eastern blacknightshade (*Solanum ptycanthum*) are weeds introduced to North Carolina in recent decades. Reports of herbicide tolerances for apple of Peru and its recent and rapid increases in distribution have resulted in increased concern among soybean and cotton growers. The objective of this greenhouse experiment was to simulate the effect of soybean canopy age on the growth of apple of Peru, Eastern blacknightshade, and the native weed cutleaf groundcherry (*Physallis angulata*) (all Solanaceous weeds). Soybean (cv. Croplan 5905RR) was planted in deep pots (20 cm diameter, 45 cm deep) arranged in 30 cm rows 2, 4, or 6 weeks before emerged seedlings of each weed were transplanted to separate pots between rows. Pots were filled with a proprietary blend of peat and vermiculite and maintained moist via sub-irrigation. Supplemental lighting (1000w high-pressure sodium lamps) was used to give a maximum daytime irradiance of about 1200 umols m^{-2} s^{-1} PAR at canopy level with a 12 h photoperiod. Soybean population was thinned to 24 pl m^{-1} of row two WAP. Weed seedlings were transplanted to individual pots at the cotyledon stage of growth. Final height, stem diameter (2.5 cm above soil level), and dry weight (dried at 60C) observations were collected 8 weeks after transplanting. Main effects of treatments in the factorial arrangement were subjected to ANOVA as a split-plot design (using appropriate error terms) with canopy age as whole-plots and weed species as sub-plots. Weed height differed among canopy ages (P=0.03) and species (P=0.003), and means were subjected to a combination of curve fitting and paired t-tests. Height of apple of Peru declined linearly from an average of 172 cm to 82 cm as soybean age increased (slope =-22.5, R^2=0.92). Cutleaf groundcherry height declined linearly from an average of 128 cm to 78 cm (slope = -12.5, R^2=0.98). Although mean height of Eastern blacknightshade decreased from about 80 cm to 30 cm as soybean canopy age increased, pairwise t-tests revealed that 2 and 4 week heights were greater compared to weed height in the 6 week old soybean canopy. Final soybean canopy height was about 130 cm for all canopy ages. Weed stem diameter was affected by canopy age (P=0.04) and species (P<0.001), and a canopy age X species interaction was detected (P=0.004). Weed dry weight was influenced only by canopy age (P=0.04), and no interactions were detected. Data were, therefore, combined across species. Dry weight of weeds transplanted into the 6 week old soybean canopy was small compared to 2 and 4 week soybean canopy treatments ($P>t \leq 0.05$). These preliminary results suggest that, under these conditions, apple of Peru and cutleaf groundcherry are stronger competitors against soybean than Eastern blacknightshade. In general, these results also suggest that the 6 week old soybean canopy has a stronger effect in reducing weed seedling competitiveness than 2 and 4 week old canopies. Growers managing soybean at 30 cm or wider row spacing might need to give special attention to minimize the effects of these Solanaceous weeds for periods of about 6 weeks.

SEEDBANK LONGEVITY AND EMERGENCE DYNAMICS OF BENGHAL DAYFLOWER (*COMMELINA BENGHALENSIS* L.). M.G. Burton[1], T.M. Webster[2], and A.C. York[1], NC State University, Raleigh[1];USDA-ARS,Tifton,GA[2].

ABSTRACT

While others have indicated that tropical species are often expected to have short seedbank longevity and fairly predictable seedbank dynamics, questions as to whether “eradiation by depletion” (i.e. elimination of a plant species over years of preventing reproduction) of Benghal dayflower is feasible prompted the initiation of seedbank longevity experiments in 2004 and 2005. Seeds (75 small and 25 large aerial seeds) from a NC Benghal dayflower population were were mixed with screened native soil and sewn into plastic mesh bags. Sufficient bags were buried at 20 cm depth (at the bottom of the plow layer) to allow exhumation of four replicate bags every six months for several years. The experiment was replicated in NC by a parallel experiment (separate start year) in 2005 using seed from a GA population, and a similar experiment was initiated in 2005 in Tifton, GA, using seed from both NC and GA populations.Commelina benghalensis L.). A separate set of experiments examining the survival of Benghal dayflower seeds subjected to shallow burial (0 to 5 cm) was also initiated in NC. Treatments included annual and frequent cultivation and the presence/absence of a crop. Results of the deep burial experiments indicate that seed demise has occurred more rapidly in GA than in NC. After two years of deep burial, both NC and GA seed declined in viability to about 30% when buried in GA. However, the same seedlots had only declined to about 50% viability after 3 years of burial. Frequent cultivation in the shallow burial experiment was the only treatment that stimulated germination/emergence of Benghal dayflower in shallow depths with little apparent effect of crop. Difficulties in breaking dormancy for germination tests and difficulties with tetrazolium chloride staining continue to complicate interpretation of results.

THE HIGHER FINANCE OF BASIC LABORATORY RESEARCH OR HOW TO SQUEEZE BLOOD OUT OF A TURNIP. S.A. Senseman, Texas AgriLife Research, Department of Soil and Crop Sciences, 2474 TAMU, College Station, TX 77843-2474.

ABSTRACT

Funding for basic laboratory research, particularly in weed science, is a true challenge. It is the phase of my job of which I feel to be the most dissatisfying and where I am the most inadequate. I do not know of anyone associated with a laboratory academic position who does not consider funding a program one of the biggest challenges of their job. I can describe my experience so far after 13 years of academic life as one where possibilities were positive initially and now have matured to the point where innovation is of primary importance to move forward in a more competitive atmosphere. There are a number of funding sources that have been available to help fund our laboratory program that have included national, state, and regional agencies as well as industry funding. From my perspective, there are several funding strategies that can be employed to fund a laboratory and carry with them different levels risk. Budgeting and the concepts of direct/indirect costs are things that a young scientist will be introduced to and I will attempt to shed some light on these concepts. Certainly, a young faculty member has a great deal to worry about and funding is a necessary evil of the process. Managing this stress goes along with managing the other stresses of academic life. It can be done. Someday, I hope to prove that to myself.

WHERE'S THE MONEY? FUNDING REALITIES FOR YOUNG WEED SCIENTISTS IN ACADEMIA.
R.J. Richardson, Department of Crop Science, North Carolina State University, Raleigh.

ABSTRACT

Funding opportunities and expectations have changed greatly across the weed science community over the last 20 years. The many mergers of agrichemical companies and consistent budget reductions at the state and federal levels have depleted much of the regular funding once available. In turn, additional competitive opportunities have become available and most weed science positions are now expected to win their share of these awards. The number of peer-reviewed publications and amount of competitive grant dollars won has generally become the most important factors in promotion and tenure decisions for research appointments. Other current trends in academia today include shifting positions from 12 to 9 month appointments, reduced departmental/college support for regular faculty expenses (graduate students, vehicles, travel, gas, phones, etc.), loss of state supported secretarial and technical positions, and increased pressure for faculty to generate funding with overhead. Under these conditions, estimated yearly expenses to drive weed science programs could include $22,000 for 3 months faculty salary and fringe, $30,000 for graduate student support, $45,000 for technician salary and fringe, $5,000 to $50,000 for supplies and materials, $1,000 to $10,000 for hourly labor, $1,500 for publication costs, $1,600 for gasoline, $1,000 for one conference per individual, and $1,000 for a cell phone with data service. While these estimates would vary widely depending on locality, type of weed program (applied, basic, extension, teaching, etc.), and university policies, yearly expenses can easily exceed $100,000. In order to fund programs, faculty must be able to use many funding sources. Agrichemical money is still available, but varies widely depending on commodity or site of research. Federal competitive funding sources are many and proposal acceptance rate typically vary from 10 to 40%. Due to the amount of time most federal proposals require, it is essential that proposals are matched closely with the federal program providing the best opportunity. Many state agencies as well as commodity groups may provide funding opportunities. However, commodity money is usually dependent on commodity price and acreage harvested so the amount available can vary widely from year to year. Other funding sources, such as non-profit organizations, may also be available.

