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PREFACE

These PROCEEDINGS of the 63rd Annual Meeting of the Southern Weed Science Society contain papers and abstract of presentations in Little Rock, AR. 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.

This document is also available in PDF format at the SWSS web site (www.swss.ws).

Theodore M. Webster, 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 templates will be available on the web to help ensure the proper format is followed. It is important that submission deadlines and instruction are carefully adhered to, as the abstracts are not edited for content.

DISTINGUISHED SERVICE AWARD: INDUSTRY

DR. JACQUELYN DRIVER

Dr. Jacquelyn Driver was born in Pine Bluff, AR. After living and working (chopping and picking cotton) on the family farm near Sherrill, AR, she attended the University of Arkansas at Pine Bluff and obtained a B.S. Degree in Agronomy in 1980. During here undergraduate studies, she worked as an intern for Dow Chemical, USA and Natural Resources Conservation Service. She later became a Soil Conservationist with NRCS. She continued her studies at the University of Arkansas in Fayetteville, under the leadership of Dr. Bob Frans, and received her M.S. Degree with a Weed Science emphasis in 1983. Following graduation, she worked as an Extension Agricultural Agent and later taught soil and crops courses at Texas A&M University in Kingsville. She accepted a position with Syngenta Crop Protection, Inc. after receiving her Ph.D. Degree from Oklahoma State University in 1993 under the direction of Dr. Tom Peeper. She has worked for Syngenta Crop Protection, Inc. for 15 years as a Biological Research and Development Representative. Her current responsibilities involve research activities in turf, ornamentals, and professional pest management.

Jackie has been a member of SWSS since 1980. As a graduate student, she received 1st place in the Graduate Student Research Paper Contest and was a member of the Arkansas Weed Team. She has been active in the Society on various committees. Jackie has served as a member of the Graduate Program Committee, Nomination Committee, Local Arrangements Committee, and Sales Coordination Committee. She served as Chairperson of the Graduate Stduent Program Committee in 1997. She has also participated as a judge of the the SWSS Student Paper and Poster Contests and assisted with the Summer Weed Contest when hosted by Syngenta in MS and FL. She continued her participation and service to the Society as a Member-at-Large representing Industry on the SWSS Executive Board for several years. Jackie was elected to serve as Vice-President of the SWSS and later served in the role of President. She is currently a member of the Long Range Planning Committee. Jackie is also a member of WSSA, Sigma Xi, and Gamma Sigma Delta. She and her husband Tony reside in Waco, TX, where they active members in their community and church.

OUTSTANDING EDUCATOR AWARD

DR. PETER A. DOTRAY

Peter Dotray is a Professor of Weed Science with Texas Tech University, Texas AgriLife Research, and Texas AgriLife Extension Service. He is a native of Minneapolis, Minnesota, and received his B.S. degree in Agronomy from the University of Minnesota (St. Paul), his M.S. degree in Agronomy from Washington State University (Pullman), and his Ph.D. in Agronomy from the University of Minnesota (St. Paul). He started his current three-way appointment in Lubbock in 1993. Peter conducts weed control research mainly in cotton (over 3 million acres on the High Plains of Texas) and peanut (nearly 200,000 acres on the High Plains). In addition to weed control responsibilities, Peter has responsibilities in teaching undergraduate and graduate level courses in weed science and as an Extension Weed Specialist in District 2, which contains 20 counties on the Texas Southern High Plains. Peter has served as the major advisor or co-advisor of 24 graduate students and currently has three graduate students in progress. He has authored or coauthored 282 abstracts and proceedings, 45 journal articles, 155 technical publications and popular articles, two book chapters, and has given over 530 seminars and presentations at grower meetings.

Peter has been active in the Southern Weed Science Society and the Weed Science Society of America. For SWSS, he served on the following committees: Display, Distinguished Service Award Subcommittee, Finance, Local Arrangements, Newsletter Information, Outstanding Graduate Student Award Subcommittee, Placement, Program, Southern Weed Contest, Student Program Committee, Terminology, and Weed Scientist of the Year Subcommittee. Peter was the SWSS Proceedings Editor and recently completed his term as the SWSS Representative to CAST.

OUTSTANDING YOUNG WEED SCIENTIST-ACADEMIA

DR. BOB SCOTT

Bob Scott grew up in Southwest Oklahoma on a peanut and cattle farm with his parents and one sister. In 1991 he graduated from Oklahoma State University with a B.S. Degree in Agronomy. Two internships with Sandoz Agro during his undergraduate years convinced Bob that he wanted to work in Weed Science as a career. So, after finishing his B.S. Bob started a Masters program under Dr. Tom Peeper at OSU. His project was Extension Service oriented and evaluated the economics of broadleaf weed control in winter wheat on producer's fields.

In 1994, after completing his M.S. degree in Weed Science Bob moved to Stoneville, MS to begin a Ph.D. program under Dr. David Shaw at Mississippi State University. This Ph.D. program was in cooperation with Sandoz Agro and dealt with evaluating efficacy of dimethenamid when applied in combination with various POST applied herbicides in soybean. While attending Mississippi State Bob was active in the Mississippi Weed Science Society, the SWSS and the WSSA and presented numerous papers and posters at annual meetings. He was elected Outstanding Ph.D. student in 1997 by the MWSS. During this time Bob was active in the establishment of the Graduate Student Organization within the SWSS and served on the SWSS Board as a nominated nonvoting representative, prior to the year the first student board member was elected.

Upon graduation from Mississippi State University in 1997, Bob went to work for American Cyanamid Company, covering Arkansas as a Technical Service Representative. During this time Bob received several awards from Cyanamid for his efforts in the field, including the annual Creativity Award in 1998 and the Circle of Excellence award in 1999. In addition, Bob played several key roles in the development and marketing of the new technology "Clearfield Rice" during his tenure with Industry. Bob served on the Southern Weed Science Society Board of Directors as Member at large – Industry, while working for Cyanamid and (after the buyout) BASF. In 1998, along with Drs. Greg Stapleton and Mike Kenty, he hosted the SWSS Weed Contest in Memphis, TN. In 2001, Bob served a term in the BASF Capital Club where he traveled to Washington, D.C. to lobby representatives from Arkansas on re-registration issues.

In 2002, Bob decided to make the jump from Industry to Academia and accepted the position of Extension Weed Specialist with the University of Arkansas. Bob has continued to be active in the SWSS and WSSA. In addition, he is a regular contributor to the Delta Farm Press with over 30 published articles. He is a reviewer for both Weed Technology and Weed Science. Bob serves as major advisor to two graduate students and on the committees of several others. He recently was promoted to Professor.

Bob lives in Cabot Arkansas with his wife Susan and daughters Samantha and Elizabeth.

WEED SCIENTIST OF THE YEAR

DR. DON MURRAY

Dr. Don S. Murray was born May 3, 1944, in Beaver, OK, the son of Glen E. and Betty L. Murray. He graduated from Pauls Valley High School in Pauls Valley, OK, in May 1962. He received his B.S. degree in Agronomy (Soils option) in 1966 and his M.S. degree in Agronomy (Soil microbiology) in 1968 from Oklahoma State University, Stillwater, OK. He then enlisted in the U.S. Army in 1968 and served until 1971 primarily in the Medical Corps in Europe. He returned to Oklahoma State University in 1971 to continue his graduate studies and received the Ph.D. degree in Crop Science (Weed Science) in 1974. Following graduation, Dr. Murray joined CIBA-GEIGY Corp. as a Field Research Representative (assigned to North Dakota, South Dakota, and Montana). In 1975, he joined the faculty of Auburn University in the Department of Agronomy and Soils where he conducted weed science research with soybeans and developed and taught "Advanced Principles of Weed Science". In 1978, he joined the faculty of Oklahoma State University in the Department of Agronomy (later its name was changed to Plant and Soil Sciences) where he conducted weed science research with row crops (cotton, soybeans, peanuts, grain sorghum, etc.) and taught several junior, senior, and graduate weed sciences courses. Dr. Murray's research has resulted in over 60 published journal Articles; 3 book chapters; 4 bulletins; 8 miscellaneous publications; 2 software programs; and over 170 presentations at professional meetings. In very popular classroom courses, he's taught 812 students at the junior level, 253 at the senior level, and 140 at the graduate level. He has served or is serving as the major advisor for 47 graduate students and on the committees of 31 others. Dr. Murry has held elective offices and/or served on committees in four weed science societies including the SWSS, NCWSS, WSSA, and the Alabama Society of Weed Science. He has been a member of SWSS since 1972, served on 30 SWSS committees (multiple times on many of them), and served SWSS on the Board of Directors, as Secretary-Treasurer, Representative to WSSA, Vice President, President Elect, President, and Past President. SWSS named him "Outstanding Young Weed Scientist" in 1984 and the recipient of its "Distinguished Service Award" in 2004. He was named "Fellow" of WSSA in 1999. At Oklahoma State University, he holds the P.E. Harrill Distinguished Professorship in Crop Science since 1999 and the title of Regents Professor.

OUTSTANDING GRADUATE STUDENT AWARD (MS)

ROBIN BOND

Robin is a native of Monticello, AR. She received a Bachelor of Science in Plant and Soil Sciences and Animal Science from the University of Arkansas at Monticello. Robin is currently pursuing her Master of Science in Weed Science from Mississippi State University. Robin's career in weed science began as an undergraduate under the leadership of Dr. Ken Smith at the Southeast Extension and Research Center in Monticello, AR. After graduation, she accepted a position as a Research Associate in Dr. Smith's program. Robin's interests include off- target movement of herbicides and herbicide resistance. She has pursued her herbicide resistance interest by investigating the control of glyphosate-resistant Italian ryegrass as her thesis project at Mississippi State University. Her thesis project involved evaluating control of glyphosate-resistant Italian ryegrass as affected by the timing of herbicide application and tillage. Working as a Research Associate at the Delta Research and Extension Center in Stoneville, MS, she and Dr. Vijay Nandula are currently investigating Italian ryegrass, Palmer amaranth, johnsongrass and other weed species of interest to determine the distribution of glyphosate-resistant weed species across the Mississippi Delta.

Robin is an active member and has served in state and regional societies. She has served as vice-president and is currently president of the Southern Weed Science Society Graduate Student Organization. She has also served as the student representative for the Plant and Soil Science Club and is a member of the Graduate Student Organization at Mississippi State University.

The Southern Weed Science Society, Mississippi Weed Science Society, Mississippi State College of Agriculture and Life Sciences, Mississippi Agriculture and Forestry Experiment Station, Arkansas Crop Protection as well as Farm Bureau have all recognized her as a winner of various academic and professional awards or competitions.

OUTSTANDING GRADUATE STUDENT AWARD (PHD)

DR. TOM EUBANK

Tom Eubank began his agricultural career as a farm manager assistant in the Mississippi Delta and was responsible for crop production management in cotton, rice, soybeans, and other crops. These management responsibilities dictated that he acquire knowledge of weeds, insects, and diseases and implement control strategies. Tom was later employed as a Field Agronomist with Farmers Incorporated where he experienced the aspects of retail sales while being involved with crop production and soil fertility practices.

In 2004, Tom began his “research career” by becoming Research Associate in soybean weed control while pursuing a graduate degree. He has conducted numerous fields’ trials evaluating weed control and crop tolerance in soybeans, cotton, corn, sorghum, wheat, and vegetables. Tom conducted research in keying weeds with herbicide resistance and the evaluation of new and novel herbicides. Tom has also conducted greenhouse and growth chamber studies to support the field studies. For the past year, Tom has been responsible for soybean weed control research at the Delta Research and Extension Center where he interacted with producers, industry, and university personnel. He has also gained experience in grant writing, protocol development, data analysis, reporting, and personnel management.

Tom has been very involved in the SWSS graduate student association and served on the Board of Directors from 2007-2009. He has also been involved with the Mississippi Agricultural Industry Council, Mississippi Weed Science Society, and Washington County Soil and Water Conservation District. Tom has presented numerous oral presentations and posters at the SWSS and other professional societies, and participated in the Southern Weed Science Society Weed Contest.

MINUTES OF SOUTHERN WEED SCIENCE SOCIETY BOARD MEETING
JANUARY 24, 2010

Present: Dan Reynolds, Tom Holt, Barry Brecke, Ann Thurston, Todd Baughman, Tony Driver, Bob Scott, Jason Norsworthy, John Byrd, Donnie Miller, Scott Senseman, Ted Webster, Robin, Bond, Bob Schmidt, Tom Mueller, Mike DeFelice, Charles Bryson.

President Dan Reynolds called the meeting to order on January 24, 2010.

Todd provided overview of minutes.

Bob Schmidt provided business managers report. There are preregistration of 172 members and 69 students (Total = 241). From past records estimated attendance total would be 334. All society publications have been destroyed. Bob indicated that newsletter editor was not a member of the society. Due to his current duties Al Rankins (newsletter editor) is actively seeking a replacement. There was no awards program printed prior to the meeting due to lack of biographical information. Charles Bryson rendition of first SWSS meeting at Stoneville will be sold at auction. NCWSS responsibilities were handed over January 1, 2010 to Phil Banks. Motion to accept report was approved.

Mike DeFelice indicated that UGA Press has sold 3100 copies of Weeds of the South. UGA Press is happy with current performance. He will discuss with UGA Press and Phil Banks about additional publicity for continued sells. He has seen the galleys proofs for Weeds of the Midwest. It is currently available for pre-sales on Amazon.com. We needed to raise $40,000 for publication and currently $3000 short. Mike requested an additional $1500 from NCWSS that was approved. He is requesting an additional $1500 from SWSS. Motion to provide additional $1500 for Weeds of the Midwest was approved. The Weed DVD is behind schedule because of two books and additional pictures. The DVD will include approximately 700 weeds. He indicated that this will likely be the last DVD. Program is so huge and cumbersome and cannot be easily updated. SWSS board had approved $5000 in past for DVD. These monies will be needed once final program is completed. Mike suggested putting the DVD information on the web. He indicated that WSSA hires a consultant to put weed identification information on the web. The need to reapprove $5000 will be handled at the summer board meeting.

Scott Senseman provided business managers update. SWSS & NCWSS formed a joint committee. This committee reviewed and edited the business mangers duties. This packet was then sent out to select individuals. The committee received 9 bids. A teleconference was held with committee and candidates. The committee then selected 4 finalists - Allen Marketing, 3rd Eye Group, Laura Sweet, and Marathon Ag. During another teleconference committee decided to select Marathon Ag (Phil Banks) to serve as both SWSS and NCWSS business manager. Bob Schmidt has already transitioned some of the NCWSS information and duties to Phil. Currently SWSS book keeping is in Quick Books and membership directory is in Access. Motion to accept committee's selection of Marathon Ag as the new business manager was approved.

Ann Thurston provided the awards committee and nominating committee report. She stated that members needed to solicit more nominations in the future for awards. She indicated there was difficulty in getting nominations for officers. She was informed in the nomination process that USDA employees cannot serve on the Endowment Foundation. The 2010 award recipients are: Jackie Driver – Distinguished Service Industry, No nominee - Distinguished Service Academia, Don Murray – Weed Scientist of the Year, Peter Dotray – Outstanding Educator, Bob Scott – Outstanding Young Weed Scientist Academia, No nominee Outstanding Young Weed Scientist Industry, Tom Eubank – Outstanding Ph.D. Graduate Student, and Robin Bond – Outstanding M.S. Graduate Student. The new officers are: Tom Mueller – Vice President, Larry Newsome – Board Representative from Industry, Shawn Askew – Board Representative from Academia, and Nilda Burgos was selected to serve on the Endowment Foundation Board.

Tom Holt reported on the 2010 program. He stated that the meetings had the following number of papers: 2008 – 254, 2009 – 249, and 2010 – 271. There was an increase in Turf (14 to 23) and Agronomic Crops (28 to 53). Discussed logistics problem with how talks will be loaded for this year's meetings. Shawn Askew has stated through Dan that he has it taken care of and will have instructions at registration desk Monday morning. Need to discuss changing the MOP on the Technology committee chairs duties to cover the loading of presentations and how that will be done.

Barry Brecke provided 2011 program report. He is currently working on the program. He suggested designating a half-day for tours with no session during that period. No current plans to reach out to local scientist to participate however, some informal discussions have occurred.

Ted Webster provided Editors Report. The 2009 proceeding will include 666 pages with 508 abstracts. The cost for the proceedings for online search is $4000. The NCWSS cost to publish their proceedings is $1500. Discussion about the value of this and possible ways to provide proceedings to membership at reduced cost to the society.

Scott Senseman provided CAST Report. He indicated that CAST has continued with restructuring process. There will only be one meeting with all board members attending. The rest of business will be handled by subcommittees through teleconferences. A question was presented about the need for SWSS to continue to be a member of CAST. Obviously CAST would not be supportive of SWSS discontinuing its membership. ASA has already canceled its membership. Most of the current members are national societies. CAST is still insuring that sound science goes into policy making and that is still their goal. Motion to accept report was approved. There was a motion to discontinue membership to CAST. Discussion that most members already support CAST through WSSA and current financial situation of the society indicates that the board needs to consider expenses such as CAST. Motion carries.

Jason Norsworthy provided WSSA Report. Jason asked WSSA about Lee Van Wychen the Director of Science Policy if he could serve as joint CAST representative for SWSS and WSSA. Lee indicated that he could possibly serve in this capacity for SWSS. At the board meeting, Lee stated that he had considerable time commitments and that he would not be able to cover this additional responsibility. Therefore, WSSA stated they did not support the idea. Report accepted.

There was continued discussion about the value the Director of Science Policy provided SWSS. There was no direct example of value from this position and many stated they did not see any value. It was also stated that most members are also members of WSSA and thus support the position through membership in WSSA. The SWSS contribution is currently $16,000 per year. **A motion was made that due to budget constraints that we no longer support the Director of Science Policy position after the current commitment at the current level. Motion was seconded.** Motion to remove current motion and no longer support the Director Science Policy was made. First second was not removed. The first motion is still on the floor. Discussion was that Lee Van Wychen will meet with the Board on Monday morning and have an opportunity to indicate what service he provides and in addition he would present his Director of Science Policy report at the business meeting. **The motion was tabled** until after the meeting with Lee on Monday.

Frank Carey provided the Endowment Foundation report. Currently the foundation has $348,969.33 in the foundation account. Last year the foundation received $12,987.71 in donations and $14,902 in investments. The Foundation expenses were $6266. This resulted in a net income of $21,000. The foundation had to pay taxes of $298 last year. It was discussed that while the foundation received $12,987.72 in donations $12,300 were from the WSSA golf tournament. Thus only slight over $600 was from direct donations. The Endowment Foundation will have a silent auction fund raising at this year's meeting. This will include 2 paintings, 3 authors signed copies of Weeds of the South, and an antique toy tractor and sprayer. Report accepted.

Dick Oliver provided an update on the local arrangements. There are 96 posters this year. The sessions might have been held in smaller rooms considering the actual total number of papers and posters. Dick also needs the dates for summer board meeting in Puerto Rico. Everything is currently ready for Puerto Rico. Dr. Oliver has three people that are weed scientist in Puerto Rico. The committee is looking at three future locations Charleston, Savanna, and North Raleigh for 2012. Report accepted.
Meeting adjourned.

MINUTES OF SOUTHERN WEED SCIENCE SOCIETY BOARD MEETING
JANUARY 25, 2010

Present: Dan Reynolds, Tom Holt, Barry Brecke, Ann Thurston, Todd Baughman, Tony Driver, Bob Scott, Jason Norsworthy, John Byrd, Donnie Miller, Scott Senseman, Ted Webster, Robin, Bond, Larry Newsom.

President Dan Reynolds called the meeting to order on January 25, 2010.

Robin Bond provided update on graduate student organization. The graduate student organization will be electing officers here at the current meeting rather than by traditional ballot. The graduate student luncheon will be on Wednesday of meeting and old officers and newly elected officers will meet after the luncheon. Jason Weirich will be new representative to the board.

John Byrd provided additional information on Endowment Foundation. The Endowment Foundation would like the opportunity to request membership support at business meeting and at the awards banquet. The goal of the Endowment Foundation is that the interest from the Foundation account will offset the student portion of the meeting. The committee discussed allowing the students to choose the book of their choice for presenting a paper or poster at the annual meeting. The Endowment Foundation has agreed to provide $5000 for support of the Weed DVD and the Weeds of the Midwest. A question asked to make sure that by-laws will allow for the use of the endowment funds for this process. Foundation is currently spending $5000 and $6000 in awards and educational materials for the students.

There was no necrology report for this year.

Dan Reynolds discussed computer applications committee issues. The committee led by Shawn Askew is accepting presentations for Monday afternoon on Monday morning. Shawn has already setup the hyperlinks and just needs to download presentation files. There was discussion about the need to modify the MOP's to indicate that all computers for presentations have compatible operating system and software. Dan Reynolds discussed the business meeting agenda. Board discussed award nomination issues and how to resolve those issues including solicitation at the business meeting. Current MOP indicates that award nominees not selected for the award packets will be forwarded to the Business Manager to be resubmitted for that award for one additional year.

Tom Mueller provided weed contest committee's report. They will recognize award winners at the banquet. They currently do not have a sponsor for the 2010 contest.

Tom Holt discussed with Phil Banks about outreach for attendees that do not present papers at the meeting. Many societies have more attendees than SWSS that do not present papers. Suggested by Ann Thurston to consider having Phil Banks put together the program. Discussion about creating an Ad-Hoc committee to serve as a Focus Group to investigate issues in regards to membership. A motion was made to form a focus group on how we can build and meet the needs of our membership. Motion approved. Phil Banks was introduced as future business manger. He indicated that he would like to meet with Dan Reynolds and Tom Holt to discuss current business issues.

Meeting adjourned.

MINUTES OF SOUTHERN WEED SCIENCE SOCIETY BOARD MEETING
JANUARY 28, 2010

Present: Tom Holt, Barry Brecke, Tom Mueller, Dan Reynolds, Todd Baughman, Bob Scott, Jason Norsworthy, John Byrd, Donnie Miller, Scott Senseman, Ted Webster, Steve Kelly, Larry Newsom, Jason Weirich, Robin Bond, Phil Banks, Bob Schmidt, Lee Van Wychen.

President Tom Holt called the meeting to order on January 28, 2010.

Dick Oliver presented information from the local arrangements committee. The society had a lot of additional meeting room that was not utilized due to current size of the society. For future reference in a similar hotel setting need to put what level the meeting room was in for each of the individual sections. The General Session would likely be better if hosted on Tuesday Morning. Total attendance was 230 members, 96 students, for total of 326 members, and 17 no-shows/cancellations. We guaranteed 175 at the banquet and had 156 actual attendees at the banquet. Consider increasing the actual breakfast provided for the judges at the graduate student judge's breakfast. Total meal cost from the 2010 meeting was $12,135; audio visual equipment rental cost $6,610 for total expense cost of $18,746. The breaks cost $6164 but were paid for totally by sponsorship. We saved $7000 by reducing our banquet number attendees on Monday of the meeting.

Todd Baughman provided minutes for the summer board meeting and winter board meeting. A motion was made to approve summer board meeting minutes and Monday and Tuesday January 24 and 25, 2010. Motion carried.
Bob Schmidt provided business manager's report. Bayer provided funds for sustaining membership this year. The end of the fiscal year is May 31, 2010. He has set this as a transition date to relinquish Business Manager duties to Phil Banks. Bob will have to close out and transfer CD investments and bank accounts to Phil to be reinvested. The renewals for non-attendees will be forwarded in next couple of months. Phil stated he would like to discuss with the board after the transition issues including: investment policy, accepting credit card payment, along with differences in the current contract versus past practices. Phil has offered to serve as site selection negotiator and would be willing to also serve as a website host which is not in the current contract and would potentially cost an additional estimated $300-$400. He suggested providing a new member orientation for new members who have never attended the meeting. He also suggested providing a new officer orientation for new officers and for potential officer candidates to provide information on duties and schedules. It was suggested to place these presentations on the website.

Dick Oliver provided an update from the site selection committee. First choice recommendation from the site selection committee to the board was the Francis Marion in Charleston, SC. Site selection committee chair in 2012 is Tim Grey and 2013 is Peter Dotray. A motion was made to accept the site selection committee recommendation to host the meeting in Charleston, SC at the Francis Marion. Howard Harrison is a member and lives in Charleston, SC. It was discussed that several years ago the decision was made to move the annual banquet to a luncheon. Charleston should allow us to do that. Motion carries. Dearl Sanders has agreed to serve as co-chair for local arrangements for the 2011 meeting in Puerto Rico. He has a contact in Puerto Rico to serve as his co-chair. Discussed potential dates for summer board meeting in Puerto Rico. Tom Holt suggested June 24 and 25, 2010 as first choice and June 10 and 11, 2010 as second choice. This was agreed upon and Dick Oliver will check on availability of these dates.

Shawn Askew made a computer technology report. If registration desk has room than the presentation loading area should be held there rather than in separate room. This would likely facilitate better communication between presenters and staff. Need to make sure all presentations are in Office 2003 version and provide them with information on how to name their file. Shawn needs program as soon as possible to develop hyperlinks.
John Byrd provided Constitutional and Operating Procedure Committee report. Provided update on whistle blower policy and updated file that he developed to cover SWSS. A motion was made to accept the whistle blower policy. Motion carried.

Jason Weirich provided graduate student program update. Over 60 attended the luncheon and several agreed to serve as moderators at the annual meeting. It was suggested to move job placement books to a more visible location such as where the breaks are held. Possible future graduate student symposium topics included: networking skills, grant writing and funding, interviewing skills, and personality trait skills. Many students have both books and mentioned the Herbicide Handbook as a possible option. An issue was discussed about there being only 2 Ph.D. posters and the by-laws states there has to be at least 5 papers/poster to form a section. Need to combine those with

M.S. posters/papers in future instances. Concern about how the quiz bowl is run and if need for changes. Consensus was that it went fine and no need for change. Tennessee will host the Weed Contest in 2011 and BASF in 2012.

Barry Brecke provided a program chair update for 2011 meeting in Puerto Rico. He has most section chairs lined up. There was discussion about possible tours and also about trying to draw in more of the ornamental scientist to the meeting. Possible symposia topics included: photography, history of weed control, statistics, new genetics in regards to herbicide resistance, changes to herbicide registration process, ways to improve liaisons with EPA. Suggested that we use computer poster session rather than on poster board and easel. It was also questioned about the possibility of members providing slides to be played at the breaks and the banquet. Barry stated that the possible 2011 SWSS theme is “Back to the Future”.

Tom Holt suggested having a teleconference 1st quarter, summer board meeting, and a teleconference the 3rd or 4th quarter. Program updates will be provided as they become available. There was a discussion of how to handle abstracts for the 2010 meeting. This included on whether to use Omnipress’s services or to develop our own searchable pdf. This issue will be decided on at the first quarter teleconference. Everyone seemed positive to the electronic balloting. Returns were similar to traditional mailed balloting and saved the society the cost of printing and mailing of the ballots and biographical sketches. Everyone needs to work on candidates for award nominations and board members nominations.

There was considerable discussion about the societies return on investment for the Director Science Policy (DSP) for the Weed Science Society of America position. There is a committee that works with the DSP and each society has a member to that committee. The DSP helped to maintain the position of the USDA-ARS National Program Leader for Weed Science, participated in conducting EPA Florida Aquatic Pesticide Tour in conjunction with the Clean Water Act and the National Pollutant Discharge Elimination System Permits, provide information on atrazine to EPA. It was suggested how we change the engagement where the SWSS President is a standing member of the WSSA Science Policy committee. We will have a continued discussion during our first quarter teleconference. It was suggested that we have some impact statements provided from the DSP for the board. There were real questions about how to truly value the position of DSP. We need to inform Lee of issues that are important to the SWSS so that he can interact with us on those issues. Have a time for the DSP to address the society at the General Session to give an overview of his interactions with Washington.

Meeting adjourned.

MINUTES OF SOUTHERN WEED SCIENCE SOCIETY BOARD MEETING TELECONFERENCE MARCH 26, 2010

Present: Tom Holt, Barry Brecke, Tom Mueller, Dan Reynolds, Todd Baughman, Bob Scott, Jason Norsworthy, Donnie Miller, Scott Senseman, Ted Webster, Steve Kelly, Larry Newsom, Shawn Askew, Jason Weirich, Phil Banks, Bob Schmidt, Dearl Sanders.

President Tom Holt called the meeting to order on March 26, 2010.

Tom Holt indicated that the goal is to have 400 participants at Puerto Rico.

Ted Webster provided discussion on where to publish current and past proceedings. In past have dealt with Omnipress where abstract editor put the proceedings together and Omnipress developed search engine and the actual file to post on the website. The cost for this is $4000. If the society, published the proceedings then members might only be able to search current year and not all years in one single search engine. Members currently can search across years with Omnipress. There is a concern about what happens to previous abstracts that are currently on the website. The abstracts are the property of the society. However, not sure where past abstracts are since we quit producing CD-ROMs. A recommendation was made that Ted develop a plan on most cost effective and efficient method to publish 2010 proceedings on the new website. Ted also needs to determine how to handle past proceedings if we no longer use Omnipress's services. Dan and Ted are in current communication to finalize committee reports for the 2010 proceedings.

Greg Armel and Jim Brosnan have been in contact with Tom Holt to discuss SWSS support of a potential Weed Olympics in 2011 that would include involvement of all the regional societies. Information indicated that the SWSS Weed Contest Committee recommended that they supported the idea of a Weed Olympics. Jason Norsworthy informed the board that Greg and Jim present idea to WSSA Sustaining Membership and asked for $50,000 to support the Weed Olympics. The WSSA Sustaining Membership said that it would not financially support the Weed Olympics. The WSSA Board suggested that the various societies support the Weed Olympics if interested in participating. Currently have approximately $15,000 in the weed contest account. The Weed Olympics cost could potentially require this entire amount. Tom Mueller indicated that he would visit with Greg and Jim to discuss funding and support of the Weed Olympics. The 2010 contest is scheduled this year for Leland, MS and hosted by Monsanto. SWSS has a separate fund to annually support the Weed Contest. This is currently the only potential host for 2011. BASF has agreed to host the SWSS Weed Contest in 2012.

Phil Banks and Bob Schmidt provided an update of the Business Manager transition. Bob is still officially the Business Manager and will continue in this role until closing out the fiscal year on May 31, 2010. However, the process of transferring the job and accounts will continue after May 31. It was agreed to start the summer board meeting on Thursday June 24, 2010 will start in the morning rather than the traditional 1:00 PM start time. There will also be a teleconference number made available for those that will not be able to attend. We have a signed contract with Francis Marion Hotel in Charleston, SC for the 2012 meeting. Tony White is working on the new SWSS website. Dan is working with Tony to move current site to the new server. Tony will then work on developing the website. WSWS is currently charged $350 to host the WSWS website on this server. The new site will be able to accept credit card charges and registration. Traditional call for papers sent in June with final submission in September. Phil will check with Tony to determine some type of timeline for having the new website online. Determine if we can have June 1 as a target date for having the site up and running. However, the society will not have a period where we do not have a website. Phil will determine how to most efficiently handle bank accounts and how that will affect our insurance policies.

Barry Brecke discussed plans for the 2011 program. Renee Keese has indicated that they have developed enough interest for a separate ornamentals section at the 2011 meeting. Barry stated that there is a plan to have an aquatics weed management section. Potential symposia include federal regulatory issues, experimental statistics, managing resistant weeds, tropical agriculture, new herbicide resistance genes, and photography. Shawn Askew will visit with Mike DeFelice about potential photography symposium. Potential tours in Puerto Rico included rainforest, horticulture, and/or research station tour(s). There was a discussion on the potential of hosting these on Sunday afternoon. There may also be a potential to host a golf tournament. Barry requested a list of membership by states. He needs this to determine potential clientele that are not currently members of SWSS to make sure they get announcements on the 2011 meeting. Ted Webster asked if there was a group of Caribbean weed scientist that we should contact about possibly attending the meeting. Larry Newsom will check into that.

Dearl Sanders provided update on local arrangements. Dearl has been to the hotel to determine potential issues. He indicated that currently the plan is to host the poster sessions, breaks, and display participants in another section of the hotel (exhibition hall). This is not the most logistical location. The hotel does have another ballroom adjacent to our meeting space. If they do not rent out the other ballroom then can possibly move posters and displays to that room. Dearl has met with many of the faculty at the University. Potentially have a new chancellor to give the welcome address. There is a research station within an hour of downtown that would provide a tour at our convenience. Puerto Rico does have several commercial tour opportunities (extremely expensive, checking to see if we can get a discounted group rate). Hotel does not have audio visual equipment or easels. The membership can likely take care of computer and projectors, but two major issues are screens and easels. The 2010 meeting had had 88 posters. The University is checking on availability of audio visual equipment to allow us to employ. The Visitor's Bureau is providing $1,950 that has to be spent outside the hotel. The local arrangements committee is investigating various options for these funds including the renting of screens and easels. Dearl has 6-8 people to help with local arrangements. Tom Holt indicated BASF would again sponsor the graduate student luncheon. The current contract indicates that we have to spend $20,000 on banquet food and beverage in Puerto Rico. The society spent $9,600 on banquet and $6,200 on breaks at Little Rock in 2010 (Total = $15,800).

Bob Scott provided update on current newsletter status. The 2010 award pictures were not of high quality; winners were contacted for traditional head and shoulder picture. Discussed for future awards banquet having newsletter editor arrange to take award winners pictures (2010 meeting the newsletter editor was not in attendance). Bob stated that April 15 is the deadline for items to be published in May newsletter. He plans to have the May Newsletter out by May 1, 2010.

Tom Holt asked for updated list of committee membership and chair list. We do not have a current list. Need this so that we can fill committees and chairperson positions. There is a 2008-2009 committee list on the website.

Jason Norsworthy brought up about discussion on Lee Van Wychen's WSSA Director of Science Policy position. Steve Kelly indicated that we should have an impact statement and bullet points from Lee for the discussion at the summer board meeting. Jason indicated concern that weed science was left out of the recent AFRI release. Todd mentioned concern over late information from Lee for the comment period on spray drift legislation. Tom stated that he was continuing to gather information and suggested that we do the same. We will discuss SWSS future funding of the DSP position at the summer board meeting with plans to make a vote at that time.

Larry Newsom visited with members of the Southeast Branch of Entomological Society of America about possible joint meeting in the future. The SE branch has participated in other joint meeting and will be in Puerto Rico in 2011. There were several positive comments about this possibility. Donnie Miller has agreed to visit with Roger Leonard and Tim Showalter (local arrangements chair) in regards to a joint meeting. Tom Mueller indicated he would visit with Fred Hale at Tennessee. The 2013 SE branch meeting is scheduled for Louisiana but dates or location was not known. Traditionally this meeting is held in March.

Meeting was adjourned.

SOUTHERN WEED SCIENCE SOCIETY
BUSINESS MANAGER'S REPORT

Membership as of December 31

	2009	2008	2007	2006	2005	2004	2003	2002
Members and Sustaining Members	356	302	338	348	376	464	452	500
Students	106	93	72	81	85	104	111	118
Totals	462	395	420	430	461	545	563	618

Preregistration

	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000
Members	172	SWSS	151	194	177	180	181	220	226	248	249
Students	69	and	68	54	65	61	74	66	80	87	115
Total	241	WSSA	219	248	242	241	255	266	306	335	364
Percentage of final	72%	72%	74%	74%	74%	68%	66%	68%	76%	75%	
Total Attendance	334	~301	314	319	326	354	374	400	456	492	

Publications

All Proceedings and Research Reports that SWSS had copies of and the University of Iowa did not have been shipped to Iowa. The remaining copies of all SWSS publiciations have been destroyed.

Newsletter

The current editor is not a member of SWSS, last year of his membership was 2008

Investments

$15,000 CD 4.00% due 7/05
$70,000 CD 2.20% due 8/06
$25,000 CD 4.50% due 4/12
$25,000 CD 5.75% due 5/06
$30,000 CD 2.20% due 10/06
$25,000 CD 5.50% due 6/06
$29.764 MM

SWSS Net Worth, May 31

2001	$277,424	1990	$155,328
2000	$253,820	1989	$144,333
1999	$324,919	1988	$134,670
1998	$279,925	1987	$100,395
1997	$289,104	1986	$105,280
1996	$293,453	1985	$103,878
1995	$302,303	1984	$ 88,587
1994	$272,351	1983	$ 67,892
1993	$271,436	1982	$ 65,681
1992	$253,927	1981	$ 69,404
1991	$212,096		

Annual Meeting

Year	Location	Attendance	Income	Expense
2009	Orlando combined with WSSA			
2008	Jacksonville	395		
2007	Nashville	248		
2006	San Antonio	391		
2005	Charlotte	326		
2004	Memphis	354		
2003	Houston	374		
2002	Atlanta	400		
2001	Biloxi	492	$38,550	$45,284
2000	Tulsa	476	$42,257	$46,340
1999	Greensboro	501	$48,266	$45,713
1998	Birmingham	601	$48,542	$54,599
1997	Houston	584	$40,888	$56,732
1996	Charlotte	566	39,777	38,148
1995	Memphis	703	45,145	42,551
1994	Dallas	622	33,500	37,777
1993	Charlotte	669	36,695	35,161
1992	Little Rock	719	37,608	32,343
1991	San Antonio	731	42,072	43,105
1990	Atlanta	820	24,722	31,084
1989	Nashville	893	41,865	49,903
1988	Tulsa	725	30,145	35,277
1987	Orlando	884	38,639	49,849
1986	Nashville	1,042	42,826	51,111
1985	Houston	933	21,520	24,131
1984	Hot Springs	840	23,302	23,751
1983	Biloxi	905	20,532	24,535
1982	Atlanta	813	19,706	25,442
1981	Dallas			

Annual Meeting registration fees

Year	Member	Student	
2009	$295	$75	combined meeting WSSA/SWSS
2008	$255	$75	
2007	$255	$75	
2006	$255	$75	
2005	$210	$75	
2004	$210	$75	
2003	$210	$75	
2002	$115	$60	
2001	$90	$45	
2000	$90	$45	
1999	$90	$45	
1998	$60	$30	
1997	$60	$30	
1996	$60	$30	
1995	$60	$30	
1994	$50	$25	
1993	$50	$25	
1992	$50	$25	
1991	$40	$20	
1990	$30	$12	
1989	$30	$12	
1988	$30	$12	
1987	$30	$12	
1986	$30	$10	
1985	$30	$10	
1984	$30	$10	
1983	$20	$1	
1982	$20	$1	

Committee: 100a

Committee Name: EDITOR'S REPORT

Summary of Progress:

The 2009 Proceedings included abstracts from the joint WSSA/SWSS meeting, contained 656 pages and 508 abstracts, including 229 posters, eight symposia, and one workshop. The 2009 Proceedings contained executive board minutes, business manager's report, committee reports (including: awards, nominations, endowment, editor's, CAST, WSSA, Weed Contest, Weed Identification, and Herbicide Resitance), 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 presentations and numbers of pages.

Section	Number of Pages
Minutes of Executive Board, Committee Reports, etc	31
Weed Management – Agronomic Crops	52
Weed Management – Turfgrass & Ornamentals	28
Weed Management – Pastures, Rangelands, Forest, & Rights-of-Way	30
Weed Management – Horticultural Crops	20
Teaching and Extension	4
Weed Biology and Ecology	27
Physiology	21
Regulatory Aspects	3
Wildland and Aquatic Invasives	11
Formulations and Adjuvants	8
Soil & Environmental Aspects of Weed Control	8
Biocontrol of Weeds	5
Poster Contest: MS/Ph.D	11/8
Paper Contest: MS/Ph.D	12/12
Posters	184
Integrated Weed Management	8
Symposium: Research Ethics and Mentoring in Weed Science	4
Symposium: Glyphosate resistant Palmer Amaranth – Incidence, Impacts, Mechanisms, and Management	10
Symposium: Impact of Usage of Below-Label Herbicide Rates	5
Symposium: Plant Pathogens and Biological Control of Weeds, a Symposium in Honor of Dr. R. Charudattan	11
Symposium: Technology Innovations in Weed Science Communication	1
Symposium: New Directions in Weed Population and Community Modeling	6
Symposium: Non-herbicide Uses of Herbicides	7
Symposium: Invasive Plant Web-Accessible Database and Volunteer Monitoring Program	6
IBG Workshop	16
Weed Survey (Most Common & Most Troublesome)	16
State Weed Control Publications – 2009	18
Herbicide Names (common, chemical, and trade)	6
Registrants of 2009 Annual Meeting	38

Objective(s) for Next Year: To get the final copy of the Proceedings to membership earlier and to find ways to streamline the process. Getting committee reports submitted has been a significant challenge. I will be working with the new webmaster, Tony White, to develop a system that allows for the abstracts to be completed before the summer board meeting.

Finances (in any) Requested: None.

Respectively submitted;

Theodore M. Webster, Editor

Committee: 121

Committee Name: SOUTHERN WEED CONTEST COMMITTEE (STANDING)

Summary of Progress: The Southern Weed Science Society Weed Contest Committee met at the annual meeting in Little Rock, Arkansas on Monday January 25th. Topics of discussion included needing a location for the 2010 contest (later hosted by Monsanto at their Scott, MS learning center), the “weed Olympics” contest hosted by The University of Tennessee in 2011, and by BASF in 2012. No major concerns were brought to the committee. Few universities were represented at the committee meeting; those who attended included Arkansas, Mississippi State, Tennessee, and Auburn.

Andrew Price,
Committee Chair

REPORT OF 2010 SWSS HERBICIDE RESISTANT WEED COMMITTEE
January 25, Little Rock, AR

The herbicide resistant weed committee met in Little Rock, AR on January 25, 2010 at 9:00 am.

a) Minutes of 2009 meeting were circulated for viewing. Minutes approved.

b) Daniel Stephenson was confirmed as the Secretary for 2010.

c) The main overall topic of the committee in 2010 was the lack of a defined protocol to determine if a weed biotype in question is truly resistant. After lengthy discussion, Nilda Burgos was nominated to take this topic of defining clear herbicide resistance screening protocol to the WSSA Herbicide Resistance Weed Committee Chairman at the WSSA meeting.

d) The other main topic that came before the committee was the ongoing meetings that have gone on between the EPA and the WSSA on herbicide resistance. Bob Nichols updated the committee on the purpose and goals of this meeting.

e) Representatives from each state updated the committee on the status of glyphosate-resistance (GR) in their respective states. GR Palmer amaranth was the main weed of concern as it had spread to over 100 counties in 8 states.

f) Ken Smith ended his chair responsibilities at the end of the meeting and turned them over to Larry Steckel. Larry Steckel ended his tenure as secretary of the committee at the end of the meeting and turned those duties over to Daniel Stephenson.

Attached please find the minutes of the meeting.

Sincerely,

Larry Steckel,
Southern Weed Science Society Herbicide Resistance Chair
Associate Professor and Extension Weed Specialist
Plant Sciences
The University of Tennessee
West TN Research and Education Center
605 Airways Blvd
Jackson, TN 38301

MINUTES OF 2010 SWSS HERBICIDE RESISTANT WEED COMMITTEE
January 25, Little Rock, AR

Ken Smith called meeting to order at 9:00 am.

Indicated he would complete his term as committee chair at the end of meeting and Larry Steckel would assume chair responsibilities.

Minutes of 2009 meeting was circulated for viewing. Minutes approved.

Members of the committee were introduced and new members welcomed.

Daniel Stephenson was confirmed as the Secretary for 2010.

In 2009, Jason Norsworthy suggested a weed resistance research technique review article be written.

Ginger Light agreed to led the charge for the review article, but she was unable to perform the task because she took a new job with Bayer.

Bob Nichols suggested a revision of the SWSS Research Methods in Weed Science publication to include a weed resistance screening method.

Committee began to discuss whether a review or methods article needs to be written. Ken Smith suggested that a methods article needs to be written so researchers will have a source to cite. Ken Smith highlighted “creeping-resistance” and asked is it resistance or tolerance that magnifies over time. Ken Smith stated that a common protocol for resistance screening was needed, but pointed out the difficulty in setting methods that would cover all scientists.

Jim Griffin pointed out that entomologists have been researching resistance for years and they have a common protocol. Bob Nichols stated that insect resistance is 15 years ahead of weed resistance.

Bob Nichols suggested that the SWSS Herbicide Resistant Weed Committee request the WSSA Herbicide Resistant Weed Committee and other regional herbicide resistance committees (ex. Northeast Weed Science Society, North-Central Weed Science Society, etc.) to join together for the development of a herbicide resistance screening method. He suggested that Larry Steckel, chairman of SWSS committee, develop a statement to WSSA and other regional societies of this problem. Bob Nichols also suggested that Ken Smith or Nilda Burgos present this problem to William Vencill, WSSA Herbicide Resistant Weed Committee Chairman, at the 2010 WSSA meeting. Ken Smith stated that the SWSS committee forms a task force to write a statement of the problem for presentation to WSSA.

Bill Witt mentioned that a group of weed scientist meeting with the EPA to discuss resistance. Bob Nichols stated that he is a member of that group. Bob Nichols explained that the group or committee was developed through the WSSA and charged to develop a training document for the EPA to explain weed science and herbicide resistance. This document is grant funded and the grant mandates two publications: 1) Discuss the expression of resistance, 2) gene flow. These documents will be presented to the WSSA, USDA-APHIS, and the EPA. Bob Nichols also stated that the U.S. GAO is questioning the EPA as to why they did not regulate pesticides properly, thus allowing herbicide resistance to occur.

Ken Smith, Larry Steckel, and Nilda Burgos stated that a method for herbicide resistance screening needed to be written. Nilda Burgos agreed to take leadership of the methods sub-committee. Motion was made for Nilda Burgos to assume responsibility, seconded, passed.

Ken Smith discussed herbicide resistance effects on conservation tillage. The NRCS is concerned about recommendations of tillage for resistance management. Ken Smith and Larry Steckel have met with the NRCS. They stated that the NRCS has developed a cost-share program to thwart tillage. Larry Steckel stated that he and David Shaw attended an emergency meeting with NRCS to discuss weed resistance and stated that he likes the program and if not provided, producers will switch to tillage for resistant weed management.

Bill Witt stated that glyphosate-resistant Palmer amaranth has been confirmed in Fulton County, KY.

STATE UPDATES:

Kentucky: Bill Witt. Finding Palmer amaranth in state for first time. Two counties have been found with tall or common waterhemp and screening has begun. Common ragweed has be observed in one county. Also, johnsongrass has been found one county, but Bill Witt says that he is able to kill it with a high rate of glyphosate.

Arkansas: Ken Smith. Palmer amaranth is in all counties and all crops; however, resistance has not been confirmed in 3 -4 counties (typical rice counties). Palmer amaranth has infested well over 1,000,000 acres. Two Palmer amaranth biotypes with different resistance mechanisms have been found. Glyphosate-resistant ryegrass has been confirmed in one county. Glyphosate-resistant johnsongrass has been confirmed at two sites in a single county.

Louisiana: Daniel Stephenson. Screening is underway investigating suspected glyphosate resistance in johnsongrass, Palmer amaranth, waterhemp, and ryegrass.

Mississippi: Jason Bond and Tom Eubank. Glyphosate-resistant horseweed is state-wide. Resistant Palmer amaranth has been confirmed in 9 counties. Ryegrass has been confirmed in 12 counties. Johnsongrass has been confirmed in 1 county. Waterhemp has been confirmed in 2 counties. Beginning to observe issues with ALS-inhibiting herbicides controlling barnyardgrass in rice.

Texas: Ginger Light. Palmer amaranth resistant to glyphosate confirmed at 2 locations.

Alabama: Glen Wehtje. Glyphosate-resistant Palmer amaranth confirmed in 1 county.

Tennessee: Larry Steckel. Glyphosate-resistant horseweed in all counties. Palmer amaranth in all West Tennessee counties. Waterhemp, ryegrass, johnsongrass.

Bill Witt stated that a publication about the management and biology of johnsongrass needed to be developed by the SWSS. The committee decided that Daniel Stephenson, Jason Norsworthy, and Bill Witt will write the publication. Topics to be included are the biology, detection, and management.

Ken Smith mentioned that www.weedscience.org needed to be kept up-to-date when resistant weeds are found in each state.

With no other business, meeting was adjourned.

Those attending the meeting:

NAME	EMAIL	TELEPHONE
Ken Smith	smithken@uamont.edu	870-723-5527
Nick Polge	Nick.polge@syngenta.com	772-567-5218 x121
Bill Witt	wwitt@uky.edu	854-333-3131
Tom Eubank	teubank@drec.msstate.edu	662-686-3232
Daniel Stephenson	dstephenson@agcenter.lsu.edu	318-308-7225
Jason Bond	jbond@drec.msstate.edu	662-820-7794
Larry Steckel	lsteckel@utk.edu	731-425-4705
Bob Nichols	bnichols@cottoninc.com	919-678-2371
Ginger Light	Ginger.light@bayercropscience.com	806-319-2673
Ralph Lassiter	rblassiter@dow.com	501-223-0381
Nilda Burgos	nburgos@uark.edu	479-263-2507
Glenn Wehtje	wehtjgr@auburn.edu	334-844-3993
Andrew Price	Andrew.price@ars.usda.gov	334-844-4741 x213
Jim Griffin	jgriffin@agcenter.lsu.edu	225-578-1768
Dearl Sanders	dsanders@agcenter.lsu.edu	225-683-5848

REPORT OF 2010 SWSS MEETING SITE SELECTION COMMITTEE
January 25, Little Rock, AR

After receiving bids from Helms Brisco for the 2012 site selection in November 2009, the committee decided to visit locations in Charleston, SC; Savannah, GA; and Raleigh, NC. Following are the comments of the personnel who visited these sites. This information was presented to the committee in January 2010 meeting in Little Rock, AR during the annual meeting. The committee suggested recommending the Francis Marion hotel in downtown Charleston, SC for the 2012 meeting. Present at the meeting were Tom Holt, Tom Mueller, Barry Brecke, Jason Norsworthy, Dick Oliver, Peter Dotray, and Timothy Grey. The board decided to go with the committee's recommendation and the 2012 meeting will be at the Francis Marion in Charleston.

Respectively submitted,

Timothy Grey

REPORT OF 2010 SWSS LEGISLATIVE AND REGULATORY COMMITTEE REPORT
January 25, Little Rock, AR

Committee Chair: Donn Shilling

Members: Bill Vencill, Bobby Walls, Craig Ramsey, Gerald Henry, Greg MacDonald, Lee Van Wychen, Bob Nichols

2010 Summary of Activities

On 1/26/2010 the committee discussed the activities reported in the 2009 Washington Science Policy report submitted by Lee Van Wychen (see attachment 1). In addition to the activities by the Director of Science Policy (DSP) the committee discussed the funding mechanism that supports the position and related activities. The committee unanimously supported SWSS continuing its funding for this position. The Chairman of the committee invested considerable time into working with WSSA and the SWSS Board to ensure a better understanding of the importance of the DSP and the need for SWSS and the other regional Weed Science Societies to continue their financial support. The issue of the DSP funding formula was extensively evaluated by SWSS and WSSA. As a result of this evaluation, WSSA changed the formula which resulted in reduced costs to all the regional societies (see attachments 2 & 3). At the SWSS summer board meeting (San Juan, PR, June 24, 2010); attended by Donn Shilling, the activities of the DSP, how the DSP interacts with SWSS and the funding formula was discussed. Donn Shilling led a discussion on the DSP and recommended the board continue support at the new formula level. Donn Shilling recommended enhanced mechanisms of interaction between the DSP and SWSS which could include but not be limited to:

1. SWSS President invite the DSP to present at the SWSS annual meeting
2. SWSS invite the DSP and the chairman of the SWSS Legislative and Regulatory committee to meet with the BOD during the annual meeting.
3. SWSS newsletter editor request reports from the DSP.

The each Board member made comments and Donn Shilling was asked to address any concerns. The BOD voted to continue to support the DSP at the new funding level.

A copy of the DSP 2010 summer report is also included (see attachment 4)

Attachment 1

2009 WASHINGTON DC SCIENCE POLICY REPORT
SUBMITTED BY LEE VAN WYCHEN

Doubling Campaign for USDA Agricultural and Food Research Initiative (AFRI)
I have been working with several research coalitions (National C-FAR, Co-Farm) to double the AFRI grants (old NRI) over the next 5 years. Funding was $193M in FY 2008 and $201M in FY 2009. Our Ag research coalition group was pushing Congress for $250 million in FY 2010 (exclusive of any Section 406 Program funding), with a goal of $500 million in total funding by FY 2015. The FY 2010 age approps bill was passed this fall with $262 million for AFRI, which is a huge increase compared to past years. We also targeted the Obama White House and OMB about campaign promises to increase science R&D. While some agencies (NSF, NIH, DOE) have done well, agriculture research funding was left in the dark.
Reminder to SWSS members to look keep an eye out for new mandatory research funding from the 2008 Farm Bill in the areas of biofuels, specialty crops, and organic ag.

USDA personnel changes
-ARS hired Dr. John Lydon as the new National Program Leader for Weed Science.
- Roger Beachy was selected as the first Director of NIFA (6 year appointment).
- Under Sec for Research, Education and Economics is vacant as Rajiv Shah left for US-AID. No replacement nominated as of Jan. 22.

Herbicide Resistance Management Policy -WSSA members Bill Vencill, Carol Mallory-Smith, Bill Johnson, Nilda Burgos, Ted Webster, Bob Nichols, and John Soteres have been working on a "state of the science" review paper on the development of herbicide-resistant weeds and weed shifts that are linked to the introduction of GE herbicide-tolerant corn, soybeans, wheat, rice, cotton, alfalfa and switchgrass. The goal is publish the review paper via "open access" in *Weed Science* by May 2010.

In October, Jill Schroeder, WSSA-EPA Liaison, helped coordinate a learning session on herbicide resistance management in Washington DC. David Shaw, WSSA President, gave presentation to EPA-OPP and CropLife America in October that discussed results after 3rd year of 4-yr, 6 state study that showed that net returns on fields managed according to recommended best practices are equal to or greater than the returns on those where glyphosate is used alone. WSSA recommendations include focused educational efforts that target all appropriate groups including media, growers, dealers/distributors, and consultants. We need to convey a consistent, accurate message about managing herbicide resistance and it must be urgent. Discussions about herbicide mode-of-action labeling is also on the table (similar to Canada and Australia).

EPA- Clean Water Act (CWA) National Pollutant Discharge Elimination System Permits (NPDES)
The WSSA wants to ensure that FIFRA remains the preeminent federal law for pesticide regulation that protects both people and the environment. The extensive research and science-based risk assessments required by FIFRA should not be jeopardized by politics (and it is).

More background info and a summary of this very important issue for our societies can be found in the report titled "EPA Florida Aquatic Pesticide Tour" on the WSSA website. Many thanks to Jill Schroeder (WSSA-EPA liaison) and Kurt Getsinger (APMS, Army Corp of Engineers) for their excellent work on this issue and Bill Haller for setting up the tour. The CWA will have a huge impact on our discipline if CWA NPDES permits are required for pesticide applications "in, over, or near water". The citizen lawsuit provisions in the CWA (but not in FIFRA) will be an incredible economic burden on everyone. In January 2009, the 6th Circuit Court ruled that EPA's final rule was not a reasonable interpretation of the CWA since the terms "chemical waste" and "biological materials" unambiguously include aquatic pesticides. The National and Regional Weed Science Societies along with many other stakeholders (including USDA Secretary Vilsack, and House and Senate Ag Committees) asked EPA to petition for a full court rehearing. In April, Industry asked for the full 6^{th} Circuit Court to rehear the case, but EPA only asked for 2 year stay to implement an NPDES permit system for pesticides applied "in, over, or near water".

There are currently 3 avenues being pursued to ensure that pesticides applied in accordance with FIFRA are exempt from any CWA regulation:

- **Judiciary Branch**- Industry (Crop Life, National Cotton Council, etc..) appeal to full 6th Circuit Court denied. Industry has petitioned the Supreme Court to hear the case. Decision on whether or not to rehear the case should come in spring 2010.
- **Legislative Branch**- Congress could provide exemption of pesticides in compliance with FIFRA from CWA. The Baucus amendment to Senate bill 787 (which broadens the scope of CWA jurisdiction) initially looked good, but did not provide a true exemption. S. 787 passed the Senate Environment and Public Works committee, but they don't have the votes to pass it in the full Senate. On the House side, the Small Business Committee had a hearing on S. 787 this summer and they heard massive opposition against the bill because enactment of S. 787 would subject federal CWA permitting requirements on ditches, water and sewer pipes, streets, gutters, man-made ponds, storm water basins, and even "puddles of rainwater" according to some of the bill's critics.
- **Executive Branch**- EPA has until **April 9, 2011** to implement an NPDES permit system for all pesticides applied in, over, or near water. Jack Faulk, EPA Office of Water, and Skee Jones, EPA Office of Pesticide Programs, are the agency leads on writing the NPDES permits. We have a very good working relationship with them. Both were on the Florida aquatic pesticide fact finding trip and provided an update on the permit writing last week at National Invasive Species Awareness Week.