MANAGEMENT CONCERNS REGARDING OLD WORLD CLIMBING FERN (*LYGODIUM MICROPHYLLUM*). J. T. Hutchinson and K. A. Langeland, University of Florida - IFAS, Agronomy Department, Center for Aquatic and Invasive Plants, 7922 NW 71st St., Gainesville, FL 32653.

ABSTRACT

Old World climbing fern (OWCF; *Lygodium microphyllum* {Cav.} R. Br.) has been documented in Florida for < 50 years, but is considered one of the most highly invasive plants in natural areas. OWCF has spread rapidly across the south Florida landscape due to wind-blown spores invading mesic and hydric wetlands, including the Florida Everglades. Current coverage of the fern is > 48,000 ha and the fern is spreading north into central Florida. Control of OWCF is expensive and labor intensive as the fern often occurs in isolated areas only accessible by helicopter. Management of the fern is difficult and control of OWCF can only be obtained with frequent monitoring and repeated herbicide treatment. We found that translocation of glyphosate, metsulfuron methyl, and triclopyr in OWCF is limited with no translocation horizontally along rhizomes, explaining why mangers often report re-growth several months following herbicide treatment of OWCF. Based on greenhouse studies, we found that OWCF can produce > 800 rachis sprouts from a single plant and > 4400 new sporophytes per m^2. Growth rates from re-sprouts on rhizomes and new sporophytes can be 3.8 and 1.9 m / year, respectively, under greenhouse conditions. The development of fertile leaflets begins at 3-4 months and spores can remain viable for at least seven years. Germination rates of OWCF can be as high as 96%. For effective management of OWCF, complete coverage with herbicide of all rachis sprouts and pinnae must be obtained. Due to the overlapping, indeterminate growth pattern of OWCF, complete control of large infestations of OWCF with one herbicide application is nearly impossible. Long-term monitoring and follow-up herbicide applications will be required in established populations of OWCF due limited herbicide translocation, re-sprouts from rhizomes, quick development of fertile leaflets, excessive spore production, high spore germination rates, high densities of new sporophytes, fast growth rates, and long spore viability.

INFLUENCE OF HERBICIDE AND TIME OF APPLICATION ON RECOVERY OF PEANUT FOLIAR BURN. J. Boyer, G. MacDonald and J. Ferrell, University of Florida, Gainesville, FL.

ABSTRACT

Extensive testing has shown that paraquat can be safely applied from peanut emergence to 28 days after cracking (DAC). However, this original research was conducted on now defunct peanut varieties. New varieties with greater yield potential and disease resistance are now available, but there has been little testing of paraquat on these newer peanut varieties. The objective of this study was to evaluate the effect of paraquat application timing on peanut yield. Field experiments were conducted in Citra, FL in 2007 on the varieties AP-3 and FL-07. Both varieties are runner-market type peanuts with medium season maturity (135 – 145 days). The site was maintained weed free and insect and disease control were conducted as needed to maintain optimum growth. Herbicide treatments included paraquat (0.14 kg/ha) and paraquat (0.14 kg/ha) plus bentazon (0.28 kg/ha) applied at 14, 21, 28, 35 or 42 DAC. Treatments were visually evaluated at 7 and 14 days after treatment (DAT) for herbicide injury. Canopy width was also measured from the time of herbicide application until canopy closure.

As expected, foliar injury was observed for all treatments relative to the untreated control at 7 and 14 DAT. Paraquat alone at 14, 28, and 42 DAC delayed canopy closure in AP3 by 14 to 17 days, relative to untreated. For FL-07, canopy closure was only impacted when paraquat was applied at 42 DAC. Paraquat, with or without bentazon, at 14 DAC and paraquat alone at 21 and 42 DAC reduced yield of AP3 by >12%. Conversely, yield loss was observed in FL-07 with the 14 DAC application, but not for any other timings. In general, the addition of bentazon did reduce foliar burn, but did not impact delays in canopy closure or yield reduction. These data indicate that paraquat applications can result in yield loss when applied according to the product label, but may not reduce yield when applied as late as 35 DAC. Additional research is needed to determine what factors interact with paraquat applications to cause yield reduction at some timings, but not others.

EVALUATION FOR NEW HERBICIDES USE IN CORN. B.J. Varner, J.T. Irby, and D.B. Reynolds, Mississippi State University, Mississippi State, MS.

ABSTRACT

In 2007, corn acreage in the United States increased to 93.6 million acres up 19% from the 2006 acreage. According to the National Agricultural Statistic Survey (NASS), 24% of this acreage was planted in herbicide resistant varieties. With this increase in acreage, growers will be faced with management decisions such as choosing a herbicide program that will do the job both economically and efficiently. Since the introduction of glyphosate tolerant crops, glyphosate resistant weeds have developed due to extensive use of single modes of action. Therefore it is important for growers to have the option of using herbicides with different modes of action either alone or in combination with their current herbicide program. Impact® (topramezone), a relatively new compound, offers growers control of many broadleaf weed species as well as suppression of some grass species. Laudis® (tembotrione) is a new postemergence corn herbicide offering control of many broadleaves including pigweed species as well as common cocklebur. This product also controls grass species such as seedling johnsongrass, large crabgrass, and broadleaf signalgrass.

Experiments were conducted at the Plant Science Research Center in Starkville, MS to evaluate the efficacy of these herbicides on weed species common to Mississippi. The soil consists mostly of a loam soil and the corn used in these experiments was Pioneer 31G71. This variety contains the Roundup Ready II, Liberty Link, and Herculex I technologies. The seeding rate was 32,000 seeds per acre. A randomized complete block design was used with each treatment being replicated four times. Each experimental unit was 12.66 by 40ft. Applications were made using a backpack sprayer at an output rate of 15 gallons per acre (GPA). Visual ratings of weed control and crop injury were recorded 7, 21, and 28 days after application. Weeds present included large crabgrass (*Digitaria sanguinalis* (L.) Scop.), johnsongrass (S*orghum halepense* L. Pers.), pitted morningglory (*Ipomoea lacunosa* L.), and tall water hemp (*Amaranthus tuberculatus* (Moq.) J.D. Sauer)

Liberty (glufosinate) 32 oz/A + Impact 0.75 oz/A + atrazine 1.0 lb ai/A showed 97 to 98% control of all species evaluated 7 days after treatment and 99% control 28 days after treatment. Both Impact 0.75 oz/A + AAtrex 1.5 lb ai/A and Liberty 32 oz/A + AAtrex 1.5 lb ai/A provided 92 to 99% control of all species 28 days after application. Roundup OriginalMax (glyphosate) 22 oz/A + Impact 0.75 oz/A + AAtrex 1.0 lb ai/A showed 99% control of all rated species 28 days after application. Both Laudis and Impact could provide excellent weed control when utilized in Roundup Ready® and Liberty Link corn systems. No significant differences were observed among treatments for corn yields. Further research needs to be conducted to determine the fit of Laudis and Impact in Roundup Ready® and Liberty Link® Corn systems to optimize weed control and increase yields.