EPA plans to release a draft version of an NPDES general permit for public comment by **April 2010**. Comments will be incorporated into final permit language that will be released to the states in December 2010. States will be required to do their own permitting, but EPA would not object to "plagiarism" of its general permit. State general permits must be approved by EPA prior to April 9, 2011.

An NPDES General Permit will allow an applicator to perform certain activities (mosquito control, aquatic weed control, etc.). Cost of the permit is uncertain at this time ($50-$500), but will be up to each state. Applicators would need to file a 'notice of intent' (NOI) that would be good for 5 years (still discussing timeframe). The NOI is intended to be a simple 1 to 2 or 3 page form with name, address, application type, discharge area, etc. Applications should be able to be made within 2 days to a week of NOI submission. EPA does not believe that individual NOI's should be made available to the public, although general permits could be made public.

Atrazine Re-Evaluation in 2010 -Atrazine was re-registered in 2006 after a 3 year review of over 6,000 studies on atrazine. EPA concluded that "no harm that would result to the general U.S. population, infants, children or other…consumers" from atrazine use. However, the new EPA admins want to review atrazine again, but there is no new valid data.

Climate Change Bill (H.R. 2454)- Passed House. Stalled in Senate, but could see action early this year. WSSA has no official position on the bill. The Ag lobbying 'block' is divided, as are past USDA Secretaries. The no-till carbon sequestration provisions under a Cap and Trade system would likely be good for WSSA.

National Invasive Species Awareness Week (NISAW)- First All-Taxa event on Jan. 10-14, 2010 was a big success! I would suggest APMS needs a board member(s) on the steering committee. The NISAW steering committee is having a conference call on **Wed., Jan. 27, 2010 at 11 AM** (Eastern) to recap 2010 and **begin planning for 2011**. Call in number is 800-377-8846.

Attachment 2

DIRECTOR OF SCIENCE POLICY
AGREEMENT AND STATEMENT OF RELATIONSHIPS, ROLES, AND RESPONSIBILITIES

The Director of Science Policy (DSP) position serves the needs of the six cooperating weed sciences societies (WSSA, NEWSS, NCWSS, SWSS, WSWS, and APMS) for a Washington D.C. representative to perform activities that are of interest and concern to the societies.

Core Activities of the DSP

- To monitor and report on activities in Washington D.C. that are relevant to the societies
- To make the expertise of the societies readily accessible to the legislature and administrative agencies
- To comment on specific science issues that are of concern to the societies or where the societies have specific competencies
- To pursue specific interests of the societies as a group, or as individual societies, when there is a compelling need

Reporting of the DSP

- The DSP reports directly to the chair of the WSSA Science Policy Committee
- The DSP will provide quarterly reports to the societies' newsletter editors for distribution to the membership. These reports will also be available for electronic distribution.
- The DSP will provide reports to specific committees of the WSSA and the five societies as appropriate and work with the committees on specific issues as needs arise.
- The DSP will submit local travel expense reimbursement requests to the WSSA Executive Secretary.
- The DSP will submit cooperating weed science societies travel requests and expenses to the President of the requesting society.

Responsibilities of the WSSA Science Policy Committee (SPC)

- The SPC will establish an annual list of work priorities for the DSP
- The SPC will provide policy and decision making guidance to the DSP as needed.
- The SPC will provide an annual review of the DSP's job performance and make recommendations to the WSSA Board of Directors prior to the WSSA annual meeting.

Responsibilities of the Societies

- Participate in the selection of the person who will serve as DSP
- Designate an individual member to the DSP Committee. This individual will be the primary communication link between the DSP and the respective society.
- Designate an individual member to each of the WSSA committees having a link to the DSP so that there is appropriate representation when the DSP needs to work with a specific committee.
- Provide the DSP copies of the society's newsletter and other pertinent mailings.
- Provide input to the WSSA SPC regarding the annual performance review of the DSP.
- Support the financial requirements of the DSP position with annual contributions.

Responsibilities of the WSSA

- The WSSA is responsible for the establishment of the DSP as its employee and providing all necessary structures to support the position, including wage payment processing, tax reporting to federal and state entities, establishment of workman's compensation insurance, retirement benefits accounts, and payment for all other associated costs such as rent/parking/office supplies.
- Monitor the activities of the Science Policy Committee and the DSP and provide guidance and resources of the membership's expertise on specific policy issues.

Monetary Support Associated with the DSP

- The WSSA provides monthly payment of expenses associated with the DSP position.
- The WSSA President will sign contracts associated with the DSP position.
- The WSSA will receive financial program support from the other associated societies as set forth in Attachment 1 of this Agreement. The underlying assumptions for this support are:
    1. The base funding is obtained by calculating the mean cost of the position over a five year term. Expenses are projected at a 4% annual increase.
    2. On an annual basis the WSSA will pay 65% of the mean cost; the contributing societies will pay 35% of the mean cost.
    3. Each contributing society's annual contribution is based on its percentage of membership (based on 2009 membership figures) to the whole.
- Funds not expended within an annual budget will be held in escrow for future use. Attachment 2 contains a projection of contributions, estimated expenses, and the amount of the escrow account through the year 2020.

Reviews of the DSP position

- The WSSA Science Policy Committee will conduct an annual review of the work and activities of the Director of Science Policy, requesting input from all contributing societies. The SPC Committee will provide this report to the WSSA Board of Directors prior to the WSSA annual meeting.
- Every three years, the WSSA Finance Committee will initiate a review of the DSP funding and escrow accounts, seeking input from all contributing societies. Upon conclusion of the review, the Treasurer of the WSSA Finance Committee will report the findings to the President of the WSSA who will in turn report to the Presidents of the contributing societies. This review may result in adjustments to the projected contributions, estimated expenses and the escrow account as needed.

Signed by:

______________________________	__________________
President, Aquatic Plant Management Society	Date
______________________________	__________________
President, Northeastern Weed Science Society	Date
______________________________	__________________
President, North Central Weed Science Society	Date
______________________________	__________________
President, Southern Weed Science Society	Date
______________________________	__________________
President, Western Society of Weed Science	Date
______________________________	__________________
President, Weed Science Society of America	Date

Attachment 3

Based on historical shares, WSSA was responsible for 65% of the DSP expenses, with 35% shared among the regional and affiliated societies based on comparing and adjusting the historical 1999 and 2005 membership numbers.

If WSSA continues to cover 65% and if 35% of total DSP expenses are shared ($43,070) among the regional and affiliated societies, the suggested contributions for the regional and affiliated societies would be as follows:

	2009 membership	Proportions among regionals	Contributions based on proportions	Historical contributions (2007)	Change	% change
NCWSS	529	0.28	$12,263	16,000	-$3,737	-23.4
SWSS	466	0.25	$10,802	16,000	-$5,198	-32.5
WSWS	381	0.21	$8,832	15,000	-$6,168	-41.1
NEWSS	214	0.12	$4,961	6,300	-$1,339	-21.3
APMS	268	0.14	$6,212	5,000	+$1,212	+24.2
Totals	1858	1.00	$43,070	$58,300		

Attachment 4

SWSS Summer Report, July, 2010

Major weed science policy initiatives during 2010:

1. Address Weed Science funding issues with the newly established USDA National Institute for Food and Agriculture (NIFA).
2. Submit Federal Register comments on Spray Drift Pesticide Registration Notice and bring in outside expertise to educate federal staff on the advances in herbicide application technologies
3. Continue to provide input to EPA on National Pollutant Discharge Elimination System (NPDES) permits and submit Federal Register comments on their draft NPDES Pesticide General Permit (PGP) due on July 19.
4. Work with APHIS/EPA and WSSA members on the two herbicide resistance white papers
5. Work with all herbicide resistant stakeholders to help develop a uniform herbicide resistance management strategy and move towards a resolution that can be approved by all the National and Regional Weed Science Societies
6. Work with federal invasive weed stakeholders, in particular the National Invasive Species Council to develop an agenda for National Invasive Species Awareness Week (NISAW)
7. Work with invasive weed related non-government organizations (NGO's) like the Healthy Habitats Coalition and APMS to coordinate a legislative fly-in to Washington DC during NISAW.
8. Maintain input and interaction with the Public Awareness Committee
9. Continue to provide weed science based information and resources to Federal agencies, Congress, and NGO's.

USDA-NIFA I met with numerous USDA staff and stakeholders about the Agricultural and Food Research Initiative (AFRI) grant program and coordinated the comments submitted jointly by the National and Regional Weed Science Societies. WSSA appealed to USDA to make three changes: **1)**. Add a Foundational program within AFRI to address weedy plant biology, ecology and management, similar to those focused on phytopathology and entomology; **2)** Reconfigure larger AFRI research programs to encompass the full breadth of the agricultural sciences. Currently, program objectives are written so narrowly as to exclude not only weed science, but many other important areas of study; and **3)** Restore funding for integrated activities under the Section 406 Legislative Authority. Section 406 supports integrated weed management research through initiatives like the Regional IPM Centers, Risk Avoidance and Mitigation Program, Crops at Risk and Organic Transitions Program. Funding for these programs was zeroed out in the President's FY 2011 budget. I'd like to give special thanks to Dave Mortensen and Adam Davis on the WSSA Research and Competitive Grants Committee as well as Mike Barrett for substantial comments and editing. In addition, both Mortensen and Barrett traveled to Washington DC to represent the WSSA in separate USDA-NIFA stakeholder workshops. The NIFA response to the joint letter indicates that money will be directed to weed resistance issues and that more money will go to foundational programs rather than the 5 "pipeline" initiatives. The letter from Beachy also indicated that NIFA will not support separate funding lines for the Section 406 programs (which has been USDA position for 8 years), thus I will continue to lobby House and Senate appropriators to restore that funding through the appropriations process (which they have done for the past 8 years). The National Coalition for Food and Agricultural Research (NC-FAR) and I will meet with Dr. Beachy at the end of July to discuss their changes to the 2011 AFRI RFA's, which are currently scheduled to be announced in December.

Spray Drift- The regulation of spray drift remains problematic and the risk assessment tools that EPA employs are based on aging data and the application technology in current use has improved significantly. The WSSA, Entomological Society of America -Plant-Insect Ecosystems Section (ESA P-IE), and the American Phytopathological Society (APS) jointly submitted Federal Register comments on the EPA Spray Drift Pesticide Registration Notice in March. Our main recommendations included removing the word "could" from "could cause" (compared to "causes adverse observable effects"). "Could cause" is very subjective and could attract frivolous complaints, leading to difficult, confusing and uneven drift enforcement decisions. Obvious and off-label drift occurrences that might not have readily observable adverse effects are already enforceable as application violations (residues, species decline, etc). Another important recommendation was to only use down-wind buffers between target and sensitive sites instead of uniform buffers around all sides regardless of wind direction. USDA determined, with the previous EPA drift PR notice in 2000, that, if buffers were not made wind-directional, the economic loss would be on the order of $1-2 billion dollars due to the large amount of irreplaceable acreage removed from production. Finally, I am working with Jill Schroeder and John Jachetta to bring in Bob Wolf this fall to give a presentation on the progress made in spray drift reduction technologies to EPA and Capitol Hill.

NPDES- I am working to submit comments on behalf of the National and Regional Weed Science Societies by Thursday, July 15. In my humble opinion, there is no way that all 44 states will be ready issue NPDES Pesticide General Permits (PGP's) by April 9, 2011. The remaining states, U.S. and Indian territories have to use EPA's NPDES PGP that is currently in the comment period and will apparently be finalized by December. The National and Regional Weed Science Societies key comments will include:

1) EPA Should ask 6th Circuit Court for additional time (at least 2 more years)
2) Application rate objectives are best met by directing the applicator to follow the FIFRA prescriptive label, rather than requiring research-based judgments the applicator is unqualified to make in order to "minimize" application rates.
3) EPA is incorrect that reduced rates are effective for resistance prevention (note- EPA Office of Water staff assured me that this is not their objective, but that is not how the draft PGP currently reads!). Again, the PGP stresses "MINIMIZE" and makes it sound like you will be in violation of your permit if you DO NOT USE LESS than the labeled rate.
4) Increased jurisdictional clarity would help others determine if their pesticide use(s) warrant inclusion under this general NPDES permit. It's plausible that an applicator could be sued for applying a herbicide in their field where that field has a ditch with water in it at the time of application. While Agricultural Stormwater runoff and Irrigation Return Flow are exempt from Clean Water Act permitting, the application of pesticides for control of terrestrial pests associated with crop production is not covered under EPA's NPDES draft PGP. Farmers that apply pesticides in any of the four use patterns that discharge to U.S. waters may need permit coverage. Example: application of pesticides in or along the sides of irrigation canals or ditches to control vegetation.
5) Make Outstanding National Resources Water (Tier 3) eligible for PGP.
6) Pesticide R&D (such as that done at Land Grant colleges or Industry) should be automatically covered by this permit and not be required to submit an NOI and be subject to "citizen lawsuits"

Herbicide Resistance- I would like to especially thank John Jachetta, David Shaw, and Jill Schroeder for their outstanding work on this issue on behalf of the weed science societies. The WSSA created a special "Herbicide Resistance Education Committee" chaired by David Shaw to address emerging issues and develop a comprehensive education strategy. WSSA and its affiliated societies need to be the go-to organization for science-based information on herbicide resistant weeds. I cannot stress how important this for us as other groups and federal agencies look for answers. The committee is working with many stakeholders including industry and commodity groups to build on and develop new materials in a wide range of formats that will be used to educate growers about herbicide resistance management.
Related to this are 2 herbicide resistance white papers that are being developed by WSSA with financial support from USDA-APHIS and EPA. The first paper, led by Bill Vencill in coordination with Carol Mallory-Smith, Bill Johnson, Nilda Burgos, Ted Webster, Bob Nichols, John Soteres, and Mike Owen deals with the development of herbicide-resistant weeds and weed shifts that are linked to the introduction of GE herbicide-tolerant corn, soybeans, wheat, rice, cotton, alfalfa and switchgrass. The paper is scheduled for review in *Weed Science* by the end of August. The second white paper is being developed by the Herbicide Resistance Education committee led by Shaw and deals with the extent to which weed resistance management programs are being utilized in various cropping systems and an understanding of how successful they are at achieving their goals. Work on this paper is just getting started, but is expected to be completed by Sept. 2011.

NISAW is being planned for February 28 to March 4, 2011. I am working at this from two fronts. My goal is to have the National Invasive Species Council (NISC) coordinate invasive species education and awareness events and PR during that week. This is a departure from past NIWAWs in that 1) it is all-taxa, 2) NISC will put resources into coordinating this; and 3) individual invasive species coalitions will encourage their members to have legislative fly-ins that are independent of NISAW. Planning is underway for a Kid's Day event at the U.S. Botanic Garden, an invasive species briefing on Capitol Hill, and a joint reception between federal agency staff and NGO's such as the WSSA. While I am helping NISC move in this direction (and to hopefully lead the national invasive species education and awareness effort in the future), my main focus is on coordinating a legislative fly-in during NISAW for the Healthy Habitats Coalition (HHC) and possibly the Aquatic Plant Management Society. Current members of the HHC Steering Committee are John Jachetta (Dow), John Cantlon (DuPont), Eric Lane (WWCC), George Beck (Colorado St), Fred Raish (NAWMA), and me. HHC has been working at the state, regional and national level to obtain new funding and more effective federal participation in invasive species management efforts. As a result of these efforts, the Western Governors Association (WGA) just passed a new Resolution on Combating Invasive Species in support of invasive species management that we intend to utilize as a lobbying platform. Our 3 main legislative goals are to 1) procure the funding Asks associated with the WGA invasive species resolution; 2) pass the Invasive Species Emergency Response Fund Act; and 3) insure that the 2012 Farm Bill adequately addresses invasive weed management. HHC members have visited DC in February and May where we have already met with over 20 different Representatives, Senators, NGO's and Federal Agencies. If you are interested in traveling to Washington DC during March 1-3, 2011 to lobby for invasive weed funding, please contact me.

Public Awareness- The WSSA Public Awareness committee continues to be very active and is an important committee in helping me disseminate key science policy messages. In particular, the press releases titled "WSSA Issues Strong Appeal to USDA for Restoration of Funding for Weed Science" and "New Application Technologies Keep Herbicides Where They Belong" were very effective at generating national attention to USDA and EPA. While this committee is still less than 5 years old, our consistent, timely press releases has given us a national platform and name recognition. Just in the past few months, I have fielded weed science information inquiries from media sources such as the Wall Street Journal, New York Times, Seed World Magazine, Iowa Farmer Today, Hobby Farm Home, and Western Farm Press. We are gaining national credibility!

Educating NGO's, Feds, and Congress- I coordinated a seminar on Capitol Hill on June 28 in conjunction with NC-FAR and CropLife America titled "Solving Africa's Weed Problem" presented by Leonard Gianessi. Over 90 congressional staffers attended this event at the House Agriculture Committee. The main purpose of the seminar was to spur USDA, NGO's, and international development agencies to help fund weed science work in Africa. The primary method of weed control by smallholder farmers in Africa is hand weeding with short handled tools. Herbicides have been tested for forty years in Africa and have been widely-adopted by large-scale commercial farmers but not by smallholders, who lack training and access. CropLife Foundation (CLF) and CNFA, Inc. have launched a pilot project in Kenya and Malawi and 4 WSSA scientists have been supported as volunteers to visit and aid in the weed research. We hope to continue to build support for this program, but face large opposition from anti-pesticide groups.

I've also coordinated meetings for Jill Schroeder, Harold Coble, Kurt Getsinger and I to meet with the new USDA Director of the Office of Pest Management Policy, Sheryl Kunickis and CropLife America's new Vice President for Research, Barb Glenn, to discuss a wide array of weed science policy issues.

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EFFECT OF DRIFT REDUCTION AGENT ON THE EFFICACY OF GLYPHOSATE, GLUFOSINATE, DICAMBA, AND 2,4-D FOR CONTROL OF SEVERAL BROADLEAF WEEDS. J.A. Johnson, P.M. Eure, D.L. Jordan, L.R. Fisher, J.A. Priest, D.S. Whitley, G.S. Chahal and M.C. Vann; North Carolina State University, Raleigh.

ABSTRACT

In addition to crops already tolerant to glyphosate and glufosinate, prospective advances in agricultural technology have resulted in germplasm that will have the ability to tolerate topical applications of dicamba and 2,4-D. However, these herbicides can cause issues with non-target, sensitive crops if spray or vapor drift were to occur. One attempt to control spray drift would be the use of a drift control agent in the tank with herbicides. Although it is important to reduce off target movement of herbicides, it is also crucial to avoid negative impacts on herbicide performance. Therefore, determining the effect drift control agent has on the efficacy of herbicides is important when attempting to minimize off site movement without sacrificing weed control.

Experiments were conducted in separate but adjacent tilled fallow fields in 2009 with a natural infestation of weeds. Plot size was 6 by 20 feet. Glyphosate (1, 0.5 lb ai/A), glufosinate (0.54, 0.27 lb ai/A), dicamba (0.25, 0.125 lb ai/A), and 2,4-D (0.48, 0.24 lb ai/A) were applied postemergence and constitute rates that are the manufacturers suggested use rate and half this rate with the recommended surfactant. The application volume was 15 gallons per acre delivered using a CO_2-pressurized backpack sprayer at 31 psi. Each treatment also included no drift agent or Interlock ^{TM} at 1% (v/v). In order to effectively compare the treatments, a non-treated control was included. At the time of application the various weeds (common ragweed, common lambsquarters, entireleaf morniggIory, and Palmer amaranth) ranged in size from 5 to 13 inches. Visual estimates of percent weed control were recorded 7, 14 and 28 days after treatment on a scale of 0-100% where 0 = no control and 100 = complete control. Data were subjected to ANOVA by experiment appropriate for the factorial treatment arrangement.

When comparing across experiments and weed species, a wide range of interactions were noted. Weed response to herbicides and herbicide rates was generally predictable based on previous research. Variability in response to drift agent was noted, however it was not consistent across herbicides and herbicide rates. Although not consistent in all trials, the drift control agent reduced efficacy of glyphosate and increased efficacy of glufosinate in some instances. The phenoxy herbicides, dicamba and 2,4-D, were generally not affected by drift control agent. Even though some differences in control were noted when drift control agent was included, there remains no firm recommendation on use based on these data. Therefore, these trials will be repeated in 2010. Research will also to be expanded to other weeds and herbicides in order to evaluate the influence of drift agent on herbicide efficacy.

PALMER AMARANTH CONTROL IN LIBERTY LINK® SOYBEAN. J.W. Dickson, R.C. Scott, N.D. Pearrow, and B.M. Davis; University of Arkansas Cooperative Extension Service, Lonoke, AR

ABSTRACT

Glyphosate-resistant palmer amaranth (*Amaranthus palmeri*) (AMAPA) was first discovered in Arkansas in 2006. Since then, glyphosate-resistant palmer amaranth has been confirmed in 21 Arkansas counties. Several non-glyphosate control options exist, but are based on residual herbicide programs. With the introduction of Liberty Link® soybean (*Glycine max*) varieties in 2009, producers have a new postemergence option with Ignite® (glufosinate) herbicide. The objective of this research was to evaluate palmer amaranth control using pre-emergence (PRE) herbicides, Ignite, and Ignite tank mixes with post-emergence residual herbicides in Liberty Link soybean. Studies were conducted from 2008 -2009 near Newport, Arkansas to evaluate Palmer amaranth control using various residual herbicides and Ignite herbicide. Valor, Valor XLT, Gangster FR, Valor + Sencor and Prefix applied PRE all controlled AMAPA above 85%, 28 days after treatment (DAT). Authority MTZ and Boundary appeared to be less effective, but did not significantly differ from the other pre-emergence herbicides. Valor, Valor XLT, Gangster FR, Valor + Sencor, and Prefix applied PRE followed by 2 post-emergence (POST) applications of Ignite 22 oz/a at 22 and 44 days after emergence (DAE) all controlled AMAPA 97% or better 98 DAT. In these treatments it is possible that only one POST Ignite application might have been needed. Without PRE herbicides, 2 applications of Ignite (22 oz/a) at 22 and 44 DAE controlled AMAPA 76%, at 98 DAT. However, 2 earlier applications (10 and 22 DAE) controlled AMAPA 98%, by 98 DAT. Soybean plots treated with Valor, Valor XLT, Gangster FR, Valor + Sencor, and Prefix followed by (fb) 2 applications of Ignite (22 oz/a) at 22 and 44 DAE all yielded 72 to 78 bu/a. Plots only treated with Ignite 22 and 44 DAE yielded 62 bu/a compared to 77 bu/a in the plots treated with Ignite 10 and 22 DAE. In another study, AMAPA control 44 DAT with Ignite at 22 and 36 oz/a was reduced as weed size at time of application increased from 3 to 6 to 12 inches tall, with the best control (94%) achieved when AMAPA was treated at 3 inches tall with Ignite at 36 oz/a. AMAPA was controlled 95% 44 DAT when 22 oz/a of Ignite was applied at the 3 and 12 inch timings. In a postemerge tank-mix study, Ignite at 29 oz/a alone or combined with the residual herbicides: Flexstar, Resource, Classic, Dual Magnum, Scepter, and Cadet, all controlled AMAPA 96% or better at 50 DAT. Ignite tank-mixed with Prefix only controlled AMAPA 73% 50 DAT. Palmer amaranth can be controlled initially with pre-emergence herbicides in Liberty Link soybeans. However, to achieve season long control, sequential post-emerge applications of Ignite are required. Although two post applications were applied to these plots, where residuals were used it appeared that only one sequential post treatment with Ignite might have been needed. Palmer amaranth can be controlled with only post-emergence applications of Ignite at 22 oz/a, but the timing is very critical. Palmer amaranth can be controlled with tank mixes where Ignite is combined with residual post-emergence herbicides.

HYBRID RICE TOLERANCE TO CLOMAZONE AS AFFECTED BY PLANTING DATE AND SOIL CHARACTERISTIC. B.M. McKnight[1], S.A. Senseman[1], E.R. Camargo[1], A. Turner[1] , G.N. McCauley[2] and Jason Samford [12]; [1]Texas A&M University, Texas AgriLife Research, College Station, TX, [2]Texas AgriLife Research, Eagle Lake, TX

ABSTRACT

Field studies were conducted to evaluate hybrid rice tolerance to clomazone herbicide on two different soils in March and April plantings. Hybrid rice was seeded at three densities in Morey silty clay loam near Beaumont, TX and Nada fine sandy loam near Eagle Lake, TX. Seeding rates were 25 lbs/A, 35 lbs/A, and 45 lbs/A. Clomazone was applied at seven different rates PRE and EPOST. Each herbicide treatment was applied to the three seeding rates to assess the impact of injury on that particular seeding density. Visual ratings were recorded on weekly intervals and yield data was collected at the end of the study. The March planting on the fine textured soil in Beaumont showed minimal injury (<10%) while the April planting showed no clomazone injury. The March planting on the course textured soil in Eagle Lake showed significant injury as high as 90% in some plots. The April planting in Eagle Lake showed minimal injury (<10%). Over time, injury symptoms dissipated and were visually undetectable in the most severely injured plots 50 days after the last clomazone application. No significant difference was observed in mean yield in any of the treatments. There was also no interaction between herbicide treatment and seeding rate.

HYBRID RICE TOLERANCE TO IMAZETHAPYR. A.L.Turner1, S.A.Senseman1, G.McCauley2, B.McKnight[1], E.Camargo[1], J.Samford[2]; [1]Texas A&M University, Texas AgriLife Research College Station,TX, [2]Texas AgriLife Research Eagle Lake, TX

ABSTRACT

Hybrid rice was planted in Beaumont, TX and Eagle Lake, TX in early March and April to evaluate the visual injury caused at different imazethapyr application rates and seeding rates. Each study had an early-post emergence and a late-post emergence application in increasing rates. Hybrid rice plants showed injury symptoms early in the trial after the second application in the plots with increased herbicide rates, but the injury recorded was not significant. Once fertilizer was applied and a flood was permanently established, the plants were able to recover. The data did not show a higher percent injury with respect to different planting rates. There were no significant differences in the hybrid rice yield.

HIGH THROUGHPUT SCREENING OF SURFACTANTS USING SHIKIMIC ACID ANALYSIS. C.A. Massey, D.R. Shaw, J.A. Huff, J.W. Weirich, and M.B. Wixson; Mississippi State University, Mississippi State, MS.

ABSTRACT

Since herbicide discovery programs have slowed dramatically, and the cost of developing them has increased, surfactants are playing a more critical role in the herbicide industry. A quick surfactant screening procedure could assist herbicide manufacturers in identifying potential candidates in a cost-effective and timely manner. The objective of this research was to develop a rapid screening procedure to evaluate surfactant effectiveness on glyphosate efficacy. Studies were conducted comparing glyphosate efficacy from a number of surfactants using non-glyphosate-resistant soybean [*Glycine* max. (L.) Merr.] as the indicator species. Glyphosate was applied at 0.88 kg ae/ha at the V7 stage. Visual ratings were determined 7, 14, and 21 days after treatment (DAT). In 2008 the surfactants HAI 1022-1 and HAI 1022-2 controlled barnyardgrass [*Echinochloa crus-galli* (L.) P. Beauv.] the least (85% and 88%, respectively) at 21 DAT. In 2009 HAI 1039 exhibited the least control (32%) 21 DAT. An initial rate titration was set up using soybean to establish a reduced rate of glyphosate that would be useful to establish differential efficacy. Plants were sprayed at the V3 stage with various rates ranging from 1/4 of the labeled rate to a full rate of glyphosate. Three, six, nine, or twelve leaf discs were collected from the third trifoliolate of each plant for shikimate analysis 24, 48, or 72 hours after treatment (HAT). Absorbance was measured at 380 nm using a spectrophotometer.

WEED CONTROL PROGRAMS IN SOYBEAN. C.G. Bell and L.R. Oliver; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR

ABSTRACT

Soybean weed management is a perennial challenge, and evaluation of new herbicide programs is essential to allow producers to decide which programs fit their needs. The objective of this study was to determine weed control and crop tolerance from three herbicide-resistant cultivars, Roundup Ready (NK 546-U6), Liberty Link (Halo 4.9), GAT (AG 4605), and a conventional (HBK 4924) cultivar program. Research was conducted in 2009 at two locations on a Calloway silt loam (Pine Tree) and Sharkey clay loam (Keiser), AR, in a split-split-plot design analyzing the interaction of two locations (whole plot) by four cultivar programs (subplot) by six herbicide application timings (sub-subplot) with four replications. The six treatments within each subplot varied (by herbicide) with each program but a comparable herbicide program for each cultivar program was selected. The treatments were 1) weedy check, 2) delayed preplant burndown (PPB) followed by (fb) postemergence (POST), 3) preemergence (PRE) or POST only, 4) short-residual PRE fb POST, 5) long-residual PRE fb POST, and 6) POST fb POST. Soybean emerged on June 10 and 13 at Keiser and Pine Tree, respectively. Weed control of four weed species Palmer amaranth (*Amaranthus palmeri*), hemp sesbania (*Sesbania exaltata*), prickly sida (*Sida spinosa*) and barnyardgrass (*Echinochloa crus-galli*) were visually rated at 4 and 8 weeks after emergence (WAE). Soybean yield was obtain from center two row of each plot.

The two way interaction of cultivar program by timing was significant for yield (bu/A) at alpha = 0.05. Cultivar, when pooled over location and timing, yielded equally except for the Roundup Ready program. Herbicide application timing, when pooled over location and program, yielded equally except for the PRE or POST single treatment and weedy check (34 bu/A). For weed control in the conventional treatments, the major problem was late timing of initial Typhoon (fluazifop + fomesafen at 0.56 lb ai/A) for prickly sida control at Keiser and late emergence of barnyardgrass in plots treated with Authority (sulfentrazone at 0.3 lb ai/A) + Sencor (metribuzin at 0.3 lb ai/A) PRE and Valor (flumoxazin at 0.063 lb ai/A) PPB fb Typhoon (0.56 lb ai/A) + COC at V3 at Pine Tree. Weeds in GAT treatments were controlled (85 to 100%) throughout the growing season, except for late-season barnyardgrass at Pine Tree and for hemp sesbania at Keiser with Diligent (chorimuron at 0.156 lb ai/A + rimsulfuron at 0.0156 lb ai/A + flumioxazin at 0.0625 lb ai/A) PRE. For the Liberty Link program, control was excellent until 8 WAE then Valor XLT (flumioxazin + chlorimuron at 0.1 lb ai/A) PPB fb Ignite 280 (glufosinate at 0.4 lb ai/A) + AMS at V3, Ignite 280 (0.4 lb/A) + AMS at V2 to V3 (40%), Valor (0.063 lb/A) PRE fb Ignite 280 (0.4 lb/A) + AMS at V3 to V4, Authority First (sulfentrazone + chloransulam methyl at 0.175 lb ai/A) PRE fb Ignite 280 (0.4 lb/A) at V3 to V4, and Ignite 280 (0.4 lb/A) at V2 fb Ignite 280 (0.4 lb/A) at V4 gave only 39 to 75% barnyardgrass control at Pine Tree following excessive rainfall and less canopy cover. Prickly sida control was 70% at Keiser with only a single POST Ignite 280 (0.4 lb/A) application. The Roundup Ready program was least effective for weed control at 8 WAE and soybean yield (2 bu/A less) because of lack of control of hemp sesbania and barnyardgrass. Single application of Roundup PowerMax (glyphosate at 0.75 lb ae/A) controlled hemp sesbania only 66% after a V2 to V3 application at Pine Tree. At Keiser, hemp sesbania control was less than 80% following applications of Canopy (metribuzin + chlorimuron at 0.5 lb/A) PPB fb Roundup PowerMax (0.75 lb/A) at V3 (74%), Valor (0.063 lb/A) PRE fb Roundup PowerMax (0.75 lb/A) at V2-V3 (78%), and Prefix (fomesafen + S-metalochlor at 1.6 lb ai/A) PRE fb Roundup PowerMax (0.75 lb/A) at V2 to V3 (64%). Barnyardgrss was controlled less than 77% following applications of Canopy (metribuzin + chlorimuron at 0.5 lb ai/A) PPB fb Roundup PowerMax (0.75 lb/A) at V3 (74%), Roundup PowerMax (0.75 lb/A) at V3 to V4 (50%), and Valor (0.063 lb/A) PRE fb Roundup PowerMax (0.75 lb/A) at V2-V3 (76%) at Pine Tree.

In conclusion, after one year, all four cultivar programs were variable under the weed spectrum and environmental conditions at 8 WAE. The variability was due to lack of residual weed control an excessive late-season rainfall.

SHIKIMIC ACID ACCUMULATION IN ARKANSAS PALMER AMARANTH POPULATIONS. G.M. Griffith, J.K. Norsworthy, J. Mattice, and P. Jha; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR

ABSTRACT

One of the first steps in resistance management should be differentiating resistant (R) and susceptible (S) biotypes. There are several methods of screening for R and S biotypes. One of those involves a rate titration experiment that determines the lethal dose of herbicide required to kill 50% of a given population. Another method of differentiating between R and S biotypes involves measuring shikimate, an intermediate in the shikimic acid pathway. When glyphosate reaches its target site, it inhibits 5-enolpyruvalshikimate-3-phosphate synthase (EPSPS), which is responsible for catalyzing phosphoenolpyruvate and shikimate-3-phosphate to form 5-enolpyruvalshikimate-3-phosphate (EPSP) and inorganic phosphate. EPSP directly precedes the branch-point intermediate chlorismate, which is responsible for synthesizing the aromatic amino acids tryptophan, phenylalanine, and tyrosine. When glyphosate inhibits EPSPS, there is a buildup of carbon in the form of shikimate, which can be extracted and quantified using high performance liquid chromatography (HPLC). The objective of this research was to determine the level of shikimate accumulation in two glyphosate-resistant Palmer amaranth populations from Arkansas and one S Palmer amaranth population from South Carolina. The R populations from Arkansas were from Mississippi (R1) and Lincoln counties (R2), while the S population from South Carolina was used because it is believed to have never been exposed to glyphosate. Research was conducted in growth chambers, where all plants were fertilized as needed and grown with 30/20 C day/night temperatures with a 16-h photoperiod. At the five- to seven-leaf stage, glyphosate at 210 g ae/ha was applied to five plants, while one served as a nontreated control. Above-ground tissue was harvested at 1, 3, 5, and 7 days after treatment. Each plant was finely ground using a mortar and pestle with liquid nitrogen. A subsample, was weighed and recorded, then placed in a 25-ml centrifuge tube and diluted with 6 ml of 0.25 N HCl. Centrifuge tubes were placed on an orbital rotator and mixed at 60 rpm for 24 hr. A 2 ml aliquot was transferred to smaller centrifuge tubes and centrifuged at 10,000 rpm for 7 minutes. An aliquot of the supernatant was transferred through a 0.20 µm nylon filter to a 2 ml HPLC vial for quantification of shikimate. Shikimate data were analyzed as a split-plot design with run as the main plot and population as the subplot. A separate ANOVA for each harvest was used due to heteroscadasticity among harvest timings. This experiment had two runs with five replications per run. Means were separated according to Fisher's protected LSD (α=0.05). All biotypes accumulated shikimate as a result of glyphosate application, indicating that EPSPS activity was inhibited in both R and S Palmer amaranth. At 1 day after treatment (DAT), the S biotype had accumulated significantly more shikimate (2,817 µg/g fresh tissue) than R1 (675 µg/g) or R2 (673 µg/g). By 3 DAT, the R2 biotype's shikimate accumulation had peaked at 1,847 µg/g, yet was not significantly different than R1 (679 µg/g). At each harvest timing, the S biotype accumulated more shikimate than both R biotypes. By 7 DAT, the R biotypes had peaked and began to stabilize, while the S biotype (11,691µg/g) had yet to peak. These results are similar to research from Georgia that showed significant differences in shikimate accumulation between R and S biotypes, yet different than results from Tennessee, which showed no significant differences in shikimate accumulation in R and S biotypes. Future research will address glyphosate metabolism and C^{14}-glyphosate absorption and translocation as possible resistant mechanisms of these Palmer amaranth biotypes.

RICE RESPONSE AND WEED CONTROL FROM TANK-MIX APPLICATIONS OF SAFLUFENACIL AND IMAZETHAPYR. E.R. Camargo[1,2], S.A. Senseman[1], G.N. McCauley[3], J.B. Guice[4]; [1]Texas A&M University, Texas AgriLife Research, College Station, TX, [2]Conselho Nacional de Desenvolvimento Científico e Tecnológico, Brazil, [3]Texas AgriLife Research, Eagle Lake, TX, [4]BASF Corporation, Winnsboro, LA.

ABSTRACT

Saflufenacil, which inhibits the protoporphyrinogen-IX-oxidase enzyme (Geier et al., 2009), is a new herbicide being globally developed by BASF for residual broadleaf weed control in corn and other crops (Sikkema et al., 2008). In rice, saflufenacil can be an effective tool for broadleaf weed control, depending on crop tolerance, efficacy and interaction with currently used herbicides such as imazethapyr. Because saflufenacil action takes place rapidly causing loss of membrane integrity, it can reduce the effectiveness of other herbicides when using in a tank-mixed application. Therefore, saflufenacil performance needs to be investigated before this herbicide can be effectively used in a comprehensive weed control program in rice containing imazethapyr. This study was established to evaluate 1) rice tolerance and 2) weed control of red rice (*Oryza sativa*) and hemp sesbania (*Sesbania exaltata*) to saflufenacil tank-mixed with imazethapyr. The experiment was conducted during 2009 at the Texas A&M AgriLife Research and Extension Center located at Beaumont, TX. The soil was a Morey silty clay loam with 19.4% of sand, 45.2% of silt, 35.4% of clay, 1.3% of organic carbon, and pH of 7.3. The experimental design was a randomized complete block with four replications. Treatments included a check, an imazethapyr treatment alone (70 g ha^{-1} at the 1- to 2-leaf stage (EPOST) plus 70 g ha^{-1} at the 4- to 6-leaf stage (LPOST)), and four saflufenacil rates (12.5, 18.75, 25, and 50 g ha^{-1}) applied at EPOST and LPOST. Imazethapyr treatment was applied to all saflufenacil treatments. EPOST or LPOST saflufenacil aplications were tank-mixed with either the first or second application of imazethapyr depending on the treatment. Triclopyr (420 g ae ha^{-1}) was applied LPOST only in the imazethapyr treatment alone to provide hemp sesbania control. Methylated seed oil at 1% v/v was included in all postemergence applications. The experiment was seeded on April 9th using hybrid “CL XL729”. Crop management practices were followed according to the 2008 Texas Rice Production Guidelines. Rice injury was estimated visually using a scale of 0 to 100% where 0 = no rice injury and 100 = rice death. Red rice and hemp sesbania control was estimated visually using a scale of 0 to 100% where 0 = no control and 100 = total control. Rice grain was harvested with a mechanical plot harvester when grain moisture was approximately 20%. Final grain yield was adjusted to 12% moisture. Visual injury and weed control data were subjected to arcsine transformation prior to analysis to normalize distribution. Analysis of variance was performed and significant effects were separated using Tukey’s Test ($p \leq 0.05$). Rice injury was significantly higher at the highest saflufenacil rate (50 g ha^{-1}) in evaluations conducted 14 days after EPOST (DAEP). Treatments containing saflufenacil had 13% to 65% injury. No injury was observed in the imazethapyr treatment alone. Overall injury decreased among saflufenacil treatments in evaluations conducted 24 DAEP. Treatments from 12.5 to 25 g ha^{-1} showed injury lower than 10% indicating more rapid rice recovery for LPOST applications. Larger rice plants were able to overcome faster the burning injury from saflufenacil. In evaluations conducted 17 DAEP, red rice control was higher in the treatments containing saflufenacil. Burning injury from saflufenacil associated with imazethapyr activity seemed to visually display a more rapid response to and control of red rice. However, before harvesting, red rice control was 100% in all treated plots containing imazethapyr. In evaluations conducted before harvest, hemp sesbania control was ≥ 80% in all saflufenacil treatments, indicating effectiveness of control throughout the season. Rice yield was not affected by herbicide treatments. Although injury was significantly higher on the highest rates of saflufenacil, rice yield was not adversely affected. In summary, rice was injured at the highest rates of saflufenacil, but injury did not reduce rice yield. Hemp sesbania was effectively controlled by saflufenacil. Imazethapyr control of red rice was not adversely affected by tank-mixing with saflufenacil. Saflufenacil may be a potentially effective herbicide for broadleaf control in rice.

RICE HYBRIDS AS WEEDS. J.C. Fish, E.P. Webster, S.L. Bottoms, J.B. Hensley, and T.P. Carlson; School of Plant, Environment, and Soil Sciences, LSU Agricultural Center, Baton Rouge.

ABTRACT

Clearfield rice, developed at the Louisiana State University Agricultural Center Rice Research Station near Crowley, Louisiana, is a non-genetically modified rice that allows the use of herbicides in the imidazolinone family to be applied over the crop to control red rice and other difficult to control weeds. Clearfield rice is now available in conventional and hybrids. Hybrid Clearfield rice has some shattering and dormancy characteristics and can become a non-conventional weed problem the following growing season if not properly managed. A study was established at the Rice Research Station to determine the competitiveness of rice hybrids with a Clearfield cultivar.

'Arize', 'CLXL 745', 'CLXL 729', and 'XL 723' were evaluated for their competitiveness with Clearfield 'CL 131' rice. The hybrids were planted at 0, 1, 2, and 4 plants/m^2. CL 131 was planted at 50 kg/ha. The area was managed weed-free throughout the growing season to allow for evaluating competition between the rice and hybrids without other weed competition.

CL 131 was planted April 14, 2009 and immediately received a surface irrigation. At 72 hours after surface irrigation pregerminated hybrid seed were planted at the appropriate densities. At 4 weeks after emergence, stand counts were obtained to ensure proper hybrid densities. Immediately prior to harvest four hybrid plants were removed from each plot to determine the number of stems and panicles produced. All panicles were removed from remaining hybrids to prevent seed from contributing to overall yield.

Immediately prior to harvest a 45 cm section of CL 131 was removed from the center row of each plot to evaluate the impact of the hybrid on CL 131 agronomic characteristics. CL 131 stem counts were reduced with XL 723 and CLXL 745 planted at 2 and 4 plans/m^2. Stem counts from CL 131 were similar to the nontreated when CLXL 729 and Arize were planted at all densities evaluated. CL 131 panicle numbers were reduced with 2 and 4 plants/m^2 of XL 723 and CLXL 745 compared with CLXL729 and Arize. At 4 plants/m^2, Arize reduced the overall yield of CL 131 by 16%, while the XL hybrids reduced yield 18 to 24%, and XL 723 appears to be the more competitive with CL 131 than the other hybrids evaluated.

This study did not evaluate the impact of F_2 seed harvested from the F_1 hybrids. With these data and observations from actual fields with a hybrid infestation the following year it is hypothesized that yield reductions will be greater under F_2 and later generations of hybrids. Producers should take all precautions and employ management practices to prevent hybrids from shattering and becoming weed problems the following growing season.

PURPLE MOONFLOWER CONTROL WITH POSTEMERGENCE HERBICIDES. E.P. Prostko* and D.S. Price; Department of Crop & Soil Sciences, The University of Georgia, Tifton and Crisp County Cooperative Extension, Cordele.

ABSTRACT

Purple moonflower (*Ipomoea turbinata*) is becoming common in many agricultural fields in Georgia. Because this weed has typically not been a major problem, growers are unfamiliar with its identification and control. Unfortunately, limited information on the control of this weed is available. Therefore, the objective of this research was to evaluate various postemergence herbicides for the control of purple moonflower in the greenhouse. Purple moonflower seed were collected in the fall of 2008 from a commercial corn field in Crisp County. The seed were air dried at room temperature for 40 days. Prior to planting in the greenhouse, the seed were mechanically scarified with sandpaper to improve germination. Five seeds were planted into Styrofoam cups or plastic pots filled with Miracle-Gro potting mix. After emergence, the pots were thinned to contain 1 moonflower plant. Once the plants reached the 2 leaf stage (3-6" tall), 26 different herbicide treatments were applied using a spray chamber calibrated to deliver 15 GPA using 8002XR nozzle tips. Recommended adjuvants were included with each treatment. Each treatment was replicated 3 times and the experiment was repeated. Visual weed control ratings (0-100%) and above-ground fresh weight biomass data were collected 10 days after treatment. The data for each experiment were combined and means were separated using Fischer's Protected LSD Test ($P = 0.10$). The following treatments provided $\geq$ 90% visual control and biomass reduction: Reflex 2SL @ 16 oz/A; Cobra 2EC @ 12.5 oz/A; Ultra Blazer 2SL @ 1.5 pt/A; Callisto 4SC @ 3 oz/A; Atrazine 4L @ 48 oz/A; Aim 2EC @ 1.5 oz/A; 2,4-D amine 3.8SC @ 16 oz/A; Evik 80DF @ 2 lb/A; Roundup PowerMax 5.5SL @ 22 oz/A + Aim 2EC @ 1.5 oz/A; Roundup PowerMax 5.5SL @ 22 oz/A + Valor 51WG @ 2 oz/A; Direx 4L @ 32 oz/A + MSMA 6L @ 40 oz/A; Direx 4L @ 32 oz/A + MSMA 6L @ 40 oz/A + Aim 2EC @ 1.5 oz/A; Direx 4L @ 32 oz/A + MSMA 6L @ 40 oz/A + Valor 51WG @ 1 oz/A. The following treatments provided 80-89% visual weed control and biomass reduction: Ignite 2.34SL @ 22 oz/A; 2,4-DB 1.75SL @ 18 oz/A; Roundup PowerMax 5.5SL @ 22 oz/A + Staple 3.2SL @ 2.7 oz/A; and Gramoxone Inteon 2SL @ 32 oz/A. Treatments that provided 70-79% visual control and biomass reduction included Laudis 3.5L @ 3 oz/A and Cadre 2SL @ 4 oz/A. All other treatments provided less than 70% visual control and biomass reduction.

WEED CONTROL AND YIELD COMPARISONS OF TWIN- AND SINGLE-ROW GLYPHOSATE-RESISTANT COTTON PRODUCTION SYSTEMS. K.N. Reddy and J.C. Boykin; Crop Production Systems Research Unit and Cotton Ginning Research Unit, USDA-ARS, Stoneville, MS.

ABSTRACT

Cotton production is characterized by high input costs coupled with fluctuating cotton commodity prices resulting in narrow or no profit margins. Research is needed to improve profitability by manipulating agronomic practices such as row spacing, cultivars, and herbicide applications. Cotton traditionally has been grown in single-rows spaced 91- to 102-cm apart. The introduction of John Deere PRO-12 VRS spindle-type picker capable of picking cotton in row spacings from 38- to 102-cm has rejuvenated interest in narrow-row cotton production. Cotton grown in 38-cm rows produced equal or higher yield than cotton grown in conventional 97-102 cm wide-rows. Narrow-row cotton (38-cm rows) has the potential to reduce weed control costs through early canopy closure compared to wide-row cotton system. Yield advantage in twin-row (also referred to as paired-row in the literature) pattern over single row has been reported in several crops (e.g., corn, peanut, soybean).

In the lower Mississippi River Valley alluvial flood plain, cotton is predominantly grown on raised seedbeds spaced 91- to 102-cm apart that had been prepared the preceding fall. The raised seedbeds ensure adequate surface drainage during winter and enable furrow irrigation during summer. Prior to planting, the raised beds can be conditioned by flattening the top and firming up with bed conditioners. The conditioned seedbeds (slightly raised flat tops of about 50-cm wide with small furrows) enable planting cotton in 38-cm twin rows and furrow irrigation. Two rows spaced 38 cm apart can be planted on flat top of the bed with a 64-cm gap between rows. The agronomic and weed control benefits of cotton production in 38-cm twin-rows on a 102-cm centers was investigated in this study.

A 2-yr field study was conducted during 2007 and 2008 at Stoneville, MS, to determine the effect of twin-row (two rows 38 cm apart on 102-cm centers) and single-row (on 102-cm beds) pattern and four glyphosate-based programs on cotton canopy closure, weed control, and lint yield in two cultivars (‘DP117B2RF’, early maturity, hairy leaf; ‘DP164B2RF’ mid-full maturity, smooth leaf) under an irrigated environment. The experiment was conducted in a split-split plot arrangement of treatments in a randomized complete block design with row pattern as the main plot, cultivars as the subplot, and herbicide programs as the sub-subplot with four replications. Cotton canopy closed 2 wk earlier in twin-row pattern compared to single-row pattern. Canopy closure was unaffected by cultivars and herbicide programs. Control of nine predominant weeds was sufficient (≥95%) to support cotton production. Total weed dry biomass was reduced by 35% in twin-row compared to single-row pattern, 15% in ‘DP117B2RF’ compared to ‘DP164B2RF’ cultivar, and ≥97% with glyphosate EPOST, EPOST fb MPOST, EPOST fb MPOST fb LPOST following PRE herbicides or three applications of glyphosate-POST only without PRE herbicides compared to no herbicide. Cotton grown in twin-row pattern produced 6% higher lint yield than single-row cotton. Cultivar ‘DP117B2RF’ produced 23% higher lint yield than cultivar ‘DP164B2RF’. Lint yields were higher with glyphosate EPOST fb MPOST, EPOST fb MPOST fb LPOST following PRE herbicides or three applications of glyphosate-POST only without PRE herbicides (1210 to 1230 kg/ha) compared to glyphosate EPOST following PRE herbicides (1130 kg/ha). These results demonstrated that cotton production in 38-cm twin rows on 102-cm centers is an agronomically feasible option for farmers in the lower Mississippi River Valley alluvial flood plain who are seeking a simple production system that close canopy early and produce higher lint yield than cotton grown in single-row on102-cm beds.

ITALIAN RYEGRASS GROWTH AND CONTROL IN CONVENTIONAL AND NO-TILLAGE WHEAT.
J.R. Martin, C.R. Tutt, and D.L. Call; Department of Plant and Soil Sciences, University of Kentucky.

ABSTRACT

Because of the increased interest in using no-tillage practices in wheat, research was conducted to determine if tillage system impacts Italian ryegrass growth and control when a postemergence herbicide is applied in the fall or spring. Experiments were conducted during 2006-2007, 2007-2008, and 2008-2009 growing seasons and were referenced as studies 1, 2, and 3 respectively.

Wheat was planted using conventional and no-tillage practices in mid October. The timings of applications common to all three studies were mid November and mid March. Studies 2 and 3 also included a mid December timing.

Mesosulfuron methyl was used in the first two studies for managing ryegrass. Crop injury became a concern when mesosulfuron methyl was applied in the spring near the time for topdressing nitrogen fertilizer; therefore, pinoxaden was used in the third study for postemergence control of ryegrass.

Ryegrass plant samples were collected at the time of application to estimate density and growth stage. Visual ratings of control were also made at 4 weeks after treatment (WAT) and at maturity. Wheat was harvested with a plot combine and yields were adjusted to 13.5 percent moisture.

Tillage system influenced ryegrass density in two of the three studies, yet results were inconsistent. Densities in the first study were greater in the conventional tillage plots, compared with the no-tillage plots for both fall and spring timings. However, densities in the third study were greater in the no-tillage plots than the conventional tilled plots for both fall timings, but were statistically equal for both systems for the spring timing.

The development of ryegrass was diverse in both tillage systems at all sampling times. The percentage of ryegrass plants that exceeded two tillers was used as a standard for comparing treatments, since this is the maximum growth stage on the labels of most postemergence herbicides used for ryegrass control. Ryegrass plants in all three studies did not exceed two tillers for the November timing in both tillage systems. Delaying herbicide treatment until mid December resulted in 3.7 to 17 percent plants with more than two tillers. The mid March timing had a larger portion of the population with greater than two tillers in the conventional till system than the no-till system.

A few ryegrass seedheads were observed at maturity in nearly all herbicide-treated plots, regardless of tillage system or timing of herbicide. The check plots of the first study had more seedheads in the conventional till plots than the no-till plots.

Ryegrass control was slower when the herbicide was applied in the fall than in the spring. Ryegrass control at the end of the season exceeded 90 percent in most instances. In a few instances, late-season control with the fall applications was 5 to 7 percent greater in no-till than conventional till plots. In some cases, late-season control increased 3 to 11 percent when the herbicide timing was delayed until mid-March. Crop injury and competition from other weeds were factors that made it difficult to determine a consistent pattern where wheat yield was affected by tillage system and timing of herbicide.

Tillage system can influence ryegrass density in some cases, yet the results may be inconsistent. Delaying applications until March resulted in more plants that exceeded the maximum label stage of two tillers, particularly in conventional till plantings. The level of ryegrass control at the end of the season exceeded 90 percent in most cases and any differences due to tillage system or timing of herbicide were minor

Acknowledgements: Appreciation is expressed to Kentucky Small Grains Promotion Council for helping support this research.

BENCHMARK STUDY: IMPACT OF GLYPHOSATE-RESISTANT CROPS ON WEED POPULATION DENSITY. David R. Shaw, Mississippi State University, Mississippi State, MS; Micheal D.K. Owen and Philip Dixon, Iowa State University, Ames, IA; Bryan G. Young, Southern Illinois University, Carbondale, IL; Robert G. Wilson, Southern Illinois University, Carbondale, IL; David L. Jordan, North Carolina State University, Raleigh, NC; and Stephen C. Weller, Purdue University, West Lafayette, IN.

ABSTRACT

A multi-state, four-year field scale study was initiated in 2006 to assess the impact of weed management tactics on weed populations in glyphosate-resistant (GR) crops. A total of 155 commercial fields in Illinois, Indiana, Iowa, Mississippi, Nebraska and North Carolina were included in the study and seedbank, weed populations and yields were enumerated during the growing season. Fields selected for the project in 2006 had been in a glyphosate-resistant cropping system for the previous 3 yr. Each field was divided into two sections with half managed for weed control as typical for the grower and the other half managed following recommendations by a university weed specialist within the state. Forty sample locations were established throughout each field with GPS coordinates within the two sides of the study site. Cropping systems examined in the study included; continuous GR crop (corn, soybean, and cotton), a rotation of two GR crops and a rotation of a GR crop and a non-GR crop. Weed density was measured in the spring prior to crop planting, after crop emergence, two weeks after the last postemergent herbicide application and at crop harvest in both years. Weed counts by species were taken in a 0.5 M^2 area in the 20 GPS locations in each half of the field. Weed density was compared among the various cropping systems and between the grower and university sides of the field. In 2006, prior to crop planting, fields in continuous cotton had greater weed density than all other cropping systems. The measurements after crop emergence showed that continuous GR corn had greater weed density than continuous cotton. Interestingly, this higher weed density was reduced in fields where GR corn was rotated with a different GR crop or with a non-GR crop. At harvest, weed density was similar in fields cropped continuously with GR corn, cotton or soybeans but in fields practicing rotation, weed density was reduced compared to continuous GR soybean or GR corn. In 2007 the weed density measurements followed a similar pattern as in 2006 with the highest weed densities occurring in fields where a GR crop was grown continuously with no rotation. For example, at crop planting, weed density was higher in continuous GR soybean and cotton than in continuous GR corn but when the GR soybeans were rotated with a different GR crop or with a non GR crop weed density was lower. Weed density after the last postemergent herbicide application was highest in continuous corn compared to continuous soybean or cotton but densities were reduced when rotation with another crop was practiced. This pattern of weed densities continued at harvest in the various cropping systems. In comparisons of weed densities in grower versus university sides of the fields in both 2006 and 2007, there was a trend towards reduced weed density on the university side. Although, only in a few cases were these differences significant. This trend was most likely due to including a soil applied preemergence herbicide with glyphosate on the university side versus growers relying solely on glyphosate. These results suggest that both cropping system and weed control programs play a critical role in the density of weeds in glyphosate resistant crops.