CONFIRMATION AND MANAGEMENT OF GLYPHOSATE-RESISTANT GIANT RAGWEED IN ARKANSAS. J. Still, J.K. Norsworthy, and R.C. Scott, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

ABSTRACT

The response of giant ragweed to a commercial formulation of glyphosate (Roundup WEATHERMAX®) was evaluated in Greene County, AR, under field conditions in 2005. Additionally, the effectiveness of alternative postemergence-applied herbicides for controlling the putative-resistant biotype was evaluated. In the first field experiment, glyphosate was applied as a single application to 15- and 30-cm tall giant ragweed at 0.43, 0.87, 1.30, 1.73, and 3.48 kg ae/ha. Additional treatments included glyphosate applied to 15-cm tall giant ragweed at 0.87 and 1.73 kg/ha followed by a subsequent application at the same rate at 3 weeks after the initial treatment. In the second field experiment, herbicides applied to 15-cm tall giant ragweed included: glyphosate at 0.87 kg/ha, chlorimuron at 0.008 kg/ha, acifluorfen at 0.42 kg/ha, imazaquin at 0.091 kg/ha, fomesafen at 0.263 kg/ha, fluiclorac-pentyl at 0.045 kg/ha, chloramsulam-methyl at 0.024 kg/ha, carfentrazone at 0.018 kg/ha, and bentazon at 0.84 kg/ha. Fomesafen at 0.329 kg/ha, flumiclorac-pentyl at 0.06 kg/ha, carfentrazone at 0.026 kg/ha, and bentazon at 1.12 kg/ha were applied to 30-cm tall giant ragweed. All other herbicides were applied to 30-cm tall giant ragweed at the same rate applied at the earlier stage. An adjuvant was added to each herbicide. A nontreated control was included in both studies, and control was visually rated at 3 weeks after the 30-cm application.

Giant ragweed control increased with glyphosate rate at both application timings. At 3 weeks after the later application, the 1X rate of glyphosate (0.87 kg/ha) provided only 11% control, regardless of application timing. Overall, glyphosate was more effective in controlling 15-cm than 30-cm tall plants. For instance, glyphosate rate at 3.48 kg/ha (4X rate) provided 96% control at the earlier timing compared with only 56% control following the later application. Sequential glyphosate applications at 0.87 kg/ha resulted in 90% control. In the second experiment, all herbicide treatments provided <60% control regardless of application timing, except for chloramsulam-methyl and fomesafen applied at the 15 cm height. Control of 15-cm tall giant ragweed was 64% with chloramsulam-methyl and 86% with fomesafen.

The Greene County giant ragweed accession and additional accessions from Mississippi County and Jefferson County were screened for resistance to glyphosate in the fall of 2006. Susceptible accessions from Lonoke and Washington County were used for comparison. A glyphosate rate titration experiment was conducted twice in the greenhouse on 4- to 6-leaf (10- to 12-cm tall) giant ragweed seedlings. Seedlings were treated with 8 rates of glyphosate (MON 78623) ranging from 0.035 to 2.24 kg/ha plus 0.25% v/v nonionic surfactant. Plant death was recorded 28 days after treatment. The lethal dose needed to kill 50% of each population (LD_{50}) was determined. The LD_{50} values for the susceptible biotypes were 0.164 and 0.335 kg/ha glyphosate for Lonoke and Washington County, respectively. The Mississippi, Greene, and Jefferson County accessions had an LD_{50} of 0.680, 0.765, and 1.180 kg/ha glyphosate, respectively. The Jefferson County accession was 7.2 times more tolerant to glyphosate than the Lonoke County accession, indicating the evolution of glyphosate-resistant giant ragweed in Arkansas. Additional research is underway to determine control measures for progeny from the greenhouse experiment as well as sensitivity of the subsequent generation to glyphosate.

WEED SURVEY – SOUTHERN STATES

2008

Grass Crops Subsection

(Corn; Grain Sorghum, Hay, Pastures, and Rangelands; Rice; Small Grains; Sugarcane; Turf; Wheat)

Theodore M. Webster
Chairperson

Information in this report is provided by the following individuals:

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Table 1. The Southern States 10 Most Common and Troublesome Weeds in Corn.

	States		
Ranking	Alabama	Florida	Georgia
Ten Most Common Weeds			
1	Broadleaf signalgrass	Crabgrasses	Crabgrasses
2	Crabgrasses	Goosegrass	Texas millet
3	Morningglories	Wild radish	Morningglories
4	Florida pusley	Florida pusley	Pigweeds
5	Pigweeds	Nutsedges	Sicklepod
6	Sicklepod	Pigweeds	Common cocklebur
7	Fall panicum	Texas millet	Johnsongrass
8	Johnsongrass	Morningglories	Florida pusley
9	Common cocklebur	Sicklepod	Nutsedges
10	Nutsedges	Common bermudagrass	Common bermudagrass
Ten Most Troublesome Weeds			
1	Texas millet	Common bermudagrass	Texas millet
2	Morningglories	Morningglories	Crabgrasses
3	Sicklepod	Nutsedges	Morningglories
4	Fall panicum	Texas millet	Pigweeds
5	Pigweeds	Wild radish	Sicklepod
6	Johnsongrass	Pigweeds	Nutsedges
7	Broadleaf signalgrass	Hemp sesbania	Johnsongrass
8	Smooth crabgrass	Cutleaf eveningprimrose	Annual ryegrass
9	Nutsedges	Sicklepod	Pennsylvania smartweed
10	Common cocklebur	Benghal dayflower	Benghal dayflower

Table 1. The Southern States 10 Most Common and Troublesome Weeds in Corn (continued).

	States		
Ranking	Kentucky	North Carolina	Puerto Rico
Ten Most Common Weeds			
1	Smooth pigweed	Large crabgrass	Johnsongrass
2	Large crabgrass	Broadleaf signalgrass	Crabgrasses
3	Johnsongrass	Pigweeds	Red sprangletop
4	Morningglories	*Ipomoea* spp.	Itchgrass
5	Giant foxtail	Common lambsquarters	Alexandergrass
6	Giant ragweed	Sicklepod	Goosegrass
7	Common cocklebur	Goosegrass	Junglerice
8	Honeyvine swallowwort	Common ragweed	Horse purslane
9	Fall panicum	Prickly sida	Pigweeds
10	Yellow nutsedge	Pennsylvania smartweed	Wild poinsettia
Ten Most Troublesome Weeds			
1	Honeyvine swallowwort	*Ipomoea* spp.	Itchgrass
2	Broadleaf signalgrass	Palmer amaranth	Johnsongrass
3	Burcucumber	Broadleaf signalgrass	Nutsedges
4	Giant ragweed	Texas millet	Bermudagrass
5	Johnsongrass	Burcucumber	Crabgrasses
6	Dandelion	Pennsylvania smartweed	Goosegrass
7	Common pokeweed	Yellow nutsedge	Junglerice
8	Morningglories	Common bermudagrass	Alexandergrass
9	Yellow nutsedge	Johnsongrass	Wild poinsettia
10	Italian ryegrass	Trumpetcreeper	Red sprangletop

Table 1. The Southern States 10 Most Common and Troublesome Weeds in Corn (continued).

	States	
Ranking	South Carolina	Tennessee
Ten Most Common Weeds		
1	Large crabgrass	Broadleaf signalgrass
2	Texas millet	Palmer amaranth
3	Morningglories	Morningglories
4	Sicklepod	Johnsongrass
5	Pigweeds	Goosegrass
6	Broadleaf signalgrass	Smooth pigweed
7	Johnsongrass	Large crabgrass
8	Common cocklebur	Fall panicum
9	Yellow nutsedge	Slender amaranth
10	Common bermudagrass	Horseweed
Ten Most Troublesome Weeds		
1	Texas millet	Broadleaf signalgrass
2	Palmer amaranth*	Morningglories
3	Morningglories	Johnsongrass
4	Sicklepod	Goosegrass
5	Florida pusley	Large crabgrass
6	Prickly sida	Fall panicum
7	Large crabgrass	Redvine
8	Pennsylvania smartweed	Palmer amaranth
9	Bristly starbur	Smooth pigweed
10	Nutsedges	Italian ryegrass

*Glyphosate-resistant

Table 2. The Southern States 10 Most Common and Troublesome Weeds in Grain sorghum.