SOYBEAN AND COTTON DOUBLE CROP ROTATION RESPONSE TO PYROXSULAM APPLIED IN SOUTHERN US SOFT RED WINTER WHEAT. R.A. Haygood, L.B. Braxton, A.T. Ellis, R.E. Gast, R.B. Lassiter, J.S. Richburg and L.C. Walton; Dow AgroSciences, Indianapolis, IN

ABSTRACT

PowerFlex® herbicide, containing the new active ingredient pyroxsulam, was introduced for use in winter wheat in the Southern US in 2008. Pyroxsulam is a sulfonamide herbicide that provides broad spectrum postemergence annual grass and broadleaf weed control in cereals. Studies were conducted in 2008 – 2009 to further characterize and determine the feasibility of 3 month rotation intervals to soybeans and cotton after a pyroxsulam application.
PowerFlex, up to 4X rates, demonstrated excellent rotational safety to both soybeans and cotton after a late winter application in winter wheat in all trials. Based on these results the plant back interval after the application of PowerFlex on winter wheat will be reduced to 3 months for soybeans and cotton in most states in the Southern US. This attribute of rotational crop safety in winter wheat will offer growers greater flexibility. Product labels should be checked for the plant back interval prior to application.

BARNYARDGRASS EMERGENCE AND SEED PRODUCTION AS A FUNCTION OF TIME IN COTTON AND RICE. J.A. Still, J.K. Norsworthy, P. Jha, G.M. Griffith, M.J. Wilson, E. McCallister, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR, and K.L. Smith Southeast Research and Extension Center, University of Arkansas, Monticello, AR

ABSTRACT

Barnyardgrass (*Echinochloa crus-galli*) is a summer annual belonging to the *Poaceae* family and is considered one of the most problematic weeds in cotton and rice in Arkansas. Herbicide-resistant barnyardgrass biotypes have recently been documented in Arkansas. They include propanil-resistant (1992), propanil and quinclorac-resistant (1998), and clomazone-resistant (2007) biotypes. The widespread adoption of Roundup Ready® and Roundup Ready® Flex cotton and Clearfield™ rice and the exclusive use of glyphosate and imazethapyr in the respective crops have increased the selection pressure for the evolution of glyphosate and ALS-resistant barnyardgrass biotypes. The knowledge of barnyardgrass emergence is essential to producing a herbicide-resistance model. The objectives of this study were to characterize barnyardgrass emergence from natural seed banks and study the impact of time of emergence on barnyardgrass seed production in cotton and rice. In 2008 and 2009, sites in Fayetteville, Stuttgart, and Rohwer, AR, were established to observe cumulative barnyardgrass emergence from natural seed banks in silt loam and clay soil. Newly emerged barnyardgrass seedlings were counted biweekly or weekly and sprayed with 0.77 lb ae/A of glyphosate. For the second objective, cotton was planted at Fayetteville and both cotton and rice were planted at Rohwer. Barnyardgrass cohorts were established at planting through 7 weeks after planting (WAP) in cotton and through 5 WAP in rice. Plots were kept weed free except for the established cohorts. Seeds were counted from two panicles from each plot and the number of panicles per plot was also documented. Barnyardgrass emerged earlier in clay soil than in silt loam soil. Peak emergence of barnyardgrass coincided with early growth stages of cotton and rice if planted in late-April or early-May. Barnyardgrass produced up to 31 panicles per plot in both rice and cotton and 21,000 and 26,000 seeds per panicle respectively. Significantly fewer seeds were produced by barnyardgrass when plants emerged after 5 WAP in cotton. Barnyardgrass seed production was not significantly impacted by time of emergence in rice. Early emerging barnyardgrass cohorts have the potential to produce an extensive amount of seed. Data from this research will contribute to development of a computer-aided simulation model to evaluate risks of management strategies for reducing incidence of ACCase-, ALS-, and glyphosate-resistant barnyardgrass.

PALMER AMARANTH (*Amaranthus palmeri*) AND IVYLEAF MORNINGGLORY (*Ipomoea hederacea*) CONTROL IN GLYTOL™ PLUS LIBERTYLINK® COTTON. J.W. Keeling, P.A. Dotray, and J.D. Reed; Texas AgriLife Research, Lubbock, TX 79403.

ABSTRACT

Field experiments were conducted in 2008 and 2009 to examine GlyTol™ plus LibertyLink® cotton response following sequential applications of glyphosate (Glyphos X-TRA), of glufosinate-ammonium (Ignite 280), glyphosate followed by (fb) glufosinate-ammonium, glufosinate-ammonium fb glyphosate, and glyphosate + glufosinate-ammonium in tank mixture. The objective of this research was to determine Palmer amaranth (*Amaranthus palmeri*) and ivyleaf morningglory (*Ipomoea hederacea*) control following tank mix combinations of glyphosate (Roundup PowerMax) and Ignite 280 when holding the rate of Roundup PowerMax at 1X (0.75 lb ae/A or 21 oz/A) and varying the amount of Ignite 280 (1X (0.52 lb ai/A or 29 oz/A), 0.75X, 0.5X, 0.25X). Applications were made to 2- to 3-inch Palmer amaranth or 2- to 6-inch ivyleaf morningglory in separate field experiments. Additional studies examined Palmer amaranth and ivyleaf morningglory control following reduced rates of glyphosate and glufosinate-ammonium (1X + 0X, 0.75X + 0.25X, 0.5X + 0.5X, 0.25X + 0.75X, 0X + 1X). Applications were made using a tractor-mounted compressed-air sprayer calibrated to deliver 10 GPA at 3 MPH using 110015 TT flat fan nozzles.

Roundup PowerMax alone controlled Palmer amaranth 100% 10 days after application (DAA) in 2008. When Ignite 280 at 1X, 0.75X, 0.5X, or 0.25X was added in tank mixture, Palmer amaranth control decreased to 62 to 88%. Roundup PowerMax at 1X plus Ignite 280 at 0.25X provided the greatest level of Palmer amaranth control (88%) when using this tank mix combination, but control was less than the Roundup PowerMax alone. At 24 DAA, Roundup PowerMax alone controlled Palmer amaranth 77%, whereas no tank mix combination controlled this weed greater than 15%. When Roundup PowerMax was reduced to 0.75X, 0.5X, and 0.25X with the addition of Ignite 280 at 0.25X, 0.5X, and 0.75X, respectively, control was reduced. Roundup PowerMax or Ignite 280 alone at 1X controlled ivyleaf morningglory 58 and 85%, respectively, 14 DAA in 2008. The 1X rate of both herbicides in tank mix controlled this weed 79% and control declined as the rate of Ignite 280 was reduced in tank mixture. Similar results were observed in 2009 although the overall control of ivyleaf morningglory was improved when compared to 2008.

GlyTol™ plus LibertyLink® cotton (GHB614/LL25) exhibited exceptional tolerance to glyphosate, glufosinate-ammonium, and glyphosate + glufosinate-ammonium “systems” at rates up to 2X. Tank mix combination of glyphosate and glufosinate-ammonium may be antagonistic on some weeds and sequential applications of glyphosate fb glufosinate-ammonium or glufosinate-ammonium fb glyphosate is suggested. The herbicide order will likely be dependent on the weed size and density, weed species, environmental conditions at application, and individual grower production practices.

PALMER AMARANTH CONTROL AND ECONOMICS IN COTTON TILLAGE SYSTEMS IN THE TEXAS HIGH PLAINS. A.J. Bloodworth, P.A. Dotray, J.W. Keeling, J.W. Johnson, L.V. Gilbert and B.W. Bean; Texas Tech University, Lubbock, TX and Texas AgriLife Research and Extension, Lubbock and Amarillo, TX.

ABSTRACT

Producers in the Texas High Plains continue to look for effective methods to produce high yields while reducing input costs and maximizing the use of rainfall and irrigation water. One potential solution is conservation tillage. No-till and strip-till are two forms of conservation tillage that retain soil moisture and reduce input costs due to fewer trips across the field. However, these systems rely heavily on the use of herbicides to control weeds. The development of glyphosate resistant cotton has improved weed control in conservation tillage. One concern with glyphosate resistant cotton is the development of weed resistance due to the continued use of one herbicide mode of action. The overall objective was to examine control options in three tillage systems for effective and economical weed management in Roundup Ready Flex cotton.

Studies were conducted in 2007-2009 at the Texas AgriLife Research Center near Halfway, TX on an Olton clay loam, with a pH of 7.8 and organic matter less than 2% using an overhead sprinkler irrigation system. Sixteen treatments were established in no-till, strip-till and conventional till systems using various combinations of soil residual herbicides. In 2009, pendimethalin at 1.0 lb ai/A was applied to designated plots on April 21. A rolling cultivator was used to incorporate the herbicide in the conventional tillage plots and a strip-till implement was used to incorporate the herbicide and prepare a seedbed. The entire test area was irrigated with 0.9 inches of water to incorporate the herbicides in the no-till and inter-row areas of the strip-till areas. Cotton (ST4554B2F) was planted, and prometryn at 1.2 lb ai/A was applied broadcast to selected plots on May 14. Glyphosate at 0.75 lb ae/A was used alone or in tank mix combination with pyrithiobac in selected plots on June 17. A layby treatment consisting of glyphosate alone or in tank mix combination with diuron was applied to selected plots on July 10. On August 11, a third glyphosate application was made to plots that had received no residual herbicides.

Cotton stand was analyzed using *t* tests to compare conventional tillage to strip-tillage, conventional tillage to no-tillage and strip-tillage to no-tillage at Pr>t at 0.05. There was no difference between stand in conventional tillage compared to no-tillage; however, stand in strip-tillage was greater compared to conventional tillage and strip-tillage. Palmer amaranth (*Amaranthus palmeri*) control was effective throughout the growing season. Season-long control of Palmer amaranth by treatment in the no-till system, strip-till system and conventional till system ranged from 86 to 100%, 90 to 99%, and 85-100%, respectively. Cotton lint yield was analyzed using *t* tests. Strip-tillage lint yield was greater than conventional tillage and no-tillage, and no-tillage lint yield was greater than conventional tillage. Weed control costs were analyzed by calculating herbicide input costs per treatment and net returns above weed control costs. Herbicide input costs per treatment ranged from $35 to $79/A. Net returns above weed control and tillage costs in strip-tillage ranged from $385 to $597/A. Treatments included pendimethalin followed by (fb) glyphosate fb glyphosate; prometryn fb glyphosate + pyrithiobac fb glyphosate; glyphosate fb glyphosate fb glyphosate; and glyphosate + pyrithiobac fb glyphosate had returns over $550 per acre.

RESPONSE OF PEARL MILLET TO HPPD-INHIBITING HERBICIDES. W.K. Vencill, University of Georgia, Athens.

ABSTRACT

Field and greenhouse studies were conducted to evaluate the response of pearl millet (*Pennisetum glaucum*) to two HPPD-inhibiting herbicides. In greenhouse studies, tembotrione:isoxadifen (2:1) was applied to pearl millet at 1, 2.5, and 4 cm height at a rate range of 11 to 440 g ai/ha. Pearl millet tolerance increased with increasing height. Injury ranged from 37 to 91% for 2 cm plants 7 DAT whereas pearl millet injury did not exceed 5% on plants treated at the 4 cm height 7 DAT. Pearl millet treated with mesotrione applied POST at 110 and 440 g ai/ha responded similarly. Injury was greatest on plants treated at 1 cm height (31%) and the least when treated at 4 cm (0%). In the field, tembotrione:isoxadifen was applied POST to pearl millet at 5 cm height. Foliar injury did not exceed 10% at the 440 g/ha rate 7 DAT. Pearl millet treated with mesotrione applied POST at 4 cm in the field caused 20 and 30% injury 7 DAT. No injury was observed from any foliar applications 14 DAT. These data indicate that HPPD inhibitors such as tembotrione and mesotrione have the potential to provide POST control of annual grass and broadleaf weeds with minimal crop injury when applied at the proper crop height.

CONTROL OF GLYPHOSATE-RESISTANT GIANT RAGWEED IN GLYPHOSATE/GLUFOSINATE TOLERANT COTTON. C. L. Main and L. E. Steckel, The University of Tennessee, Jackson, TN.

Research was established in Tennessee during 2009 on a field invested with glyphosate-resistant giant ragweed (*Ambrosia trifida*) to evaluate glufosinate and glufosinate tank-mixtures for giant ragweed control and tolerance of a Widestrike cotton variety to glufosinate. The trial was established as a randomized complete block design with 4 replications. Herbicides were applied with CO_2 Backpack sprayer calibrated to deliver 10 gallons per acre of herbicide solution with 80015 flat fan spray nozzles. Applications were made to 2 leaf cotton on June 2 and or 5 leaf cotton on June 20. Giant Ragweed control evaluations were recorded 10 and 30 DAT. Cotton variety evaluated for tolerance to glufosinate was Phytogen 375 WRF. Treatments evaluated included: 1) Ignite 29 oz/ac, 2)Ignite 29 oz/ac followed by Ignite 29 oz/ac, 3) Roundup Power Max 22 oz/ac, 4) Ignite 29 oz/ac + Roundup Power Max 22 oz/ac, 5) Ignite 29 oz/ac + Staple 3 oz/ac, 6) Roundup Power Max 22 oz/ac + Staple 3 oz/ac, 7) Roundup Power Max + Envoke 0.10 oz/ac, 8) Non-treated check.

Visual cotton injury at 10 days after initial application was significantly higher with Ignite based treatments (9-14%) compared to Roundup Power Max (0%), and Roundup Power Max mixed with Staple or Envoke (5-9%) with LSD of 8%. By 30 days after initial application injury was non-significant with 1-3% injury with Ignite, Staple, and Envoke containing treatments.

Giant ragweed control 30 days after initial application was significantly higher with Ignite based treatments (80-99%) as long as Roundup Power Max was not co-applied compared to Roundup Power Max (0%), Ignite + Roundup Power Max (65%), and Roundup Power Max mixed with Staple or Envoke (45-60%) with an LSD of 10%.

Lint cotton yields ranged from 850-1150 lbs/ac when Ignite was applied to control giant ragweed. Roundup Power Max applied alone yielded 50 lbs/ac. Roundup Power Max tank-mixed with Staple or Envoke yield from 300-350 lbs/ac with LSD of 170 lbs/ac. Cotton tolerated two postemergence applications of Ignite (29 oz/ac) and recovered by 30 days after application.

EVALUATION OF SHARPEN FOR PRE-PLANT WEED CONTROL IN SOYBEAN. D.K. Miller, D.O. Stephenson, and M.S. Mathews, LSU AgCenter, Baton Rouge, LA.

ABSTRACT

A field study was conducted in 2009 at the Northeast Research Station near St. Joseph, La. to evaluate control of common winter weeds with Sharpen pre-plant application in soybean. The study was conducted in a randomized complete block design with four replications. Treatments were applied at 15 GPA. Treatments evaluated included Roundup Original Max at 32 oz/A with NIS at 0.25% v/v and ammonium sulfate at 17 lb/100 gal, alone or in combination with Sharpen at 1 oz/A, Clarity at 8 oz/A, Valor at 2 oz/A, or 2,4-D ester at 16 oz/A, or Sharpen at 1 oz/A plus Clarity or 2,4-D ester at previously mentioned rates or Valor at 1 oz/A. Parameter estimates included visual weed control 7 and 21 d after treatment (DAT).

At 7 DAT, Roundup Original Max applied alone resulted in 68, 38, 93, 96, and 36% control of henbit, swinecress, shepherd's purse, hairy bittercress, and mouse-ear chickweed, respectively. Addition of 2,4-D ester to Roundup Original Max did not result in significant increase in control of any weed species evaluated. Co-application of Clarity at 8 oz/A to Roundup Original Max resulted in increased control of swinecress (58 vs 38%) while addition of Valor at 2 oz/A increased control of swinecress (61 vs 38%) and mouse-ear chickweed (69 vs 36%). Likewise, addition of Sharpen to Roundup Original Max resulted in increased control of swinecress (64 vs 38%) and mouse-ear chickweed (60 vs 36%). Addition of Sharpen to co-application of 2,4-D ester, Clarity, or Valor with Roundup Original Max resulted in increased control only with respect to mouse-ear chickweed with 2,4-D ester (60 vs 36%) and Clarity (61 vs 33%). At 21 DAT, with the exception of swinecress control with Valor in combination with Roundup Original Max (74%), all treatments resulted in at least 93% control of winter weeds evaluated.

WEED CONTROL WITH CEREAL AND BRASSICACEAE COVER CROPS IN CONSERVATION-TILLAGE COTTON. M.R. McClelland, J.K. Norsworthy, G.M. Griffith, S.K. Bangarwa, and J.A. Still; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville.

ABSTRACT

Cereal crops such as rye and wheat, legumes, mixtures of the two, and Brassicaceae crops such as turnip and mustard are common cover crops. Cover crops can reduce early-season weed pressure by direct competition or allelopathy and may allow elimination of a preemergence (PRE) herbicide or complement an early postemergence (POST) herbicide. However, residual weed suppression is short, so herbicides are still needed, but an appropriate cover crop could be an important part of a sustainable weed management program. Cover crop efficacy depends on location, management practices, cover crop cultivar, and environmental conditions. The data base for cover crops needs to be expanded so appropriate cover crops can be selected for different locales and production practices.

An experiment was conducted in Arkansas in 2007 and 2008 to determine whether two cereal and two Brassicaceae cover crops would aid various weed management programs in a conservation-tilled, enhanced-glyphosate-resistant cotton production system in the mid-South. Cover crops evaluated were cereal rye (*Secale cereale*, 'Wrens'), wheat (*Triticum aestivum*, 'Berretta'), turnip (*Brassica rapa*, 'Seventop'), and 'Caliente,' a commercial blend of white mustard (*Sinapis alba*) and brown mustard (*Brassica juncea*). Cover crops were seeded in October 2006 and 2007, rye and wheat were drill-seeded in 8-inch rows at 60 lb/A; turnip and Caliente mustard were broadcast-seeded at 5 and 8 lb/A, respectively. Herbicide programs were: no herbicide; *S*-metolachlor + fluometuron PRE followed by (fb) glyphosate + pyrithiobac at 4-node cotton; glyphosate at 1-leaf cotton fb glyphosate + pyrithiobac at 4-node cotton; glyphosate + pyrithiobac at 4-node cotton; and glyphosate + *S*-metolachlor at 1-leaf cotton. Glyphosate at 0.75 lb ae/A at 8-node cotton and flumioxazin at 0.06 lb ai/A + MSMA at 2 lb/A at layby were applied to all except the 'no herbicide' plots. Palmer amaranth (*Amaranthus palmeri*), pitted morningglory (*Ipomoea lacunosa*), and goosegrass (*Eleusine indica*) were visually rated for percentage control at 4-node cotton, 1-leaf cotton, layby, and 1 week after layby. Biomass of cover crops and weeds was taken prior to cover crop termination (3 wk before planting). Cotton was harvested at maturity.

Biomass was higher in 2008 than in 2007 because of more rainfall in 2008 and a later termination date. In both years, weeds were controlled better with rye alone than by any other cover crop alone. With cover crops alone, control of Palmer amaranth at 4-node cotton ranged from 0 (fallow) to 28% (rye) in 2007 and 0 (fallow) to 91% (rye) in 2008. Even with the addition of a PRE, control was poor in 2007 (13 to 44%), but in 2008, control with a PRE ranged from 94 (fallow) to 100%. In 2008, averaged over herbicide program, all cover crops improved Palmer amaranth control at 8-node cotton over the fallowed control, and averaged over cover crops, herbicide programs controlled Palmer amaranth 92 to 99% over both years. Control of pitted morningglory and goosegrass was also poor with cover crops alone, with rye providing 50 % control of morningglory and 60% for goosegrass. Control with other cover crops was 33% or less. A PRE herbicide increased control of pitted morningglory to 85% and goosegrass to 88% in 2007 and to 98 to 100% in 2008. Glyphosate applied at 1-leaf cotton controlled both species 96 to 100% at 4-node cotton, regardless of cover crop. A single 4-node application of glyphosate plus pyrithiobac controlled pitted morningglory and goosegrass 97 to 100% in rye and wheat plots both years and in turnip and mustard in 2008. In 2007, weed control in turnip and mustard cover crops was only 74 to 75%. Palmer amaranth control was also lower when herbicide application was delayed until the 4-node cotton stage, although control in rye plots was 90%. Only the main effect of cover crop was significant for seed-cotton yields both years. Yields were lowest in turnip plots, even though cotton was not visibly injured. The low yield in 2007 may partially be a result of poor weed control. However, another possibility, especially in 2008, may be the glucosinolates produced by turnip, which are precursors for the isothiocyanate allelochemicals. The herbicide programs in this research were very effective, partly because of the use of glyphosate and the absence of glyphosate-resistant weeds in the experiments. With continued evolution and spread of glyphosate-resistant weeds, greater emphasis must be place on integrating cultural practices back into cotton production. This research shows that fall-seeded cereal cover crops can be used in mid-South cotton production systems without negatively affecting cotton yield. An additional benefit of the rye and wheat in these experiments was a reduction of erosion of the cotton beds from the previous fall. In fallow or in turnip or mustard plots in 2007 when biomass was low, beds on which the cotton had been planted had deteriorated and needed rehipping, but the beds remained intact in the wheat and rye plots. Research in the future should focus on integrating cereal cover crops with cultural practices that reduce weed emergence, weed biomass, and herbicide applications, thus improving current weed management programs.

REDUCED RATE DICAMBA EFFECTS ON SOYBEAN GROWTH AND YIELD. D.K. Miller, J.L. Griffin, D.O. Stephenson, J.M. Boudreaux, and M.S. Mathews, LSU AgCenter, Baton Rouge, LA.

ABSTRACT

Field studies were conducted in 2009 at the Northeast Research Station near St. Joseph, La., the Dean Lee Research Station near Alexandria, La., and the Ben Hur Research Station near Baton Rouge, La. to evaluate the effects of dicamba on soybean growth and yield at rates encountered in off-target or contamination events. Effects on soybean at the R1 growth stage were evaluated at all three locations while effects on soybean at the V3 to V4 growth stage were evaluated at Baton Rouge only. Studies were conducted in a randomized complete block design with four replications. Treatments were applied at 15 GPA. Treatments evaluated in the R1 studies included dicamba (Clarity) applied at 2, 1, 0.5, 0.25, 0.125, 0.063, or 0.031 oz/A with a nontreated control included for comparison. Treatments evaluated in the V3 to V4 study included dicamba applied at 8, 4, 2, 1, 0.5, 0.25, or 0.125 oz/A with a nontreated control included for comparison. Parameter measurements included visual crop injury 7 to 14 and 14 to 21 d after treatment (DAT). In addition, crop height and canopy width were determined 28 to 32 DAT along with soybean yield.

At 7 DAT to soybean in the R1 growth stage, visual injury was greatest at St. Joseph (65%), Alexandria (76%) and Baton Rouge (61%) with dicamba at 2 oz/A. Dicamba at 1 oz/A resulted in 43, 51, and 39% injury at these respective locations. Lower rates resulted in 23 to 25, 31 to 13, and 35 to 14% injury, respectively. At 14 to 21 DAT, injury severity and rate differences was similar to the earlier evaluation interval at all locations. Soybean height was reduced compared to nontreated plots by all rates of dicamba at St. Joseph (66 to 27%), Alexandria (73 to 50%), and Baton Rouge (55 to 16%). Soybean canopy width was reduced by all rates at St. Joseph (54 to 21%) and Alexandria (57 to 45%) and by rates of 2 to 0.125 oz/A at Baton Rouge (31 to 18%). Soybean yield was reduced by rates of 2 to 0.25 oz/A at St. Joseph (85 to 36%), and rates of 2 to 0.063 oz/A at Alexandria (100 to 29%) and Baton Rouge (69 to 28%).

At 7 to 14 DAT to soybean in the V3 t V4 growth stage, a stair step effect in visual injury was observed at Baton Rouge as rates increased from 0.125 (25%) to 8 oz/A (95%). Results were similar 14 to 21 DAT with injury ranging from 48 to 100%. All rates resulted in reduced plant height (100 to 24%) and plant canopy width (100 to 10%). Soybean yield was reduced by rates of 8 to 0.5 oz/A (100 to 26%).

CAPRENO, CORVUS, AND BALANCE FLEXX WEED CONTROL AND INJURY IN THE TEXAS PANHANDLE. J. Robinson* and B. Bean; Texas AgriLife Research, Bushland, TX

ABSTRACT

Corvus(Isoxaflutole @ 1.88 lb/gal + Thiencarbazone @ 0.75 lb/gal + Cyprosulfamide), Capreno(Tembotrione @ 2.88 lb/gal + Thiencarbazone @ 0.57 lb/gal + Isoxadifin), Laudis(Tembotrione @ 3.5 lb/gal + Isoxadifin), and Balance Flexx(Isoxaflutole @ 2 lb/gal + Cyprosulfamide) have recently been released by Bayer to provide more options for weed control in corn (*Zea mays*). Studies were initiated to compare the weed control and crop safety of these chemicals in the Texas Panhandle. Applications were made at Preemergence (PRE), Early postemergence (EPOST), and mid postemergence (MPOST). Corvus was applied at 2.42 oz ai/A with and without atrazine at 1 lb ai/A. Balance Flexx rates were 1.5 oz ai/A for split applications and 2.5 oz ai/A for single applications, some treatments also included atrazine at 1 lb ai/A. Capreno rates were 1.3 oz ai/A with glyphosate at 7.6 oz ai/A, and 1.3 oz ai/A with atrazine at 0.5 lb/A. Laudis was applied at 1.71 oz ai/A with atrazine at 0.5 lb ai/A. Applications were made with a tractor mounted CO2 sprayer using 30 inch nozzle spacing applying 10 gal/A water. Plots were furrow irrigated during the season and maintained using common agronomic practices. Data was collected for weed control [Pigweed (*Amaranthus palmeri)*, and Velvetleaf (*Abutilon theophrasti*)], crop injury, and yield. Weed control and crop injury were obtained by visual observation up to 8 weeks after application. Plots sprayed with Capreno MPOST showed the most injury (stunting) two weeks after application (27% for Capreno @ 1.3 oz ai/A). In contrast, Capreno treatments sprayed EPOST showed 2% stunting two weeks after treatment and 0% by four weeks. By the end of the season no stunting was visible in any treatment, and no reduction in yield was observed. Laudis applied EPOST had no injury. No significant injury was observed in Corvus or Balance Flexx treatments applied PRE or EPOST. Application timing and the addition of atrazine appeared to be the most important factors for weed control with Corvus and Balance Flexx. Corvus performed best when applied EPOST with atrazine (97% control for pigweed and 100% for velvetleaf at 68 days after treatment); while Corvus applied PRE without atrazine achieved 47% control of pigweed and 60% for velvetleaf at 88 days after treatment. Balance Flexx applied EPOST with atrazine had 100% control for both pigweed and velvetleaf at 68 days after treatment, but when applied PRE without atrazine control of only 23% for pigweed and 73% for velvetleaf was observed at 88 days after treatment. Capreno performed best when applied EPOST at 1.3 oz ai/A with atrazine (98% control for both pigweed and velvetleaf at 70 days after treatment). Good control was also achieved with Capreno applied MPOST at 1.3 oz ai/A with glyphosate and sprayable ammonium sulfate (80% for pigweed and 88% for velvetleaf at 56 days after treatment). Weed control for Laudis with atrazine EPOST at 70 days after treatment was 85% for pigweed and 100% for velvetleaf. Yields in Balance Flexx treatments did not significantly differ but were the lowest in the Balance Flexx with atrazine applied PRE (133 bu/A), and the highest with Balance Flexx plus Atrazine applied EPOST (175 bu/A). Corvus treatments also were not significantly different but ranged from a low of 150 bu/A with Corvus applied PRE and a high of 174 bu/A with Corvus applied EPOST. Capreno yields ranged from 189 bu/A for Capreno plus glyphosate applied MPOST to 200 bu/A for Capreno plus atrazine at EPOST, and were not significantly different. Laudis yielded 191 bu/A.

PEANUT RESPONSE TO FLUMIOXAZIN IN THE TEXAS HIGH PLAINS. P.A. Dotray, L.V. Gilbert, K.T. Siders, S.A. Russell, and M.G. Cattaneo; Texas Tech University, Texas AgriLife Research, and Texas AgriLife Extension Service, Lubbock.

ABSTRACT

In 2008 and 2009, several studies were conducted in grower fields across the Texas Southern High Plains to evaluate peanut response to Valor SX in large plot replicated trials. In 2008 in Dawson County (fine sandy loam soil), Flavorrunner 458 was planted April 30 and Valor SX at 0 and 0.094 lb ai/A was applied May 1 followed by (fb) 0.5 inches of irrigation. At a second location in Dawson County (sandy loam soil), Tamrun OL02 was planted May 13 fb Valor SX at 0, 0.063, and 0.094 lb ai/A immediately after planting. On May 27, this location received approximately 2 inches of rainfall and damaging wind and hail. In 2009 in Dawson County (fine sandy loam soil), Gregory and Tamrun OL02 were planted April 30. Valor SX at 0, 0.063, and 0.094 lb ai/A was applied immediately after planting fb 0.7 inches of irrigation on May 1. In 2008 in Gaines County (fine sand soil), Flavorrunner 458 was planted May 3 and Valor SX at 0, 0.063, and 0.094 lb ai/A was applied May 5. A rainfall event (1 inch) occurred on May 6. At this same location, a second series of applications were made May 13 to plants 3 to 5 days post emergence. Rainfall May 13 to 15 totaled 0.3 inches. In 2009 (sandy loam soil), Flavorrunner 458 was planted April 29 and Valor SX at 0 and 0.094 lb ai/A was applied May 5 fb 1 inch of irrigation (0.5 inches fb 0.5 inches). In 2009 in Hale County (clay loam soil), OLin was planted May 6 and Valor SX at 0, 0.063, and 0.094 lb ai/A was applied immediately after planting. On May 7, 0.5 inches of irrigation was applied. In 2008 in Hockley County (fine sandy loam soil), Flavorrunner 458 was planted May 3 and Valor SX at 0 and 0.094 lb ai/A was applied May 5. Several rainfall events occurred within approximately 48 hours after application that totaled 3.63 inches. In 2009 in Hockley County (loamy sand soil), Valencia C was planted April 30. Valor SX at 0 and 0.063 lb ai/A was applied May 4 fb 1 inch of irrigation. In 2008 in Terry County (fine sandy loam soil), Flavorrunner 458 was planted May 10 and Valor SX at 0 and 0.094 lb ai/A was applied May 12. In 2009 in Terry County (fine sandy loam soil), Perry was planted May 6 and Valor SX at 0 and 0.094 lb ai/A was applied May 8. On May 9, 0.75 inches of irrigation was applied. On May 22, an at-crack (AC) application of Valor SX at 0.094 lb ai/A was applied fb 0.2 inches of rainfall and an additional 0.75 inches of irrigation. No difference in peanut stand or canopy width was observed between the Valor-treated and non-treated control at any location over two years. In 2008 in Dawson County, peanut injury up to 3% was observed on July 8. Yield ranged from 4656 to 4710 lb/A and no differences were noted between the Valor-treated and non-treated control. At a second location in Dawson County, peanut injury (up to 2%) was observed following Valor SX at 0.094 lb ai/A prior to a severe rain/wind/hail event. After this event, 22 and 30% injury was observed following Valor SX at 0.063 and 0.094 lb ai/A, respectively. Peanut recovery was slower in the Valor-treated soil when compared to the non-treated soil, and injury was still apparent late-season (Sep 19). Peanut yield from the Valor-treated plots ranged from 4159 to 4185 lb/A, and were not different from the non-treated control (4357 lb/A). In 2009 in Dawson County (AG-CARES), 5% peanut injury was noted in the Virginia market type following Valor at 0.094 lb ai/A. Yields in the Valor-treated plots ranged from 3338 to 3578 lb/A and were not different than the non-treated control (3385 lb/A). Similar results were noted in the runner market type trial (up to 6% injury) following Valor at 0.094 lb ai/A. Yield following Valor at 0.063 lb ai/A was 3722 lb/A, which was not less than the non-treated control (3299 lb/A); however, peanut yield was reduced following Valor at 0.094 lb ai/A (3116 lb/A). In 2008 in Gaines County, peanut yield from the Valor-treated plots ranged from 5796 to 5938 lb/A and were not different from the non-treated control (5630 lb/A). At this same location, in the second series of applications made after ground crack, peanut yield from the Valor-treated plots ranged from 6097 to 6364 lb/A, which were not less than the non-treated control (5849 lb/A). In 2009 in Gaines County, peanut yield following Valor at 0.094 lb ai/A was 6174 lb/A and was not different from the non-treated control (6367 lb/A). In 2009 in Hale County, up to 4% peanut injury was recorded following Valor at 0.094 lb ai/A. Peanut yield in the Valor-treated plots ranged from 4149 to 4332 lb/A and were not less than the non-treated control (4119 lb/A). In 2008 in Hockley County, peanut yield following Valor at 0.094 lb ai/A was 4298 lb/A, which was not different from the non-treated control (4327 lb/A). In 2009 in Hockley County, peanut yield following Valor at 0.063 lb ai/A was 5725 lb/A and was not different than the non-treated control (4981 lb/A). In 2008 in Terry County, peanut height was reduced slightly following Valor at 0.094 lb ai/A. Peanut yield following Valor at 0.094 lb ai/A was 4069 lb/A and was not different from the non-treated control (3867 lb/A). In 2009 in Terry County, 10% peanut injury was observed 2 weeks after the AC treatment. Peanut yield from the Valor-treated plots ranged from 4340 to 4709 lb/A and were not different than the non-treated control (4279 lb/A). In 7 studies over 2 years, Valor SX at 0.063 lb ai/A never reduced peanut yield relative to the non-treated control. In 11 of 12 studies over 2 years, Valor SX at 0.094 lb ai/A did not cause a peanut yield reduction; however, in one experiment using Flavorrunner 458, yield loss following Valor at 0.094 lb ai/A was observed. Valor SX is a good option for peanut growers with minimal risks and will provide effective early-season weed control.

LIBERTY LINK TECHNOLOGY FOR WEED CONTROL IN SOYBEAN. M.A. McClure and L.E. Steckel; Plant Sciences Department, University of Tennessee, Jackson.

ABSTRACT

Field studies were initiated in 2009 near Millington, TN to evaluate the effect of a residual herbicide at planting on the effectiveness of post emergence (POST) glufosinate and glyphosate programs to control glyphosate resistant Palmer amaranth. Preemergence (PRE) treatments were applied at the time of planting and postemergence (POST) sprays were timed on weed size when the PRE treatments lost efficacy. Canopy EX®(2 oz/A), Canopy DF®(3.5 oz/A), Envive® (3 oz/A) and Synchrony XP® (1.125 oz/A) were applied PRE in both the LL system and the RR system tests. POST treatments in the RR system were Roundup WeatherMax® at 22 oz/A tank mixed with Flexstar® (16 oz/A), Classic® (0.5 oz/A), or Dual II Magnum® (16 oz/A) + Flexstar®(16 oz/A). POST treatments in the LL system consisted of a single or a sequential application of Ignite® 280 SL at 22 oz/A. Treatments were applied with a CO^2 pressurized backpack sprayer operating at 34 psi with an output of 13.9 gallons per acre, utilizing flat fan (80015) spray tips. The treated area was 10 ft by 30 ft and plots were arranged in a Randomized Complete Block design with four replications. Data collected were percent control of pigweed and crop injury. Data were averaged across reps within a test and were subjected to an analysis of variance and means were separated with the Student-Newman-Keuls. All PRE treatments except Envive® had new pigweed flushes in 2 weeks. Envive® gave adequate control of pigweed for more than 3 weeks. In the LL system, a single application of Ignite following Envive® was adequate to control pigweed but not following Canopy EX®, Canopy DF® or Synchrony XP®. In the RR system, reduction in weed control after the early POST timing was due to new weed flushes, while reduction in weed control after the late POST timing was due to incomplete control of large pigweed and to emergence of new pigweeds. The use of residual products helped reduce pigweed density. Envive® followed by one or two applications of Ignite was the most effective treatment in the LL system. In the RR system, a PRE followed by a single POST treatment was not effective. The early POST timing in the RR system was effective but did not control new weed flushes a few weeks later. A later POST timing missed larger sized pigweeds and did not control new weed flushes observed later in the season.

PERFORMANCE OF RESIDUAL HERBICIDES APPLIED IN TANK-MIXTURES WITH PYRITHIOBAC AND GLYPHOSATE. J.B. McDuffie, J.A. Bond, D.O. Stephenson, IV, D.K. Miller, J.K. Manning, R.L. Landry. Mississippi State University, Stoneville; Louisiana State University AgCenter, Alexandria

ABSTRACT

Pyrithiobac and S-metolachlor are labeled for use in cotton and provide residual control of weeds. Currently, Mississippi State University and the Louisiana State University AgCenter recommend co-application of S-metolachlor with glyphosate for the two- to four- leaf cotton application timing to provide residual control of weeds. However, producers have encountered times when cotton fields are too wet to apply glyphosate plus S-metolachlor by ground and weeds reach a size too large for control by glyphosate. In these instances, pyrithiobac is a viable choice for management of these weeds. However, the residual activity of S-metolachlor for control of grass and small-seeded broadleaf weeds is still needed. Previous research has shown that co-applications of glyphosate, S-metolachlor, and pyrithiobac injured cotton 15 to 24% 3 to 7 days after application (DAT); however, little to no injury was observed 14 to 28 DAT and yield was not affected. Recently, a supplemental label was granted to allow pendimethalin applications postemergence in cotton. Pendimethalin provides residual control of many grass and small-seeded broadleaf weeds, which may provide an alternative to S-metolachlor when considering a glyphosate plus residual herbicide application to two- to four- leaf cotton. Therefore, research was initiated in Mississippi and Louisiana to investigate the feasibility of glyphosate co-applied with pendimethalin or S-metolachlor with and without pyrithiobac.

The study was conducted in 2009 at the Mississippi State University Delta Research and Extension Center in Stoneville, MS, the Louisiana State University AgCenter Dean Lee Research and Extension Center in Alexandria, LA, and the Northeast Research and Extension Center, in St. Joseph, LA. Individual plots were four 38- or 40-inch rows measuring 30 feet in length. Cotton was planted in mid-May at all three sites. 'Deltapine 0935 B2RF' was seeded at 43,000 seed/A at Alexandria and St. Joseph, LA. 'Phytogen 375 WRF' was seeded at 45,000 seed/A at Stoneville, MS. Treatments were arranged as a two-factor factorial within a randomized complete block experimental design with four replications. Factor 1 was glyphosate plus residual herbicide and included glyphosate (0.77 lb ae/A) plus S-metolachlor (0.95 lb ai/A), glyphosate (0.77 lb/A) plus pendimethalin (1 lb ai/A), or glyphosate (0.77 lb/A) alone. Factor 2 was pyrithiobac (0 or 0.043 lb ai/A). Treatments were applied in early-June at all three sites when cotton was in the two- to four-leaf stage. Treatments were applied in early-June at all three sites when cotton was in the two- to four-leaf stage. Control of Palmer amaranth (Amaranthus palmeri), barnyardgrass (Echinochloa crus-galli), and entireleaf morningglory (Ipomoea hederacea var. integriuscula) was visually estimated on a scale of 0 to 100% (0 = no control and 100 = total plant death) at 3, 7, and 14 DAT. All data were subjected to ANOVA with site being used as a random-effect parameter testing all interactions of glyphosate plus residual herbicide and pyrithiobac. Means were separated using Fisher's protected LSD at $p \leq 0.05$

Entireleaf morningglory was controlled 85 to 88% with all treatments that included glyphosate 14 DAT. Palmer amaranth control was 94 to 97% for two- or three-way co-applications containing glyphosate. Similar to trends observed with entireleaf morningglory and Palmer amaranth, treatments containing glyphosate controlled barnyardgrass 95 to 99% 14 DAT regardless of whether a residual herbicide or pyrithiobac was included in the tank-mixtures. This research did not investigate cotton injury from co-applications of glyphosate with residual herbicides and/or pyrithiobac. Related research indicates that injury from these mixtures can be severe. Potential cotton injury warrants further investigation before adoption of weed control programs containing three-way co-applications of glyphosate with a residual herbicide and pyrithiobac.

SOYBEAN WEED MANAGEMENT WITH PREMIX COMBINATIONS OF GLYPHOSATE, FOMESAFEN, AND *S*-METOLACHLOR. D.O. Stephenson, IV and R.L. Landry; LSU AgCenter, Alexandria, LA.

ABSTRACT

Research was conducted in 2009 at the LSU AgCenter Dean Lee Research and Extension Center in Alexandria, LA to determine the effectiveness of premix formulations of *S*-metolachlor plus fomesafen and glyphosate plus fomesafen applied preemergence (PRE) and/or early-postemergence (POST) for season-long weed management in Louisiana soybean. The experimental design was a randomized complete block with four replications. 'Pioneer 94M80 RR' was seeded on 8-Apr.-2009 at 305,000 seed/ha in 97-cm rows. Treatments were glyphosate (880 g ae/ha) alone, premixed formulation of fomesafen (270 g ai/ha) plus *S*-metolachlor (1220 g/ha) PRE followed by (fb) glyphosate POST, premixed formulation of glyphosate (1110 g/ha) plus fomesafen (280 g/ha) POST, and glyphosate plus the premixed formulation of fomesafen plus *S*-metolachlor POST. PRE and POST treatments were applied on 30-Apr.-2009 and 21-May-2009, respectively. POST treatments were applied to 5- to 8-cm weeds when soybean were at the V2 growth stage. Weeds rated included barnyardgrass (*Echinochloa crus-galli*), goosegrass (*Eleusine indica*), prickly sida (*Sida spinosa*), hemp sesbania (*Sesbania herbacea*), entireleaf morningglory (*Ipomoea hederacea* var. *integriuscula*), and velvetleaf (*Abutilon theophrasti*).

The premix of fomesafen plus *S*-metolachlor PRE provided little to no control of barnyardgrass and goosegrass, but control of all broadleaf weeds ranged 65-80% 12 d after emergence (0 d after POST). All treatments provided excellent control of all weeds 12 d after POST. Glyphosate co-applied with the premix of fomesafen plus *S*-metolachlor increased control of barnyardgrass and goosegrass compared to either glyphosate-only POST treatments 26 d after POST. The glyphosate plus fomesafen premixed formulation and the co-application of glyphosate and the premix formulation of fomesafen plus *S*-metolachlor increased control of Palmer amaranth, prickly sida, entireleaf morningglory, and velvetleaf 26 d after POST. Only the co-application of glyphosate plus the premix formulation of fomesafen plus *S*-metolachlor increased control of hemp sesbania greater than glyphosate-only treatments 26 d after POST. Glyphosate alone POST treatments provided less control of barnyardgrass and goosegrass compared to other treatments 48 d after POST. Control of Palmer amaranth, hemp sesbania, and velvetleaf 48 d after POST was similar to that observed 26 d after POST; however, all treatments controlled prickly sida and entireleaf morningglory equally 48 d after POST. No differences were observed in soybean yield with yields ranging 3.1 to 3.4 Mg/ha. Data indicated that glyphosate co-applied with the premix of fomesafen plus *S*-metolachlor and the premix formulation of glyphosate plus fomesafen applied POST provided excellent control of numerous weeds

SAFLUFENACIL BURNDOWN PROGRAMS IN NO-TILL COTTON SYSTEM. J.K. Manning, D.O. Stephenson, IV, J.A. Bond, J.B. McDuffie, R.L. Landry, and J.B. Guice. Mississippi State University, Stoneville; Louisiana State University AgCenter, Alexandria; BASF Corporation, Winnsboro, LA

ABSTRACT

Since the implementation of minimum-tillage or no-tillage by Mississippi and Louisiana cotton producers, applications of burndown herbicides have become more common. Glyphosate is used extensively by producers for burndown applications due to its broad-spectrum grass and broadleaf weed activity. However, the evolution of glyphosate-resistant (GR) weeds such as horseweed (Conyza canadensis) has necessitated the need to identify alternative burndown herbicides to control GR weeds along with other winter/spring weeds. Previous research has identified that dicamba co-applied with glyphosate can provide control of GR horseweed at a burndown application timing. However, producers continue to struggle with non-GR weeds prior to planting, including cutleaf evening-primrose (Oenothera laciniata), curly dock (Rumex crispus), henbit (Lamium amplexicaule), and others. Saflufenacil is a new PPO-inhibithing herbicide labeled for use as a burndown 42 days prior to planting in cotton.

Research was conducted in 2009 at the Mississippi State University Delta Research and Extension Center in Stoneville, MS, and the Louisiana State University AgCenter Dean Lee Research and Extension Center in Alexandria, LA, to determine the effectiveness of saflufenacil alone or co-applied with various other herbicides for winter and spring weed management preplant in cotton. Treatments were arranged as a randomized complete block with four replications. Treatments included glyphosate (0.77 lb ae/A), saflufenacil (0.0223 lb ai/A), saflufenacil (0.0223 lb/A) plus glyphosate (0.77 lb/A), saflufenacil (0.0223 lb/A) plus glyphosate (0.77 lb/A) plus dicamba (0.25 lb ae/A), saflufenacil (0.0223 lb/A) plus glyphosate (0.77 lb/A) plus diuron (0.75 lb/A), saflufenacil (0.0223 lb/A) plus paraquat (0.72 lb ai/A), and saflufenacil (0.0223 lb/A) plus glufosinate (0.75 lb ai/A). All treatments included crop-oil concentrate at 1% v/v plus ammonium sulfate at 17 lb/100 gal. Data collected included cotton injury and weed control 7, 14, 22, and 38 d after treatment (DAA). GR horseweed was evaluated in Mississippi. Excessive rainfall prevented treatment applications to traditional winter weeds in Louisiana. Therefore, barnyardgrass (Echinochloa crus-galli), Palmer amaranth (Amaranthus palmeri), hophornbeam copperleaf (Acalypha ostryifolia), and entireleaf morningglory (Ipomoea hederacea var. integriuscula) were evaluated in Louisiana. Data were subjected to ANOVA and means separated with Fisher's protected LSD at P = 0.05.

Saflufenacil alone provided 88% GR horseweed control 7 days after application (DAA), but control decreased to 75% 22 DAA. The addition of saflufenacil to glyphosate did not increase GR horseweed control compared with saflufenacil alone. Adding dicamba to saflufenacil plus glyphosate increased GR horseweed control to 90% by 22 DAA. Diuron applied with saflufenacil plus glyphosate provided at least 90% control at all evaluations. Saflufenacil plus glufosinate provided excellent control of GR horseweed. Saflufenacil co-applied with glyphosate plus dicamba or diuron may reduce barnyardgrass control compared to glyphosate alone. All treatments controlled Palmer amaranth 95% 14 DAA. Hophornbeam copperleaf and entireleaf morningglory control was greater than 85% 14 and 38 DAA, indicating the feasibility of saflufenacil for control of these weeds.

The levels of control observed in 2009 may be different in years when less rainfall occurs during the spring. Saflufenacil provided good initial control of GR horseweed in Mississippi, but the addition of clarity, diuron, or glufosinate is needed to provide at least 90% control 22 DAA. Saflufenacil holds excellent potential to supplement burndown herbicide options available for GR horseweed control. Other research indicates that saflufenacil will adequately control GR horseweed when weed size does not exceed 6 inches. Saflufenacil co-applied with glyphosate has the potential to reduce control of barnyardgrass. Saflufenacil application is a good option for control of Palmer amaranth, hophornbeam copperleaf, and entireleaf morningglory.

COMPARISON OF VARIOUS HERBICDES CO-APPLIED WITH GLUFOSINATE FOR WEED MANAGEMENT IN GLUFOSINATE-RESISTANT SOYBEAN. D.O. Stephenson, IV, D.K. Miller, J.L. Griffin, R.L. Landry, M.M. Mathews, and J.M. Boudreaux; LSU AgCenter, Alexandria, St. Joseph, and Baton Rouge, LA

ABSTRACT

Research was conducted in 2009 at the LSU AgCenter Dean Lee Research and Extension Center in Alexandria, LA, the Northeast Research Station in St. Joseph, LA, and the Ben Hur Research Station in Baton Rouge, LA. Experiments were designed to determine the effectiveness of co-applying various soybean herbicides with glufosinate for increased weed control in a glufosinate-resistant soybean weed management system. The experimental design was a randomized complete block with four replications at each location. Glufosinate-resistant soybean variety 'Mershmen Miami 949 LL' was seeded in Alexandria and Baton Rouge, LA on 29-Apr-2009 and 11-May-2009, respectively and 'S080120 LL' was seeded in St. Joseph, LA on 8-May-2009. Row spacing was 97, 102, and 6-cm rows in Alexandria, St. Joseph, and Baton Rouge, LA, respectively. Treatments included glufosinate (450 g ai/ha) alone and glufosinate co-applied with either fomesafen (100 g/ha), aciflurofen (210 g/ha), chlorimuron (4 g/ha), bentazon (280 g/ha), clethodim (140 g/ha), or fluazifop-P-butyl (210 g/ha). All treatments were applied 20 d after soybean emergence to V2-V3, V3-V4, or V4-V5 soybean at Alexandria, St. Joseph, and Baton Rouge, LA, respectively. Weeds rated included barnyardgrass (*Echinochloa crus-galli*), Palmer amaranth (*Amaranthus palmeri*), prickly sida (*Sida spinosa*), hemp sesbania (*Sesbania herbacea*), entireleaf morningglory (*Ipomoea hederacea* var. *integriuscula*), hophornbeam copperleaf (*Acalypha ostryifolia*), tall morningglory (*Ipomoea purpurea*), redroot pigweed (*Amaranthus retroflexus*), pitted morningglory (*Ipomoea lacunosa*). All weeds were 10- to 20-cm when treatments were applied. Crop injury and weed control was rated 7-9 and 14-17 d after POST treatment.

Greatest soybean injury (approximately 15%) was observed following the co-application of glufosinate plus aciflurofen at all locations. All treatments provided approximately 90% barnyardgrass control 7 d after POST; however, only the co-applications of glufosinate plus clethodim or fluazifop-P-butyl provided greater than 90% barnyardgrass control 17 d after POST in Alexandria, LA. The addition of fomesafen, aciflurofen, bentazon, and clethodim increased Palmer amaranth control over glufosinate alone 7 d after POST, but co-applying fomesafen, bentazon, and clethodim are the only treatments that controlled Palmer amaranth 80% or more 17 d after POST in Alexandria, LA. All treatments except glufosinate plus fluazifop-P-butyl controlled entireleaf morningglory and hophornbeam copperleaf greater than 90% at both ratings dates in Alexandria, LA. No treatment provided acceptable control of barnyardgrass in St. Joseph, LA, but all treatments provided excellent control of hemp sesbania. No co-applied herbicide treatment increased control of redroot pigweed greater than glufosinate alone in St. Joseph, LA. All treatments provided 90% or greater control of barnyardgrass and pitted morningglory in Baton Rouge, LA. Excellent weed control in Baton Rouge, LA may be attributed to the combination of herbicide treatment and the 6-cm row spacing. In Alexandria, LA, Palmer amaranth was controlled 30-40% greater (at both rating dates) and entireleaf morningglory was controlled 20% greater (17 d after POST) by glufosinate plus clethodim compared to the co-application of fluazifop-P-butyl. However, in St. Joseph, the co-application of glufosinate plus fluazifop-P-butyl controlled redroot pigweed 23% greater than co-applying glufosinate with clethodim. These differences were not observed in Baton Rouge, LA. Results of trials were mixed which necessitates the need to repeat this research in 2010.

CORN TOLERANCE TO RESOLVE Q. J.K. Manning, J.A. Bond, L.E. Steckel, D.O. Stephenson, IV, R.L. Landry, and J.B. McDuffie. Mississippi State University, Stoneville; University of Tennessee, Jackson; Louisiana State University AgCenter, Alexandria.

ABSTRACT

Resolve DF (rimsulfuron) and Resolve Q (rimsulfuron plus thifensulfuron-methy plus isoxadifen) are effective against grasses and broadleaf weeds, and both are labeled for use in midsouthern USA corn. Observations from research conducted in Tennessee in 2008 indicated differential tolerance of corn hybrids to Resolve DF. With the continued introduction of new corn hybrids to the market, an inconsistent herbicide response could be problematic for producers. Additionally, Resolve Q contains the safener, isoxadifen, which may provide a benefit for corn tolerance to Resolve Q. Research was initiated in Louisiana, Mississippi, and Tennessee to evaluate corn tolerance to Resolve DF and Resolve Q.

The study was conducted in 2009 at the Mississippi State University Delta Research and Extension Center in Stoneville, MS, the Louisiana State University AgCenter Dean Lee Research and Extension Center in Alexandria, LA, and the University of Tennessee West Tennessee Research and Education Center in Jackson, TN. The experimental design was a split-plot with four replications. Whole plots were two Roundup Ready corn hybrids, 'Dekalb 63-14VT3' and 'Dekalb 63-42VT3'. Herbicide treatments served as subplots. Resolve DF (0.0156 lb/A) and Resolve Q (0.0175 lb/A) were applied in single postemergence (POST) applications to corn in the V4 growth stage or as preemergence (PRE) followed by POST sequential applications. A nontreated control and Degree Xtra (3 lb ai/A) were included for comparison. Glyphosate at 0.77 lb ae/A was included with all Resolve DF and Resolve Q POST applications. Additionally, plots treated with Degree Xtra PRE and the nontreated control plots for each hybrid were treated with glyphosate at 0.77 lb/A at the time of the prescribed POST applications. Corn injury was visually estimated 14 d after V4 application in Mississippi and Tennessee. Injury evaluation was delayed until 28 d after V4 application in Louisiana due to inclement weather. Corn yield data were converted to a percent of the nontreated control for the respective hybrid in each replication. Data were subjected to ANOVA with means separated by Fisher's protected LSD test at $p < 0.05$.

In Mississippi, corn injury 14 d after V4 treatment was ≤8% for all herbicide treatments on both hybrids. No differences in injury were observed between hybrids for the single and sequential applications of Resolve DF and Resolve Q. Sequential application of Resolve Q injured DK 63-42VT3 more than a single POST application of Resolve DF (8% vs. 1%). Corn yields were not impacted by Resolve DF or Resolve Q applications in Mississippi.

Corn injury was ≤14% for all treatments on both hybrids in Tennessee. The only differences in injury were following the Resolve DF and Resolve Q sequential treatments. Injury to DK 63-14VT3 was greater than that for DK 63-14VT3 following sequential applications of Resolve DF and Resolve Q. The only yield differences between hybrids following Resolve DF or Resolve Q treatments was a lower yield for DK 63-42VT3 following Resolve DF POST (95 vs. 103% of nontreated control for each hybrid). Although yield of DK 63-14VT3 was lower following sequential application of Resolve DF compared with other Resolve DF and Resolve Q treatments, yield was still 92% of the notreated control.

In Louisiana, corn injury 28 d after V4 was greater on DK 63-42VT3 than DK 63-14VT3 for all Resolve DF and Resolve Q treatments. Resolve DF POST injured DK 63-42VT3 more than Resolve Q POST; however, injury to DK 63-14VT3 was equivalent for Resolve DF and Resolve Q POST. Sequential applications of Resolve DF or Resolve Q did not increase injury for either hybrid. Single POST applications of Resolve DF and Resolve Q and the sequential application of Resolve DF reduced yield of DK 63-42VT3 compared with DK 63-14VT3. Single and sequential applications of Resolve DF reduced yield of DK 63-42VT3 compared with Degree Xtra, but yields for DK 63-14VT3 were lower following both treatments containing Resolve Q compared with Degree Xtra

Single and sequential applications of Resolve DF and Resolve Q were safe for application to DK 63-42VT3 and DK 63-14VT3 in Mississippi. In Tennessee, sequential applications of both herbicides caused more injury to DK 63-42VT3 than DK 63-14VT3, but this did not translate into differences in corn yield. In Louisiana, Resolve DF caused more injury than Resolve Q on both hybrids. Yield of nontreated controls for both hybrids was low in Louisiana; however, regardless of low yield potential in Louisiana, differences in corn yield indicate that DK 63-42VT3 was less tolerant to Resolve DF and Resolve Q than DK 63-14VT3.

WEED CONTROL IN LIBERTY LINK™ COTTON. D.M. Dodds, D.B. Reynolds, and J.T. Irby; Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS.