	States		
Ranking	Alabama	Florida	Georgia
Ten Most Common Weeds			
1	Crabgrasses	Crabgrasses	Crabgrasses
2	Broadleaf signalgrass	Goosegrass	Texas millet
3	Morningglories	Wild radish	Morningglories
4	Pigweeds	Florida pusley	Pigweeds
5	Common cocklebur	Nutsedges	Sicklepod
6	Johnsongrass	Common bermudagrass	Common cocklebur
7	Sicklepod	Pigweeds	Johnsongrass
8	Prickly sida	Texas millet	Florida pusley
9	Florida pusley	Morningglories	Nutsedges
10	Nutsedges	Sicklepod	Bermudagrass
Ten Most Troublesome Weeds			
1	Johnsongrass	Common bermudagrass	Texas millet
2	Texas millet	Crabgrasses	Johnsongrass
3	Broadleaf signalgrass	Nutsedges	Crabgrasses
4	Pigweeds	Johnsongrass	Morningglories
5	Sicklepod	Texas millet	Bermudagrass
6	Morningglories	Goosegrass	Pigweeds
7	Crabgrasses	Morningglories	Common cocklebur
8	Nutsedges	Wild radish	Sicklepod
9	Fall panicum	Hemp sesbania	Nutsedges
10	Common cocklebur	Pigweeds	Florida pusley

Table 2. The Southern States 10 Most Common and Troublesome Weeds in Grain sorghum (continued).

	States		
Ranking	North Carolina	Puerto Rico	South Carolina
Ten Most Common Weeds			
1	Large crabgrass	Johnsongrass	Large crabgrass
2	Broadleaf signalgrass	Large crabgrass	Texas millet
3	Pigweeds	Red sprangletop	Pigweeds
4	Morningglories	Itchgrass	Morningglories
5	Common lambsquarters	Alexandergrass	Sicklepod
6	Sicklepod	Goosegrass	Broadleaf signalgrass
7	Goosegrass	Junglerice	Common cocklebur
8	Common ragweed	Horse purslane	Common ragweed
9	Prickly sida	Pigweeds	Johnsongrass
10	Pennsylvania smartweed	Wild poinsettia	Common bermudagrass
Ten Most Troublesome Weeds			
1	Morningglories	Itchgrass	Texas millet
2	Palmer amaranth	Johnsongrass	Johnsongrass
3	Broadleaf signalgrass	Bermudagrass	Sicklepod
4	Texas millet	Crabgrasses	Common bermudagrass
5	Burcucumber	Goosegrass	Morningglories
6	Pennsylvania smartweed	Nutsedges	Pigweeds
7	Yellow nutsedge	Junglerice	Florida pusley
8	Common bermudagrass	Alexandergrass	Large crabgrass
9	Johnsongrass	Wild poinsettia	Nutsedges
10	Trumpetcreeper	Red sprangletop	Bristly starbur

Table 2. The Southern States 10 Most Common and Troublesome Weeds in Grain sorghum (continued).

	State
Ranking	Tennessee
Ten Most Common Weeds	
1	Broadleaf signalgrass
2	Palmer amaranth
3	Morningglories
4	Johnsongrass
5	Goosegrass
6	Smooth pigweed
7	Large crabgrass
8	Fall panicum
9	Slender amaranth
10	Horseweed
Ten Most Troublesome Weeds	
1	Johnsongrass
2	Broadleaf signalgrass
3	Morningglories
4	Goosegrass
5	Large crabgrass
6	Fall panicum
7	Redvine
8	Palmer amaranth
9	Smooth pigweed
10	Italian ryegrass

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Hay, Pastures, and Rangelands.

	States		
Ranking	Alabama	Alabama	Florida
Ten Most Common Weeds	Hay	Pasture	Pasture
1	Crabgrasses	Dogfennel	Dogfennel
2	Bahiagrass	Broomsedge	Smutgrass
3	Smutgrass	Thistles	Tropical soda apple
4	*Rubus* spp.	Buttercups	Blackberries
5	Carolina horsenettle	Horseweed	Wild radish
6	Pigweeds	*Rubus* spp.	*Cyperus* spp.
7	Dogfennel	Crabgrasses	Broomsedge
8	Horseweed	Curly dock	Thistle
9	Red sorrel	Little barley	Goatweed
10	Field sandbur	Carolina horsenettle	Cogongrass
Ten Most Troublesome Weeds	Hay	Pasture	Pasture
1	Carolina horsenettle	Prickly pear cactus	Smutgrass
2	*Rubus* spp.	Smutgrass	Cogongrass
3	Pigweeds	Carolina horsenettle	Blackberries
4	Smutgrass	*Rubus* spp.	*Cyperus* spp.
5	Field sandbur	Dogfennel	Broomsedge
6	Crabgrasses	Broomsedge	Wild radish
7	Dogfennel	Curly dock	Spiny amaranth
8	Red sorrel	Thistles	Sandburs
9	Broadleaf signalgrass	Vervains	Goatweed
10	Horseweed	Horseweed	Vaseygrass

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Hay, Pastures, and Rangelands (continued).

	States		
Ranking	Georgia	Kentucky	North Carolina
Ten Most Common Weeds			
1	Crabgrasses	Crabgrasses	Carolina horsenettle
2	Pigweeds	Tall ironweed	Large crabgrass
3	Thistles	Buttercups	Docks
4	Carolina horsenettle	Musk thistle	Chickweeds
5	Bahiagrass	Spiny amaranth	Buttercups
6	Buttercups	Dandelion	Wild radish/mustard
7	Dogfennel	Common ragweed	*Paspalum* spp.
8	*Rubus* spp.	Plantains	Pigweeds
9	Bitter sneezeweed	Common cocklebur	Henbit
10	Broomsedge	Johnsongrass	Johnsongrass
Ten Most Troublesome Weeds			
1	Carolina horsenettle	Tall ironweed	Carolina horsenettle
2	Thistles	Musk thistle	Large crabgrass
3	Arrowleaf sida	Buttercups	*Paspalum* spp. (Bahiagrass, Vaseygrass, Dallisgrass)
4	Johnsongrass	Spiny amaranth	Field sandbur
5	Crabgrasses	Poison hemlock	*Rubus* spp. (dewberry, blackberry)
6	Smutgrass	Purpletop	Docks
7	Field sandbur	Multiflora rose	Buttercups (hairy, bulbous)
8	*Rubus* spp.	Blackberries	Wild radish/mustard
9	Spreading pricklypear	Horsenettle	Foxtails
10	Nutsedges	Broomsedge	Johnsongrass

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Hay, Pastures, and Rangelands (continued).

	States		
Ranking	Puerto Rico	South Carolina	Tennessee
Ten Most Common Weeds			
1	Tall albizia	Large crabgrass	Spiny amaranth
2	Venezuela grass	Pigweeds	Curly dock
3	Cortadera (*Paspalum millegrana*)	Thistles	Buttercups
4	Cortadero (*Paspalum virgatum*)	Italian ryegrass	Ironweeds
5	Casha	Carolina horsenettle	Burdock
6	Giant milkweed	Dogfennel	Broomsedge
7	Mesquite	Bitter sneezeweed	Buckbrush
8	Thorny sensitive plant	Wild radish	Carolina horsenettle
9	Catclaw mimosa	Broomsedge	Horseweed
10	Climbing mimosa	Curly dock	
Ten Most Troublesome Weeds			
1	Venezuela grass	Sandburs	Broomsedge
2	Tall albizia	Bahiagrass	Buttercups
3	Cortadera (*Paspalum millegrana*)	Thistles	Carolina horsenettle
4	Casha	Buckbrush	Ironweeds
5	Mesquite	Broadleaf signalgrass	Buckbrush
6	Climbing mimosa	Buttercups	Dogfennel
7	Cortadero (*Paspalum virgatum*)	Large crabgrass	Perilla mint
8	Catclaw mimosa	Blackberries	Bitter sneezeweed
9	Giant milkweed	Johnsongrass	Multiflora rose
10	*Heteropogon contortus*	Dogfennel	Musk thistle

Table 4. The Southern States 10 Most Common and Troublesome Weeds in Rice.

	States	
Ranking	Florida	Mississippi
Ten Most Common Weeds		
1	Purple nutsedge	Barnyardgrass
2	Texasweed	Hemp sesbania
3	Yellow nutsedge	Morningglories
4	Alligatorweed	Red rice
5	Fall panicum	Pigweeds
6	Sprangletops	Volunteer soybean*
7	Coast cockspur	Amazon sprangletop
8	Dayflowers	Ducksalad
9	Spiny amaranth	Yellow nutsedge
10	Goosegrass	Purple ammannia
Ten Most Troublesome Weeds		
1	Purple nutsedge	Barnyardgrass
2	Yellow nutsedge	Amazon sprangletop
3	Texasweed	Volunteer soybean*
4	Alligatorweed	Pigweeds
5	Sprangletops	Texasweed
6	Primrose willow	Morningglories
7	Dayflowers	Red rice
8	Fall panicum	Spreading dayflower
9	Coast cockspur	Pennsylvania smartweed
10	Goosegrass	Hemp sesbania

*Glyphosate-resistant

Table 5. The Southern States 10 Most Common and Troublesome Weeds in Small Grains.

	States		
Ranking	Alabama	Florida	Georgia
Ten Most Common Weeds			
1	Mustards	Wild radish	Henbit
2	Italian ryegrass	Wild mustard	Wild radish
3	Cutleaf eveningprimrose	Annual ryegrass	Chickweeds
4	Henbit	Carolina geranium	Cudweeds
5	Wild radish	Cutleaf eveningprimrose	Cutleaf eveningprimrose
6	Chickweeds	Henbit	Annual ryegrass
7	Corn spurry	Virginia pepperweed	Swinecress
8	Wild garlic	Chickweeds	Wild garlic/onion
9	Vetch	Cudweeds	Annual bluegrass
10	Little barley	Wild garlic	Little barley
Ten Most Troublesome Weeds			
1	Italian ryegrass	Wild radish	Annual ryegrass
2	Wild radish	Wild mustard	Annual bluegrass
3	Wild garlic	Annual ryegrass	Wild radish
4	Wild mustard	Cutleaf eveningprimrose	Henbit
5	Henbit	Carolina geranium	Chickweeds
6	Curly dock	Wild garlic	Wild garlic/onion
7	Corn spurry	Henbit	Swinecress
8	Cutleaf eveningprimrose		Cutleaf eveningprimrose
9	Little barley		Cudweeds
10	Virginia pepperweed		Little barley

Table 5. The Southern States 10 Most Common and Troublesome Weeds in Small Grains (continued).

	States		
Ranking	Kentucky	North Carolina	South Carolina
Ten Most Common Weeds			
1	Wild garlic	Common chickweed	Wild radish
2	Common chickweed	Henbit	Common chickweed
3	Purple deadnettle	Italian ryegrass	Henbit
4	Henbit	Mouseear chickweed	Italian ryegrass
5	Shepherdspurse	Wild radish	Wild garlic
6	Virginia pepperweed	Shepherdspurse	Annual bluegrass
7	Horseweed (Marestail)	Curly dock	Cutleaf eveningprimrose
8	Italian ryegrass	Wild mustard	Wild mustard
9	Philadelphia fleabane	Annual bluegrass	Little barley
10	Mouseear chickweed	Swinecress	Vetches
Ten Most Troublesome Weeds			
1	Italian ryegrass	Italian ryegrass	Italian ryegrass
2	Hairy chess	Annual bluegrass	Henbit
3	Cheat	Wild garlic	Cutleaf eveningprimrose
4	Wild garlic	Wild radish	Wild radish
5	Star-of-Bethlehem	Field pansy	Common chickweed
6	Curly dock	Vetch spp.	Wild garlic
7	Cornflower	Henbit	Speedwells
8	Musk thistle	Curly dock	Little barley
9	Speedwells	Cornflower	Wild mustard
10	Annual bluegrass	Cutleaf eveningprimrose	Vetches

Table 6. The Southern States 10 Most Common and Troublesome Weeds in Sugarcane.

	States	
Ranking	Florida	Puerto Rico
Ten Most Common Weeds		
1	Fall panicum	Nutsedges
2	Spiny amaranth	Crabgrasses
3	Nutsedges (purple and yellow)	Itchgrass
4	Goosegrass	Guineagrass
5	Crabgrasses	Johnsongrass
6	American black nightshade	Junglerice
7	Alligatorweed	Wild poinsettia
8	*Sorghum almum*	Pigweeds
9	Guineagrass	Morningglories
10	Napiergrass	Bermudagrass
Ten Most Troublesome Weeds		
1	Guineagrass	Itchgrass
2	Bermudagrass	Johnsongrass
3	Alexandergrass	Guineagrass
4	Napiergrass	Alexandergrass
5	Alligatorweed	Goosegrass
6	Fall panicum	Bermudagrass
7	Balsam apple	Crabgrasses
8	*Sorghum almum*	Purple nutsedge
9	Nutsedges (purple and yellow)	Paragrass
10		Red sprangletop

Table 7. The Southern States 10 Most Common and Troublesome Weeds in Turf.

	States		
Ranking	Alabama	Florida	Georgia
Ten Most Common Weeds			
1	Annual bluegrass	Crabgrasses	Crabgrasses
2	Crabgrasses	Goosegrass	Annual bluegrass
3	Goosegrass	*Cyperus* spp.	Henbit
4	Spurges	Pennywort	Common chickweed
5	Henbit	Lawn burweed	Dallisgrass
6	Nutsedges	*Phyllanthus* spp.	Goosegrass
7	Wild garlic	Annual bluegrass	Common lespedeza
8	Chickweeds	Tropical signalgrass	Sedges
9	Dandelion	Sandburs	Wild garlic
10	Lawn burweed	Spurges	Bahiagrass
Ten Most Troublesome Weeds			
1	Virginia buttonweed	Virginia buttonweed	Virginia buttonweed
2	Torpedograss	*Phyllanthus* spp.	Sedges
3	Ground ivy	Torpedograss	Dallisgrass
4	Dallisgrass	Goosegrass	Violets
5	Nutsedges	Crabgrasses	Annual bluegrass
6	Tufted lovegrass	Florida betony	Doveweed
7	Wild violet	Annual bluegrass	*Phyllanthus* spp.
8	Florida betony	Doveweed	Tall fescue
9	Goosegrass	*Cyperus* spp.	Bermudagrass
10	Wild garlic	Bermudagrass	Florida betony

Table 7. The Southern States 10 Most Common and Troublesome Weeds in Turf (continued).

	States		
Ranking	Kentucky	Louisiana	North Carolina
Ten Most Common Weeds			
1	Large crabgrass	Crabgrasses	Bluegrasses
2	Dandelion	Virginia buttonweed	Crabgrasses (smooth, large)
3	Broadleaf plantain	Dallisgrass	Chickweeds
4	White clover	Purple nutsedge	Henbit
5	Common chickweed	Goosegrass	Goosegrass
6	Henbit	Bermudagrass	Dallisgrass
7	Wild violet	Dollarweed	Clovers (white, hop)
8	Nimblewill	White clover	Dandelion
9	Dallisgrass	Bahiagrass	Wild garlic
10	Yellow nutsedge	Annual bluegrass	Cudweeds
Ten Most Troublesome Weeds			
1	Nimblewill	Dallisgrass	Dallisgrass
2	Wild violet	Virginia buttonweed	Bluegrasses
3	Virginia buttonweed	Bermudagrass	Bermudagrass
4	Annual bluegrass	Torpedograss	*Kyllinga* spp. (green, false-green)
5	Star-of-Bethlehem	Goosegrass	Bahiagrass
6	Dallisgrass	Dollarweed	Crabgrasses (smooth, large)
7	Bermudagrass	Doveweed	Goosegrass
8	Common lespedeza	Common lespedeza	Nutsedges
9	Ground ivy	Dichondra	Violets (common blue, field pansy)
10	Yellow nutsedge	Annual bluegrass	Henbit

Table 7. The Southern States 10 Most Common and Troublesome Weeds in Turf (continued).