ABSTRACT

Liberty Link™ cotton was commercially introduced in 2004. However, grower adoption of cotton varieties containing this technology has been slow. Less than 66,000 ha of Liberty Link™ cotton was planted in the United States in 2009. However, cotton varieties containing both glyphosate and glufosinate-resistance genes will be commercially available in Texas in 2010. Introduction of varieties containing both glyphosate and glufosinate-resistance genes will likely occur in the Mid-South and Southeast in 2012. This technology will provide cotton growers with the option of applying glyphosate and glufosinate postemergence over-the-top (POST). Cotton production areas with heavy infestations of glyphosate-resistant weeds, especially glyphosate-resistant Palmer amaranth (*Amaranthus palmeri*), will benefit from the introduction of this technology, provided that the technology is available in high yielding cotton varieties. As introduction of this technology looms and the potential for increased grower adoption of glufosinate-based weed control programs exists, it is vital to fully understand the strengths and weaknesses of a glufosinate-based weed control program in all geographies. Therefore, this research was conducted to determine weed control efficacy of several glufosinate-based weed control programs in northeast Mississippi.

Research was conducted in 2009 at the Plant Science Research Center (PSRC) near Starkville, MS and the Black Belt Branch Experiment Station (BBES) near Brooksville, MS. FM 1845 LLB2 cotton was planted on 22 May 2009 at PSRC and 03 May 2009 at BBES. Plots consisted of four-97 cm rows that were 12.2 m in length. All treatments were replicated four times at each location. Seeding rate at both locations was 128,000 seeds per hectare. Herbicide application rates (kg ai/ha) and timings were as follows: 1) glufosinate at 0.45 (5 leaf application fb 11-15 leaf application); 2) glufosinate at 0.59 (5 leaf application fb 11-15 leaf application); 3) glufosinate at 0.89 fb (5 leaf application fb 11-15 leaf application); 4) fluometuron PRE at 1.12 (PSRC) or 1.68 (BBES) fb glufosinate at 0.45 (5 leaf application fb 11-15 leaf application); 5) fluometuron PRE at 1.12 (PSRC) or 1.68 (BBES) fb glufosinate at 0.59 (5 leaf application fb 11-15 leaf application); 6) fluometuron PRE at 1.12 (PSRC) or 1.68 (BBES) fb glufosinate at 0.89 fb 0.59 (5 leaf application fb 11-15 leaf application); 7) s-metolachlor PRE at 1.07 fb glufosinate at 0.45 (5 leaf application fb 11-15 leaf application); and 8) pyrithiobac PRE at 0.06 fb glufosinate at 0.45 (5 leaf application fb 11-15 leaf application). A non-treated check was included for comparison purposes. All herbicide applications were made with a CO_2-pressurized backpack sprayer or a tractor-mounted, compressed-air sprayer at 140 litres per hectare. Visual estimations of weed control efficacy were made two weeks after the 11-15 leaf application with 0% being no plant injury and 100% being complete plant death. All agronomic practices including tillage, fertility, insect management, disease management, growth regulation, and defoliation were performed according to recommendations from the Mississippi State University Extension Service. Data were subjected to analysis of variance and means were separated using Fisher's Protected LSD at $p = 0.05$.

Weed control two weeks after the 11-15 leaf application was excellent with all treatments. Greater than 98% control of barnyardgrass (*Echinochloa crus-galli*), browntop millet (*Urochloa ramosa*), and tall waterhemp (*Amaranthus tuberculatus*) was observed with all treatments. Control of mixed morningglory species, including *Ipomoea lacunosa* and *Ipomoea hederacea* var. *integriuscula*, was greater than 90% with all treatments. Likewise, common purslane (*Portulaca oleracea*) control was greater than 90% with all treatments. Based upon weed control efficacy in this research, the addition of residual herbicides fluometuron, pyrithiobac, and s-metolachlor did not result in differences in weed control two weeks after the 11-15 leaf application of glufosinate. However, due to concerns over the development of herbicide resistance as well as potential weaknesses with glufosinate-based weed control programs (i.e. grass weed species larger in size), the use of residual herbicides in any weed control program is strongly recommended. Yield differences due to herbicide program and subsequent weed control efficacy could not be made to due inclement weather during harvest. Mississippi suffered from an extended period of rainfall throughout September and October which contributed to greater than 60% hardlock and/or bollrot observed in all research plots. In conclusion, glufosinate-based weed control programs provided broad spectrum control of several problematic broadleaf and grass weed species in northeast Mississippi. Adoption of glufosinate-resistant cotton varieties and/or stacked glyphosate and glufosinate-resistant varieties will largely be determined by variety performance, associated technology fees, and infiltration of glyphosate-resistant weed species within a given geography.

CONTROLLING VOLUNTEER COTTON WITH POSTEMERGENCE HERBICIDES. W. J. Grichar[1], D.D. Fromme[2], P. A. Dotray[3], and J. W. Keeling[3]. [1]Texas AgriLife Research, Beeville, TX 781021; [2]Texas AgriLife Extension Service, Corpus Christi,TX 78406; and [3]Texas AgriLife Research, Lubbock, TX 79403.

ABSTRACT

Field studies were conducted in the Texas High Plains (2007 to 2009) and in the south Texas (2009) cotton growing areas using typical small plot procedures to determine Roundup-Ready cotton response to various POST herbicides. In the High Plains region, EPOST herbicide applications were made when cotton was up to 5-leaf stage while LPOST applications were made to cotton at the 6 to 10 leaf stage. In South Texas, herbicides were applied when cotton was at the cotyledon stage (EPOST) or 6 to 8 leaf stage (LPOST).

Herbicide control of cotton in the High Plains generally was sporadic. Some herbicides provided better control of cotton when applied EPOST while others were more effective LPOST. In south Texas, several herbicides were just as effective when applied EPOST compared with LPOST applications.

Texas High Plains. In 2007, EPOST applications of Aim at 1.0 oz/A, ET at 1.5 and 2.0 oz/A, and Ignite at 29.0 oz/A controlled cotton at least 96% (Table 1). Layby-Pro at 32.0 oz/A provided 92% control of cotton while Buctril at 8.0 oz/A provided 86% control. None of the above mentioned herbicides controlled cotton better than 83% when applied EPOST. Clarity controlled cotton no better than 53% with either EPOST or LPOST applications while Gramoxone Inteon at 16.0 to 32 oz/A provided 68 to 83% control when applied EPOST or LPOST. In 2008, only EPOST or LPOST applications of Clarity or Ignite and LPOST applications of Gramoxone Inteon at 32.0 oz/A provided effective cotton control ($\geq$ 90%). Buctril and Layby Pro applied EPOST or LPOST or Aim applied LPOST controlled cotton 82 to 87% (Table 1). At Location 1 in 2009, Aim applied EPOST or LPOST, Buctril applied EPOST, ET applied LPOST, Gramoxone Inteon at 32.0 oz/A applied EPOST or LPOST, Layby Pro applied EPOST, and Sharpen at 1.5 or 2.0 oz/A controlled cotton at least 91% while tillage controlled cotton at least 92%. At location 2, only Gramoxone Inteon at 32.0 oz/A applied EPOST and both rates of Sharpen applied EPOST or LPOST effectively controlled cotton.

South Texas. When rated 4 weeks after treatment, cotton treated at the cotyledon stage was more effectively killed with some herbicides than that treated at the 6 to 8 leaf stage (Table 2). Aim at 1.0 oz/A, Buctril at 8.0 oz/A, Chaparral at 2.5 oz/A, Gramoxone Inteon at 24 oz/A, and Ignite at 29 oz/A effectively controlled cotton ($\geq$ 94%) whether applied to cotton at the cotyledon or 6 to 8 leaf stage. Atrazine at 32 oz/A, Callisto at 3.0 oz/A, and Python at 1.0 oz/A effectively controlled cotton when applied at the cotyledon stage ($\geq$ 99%) but when applied to 6 to 8 leaf cotton, control varied from 40 to 84%. Cleanwave at 14 oz/A, Starane at 16 oz/A, and 2,4-D at 32 oz/A controlled cotton 86 to 89% regardless of application timing while Peak at 0.75 oz/A and Spirit at 1 oz/A failed to control cotton (22-65%).

These studies show that herbicides can effectively control volunteer cotton but applications should be made when the cotton is small to be effective.

EFFECT OF COMPENSATORY GROWTH ON PALMER AMARANTH RESPONSE TO GLYPHOSATE.
L.M. Sosnoskie and A.S. Culpepper, Department of Crop and Soil Sciences, University of Georgia, Tifton, GA; T.M. Webster, Crop Protection and Management, USDA-ARS, Tifton, GA

ABSTRACT

Incomplete weed control can occur following herbicide applications. One manifestation of this phenomenon, at the individual plant level, is the death of one or many shoot meristems. The loss of apical dominance can lead to compensatory growth, which arises from previously dormant lateral buds. Palmer amaranth dieback and regrowth in response to POST herbicides has been observed in both the field and the greenhouse. The objective of this study was to determine if the degree of glyphosate sensitivity differed between intact plants and those undergoing mechanically stimulated compensatory growth for both glyphosate-susceptible (GLY-S) and –resistant (GLY-R) Palmer amaranth biotypes.

Seeds of GLY-S and GLY-R Palmer amaranth were planted in 820 cm^3 pots filled with a commercial potting soil. To stimulate compensatory growth from lateral buds, the apical shoot of was mechanically removed from 10-15 cm tall GLY-S and GLY-R seedlings using scissors. Plants were allowed to regrow to 10-15 cm and then treated with glyphosate. Intact GLY-S and GLY-R plants 10-15 cm were also treated. Plants were visually evaluated for injury using a scale ranging from 0 (no visual injury) to 100 (plant death) 7 DAT. Plant shoots were harvested and relative fresh weights (as a percentage of the mean of the non-treated check for each size class) were determined following visual ratings. Visual injury ratings and fresh weights were regressed over herbicide dose using log-logistic analysis.

GLY-S Plants that were experiencing compensatory growth (grown to 10-15 cm, cut back, and then regrown to 10-15 cm) were more sensitive to glyphosate than intact plants 10-15 cm tall . The GR 50 (rate resulting in 50% FW reduction) for the intact plants was >300% that of the GR50 (18 g ae/ha) for the regrown plants. The I50 (rate resulting in 50% injury) for the intact plants was 111% that of the GR50 (45 g ae/ha) for the regrown plants. Intact and regrown GLY-R plants did not differ with respect to glyphosate sensitivity (GR50 = 1181 g ae/ha; I50 = 1162 g ae/ha).

Palmer amaranth is a significant problem in cotton production in the SE US. Palmer amaranth dieback and regrowth in response to incomplete herbicide control has been observed in the field. Plants that persist following herbicide applications may compete with the crop and reproduce, thereby reducing yields and replenishing the soil seedbank, respectively. Future research will evaluate GLY-S and GLY-R Palmer amaranth susceptibility to other common POST applied herbicides in cotton production. This will allow us to determine how subsequent weed control measures following herbicide failure may be impacted by compensatory growth.

TEXASWEED (*CAPERONIA PALUSTRIS*) INTERFERENCE IN DRILL-SEEDED RICE. R.K. Godara, B.J. Williams and S.L. Angel; LSU AgCenter, Baton Rouge.

ABSTRACT

Weed management programs in rice are mostly designed to address the problem of grassy weeds and little emphasis is given on early season broadleaf weed control. Limited information is available on the competing ability of broadleaf weeds in rice, and particularly of new weeds like Texasweed, which are generally considered a problem because they reduce harvest efficiency and crop quality. Therefore, field experiments were conducted at LSU AgCenter's Northeast Research Station near St. Joseph, LA in 2008 to quantify yield losses due to Texasweed interference, to know its area of influence (AI), and to determine its critical period of interference in drill-seeded rice. Rice (Cocodrie) was drill-seeded in 19 cm rows using 100 kg seed/ha and other recommended management practices were followed. For AI study, rice was harvested from five 20 cm wide concentric circular bands around a single Texasweed plant planted in the center of each plot. Distance from Texasweed plant had no influence on rice yield thus area of influence was less than 20 cm. Regression analysis of rice yield and Texasweed density data showed significant reduction in rice yield due to increasing weed densities. Treatments in the critical period determination experiment included weedy and weed-free periods of various lengths. Critical period of interference was estimated by fitting logistic and Gompertz models to relative yield data of weedy and weed-free periods, respectively, using NLMIXED procedure of SAS. Critical period estimated at an allowable yield loss (AYL) of 5% was found to be between 2-8 WAP.

WEED CONTROL WITH GLUFOSINATE IN CORN, COTTON, AND SOYBEAN IN NORTH CAROLINA. R.W. Seagroves, J.D. Hinton, D.L. Jordan, and A.C. York; North Carolina State University, Raleigh.

ABSTRACT

The ability to control weeds in southern row crops requires a wide range of soil-applied and postemergence herbicides. The need for additional herbicide alternatives to those that have been popular for the past decade has increased due to development of resistance of some weed species to glyphosate and other herbicides with different modes of action. Glufosinate has been evaluated by many research and extension programs and industry for a number of years to define the fit of glufosinate in Liberty Link® systems. Additional research, especially with cultivars and hybrids suitable for specific geographical regions is needed to develop herbicide programs in corn, cotton, and soybean with Ignite 280.

Field experiments were conducted in 2009 at research stations in North Carolina in plots four rows wide (36-inch spacing) by 30 feet long. All crops were conventionally planted. Visual evaluations of percent crop injury and weed control were recorded at various times during the growing season, and all crops were carried through to harvest. Sufficient rainfall occurred in all experiments to adequately activate PRE herbicides. In corn, the trial was conducted using Roundup Ready® and Liberty Link® corn (DKC 69-71 and DyneGrow 57X97, respectively) planted 1 inch deep at a density of 2 seed per foot. Treatments were applied PRE (April 23), EPOST (May 13) and LPOST (May 26). All treatments, except for GMH (glyphosate or glufosinate in the appropriate transgenic hybrid) and Aatrex plus Accent, included ammonium sulfate (AMS) at a rate of 8.5 pounds per 100 gallons spray solution. The GMH, Aatrex plus Accent, and Lumax treatments included a crop oil concentrate (COC) at a rate of 1.0 % v/v. All other EPOST treatments included methylated seed oil (MSO) at a rate of 0.5% v/v. Morningglory species consisted of pitted (50%), ivyleaf (25%) and entireleaf (25%). At EPOST, morningglory and Texas panicum ranged from two to four leaf and 1 leaf to 2 tiller, respectively. At LPOST, morningglory and Texas panicum ranged from cotyledon to 10 leaf and 1 leaf to 3 tiller, respectively. At EPOST, corn was at the 3 collar stage while corn was in the 6 collar stage at LPOST. In cotton, the trial was conducted using Widestrike® cotton (PHY 375 WRF) planted 0.75 inches deep at a density of 4 seed per foot. In soybean, the trial was conducted using Liberty Link® soybeans (Stine 49LA02) planted at 0.5 inches depth and 9 seed per foot.

In corn, morningglory control was higher when Capreno was applied with Ignite 280 than when applied with Roundup PowerMax. In contrast, Texas panicum control was generally higher with Roundup PowerMax applied with Capreno than when applied with Ignite 280. Treatments including Capreno alone, Roundup PowerMax or Aatrex plus Capreno or Laudis or Accent controlled morningglory 98-100% (mid May) or 93 to 100% (early June). Texas panicum control at mid season rating for both Roundup Ready® and Liberty Link® systems ranged from 78 to 100% when applied with Aatrex. Corn was injured 21-25% (Roundup Ready®) and 16-21% (Liberty Link®) early in the season when Capreno was applied alone or with Aatrex. Injury was 0-8% with all other combinations and was not noticeable by mid season. Corn yield ranged from 145 to 163 bu/acre (Roundup Ready®) and 150-158 bu/acre (Liberty Link®) when herbicides were applied compared with 143 bu/acre (Roundup Ready®) or 131 bu/acre (Liberty Link®) in the non-treated control. In cotton, large crabgrass was controlled more effectively by Roundup WeatherMax than Ignite 280 throughout all rating periods when Reflex or Dual Magnum was not included. A similar trend was noted for Palmer amaranth control early in the season; however, by the mid and late evaluations, Roundup WeatherMax and Ignite 280 generally performed the same. Although no crop injury was observed at the early timing, combinations of Ignite 280 and Staple LX or Dual Magnum injured cotton 27 to 42% while including Staple LX or Dual Magnum with Roundup WeatherMax injured cotton 22 to 25%. Injury at mid season was 15% when Ignite 280 was applied alone or following Reflex only. Injury following all Ignite 280 applications ranged from 8 to 33% by late season while injury was 7% or less with combinations containing Roundup WeatherMax. In soybean, Palmer amaranth control was complete at all evaluation periods regardless of soil-applied herbicide preceding Ignite 280. Soybean injury was negligible and there was no difference in soybean yield when comparing herbicide treatments. Results from these experiments show potential for Ignite 280 to control weeds in three major southern row crops. Trends in weed control with both Roundup formulations as well as Ignite 280 are similar to those previously reported. Ignite 280 in cultivars and hybrids that yield well regionally will be a valuable weed management tool in southern row crops.

INTERACTION OF CLETHODIM AND 2,4-DB WITH RELATIVELY NEW FUNGICIDES USED IN PEANUT PRODUCTION SYSTEMS. G.B.S. Chahal, D.L. Jordan, B.B. Shew, R.L. Brandenburg, J. Burton, D. Danehower, and P.M. Eure; North Carolina State University, Raleigh.

ABSTRACT

Effective season-long weed control in peanut (*Arachis hypogaea* L.) is necessary because of the limited competitive ability of peanut, the requirement of digging and inverting vines, and the importance of uniform distribution of fungicides and other pesticides in the canopy. To manage weeds and other pests, growers apply a wide range of agrichemicals. Peanut growers routinely apply 2,4-DB several times during the growing season to control broadleaf weeds. Annual grasses not controlled by herbicides applied early in the season are often controlled by clethodim or sethoxydim. In North Carolina, fungicides are generally applied from late June through mid September to control early leaf spot (*Cercospora arachidicola*), late leaf spot (*Cercosporidium personatum*), web blotch (*Phoma arachidicola*), sclerotinia blight (*Sclerotinia minor*), stem rot (*Sclerotium rolfsii*), and limb rot (*Rhizoctonia* spp.). Azoxystrobin, boscalid, chlorothalonil, fluazinam, tebuconazole plus trifloxystrobin, pyraclostrobin, and tebuconazole are often used to control diseases in peanut. In recent years the fungicides flutriafol and tebuconazole plus trifloxystrobin received registration in peanut and are becoming more popular. Timing of application of herbicides, in particular clethodim and 2,4-DB, and fungicides to control pest complexes often coincide. Efficacy of clethodim and 2,4-DB has been evaluated when applied with azoxystrobin, chlorothalonil, tebuconazole, and other standard fungicides. However, interactions of clethodim and 2,4-DB with relatively new fungicides have not been clearly defined. Therefore, research was conducted to define interactions of clethodim and 2,4-DB with relatively new fungicides recently being marketed for peanut production systems.

Field experiments were conducted in 2008 and 2009 at two locations in North Carolina. Treatments consisted of clethodim (control of large crabgrass, *Digitaria sanguinalis*) or 2,4-DB (control of Palmer amaranth, *Amaranthus palmeri*) applied alone or in combination with flutriafol, prothiaconazole plus tebuconazole, chlorothalonil, tebuconazole plus trifloxystrobin, and pyracloatrobin. Pesticides were applied at the manufacturer's suggested rate, and small-plot research techniques were used to conduct the experiments. Visual estimates of percent weed control were recorded 3 weeks after treatment on a scale of 0 to 100% where 0 = no control and 100 = complete control. Data were subjected to ANOVA and means were separated using Fisher's Protected LSD test at $p \leq 0.05$.

Chlorothalonil and pyraclostrobin reduced Palmer amaranth control by 2,4-DB in only one of four runs of the experiment. Flutraifol, prothioconazole plus tebuconazole, and tebuconazole plus trifloxystrobin did not affect Palmer amaranth control by 2,4-DB in any experiment. Pyraclostrobin reduced large crabgrass control by clethodim in all three experiments while chlorothalonil and tebuconazole plus trifloxystrobin reduced control in one of three experiments. Flutriafol and prothioconazole plus tebuconazole did not affect efficacy of clethodim.

SIMULATED DRIFT OF 2,4-D, AMINOPYRALID, AND AMINOCYCLOPYRACHLOR TO COTTON (*Gossypium hirsutum*). L.A. Cardoso[1], M.L. Flessner[2], J.S. McElroy[2], and G.R. Wehtje[2]; [1]Sao Paulo State University (UNESP)- Botucatu, Sao Paulo, Brazil, [2]Auburn, University, Auburn, AL.

ABSTRACT

Cotton (*Gossypium hirsutum* L.) is extremely sensitive to synthetic auxin herbicide drift and typically responds with epinasty, malformed leaves, and callus tissue formation at the stem apex. Aminocyclopyrachlor (AMCP) is a synthetic auxin herbicide in development by the DuPont Company. Literature contains minimal information about the consequences of AMCP spray drift. Therefore greenhouse trials were conducted to evaluate the response of cotton to simulated AMCP and comparable synthetic auxin herbicides spray drift.

Cotton plants were treated at the four mature leaf stage. Treatments included 2,4-D (2,4-D LV6; Agriliance, LLC, St. Paul, Minnesota), aminopyralid (Milestone; Dow AgroSciences, Indianapolis, Illinois), and AMCP (DPX-KJM44; DuPont Company, Wilmington, Delaware) applied as percentages of labeled rates in order to simulate spray drift. Labeled rates were 663, 120, 87.4 g ae ha^{-1} of 2,4-D, aminopyralid, and AMCP, respectively. Percentages of labeled rates were 8, 4, 2, 1, 0.5, 0.25, 0.125, and 0.0625%. A non-treated check was also included. Treatments were applied in a research spray cabinet powered by compressed air and calibrated at 280 L ha^{-1} with a single TeeJet 8002E nozzle. The experimental design was a randomized complete block with four replications and one plant per experimental unit. Data collected included percent visual injury (where 0 = no injury and 100 = complete plant death) and photochemical efficiency (Φ_{PSII}; Opti-Sciences OS1-FL modulated fluorometer, OptiSciences, Inc., Hudson, New Hampshire) at 10, 15, 21, and 28 days after application (DAA). Height data was also collected at 15 and 28 DAA and above ground dry mass data were also collected at 28 DAA. Statistical analysis using PROC ANOVA in SAS (SAS Statistical Software. V. 9.1 Cary, NC) indicated data could not be pooled between runs, therefore data is presented separately. Subsequent analysis was conducted using PROC MIXED. Responses different than the non-treated were considered unacceptable.

All herbicides caused immature cotton leaves to respond with malformed and epinastic growth. Visual injury increased with herbicide rate. Spray drift of less than 0.25, 2.0, and 0.25% of 2,4-D, aminopyralid, and AMCP labeled rates respectively, were visually similar to the non-treated check. Higher rates of herbicide resulted in unacceptable cotton injury. Dry mass decreased as herbicide rate increased. Dry mass was reduced by rates greater than 1.0, 1.0, and 0.25% of 2,4-D, aminopyralid, and AMCP labeled rates, respectively. Cotton height response marginally changed from increasing herbicide rates. Rates less than 1.0, 2.0, and 0.5% of 2,4-D, aminopyralid, and AMCP labeled rates did not reduce height compared to the non-treated check. These parameters indicate spray drift should be kept below about 0.75, 1.0, and 0.4% of 2,4-D, aminopyralid, and AMCP, respectively. Φ_{PSII} did not vary with any treatment. This phenomenon may be because the data was obtained from mature leaves which did not display any visual symptoms from any treatment, and/or these herbicides are not known to directly inhibit photosystem II. Field studies are necessary to quantify yield loss from spray drift. These data indicate cotton is the least sensitive to aminopyralid, followed by 2,4-D, and the most sentitive to AMCP spray drift based on percentage of labeled rates.

WEED MANAGEMENT AND SORGHUM RESPONSE WITH SAFLUFENACIL. B.A. Brown, J.W. Keeling and P.A. Dotray; Texas AgriLife Research and Texas Tech University, Lubbock, TX 79403.

ABSTRACT

Saflufenacil (Sharpen), a new herbicide developed by BASF, is a protoporphyrinogen IX oxidase (PPO) inhibitor and belongs to the pyrimidinedione class of herbicides. Studies were conducted in 2008 and 2009 near Lubbock, TX to evaluate sorghum (*Sorghum bicolor*) tolerance and weed control following preplant burndown and preemergence (PRE) treatments of saflufenacil or saflufenacil + dimethenamid (Integrity). Sharpen was applied PRE at rates ranging from 0.03 to 0.18 lb/A. Integrity (saflufenacil + demethenamid) was applied PRE at 0.28 to 1.74 lb/A in the crop tolerance trials. In the preplant burndown trial, Sharpen and glyphosate were applied 14 days before sorghum planting. Sharpen and Integrity were applied PRE alone or combined with atrazine for Palmer amaranth (*Amaranthus palmeri*) control. All treatments were applied at 10 GPA using a CO2 backpack sprayer. Crop oil concentrate and ammonium sulfate were added to treatments applied for preplant burndown of Russian thistle (*Salsola iberica*) and Kochia (*Kochia scoparia*). The soil type at this location was an Acuff loam. The soil types for the two tolerance trials were an Amarillo fine sandy loam and a Pullman clay loam. Furrow irrigation and center pivot irrigation was applied during the season to ensure normal sorghum growth and yield.

Two sorghum hybrids, Dekalb 44-20 and Pioneer 85G01, were planted May 14, 2008 and May 21, 2009 at Halfway and May 21, 2008 and May 21, 2009 at Lamesa, and PRE treatments were applied in the tolerance trials. At 14 days after planting (DAP), sorghum injury in the Dekalb ranged from 0 to 93% with Sharpen PRE, and 5 to 99% with the Pioneer hybrid. Increasing rates of Sharpen decreased sorghum yield. Sharpen treatments applied 14 days before planting (DBP) controlled Russian thistle and Kochia 99 to 100% compared to 92 to 97% control achieved with glyphosate. Palmer amaranth control 28 DAP with Sharpen and Integrity PRE ranged from 95 to 99% and 98 to 100%, respectively.

These initial results suggest that Sharpen at 0.022 – 0.045 lb ai/A can effectively control emerged Russian thistle and kochia as a preplant burndown treatment and Palmer amaranth as a PRE application.

EFFECTIVENESS OF COTTON HERBICIDES ON GLYPHOSATE-RESISTANT PALMER AMARANTH POPULATIONS IN ARKANSAS. E. A. L. Alcober[1]*, N. R. Burgos[1], K.L. Smith[2], L.E. Estorninos[1], T. M. Tseng[1], S. Fogliato[1] and R.A Salas[1]; [1]University of Arkansas, Fayetteville, AR and [2]University of Arkansas, Monticello, AR

ABSTRACT

Herbicide-resistant Palmer amaranth has been spreading exponentially; becoming a major problem in the southern US. In Arkansas, 19 counties were confirmed to have glyphosate-resistant Palmer in 2008. Managing herbicide-resistant Palmer amaranth can be achieved by using herbicides with different modes of action. Hence, this study was conducted to evaluate the effectiveness of various cotton herbicides on Palmer amaranth. A greenhouse bio-assay was conducted in 2009, evaluating 3 foliar herbicide (pyrithobac, glyphosate, fomesafen) applied at 0.25x, 0.50x, 1x, 2x, and 4x; and 4 soil-applied (fomesafen, pendimethalin, diuron, *S*-metolachor) sprayed at 0.25x, 0.50x, 1x, 2x. The 1x rates were: pyrithiobac , 0.065 lb ai/A + 0.25% NIS; glyphosate , 0.75 lb ae/A; fomesafen (foliar) , 0.235 lb ai/A + 1% COC; pendimethalin and diuron, 1.0 lb ai/A; *S*-metolachor , 1.27 lb ai/A and fomesafen (soil), 0.25 lb ai/A.