	States	
Ranking	Puerto Rico	Tennessee
Ten Most Common Weeds		
1	Bermudagrass	Bermudagrass
2	Sour paspalum	Dallisgrass
3	Sensitive plant	White clover
4	Garden spurge	Crabgrasses
5	Tall fringe rush	Annual bluegrass
6	Green kyllinga	Goosegrass
7	Goosegrass	Wild garlic
8	Nutsedges	Virginia buttonweed
9	Florida beggarweed	Henbit/deadnettle
10	Fingergrass	Common chickweed
Ten Most Troublesome Weeds		
1	Nutsedges	Dallisgrass
2	Bermudagrass	Annual bluegrass
3	Sour paspalum	Virginia buttonweed
4	Tall fringe rush	Nimblewill
5	Green kyllinga	Bermudagrass
6	Sensitive plant	Purple nutsedge
7	Goosegrass	Wild garlic
8	Florida beggarweed	Tufted lovegrass
9	Garden spurge	Goosegrass
10	Fingergrass	Broadleaf signalgrass

Table 8. The Southern States 10 Most Common and Troublesome Weeds in Wheat.

	States		
Ranking	Alabama	Florida	Kentucky
Ten Most Common Weeds			
1	Mustards	Wild radish	Wild garlic
2	Italian ryegrass	Wild mustard	Common chickweed
3	Cutleaf eveningprimrose	Italian ryegrass	Purple deadnettle
4	Wild radish	Carolina geranium	Henbit
5	Henbit	Cutleaf eveningprimrose	Shepherdspurse
6	Chickweeds	Henbit	Virginia pepperweed
7	Wild garlic	Virginia pepperweed	Horseweed (Marestail)
8	Virginia pepperweed	Chickweeds	Italian ryegrass
9	Curly dock	Cudweeds	Philadelphia fleabane
10	Little barley	Wild garlic	Mouseear chickweed
Ten Most Troublesome Weeds			
1	Wild radish	Wild radish	Italian ryegrass
2	Wild garlic	Wild mustard	Hairy chess
3	Italian ryegrass	Italian ryegrass	Cheat
4	Mustards	Cutleaf eveningprimrose	Wild garlic
5	Henbit	Carolina geranium	Star-of-Bethlehem
6	Chickweeds	Wild garlic	Curly dock
7	Little barley	Henbit	Cornflower
8	Curly dock		Musk thistle
9	Virginia pepperweed		Speedwells
10	Cutleaf eveningprimrose		Annual bluegrass

Table 8. The Southern States 10 Most Common and Troublesome Weeds in Wheat (continued).

	States		
Ranking	Georgia	North Carolina	South Carolina
Ten Most Common Weeds			
1	Henbit	Common chickweed	Wild radish
2	Wild radish	Henbit	Common chickweed
3	Chickweeds	Italian ryegrass	Henbit
4	Cudweeds	Mouseear chickweed	Italian ryegrass
5	Cutleaf eveningprimrose	Wild radish	Wild garlic
6	Annual ryegrass	Shepherdspurse	Annual bluegrass
7	Swinecress	Curly dock	Cutleaf eveningprimrose
8	Wild garlic/onion	Wild mustard	Wild mustard
9	Annual bluegrass	Annual bluegrass	Little barley
10	Little barley	Swinecress	Vetches
Ten Most Troublesome Weeds			
1	Annual ryegrass	Italian ryegrass	Italian ryegrass
2	Annual bluegrass	Annual bluegrass	Henbit
3	Wild radish	Wild garlic	Cutleaf eveningprimrose
4	Henbit	Wild radish	Wild radish
5	Chickweeds	Field pansy	Common chickweed
6	Wild garlic/onion	Vetch spp.	Wild garlic
7	Swinecress	Henbit	Speedwells
8	Cutleaf eveningprimrose	Curly dock	Little barley
9	Cudweeds	Cornflower	Wild mustard
10	Little barley	Cutleaf eveningprimrose	Vetches

Table 8. The Southern States 10 Most Common and Troublesome Weeds in Wheat (continued).

	State
Ranking	Tennessee
Ten Most Common Weeds	
1	Henbit
2	Purple deadnettle
3	Italian ryegrass
4	Bluegrass
5	Chickweeds
6	Wild garlic
7	Horseweed
8	Little barley
9	Carolina foxtail
10	Groundsel
Ten Most Troublesome Weeds	
1	Italian ryegrass
2	Henbit
3	Purple deadnettle
4	Wild garlic
5	Bluegrass
6	Chickweeds
7	Field pennycress
8	Horseweed
9	Little barley
10	Carolina foxtail/cutleaf eveningprimrose

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-616	Weeds of Southern Turfgrasses ($15.00)
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
ANR-1241	Wanted Dead Not Alive: Cogongrass
INFORMATION SHEETS	
2004IPM-2	Commercial Vegetable IPM
2004IPM-8	Peach IPM
2004IPM-11	Apple IPM
2004IPM-22	Weed Control in Commercial Turfgrass
2004IPM-27	Pecan IPM
2004IPM-28	Forage Crops IPM
2004IPM-223	Noncropland IPM
2004IPM-360	Peanut IPM
2004IPM-413	Soybean IPM
2004IPM-415	Cotton IPM
2004IPM-428	Corn IPM
2004IPM-429	Grain Sorghum IPM
2004IPM-453	Christmas Tree IPM
2004IPM-458	Small Grain IPM
2004IPM-478	Small Fruit IPM
2004IPM-590	Chemical Weed Control for Home Lawns
2004IPM-978	Alfalfa IPM

State: ARKANSAS

Prepared by: Bob Scott, John Boyd, and Ken Smith

Internet URL: http://pubs4sale.uaex.edu/

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-1691	Weeds of Arkansas Lawns, Turf, Roadsides, and Recreation Areas: A Guide to Identification ($5.00)
MP-370	Turfgrass Weed Control for Professionals
MP-415	Weed Control in Landscape Plantings
FSA-2080	Pasture Weed and Brush Control
FSA-2109	Home Lawn Weed Control
FSA-2145	Spot Spraying Pasture Brush

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: Jay Ferrell, Ken Langeland, William Stall, and Brian Unruh

Internet URL: http://edis.ifas.ufl.edu/publications.html

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-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-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-108	Using Herbicides Safely and Herbicide Toxicity
SS-AGR-109	Adjuvants
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-0044	2003 University of Florida's Pest Control Recommendations for Turfgrass Managers
AGR-72	Labelled Aquatic Sites for Specific Herbicides
AGR-79	Florida Department of Environmental Protection Aquatic Plant Management Permits
A-87-63	Application Procedure for Use of Grass Carp for Control of Aquatic Weeds
A-87-73	Biology and Chemical Control of Algae
A-87-103	Biology and Chemical Control of Duckweed

A-87-113 Chemical Control of Hydrilla
A-87-123 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-1881 Weed Management in Commercial Citrus
HS-1891 Weed Control in Cole or Brassica Leafy Vegetables
HS-1901 Weed Control in Cucurbit Crops
HS-1911 Weed Control in Eggplant
HS-1921 Weed Control in Okra
HS-1931 Weed Control in Bulb Crops
HS-1941 Weed Control in Potato
HS-1951 Potato Vine Dessicants
HS-1961 Weed Control in Strawberry
HS-1971 Weed Control in Sweet Corn
HS-1981 Weed Control in Sweet Potato
HS-1991 Weed Control in Pepper
HS-2001 Weed Control in Tomato
HS-2011 Weed Control in Carrots and Parsley
HS-2021 Weed Control in Celery
HS-2031 Weed Control in Lettuce, Endive, and Spinach
HS-7061 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
2805 Families, Mode of Action and Characteristics of Agronomic, Non-Crop and Turf Herbicides
4592 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
8524 Weed Control in Sod Production
1114 Weed Management for Florida Golf Courses
-----5 Florida Weed Control Guide ($8.00)
DH-88-054 Turfgrass Weed Control Guide for Lawn Care Professionals
DH-88-074 Commercial Bermudagrass Weed Control Guide
SM-445 Aquatic and Wetland Plants of Florida ($11.00)
SP-355 Identification Manual for Wetland Plant Species of Florida ($18.00)

SP-375	Weeds in Florida ($7.00)
	Florida Weeds Part II ($1.00)
SP-795	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://pubs.caes.uga.edu/caespubs/pubs.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*
865	Tropic Croton Identification and Control in Cotton and Peanut
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

281	Georgia Pest Control Handbook ($15.00)*

MISCELLANEOUS

Pub. 46	2005 Georgia Peach Spray and Production Guide
Pub. 377	2005 Georgia Tobacco Growers Guide
Pub. 380	2005 Cotton Production Package
Hdbk. No. 11	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)
7611	Weeds of the Southern United States ($3.00)
8391	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/agc/pubs/pubs.htm

Order from: Dr. J. D. Green, Extension Weed Control Specialist, Plant and Soil Sciences Department, 413 Plant Science Building, University of Kentucky, Lexington, KY 40546-0312
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-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: Steve Kelly

Internet URL: http://www.lsuagcenter.com/nav/publications/pubs.asp

Order from: LSU AgCenter communications, Publications Office, PO Box 25100, Baton Rouge, LA 70894-5100

Number	Title
PUBLICATIONS	
1565	Louisiana's Suggested Chemical Weed Control Guide for 2004 ($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 2004 ($1)
2746	2004 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)
RIS 105	Guidelines for Managing Winter Vegetation in Northeast Louisiana

State: MISSISSIPPI

Prepared by: John D. Byrd, Jr.

Internet URL: http://www.ces.msstate.edu/anr/plantsoil/weeds
http://www.msucares.com/pubs/index.html

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. Nathan Buehring, 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	
6731	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
10251	Aquatic Weed Identification and Control--Bushy Pondweed and Coontail
10261	Aquatic Weed Identification and Control--Willows and Arrowhead
10271	Aquatic Weed Identification and Control--Cattail and Spikerush
10281	Aquatic Weed Identification and Control--Pondweed and Bladderwort
10291	Aquatic Weed Identification and Control--Fanwort and Parrotfeather
10301	Aquatic Weed Identification and Control--Frogbit and Watershield
10311	Aquatic Weed Identification and Control--Burreed and Bulrush
10321	Aquatic Weed Identification and Control--White Waterlily and American Lotus
10331	Aquatic Weed Identification and Control--Duckweed and Water Hyacinth
10341	Aquatic Weed Identification and Control--Hydrilla and Alligatorweed
10351	Aquatic Weed Identification and Control--Algae
10361	Aquatic Weed Identification and Control--Methods of Aquatic Weed Control
10371	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
10053	Christmas Tree Production in Mississippi
10064	Calibration of Ground Spray Equipment
1091	Garden Tabloid

1100	Soybeans Postemergence Weed Control
12175	Rice Weed Control
12773	Forest Management Alternatives for Private Landowners
1322	Establish and Manage Your Home Lawn
1344	Weed Control in Small Grain Crops
1532	2005 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
21662	Poisonous Plants of the Southeastern United States

TECHNICAL NOTES

MTN-SG3	Weed Control in Christmas Tree Plantations
MTN-7F3	An Overview of Herbicide Alternatives for the Private Forest Landowner
MTN-8F3	Tree Injection: Equipment, Methods, Effective Herbicides, Productivity, and Costs
MTN-11F3	Effective Kudzu Control

COMPUTER SOFTWARE

-----6 Mississippi HADSS ($95.00)

State: MISSOURI

Prepared by: Andy Kendig

Internet URL: http://outreach.missouri.edu/main/publications.shtml

Order from: Extension Publications, 2800 Maguire, University of Missouri, Columbia, MO 65211
Add $1.00 for shipping and handling with each order.

Number	Title
MP171	Missouri Pest Management Guide: Corn, Soybean, Wheat
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)
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: David Monks, Joe Neal, Fred Yelverton, and Alan York

Internet URL: http://cipm.ncsu.edu/ent/ncpmip/
http://www.turffiles.ncsu.edu/AllPublications.aspx

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-371	Agricultural Chemicals for North Carolina Apples
AG-1461	Peach and Nectarine Spray Schedule
AG-187	Tobacco Information - 2005
AG-208	Identifying Seedling and Mature Weeds in Southeastern United States ($7.00)
AG-331	2005 Peanut Information
AG-348	Turfgrass Pest Management Manual ($7.00)
AG-408	Pest Control for Professional Turfgrass Managers 2005
AG-417	2005 Cotton Information
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-5722	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 ($22.00-Revised yearly)
-----3	Southern Peach, Nectarine, and Plum Pest Management and Cultural Guide
INFORMATION LEAFLETS	
HIL205B1	Weed Control Options for Strawberries on Plastic
HIL3251	Peach Orchard Weed Management
HIL380	Orchard Floor Management in Pecans
HIL449	Weed Management in Conifer Seedbeds
HIL570	Greenhouse Weed Management
HIL6431	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
HIL81011	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-832	OSU Extension Agent's Handbook of Insect, Plant Disease, and Weed Control
E-943	Alfalfa Harvest Management Discussions with Cost-Benefit Analysis
E-948	Aerial Pesticide Drift Management
E-949	Alfalfa Stand Establishment Questions and Answers
B-812	Hogpotato: Its Biology, Competition, and Control
F-2089	Alfalfa Stand Establishment
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
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
FS-2774	Cheat Control in Winter Wheat
FS-9998	Clearfield Wheat Production Systems in Oklahoma

State: SOUTH CAROLINA

Prepared By: Bert McCarty, Ed Murdock, and Jason Norsworthy

Internet URL: http://www.clemson.edu/public/

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	2004 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: Darren K. Robinson and Larry Steckel

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	2005 Weed Control Manual for Tennessee Field Crops
1659	Weeds in Ornamental Plantings: A Management Plan for Tennessee Homeowners
1758	Weed Management in Annuals, Perennials and Herbaceous Ground Covers: Nursery Production and Professional Grounds Maintenance

State: TEXAS

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Prepared By: Scott Hagood

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Number	Title
PUBLICATIONS	
456-016	Pest Management Guide for Field Crops
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Herbicide Names and Manufacturers

Common or Code Name	**Trade Name**	**Manufacturer**
A		
acetochlor	Harness	Monsanto
	Surpass	Dow AgroSciences
acifluorfen	Ultra Blazer	BASF
acifluorfen + bentazon	Conclude Xact	BASF
alachlor	Lasso, Partner, Micro-Tech	Monsanto
ametryn	Evik	Syngenta
aminopyralid	Milestone	Dow AgroSciences
asulam	Asulox	Bayer
atrazine	AAtrex / others	Syngenta / others
Atrazine + s-metolachlor + glyphosate	Expert	Syngenta
azafenidin		DuPont Ag Products
AEF 130060		Dow AgroSciences
B		
BAS 625H	Aura	BASF
BAS 654		BASF
BAY FOE5043	Axiom	Bayer
BAY MKH 6561		Bayer Crop Science
benefin	Balan	Dow AgroSciences
bensulfuron	Londax	DuPont Ag Products
bentazon	Basagran	BASF, Micro Flo
bispyribac-sodium	Regiment, Velocity	Valent USA
bromacil	Hyvar X	DuPont Ag Products
bromoxynil	Buctril, Bronate	Bayer Crop Science
butroxydim	Falcon	
C		
carfentrazone	Aim, Shark	FMC
CGA-362622	Envoke, Monument	Syngenta
chlorimuron	Classic	DuPont Ag Products
Chlorimuron + metribuzin	Canopy XL	DuPont Ag Products
chlorimuron + sulfentrazone	Canopy Extra	DuPont Ag Products
chlorimuron + thifensulfuron	Synchrony	DuPont Ag Products
chlorsulfuron	Glean, Telar	DuPont Ag Products
chlorsulfuron + metsulfuron	Finesse	DuPont Ag Products
clethodium	Select, Envoy, Prism	Valent USA
clomazone	Command	FMC
clopyralid	Lontrel Stinger	Dow AgroSciences

cloransulam	FirstRate Amplify	Dow AgroSciences Monsanto
cyhalofop	Clincher	Dow AgroSciences
D		
2,4-D	Several	Several
2,4-D + MCPP + dicamba	Trimec Classic	PBI Gordon
2,4-DB	Butoxone Butyrac	Bayer Crop Science
DCPA	Dacthal	Amvac
dicamba	Banvel Clarity Vanquish	Micro Flo BASF Syngenta
dicamba + diflufenzopyr	Distinct, Overdrive	BASF
dicamba + diflufenzopyr + nicosulfuron	Celebrity Plus	BASF
dicamba + 2,4-D	Weedmaster	BASF
dichlobenil	Casoron	Uniroyal
dichlorprop (2,4-DP)	Several	Bayer Crop Science
diclofop	Hoelon	Bayer Crop Science
diclosulam	Strongarm	Dow AgroSciences
dimethenamid dimethenamid-P	Frontier Outlook	BASF BASF
diquat	Reglone, Reward	Syngenta
dithiopyr	Dimension	Rohm & Haas
diuron	Karmex Direx	Griffin Griffin
E		
endothall	Endothal	Pennwalt
ethalfluralin	Sonalan, Curbit	Dow AgroSciences
ethofumesate	Prograss	Bayer Crop Science
F		
fenoxaprop	Puma, Ricestar, Whip	Bayer Crop Science
Flazasulfuon	Katana	ISK Bioscience
fluazifop-P	Fusilade DX	Syngenta
fluazifop + fenoxaprop	Fusion	Syngenta
flufenacet	Define	Bayer
flufenacet + metribuzin + atrazine	Axiom, Domain	Bayer Crop Science
flumetsulam	Python	Dow AgroSciences
flumetsulam + clorpyralid	Hornet	Dow AgroSciences
flumetsulam + clopyralid +2,4-D	Scorpion III	Dow AgroSciences
flumetsulam + metolachlor	Broadstrike SF + Dual	Dow AgroSciences

flumiclorac	Resource	Valent USA
flumioxazin	Valor	Valent USA
fluometuron	Cotoran, Meturon	Griffin Griffin
fluoroxypyr	Vista	Dow AgroSciences
fluthiacet methyl	Action Appeal	Syngenta KI USA
fomesafen	Reflex	Syngenta
fosamine	Krenite	DuPont Ag Products
G		
glufosinate	Liberty Rely Ignite	Bayer Crop Science Bayer Crop Science Bayer Crop Science
glyphosate	Many	many
H		
halosulfuron	Permit, Sempra	Monsanto
hexazinone	Velpar	DuPont Ag Products
I		
imazamethabenz	Assert	BASF
imazamox	Beyond, Raptor	BASF
imazapic	Cadre, Plateau	BASF
imazapyr	Arsenal, Chopper, Stalker, Habitat	BASF BASF BASF
imazaquin	Scepter Image	BASF BASF
imazethapyr	Pursuit NewPath	BASF BASF
imazethapyr + imazapyr	Lightning Event	BASF
isoxaben	Gallery	Dow AgroSciences
isoxaben + oryzalin	Snapshot DF	Dow AgroSciences
isoxoben + trifluralin	Snapshot TG	Dow AgroSciences
isoxaflutole	Balance	Bayer Crop Science
J-L		
KIH-485		Kumiai
lactofen	Cobra	Valent USA
M		
MON 3539		Monsanto
MCPA	Several	Several
mecoprop	Several	Several
mesosulfuron	Osprey	Bayer
mesotrione	Callisto	Syngenta
mesotrione + metolachlor	Camix	Syngenta
mesotrione + metolachlor + atrazine	Lumax	Syngenta
metham	Vapam	Amvac
methyl bromide	Bromo-gas	Great Lakes

metolachlor	Dual Magnum Pennant	Syngenta Syngenta
metolachlor + atrazine	Bicep	Syngenta
metribuzin	Sencor	Bayer Crop Science
metribuzin + metolachlor	Turbo	Bayer Crop Science
metribuzin + trifluralin	Salute	Bayer Crop Science
metsulfuron	Ally, Escort	DuPont Ag Products
molinate	Ordram	Syngenta
MSMA	Several	Several
N		
napropamide	Devrinol	Syngenta
nicosulfuron	Accent	DuPont Ag Products
nicosulfuron + rimsulfuron + atrazine	Basis Gold	DuPont Ag Products
nicosulfuron + rimsulfuron	Steadfast	DuPont Ag Products
norflurazon	Zorial, Solicam, Evital	Syngenta Syngenta
O		
oryzalin	Surflan	Dow AgroSciences
oxadiazon	Ronstar	Bayer Crop Science
oxadiazon + prodiamine	Regalstar	Regal Chemical Company
oxasulfuron		Syngenta
oxyfluorfen	Goal	Dow
oxyfluorfen + oryzalin	Rout	The Scotts Company
oxyfluorfen + oxadiazon	Regal	Regal Chemical Company
oxyfluorfen + pendimethalin	Ornamental Herbicide II	The Scotts Company
P		
paraquat	Gramoxone Max, Gramoxone Extra, Gramoxone Inteon, Starfire, Cyclone	Syngenta
pelargonic acid	Scythe	Mycogen
pendimethalin	Prowl, Prowl H2O Pendulum Pentagon Lesco PRE-M Corral	BASF BASF BASF Lesco The Scotts Company
penoxsulam	Grasp, Granite	Dow AgroSciences
picloram	Tordon	Dow AgroSciences
picloram + 2,4-D	Grazon P+D	Dow AgroSciences
picloram + fluoroxypyr	Surmount	Dow AgroSciences
pinoxaden	Axial	Syngenta
primisulfuron	Beacon	Syngenta

primisulforon + dicamba	NorthStar	Syngenta
prodiamine	Barricade, Factor	Syngenta
prohexadione	Apogee	BASF
prometryn	Caparol	Syngenta
	Cotton Pro	Griffin
propanil	Stam, Stampede	Dow
prosulfuron	Peak	Syngenta
prosulfuron + primisulfuron	Exceed	Syngenta
	Spirit	Syngenta
pyridate	Tough	Syngenta
pyrithiobac	Staple	DuPont
pyrithiobac + glyphosate	Staple Plus	DuPont
Q		
quinclorac	Facet, Drive	BASF
	Paramount	BASF
quizalofop	Assure II	DuPont
R		
rimsulfuron	Titus, Matrix	DuPont
rimsulfuron + thifensulfuron	Basis	DuPont
S		
sethoxydim	Poast, Poast Plus, Vantage	BASF
simazine	Princep	Syngenta
sulfentrazone	Authority, Spartan	FMC
sulfentrazone + clomazone	Authority	FMC
	One-Pass	
sulfometuron	Oust	DuPont
sulfosulfuron	Monitor, Maverick, Outrider, Certainity	Monsanto
T-Z		
tebuthiuron	Spike	Dow
terbacil	Sinbar	DuPont
thiafluamide +		

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metribuzin	Axiom	Bayer
thiazopyr	Dimension Spindle, Visor	Dow
thifensulfuron	Harmony GT	DuPont
thifensulfuron + tribenuron	Harmony Extra	DuPont
topremazone	Impact	AmVac
triasulfuron	Amber	Syngenta
triasulfuron + dicamba	Rave	Syngenta
tribenuron	Express	DuPont
triclopyr	Garlon Grandstand	Dow
triclopyr +clopyralid	Redeem R&P	Dow
trifloxysulfuron	Envoke	Syngenta
trifluralin	Treflan Trifluralin	Dow Dow /
trinexapac-ethyl	Primo Palisade	Syngenta

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