Thirteen Palmer amaranth populations were evaluated. Ten plants that escaped from a glyphosate-based weed control program were selected randomly within a population. Glyphosate-resistant Palmer was observed in Mississippi (MIS-B), Lonoke (LON-A), Crittenden (CRI-A) and Craighead (CRA-A) populations. Mississippi and Crittenden populations were resistant to 2x rate. Lonoke and Mississippi population had an LD_{95} of 1.31 and 2.18 lb ae/A, respectively. All populations were resistant to Staple 3.2LX. The LD_{50} and GR_{50} ranged from 0.078 to 0.237 lb ai/A and 0.114 to 0.286 lb ai/A, respectively. The foliar application of Flexstar (fomesafen) controlled Palmer amaranth 100% at the 1x rate. 100% control was recorded for all Palmer amaranth populations sprayed with Dual Magnum and Reflex at 1x rate. Diuron controlled Palmer amaranth at 0.5x rate. The 1x rate of Prowl controlled Palmer amaranth, except the Lee-C population with only 82% mortality. Pendimethalin, diuron, fomesafen and S-metolachor are viable options for the control of glyphosate-R Palmer amaranth in cotton but not ALS herbicides. Integration of effective herbicides into glyphosate-based production system will control glyphosate-resistant Palmer amaranth and mitigate resistance evolution.

INFLUENCE OF CORN GROWTH STAGE ON EFFICACY OF PARAQUAT ALONE AND WITH ATRAZINE. J.D. DeVore, J.K. Norsworthy, K.L. Smith, D. Black, S.K. Bangarwa, and D.B. Johnson; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

ABSTRACT

The use of glyphosate-resistant corn in the United States has created a lack of options in a situation where a failed corn stand must be eliminated prior to replant. In 2009, studies were conducted at Keiser, Marianna, and McRae, AR, to evaluate the influence of corn growth stage on the effectiveness of two herbicide options for controlling failed herbicide-resistant corn crops without affecting a subsequent corn crop. Paraquat alone and paraquat with atrazine were evaluated to determine their efficacy on various stages of corn growth. This experiment was organized in a randomized complete block design replicated four times. Paraquat was applied alone at 0.624 lb ai/A, and in a tank mixture with atrazine, a PSII inhibitor labeled in corn at 1 lb ai/A. Treatments were applied at the V4, V6, and V8 stage at Marianna, the V2, V4, V8, and V10 stage at Keiser, and the V2, V4, V6, and V8 stage at McRae. At 1 wk after treatment in Marianna, paraquat alone provided 91% control at V6 and V8 stages. At 3 wk after treatment, control remained at 91% at V6 but only 3% at V8. When atrazine was added to paraquat, control improved to 95 to 100% from 1 to 3 wk after treatment at the V6 stage. At Keiser, 98 to 100% control with both treatments was achieved from 1 to 3 wk after treatment at the V2 stage. Control at the V4 stage was 99% with paraquat plus atrazine from 1 to 3 wk after treatment. At McRae, the highest control was 90% with paraquat plus atrazine at the V6 stage 1 wk after treatment, but control declined to 82% by 4 wk after treatment. In conclusion, paraquat plus atrazine effectively controlled corn prior to replant when it was applied at the V2 to V6 stages.

WEED CONTROL PROGRAMS WITH IMAZOSULFURON PROGRAMS IN RICE. J.K. Norsworthy, P. Jha, J.A. Still, D.B. Johnson, and E.K. McCallister; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

ABSTRACT

Imazosulfuron is a new sulfonylurea herbicide that is being developed by Valent for use in rice. It is known to provide preemergence (PRE) and postemergence (POST) control of several important weeds of Arkansas rice. However, imazosulfuron is not a stand-alone herbicide, and thus, it must incorporated into existing herbicide programs. Research was conducted in 2009 at Keiser and Stuttgart, AR, to evaluate the effectiveness of imazosulfuron-containing herbicide programs relative to a standard herbicide program for drill-seeded rice culture. Herbicide programs evaluated included imazosulfuron applied at 0.2, 0.3, and 0.4 lb ai/A PRE with clomazone followed by (fb) quinclorac plus propanil early POST (EPOST), imazosulfuron applied EPOST at 0.15, 0.2, and 0.3 lb/A with clomazone fb quinclorac plus propanil preflood (PREFLD), imazosulfuron applied EPOST at 0.15, 0.2, and 0.3 lb/A with clomazone fb imazosulfuron applied PREFLD at 0.15, 0.2, and 0.3 lb/A with quinclorac, and imazosulfuron applied EPOST at 0.15, 0.2, and 0.3 lb/A with clomazone fb imazosulfuron applied PREFLD at 0.15, 0.2, and 0.3 lb/A with propanil. The standard program for comparison consisted of clomazone plus quinclorac PRE fb propanil plus halosulfuron PREFLD. All herbicides, excluding imazosulfuron, were applied at labeled rates. Clomazone use rates were adjusted for soil type. All non-propanil POST treatments contained Dyne-A-Pak at 2.5% v/v, and a nontreated control was included. Although imazosulfuron was not evaluated alone, its use did not appear to increase rice injury. Imazosulfuron provided good PRE and excellent POST hemp sesbania control at Keiser. Hemp sesbania control improved with increasing rate of the PRE-applied imazosulfuron programs at Keiser but not at Stuttgart. At Stuttgart, all imazosulfuron programs provided $\geq$99% late-season hemp sesbania control. The need for a higher PRE-applied rate at Keiser is because of the clay soil, whereas the higher rates were not needed on the silt loam soil at Stuttgart. Imazosulfuron has limited grass activity and thus the need for an additional grass herbicide. PRE-applied herbicide programs containing imazosulfuron generally provided more consistent barnyardgrass and broadleaf signalgrass throughout the growing season compared to POST-only programs. This consistency may be in part due to suppression of these annual grasses by imazosulfuron as well as the inability of POST-applied clomazone to provide effective control of emerged grasses. PRE- and POST-applied imazosulfuron aided the control of yellow nutsedge at Stuttgart, but control from PRE-applied imazosulfuron was highly dependent upon rate, with the highest rate needed to obtain season-long control. As a result of the highly efficacious imazosulfuron weed control programs at both locations, rice yields were comparable, and on a few occasions higher, than the standard treatment. Imazosulfuron does appear to be an additional tool that can be integrated into existing PRE and POST weed management programs in rice, contributing to the control of several weeds such as yellow nutsedge and hemp sesbania.

EFFECT OF SOIL MOISTURE AND RAINFALL TIMING ON HALOSULFURON AND IMAZOSULFURON ACTIVITY. E.K. McCallister, J.K. Norsworthy, J.A. Still, S.K. Bangarwa, and D.B. Johnson, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

ABSTRACT

With soil-applied herbicides, activation by rainfall is important and can influence the level of weed control. Some herbicides react differently to rainfall and may produce different effects on herbicide activity. Two greenhouse experiments were conducted at the University of Arkansas in Fayetteville in the fall of 2009 to determine the effect of rainfall timing and amount on halosulfuron and imazosulfuron activity. Weed species evaluated in both experiments were yellow nutsedge (*Cyperus esculentus*) and hemp sesbania (*Sesbania herbacea*). Yellow nutsedge was planted in pots at 6 tubers per pot and hemp sesbania at 20 seeds per pot. Halosulfuron was applied at 0.031 and 0.062 lb ai/A, and Imazosulfuron at 0.2 and 0.3 lb ai/A for both experiments. For the rainfall timing study, rainfall was simulated by overhead irrigation at timings of 0, 2, 4, 7, 14, and 21 days after herbicide application and stand counts were taken 14 days after rainfall. For the rainfall amount study, rainfall was simulated by overhead irrigation in amounts of 0.25, 0.5, and 1 inch after herbicide application. Pots were covered with aluminum foil for seven days to minimize moisture evaporation and stand counts were taken seven days after uncovering. Halosulfuron was activated at lower rainfall amounts than imazosulfuron. However, both herbicides had the best activity on yellow nutsedge and hemp sesbania at the 1 inch rainfall amount. For the rainfall timing study, each herbicide had similar results (>80% control) from 4 through 21 DAT. However, these results contradict the normal biological effects of herbicide degradation and would imply that alternate methods should be used for experimentation in determining the effect of rainfall timing on herbicide activity.

USE OF CLETHODIM AND GLUFOSINATE IN LIBERTY LINK® SOYBEAN FOR GLYPHOSATE-RESISTANT JOHNSONGRASS CONTROL. M.J. Wilson, J.K. Norsworthy, D.B. Johnson, and R.C. Scott; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, Arkansas.

ABSTRACT

Johnsongrass (*Sorghum halepense*) is a perennial grass weed that is competitive with field crops. Johnsongrass has been known to reduce yield, reduce harvest efficiency, cause lodging to soybean, and cause many other problems for crop production. In the fall of 2008, a population of johnsongrass a few miles south of West Memphis, AR, in Crittenden County was confirmed resistant to glyphosate. With the extensive use of glyphosate for weed control in many production systems and the increasing number of glyphosate-resistant weeds, the evolution of glyphosate-resistant johnsongrass was inevitable. A field study was conducted in 2009 at the glyphosate-resistant johnsongrass site. The goal of the study was to develop herbicide programs for controlling glyphosate-resistant johnsongrass in Liberty Link™ soybean. Ignite (glufosinate) at 22 fl oz/A was applied alone or tank mixed with Select Max (clethodim) at 8, 12, or 16 fl oz/A to 6- to 18-inch johnsongrass and was followed by (fb) the same rate of Ignite alone or tank mixed with Select Max at 8, 12, or 16 fl oz/A 4 weeks after the initial application. Two applications of Ignite at 22 fl oz/A with Select Max at 8, 12, or 16 fl oz/A proved to be the most effective treatments, providing 92 to 98% control; however, Ignite with Select Max fb Ignite alone (77 to 83%) provided comparable control to Ignite fb Ignite with Select Max (67 to 83%).

EARLY AND LATE POSTEMERGENCE CONTROL OF DALLISGRASS (*Paspalum dilatatum* Poir.) IN TALL FESCUE. M.T. Elmore, J.T. Brosnan and G.K. Breeden; University of Tennessee, Knoxville, TN

ABSTRACT

Dallisgrass (*Paspalum dilatatum*) is a problematic weed that commonly invades various turfgrass areas throughout the southern United States. Restrictions on the use of monosodium methanearsonate (MSMA) in turfgrass management will limit the number of herbicides that can be used to provide selective control of this species. In 2008, a two-year study was initiated at the University of Tennessee (Knoxville, TN) evaluating programs for selective dallisgrass control in tall fescue (*Festuca arundinacea*) turf.

Treatments included fluazifop-p-butyl (fluazifop) at 0.28 kg ha^{-1}, mesotrione at 0.105 kg ha^{-1}, and fluazifop + mesotrione at 0.28 kg ha^{-1} + 0.105 kg ha^{-1}, respectively. All treatments included a nonionic surfactant at a 0.25% v/v ratio. Treatments were applied singly and sequentially (3 week interval) in early spring [<160 growing degree days (GDD_{10})] and early summer (>500 GDD_{10}) to a mature stand of tall fescue maintained as a utility turf with respect to irrigation, fertility, and mowing. Yearly accumulated GDD_{10C} were calculated beginning January 1st using a Celsius scale according to the equation,

$$GDD_{10C} = [(T_{max} - T_{min})/2] - T_{base}$$

where T_{max} represented the daily maximum air temperature, T_{min} represented the daily minimum air temperature, and T_{base} equaled 10°C. Dallisgrass control and tall fescue injury were assessed visually on a 0 to 100% scale, with a score of 100 representing complete plant death.

When applied in early spring (<160 GDD_{10}) in 2008, single and sequential applications of fluazifop at 0.28 kg ha^{-1} provided 90% or greater control of dallisgrass at 77 days after initial treatment (DAIT). When applied in early summer (>500 GDD_{10}), single and sequential applications of fluazifop at 0.28 kg ha^{-1} only provided 0 and 30% control at 77 DAIT in 2008 and 2009, respectively. A single application of fluazifop + mesotrione in early spring (<160 GDD_{10}) provided 93% control of dallisgrass 77 DAIT in 2008. When applied in early summer (>500 GDD_{10}) the same treatment only provided 56 % control at 21 DAIT and 0% control at 77 DAIT. Sequential applications of this treatment yielded similar results. The level of dallisgrass control provided by single and sequential applications of fluazifop at 77 DAIT in 2008 was not significantly different from that which was observed following applications of fluazifop + mesotrione in both the early spring (<160 GDD_{10}) and early summer (>500 GDD_{10}). These data suggest that application timing may affect the level of dallisgrass control provided by applications of fluazifop and fluazifop + mesotrione.

ALTERNATIVE METHODS FOR CRABGRASS MANAGEMENT IN ST. AUGUSTINEGRASS.
B.D. Glenn[1], B.J. Brecke[1], J.A. Ferrell[2], J.B. Unruh[1], G.E. Macdonald[2], and K.E. Kenworthy[2]. University of Florida-IFAS, West Florida Research and Education Center[1], Jay, FL. University of Florida[2], Gainesville, FL.

ABSTRACT

Southern crabgrass (*Digitaria ciliaris*) is a common weed found in St. Augustinegrass (*Stenotaphrum secundatum*). New regulations and loss of registered herbicides have greatly limited postemergence control options for crabgrass. Alternative materials that have shown weed control properties are being studied for effectiveness, including sodium bicarbonate and cinnamon. The company Garden Weasel is marketing the product Crabgrass Killer, which is a mixture of cinnamon and sodium bicarbonate. Greenhouse and field trials were conducted in the spring and summer of 2009 to evaluate the effectiveness of sodium bicarbonate for controlling crabgrass, as well as tolerance in St. Augustinegrass. Four rates of Crabgrass Killer were applied (244, 488, 977, and 1465 kg/ha), and one rate of sodium bicarbonate (1465 kg/ha). Both trials compared two crabgrass growth stages, 1 to 2 leaf and 1 to 2 tiller. Greenhouse studies at the 1 to 2 leaf stage showed moderate crabgrass control at all rates 7 days after treatment (DAT), with control >80% at higher rates of Crabgrass Killer (977 and 1465 Kg/ha). Control at 1 to 2 tiller stage crabgrass ranged between 13% and 43%. In field trials, crabgrass control was between 40% and 75% at both weed stages for all treatments 7 DAT. Turfgrass injury 7 DAT was >20% for all treatments when Crabgrass Killer was applied to crabgrass at the 1 to 2 leaf stage. Less injury to St. Augustinegrass (<20%) was observed 7 DAT when Crabgrass Killer was applied to crabgrass at 1-2 tiller stage. While sodium bicarbonate offered moderate control of crabgrass in both greenhouse and field trials, injury to St. Augustinegrass could limit future consideration for use.

IDENTIFICATION AND POSTEMERGENCE CONTROL OF BRAZILIAN CATSEAR DANDELION (*Hypochoeris brasiliensis*). J.S. McElroy and J.J. Rose; Auburn University, Auburn, AL.

ABSTRACT

Hypochoeris spp. (also spelled *Hypochaeris*) are plant species in the Asteraceae family that are similar to common dandelion (*Taraxacum officinale*). There are three main *Hypochoeris* species: *H. glabra* (smooth catsear dandelion), *H. radicata* (hairy catsear dandelion), and *H. brasiliensis* (brazilian catsear dandelion; also known as *H. chillensis*). *Hypochoeris* species have many similar characteristics. *Hypochoeris* are rosette forming with lanceolate, pinnatified leaves that are glabrous or pubescent depending on the species. Leaves of common dandelion are lanceolate, dentate with toothed margins pointing to rosette center. *Hypochoeris* spp. posess 2-7 dark/mustard yellow disk shaped flowers per flowering stalk, as opposed to single flowers at the end of hollow glabrous stalk for common dandelion. Involucral bracts of *Hypochoeris* spp. are red to brown on the underside. The feathery pappi are white to pale tan compared to the white pappi of common dandelion. Specifically, *H. brasiliensis* is native to South America; however, it has flourished in the Southeast U.S. and can be found from North Carolina to Texas. *H. brasiliensis* is in general a larger plant than *H. glabra* and *H. radicata*. *H. brasiliensis* leaves are generally glabrous with a prominent white mid-rib and sharply dentate margins. Currently, little information is available regarding control of *H. brasiliensis*.

Research was conducted to evaluate postemergent herbicides for *H. brasiliensis* control at Auburn University in Auburn, AL. The experimental design was a randomized complete block (r=3) with 10 treatments including a non-treated control. Treatments included: 2,4-D amine (applied at 1.4 lb ae/a), dicamba (1.0 lb ae/a), Trimec® Southern (1.15 lb ae/a; a combination product of MCPA, 2,4-D, and dicamba), Escalade 2 (1.5 lb ae/a; a combination product of fluroxypyr, 2,4-D, and dicamba), Celsius™ (0.2 lb ai/a; a combination product of thiencarbazone, iodosulfuron, and dicamba), trifloxysulfuron (0.03 lb ai/a), carfentrazone (0.03 lb ai/a), metsulfuron (0.02 lb ai/a), and fluroxypyr (0.47 lb ae/a). Visual ratings of percent control were recorded 1, 2, 5, and 7 weeks after treatment (WAT). Data was subjected to ANOVA ($P = 0.05$) and means were separated by Fisher's protected LSD ($P = 0.05$).

Carfentrazone controlled *H. brasiliensis* greater than all other treatments (52%) 1 WAT; however, control dropped to 13% by 7 WAT, at which time *H. brasiliensis* had recovered enough to bolt and bloom. At all rating dates, trifloxysulfuron controlled *H. brasiliensis* <10%. Metsulfuron and fluroxypyr were slow to control *H. brasiliensis*; however, by 5 WAT control from these herbicides was 70 and 87% respectively. Dicamba, 2,4-D, Trimec Southern, Escalade 2, and fluroxypyr all controlled *H. brasiliensis* 100%, 7 WAT.

CONTROL OF SMOOTH CRABGRASS (*Digitaria ischaemum*) WITH TWO FORMULATIONS OF DITHIOPYR AT VARIOUS STAGES OF GROWTH. G.K. Breeden and J.T. Brosnan; University of Tennessee, Knoxville, TN and P.E. McCullough; University of Georgia, Griffin, GA.

ABSTRACT

Smooth crabgrass (*Digitaria ischaemum*) is an annual grassy weedy of both warm and cool-season turf. While preemergence herbicides are commonly used for smooth crabgrass control, dithiopyr is a preemergence herbicide that has been reported to have postemergence activity against smooth crabgrass. Data describing the efficacy of dithiopyr for postemergence smooth crabgrass control are limited. Field research was initiated in the spring of 2009 in Knoxville, TN and Griffin, GA to evaluate the efficacy of dithiopyr for smooth crabgrass control at various stages of growth.

Research was conducted on mature bermudagrass (*Cynodon dactylon*) fairways at the East Tennessee Research and Education Center in Knoxville, TN and the University of Georgia Experiment Station in Griffin, GA. Plots (1.5 by 3 m) were arranged in a randomized complete block design with three replications. Herbicide treatments included dithiopyr 2EW (560 g ai/ha) and dithiopyr 40WP (560 g ai/ha) applied at the preemergence (PRE), 1-2 leaf, 1 tiller, and 3+ tiller stages of growth. These treatments were compared to quinclorac (840 g ai/ha) applied at the 1-2 leaf, 1 tiller, and 3+ tiller stages of growth. Dithiopyr treatments were delivered without a surfactant, while all quinclorac treatments were delivered with a methylated seed oil surfactant at 1.5 L/ha. Treatments were applied with a CO_2 powered boom sprayer calibrated to deliver 281 L/ha at the Knoxville location and 374 L/ha at the Griffin location. Weed control and turf injury were evaluated visually utilizing a 0 (no weed control or turf injury) to 100 (complete weed control or turf injury) % scale, relative to an untreated control. Data were collected every 2 weeks after each application (WAA).

At both locations, all PRE dithiopyr treatments controlled smooth crabgrass >90% on all rating dates. Similarly, all treatments applied in Knoxville and Griffin at the 1-2 leaf stage controlled smooth crabgrass ≥86% from 4 WAA through the end of the study. In Knoxville, all treatments applied at the 1 tiller stage controlled smooth crabgrass ≥88% from 4 WAA through the end of the study, while all dithiopyr treatments applied at the 1 tiller stage in Griffin controlled smooth crabgrass 70% (EW) and 84% (WP) at 4 WAA, and 81% to 86% at 8 WAA. Comparatively, quinclorac applied at the same growth stage controlled smooth crabgrass ≥98% at 4 WAA through the end of the study in Griffin. At the 3+ tiller stage in Knoxville, dithiopyr controlled smooth crabgrass 85% (WP) and 88% (EW) at 4 WAA, compared to 99% following treatment with quinclorac at the same growth stage; however, control with quinclorac applications at the 3+ tiller stage decreased to <70% by the end of the study in Knoxville. In Griffin, all treatments applied at the 3+ tiller growth stage controlled smooth crabgrass ≥81% at 4 WAA, except dithiopyr 40WP (51%). At both locations, all dithiopyr treatments applied at the 3+ tiller stage controlled smooth crabgrass ≤70% at 10 WAA. These data suggest applications of dithiopyr at 0.5 lb ai/a can provide postemergence control of crabgrass up to the 1 tiller stage of growth.

FLUROXYPYR COMPATIBILITY WITH FENOXAPROP FOR SMOOTH CRABGRASS AND WHITE CLOVER CONTROL IN TALL FESCUE. P.E. McCullough, University of Georgia; J.T. Brosnan, University of Tennessee; and G. Breeden, University of Tennessee.

ABSTRACT

Fenoxaprop effectively controls crabgrass (*Digitaria* spp.) in tall fescue [*Festuca arundinacea* Shreb.] turf. Antagonism with growth regulating herbicides reduces potential to apply fenaxoprop in combination with many products for broadleaf weed control. Fluroxypyr is a pyridinoxy acid, broadleaf herbicide which may have potential for use in mixtures with fenoxaprop. Field experiments investigated fenoxaprop efficacy for smooth crabgrass (*Digitaria ischaemum*) control when applied alone and in combination with either fluroxypyr or a pre-packaged mixture of 2,4-D, dicamba , and mecoprop (MCPP) in tall fescue.

Experiments were conducted on mature stands of tall fescue from June to August 2009 at the University of Georgia in Griffin, GA and the University of Tennessee in Knoxville, TN. Soil in Georgia was a Cecil sandy loam (fine, kaolinitic, thermic Typic Kanhapludults) with 4.6% organic matter and a pH of 5.6. Soil in Tennessee was Sequatchie loam soil (fine-loamy, siliceous, semiactive, thermic humic Hapludult), measuring 6.2 in soil pH and 2.1% in organic matter content. The tall fescue cultivar at each location was unknown. Irrigation at each location was applied to prevent wilt and both sites were mowed weekly at 6.4 cm height with clippings returned. Smooth crabgrass and white clover ground cover averaged 21% and 23%, respectively, on the day of initial treatments in Georgia, and 50% and 15%, respectively, in Tennessee.

Experimental design was a randomized complete block with four replications. Fenoxaprop (Acclaim Extra 0.57SC, Bayer Crop Science, Montvale, NJ 07645) was applied at 25, 50, 100, 200, or 400 g a.i./ha (0.36, 0.72, 1.43, 2.86, or 5.7 oz a.i./acre) alone, in combination with fluroxypyr (Spotlight 1.5L, Dow AgroSciences, Indianapolis, IN 46268) at 0.53 kg a.i./ha (0.47 lb a.i./acre), and in combination with a pre-packaged mixture of 2,4-D + dicamba + MCPP (hereafter delineated as three-way mixture). This three-way mixture was a prepackaged formulated product (Trimec Classic® 2.72 SL, PBI Gordon Corp., Kansas City, MO 64101) containing 237, 64, and 25 g/L (1.98, 0.53, and 0.21 lb/gal) of 2,4-D, dicamba, and MCPP, respectively; it was applied in combination with each rate of fenoxaprop at 4.7 L/ha (4 pt/acre) or 1.1, 0.29, and 0.12 kg a.i./ha, respectively (1, 0.26, and 0.11 lb a.i./acre). An untreated control was included in each block.

Treatments were applied on June, 10 2009 in Georgia and June 3, 2009 in Tennessee. In Georgia, treatments were applied to 1 x 4.5-m (3 x 15-ft) plots by making two passes in opposite directions with a single nozzle CO_2 pressured sprayer calibrated to deliver a total 375 L/ha (40 gal/acre). In Tennessee, treatments were applied to 1.5 x 3-m (5 x 10-ft) with a CO_2 pressured sprayer containing four flat-fan nozzles calibrated to deliver 280 L/ha (30 gal/acre). Sprayers in Georgia and Tennessee had 9504E and 8002 flat-fan nozzles, respectively (Tee Jet, Spraying Systems Co., Roswell, GA 30075).

Tall fescue injury was visually evaluated 2, 4, and 8 weeks after treatment (WAT) on a percent scale where 0 equaled no injury and 100 equaled dead turf. Smooth crabgrass control was also assessed visually on a percent scale, where 0 equaled no control and 100 equaled complete control (relative to the untreated control), at 2, 4, and 8 WAT. Data were subjected to analysis of variance at the 0.05 probability level with fenoxaprop, broadleaf herbicide, and location as variables. Treatment by location interactions were not detected, and thus, results were pooled over locations.

Smooth crabgrass control from mixtures of fenoxaprop and fluroxypyr was similar to fenoxaprop alone. Smooth crabgrass control with mixtures of fenoxaprop with 2,4-D, plus dicamba, plus MCPP was nearly 50% less than fenoxaprop alone. White clover was completely controlled from mixtures of fenoxaprop and fluroxypyr which was similar to fenoxaprop applied with 2,4-D plus dicamba plus MCPP. Tall fescue injury was not detected on any rating date. Results suggest tank-mixtures of fenoxaprop and fluroxypyr could provide effective control of smooth crabgrass and white clover in tall fescue.

POSTEMERGENCE CONTROL OF SWINECRESS IN A BERMUDAGRASS ROUGH. G.M. Henry, T. Williams, T. Cooper, and A.J. Hephner; Texas Tech University, Lubbock, TX 79409.

ABSTRACT

Lesser swinecress (*Coronopus didymus* (L.) Sm.) is a summer annual or biennial broadleaf weed that emerges from February to October with peaks of emergence in April and September. Tolerance to low mowing, heavy traffic, and prolific seed production has increased the prevalence of this weed in turfgrass environments. Field experiments were conducted at the Pecos County Municipal Golf Course in Fort Stockton, TX in the summer of 2009 to examine the postemergence control of lesser swinecress. Studies were located on established infestations of lesser swinecress 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 375 L/ha at 221 kPa. Treatments were initiated on June 19, 2009 and consisted of single or sequential applications of trifloxysulfuron at 0.028 kg ai/ha, single or sequential applications of metsulfuron at 0.072 kg ai/ha, single or sequential applications of carfentrazone + 2,4-D + mecoprop + dicamba at 0.22 kg ai/ha, and BAS 8004H at 0.050 kg ai/ha. Sequential applications were made on July 17, 2009. A non-ionic surfactant was applied with BAS 8004H treatments at a rate of 1% v/v. Visual estimates of percent lesser swinecress control and common bermudagrass phytotoxicity were taken 1, 2, 4, 6, and 8 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 common bermudagrass phytotoxicity was observed throughout the length of the trial regardless of treatment. Control with trifloxysulfuron and metsulfuron treatments was 92 to 100% 2 WAIT. BAS 8004H treatments exhibited 84% control 2 WAIT, while control with carfentrazone + 2,4-D + mecoprop + dicamba was only 13 to 25%. No differences were observed between single and sequential treatments 8 WAIT. Control with trifloxysulfuron, metsulfuron, and BAS 8004H treatments remained constant 8 WAIT (95, 95 to 100, and 88%, respectively). Control with carfentrazone + 2,4-D + mecoprop + dicamba decreased to 13 to 15% 8 WAIT.

TURFGRASS QUALITY AND CLIPPING RESPONSE TO PROHEXADIONE CALCIUM. S.D. Askew and J. B. Willis, Virginia Tech, Blacksburg; P. David, Gowan Company, Lititz, PA.

ABSTRACT

Prohexadione calcium (PC) is an experimental turfgrass growth regulator under evaluation in creeping bentgrass (*Agrostis stolonifera*), Kentucky bluegrass (*Poa pratensis*), and bermudagrass (*Cynodon dactylon)* and other turfgrass species. It is expected to be registered and marketed under the trade name Midori in the near future. Our objectives were to evaluate clipping response of three turfgrass species to rates of PC as compared to trinexapac ethyl (TE).

Three randomized complete block experiments were conducted with three replications each at Blacksburg, VA. Turf was mown at 13 mm and included 'Riviera' bermudagrass, 'L93' creeping bentgrass, and 'Midnight' Kentucky bluegrass. Turf was four years old and received cultural practices as per extension recommendations. Fungicides were applied as needed but no growth regulating fungicides were used. Treatments included PC at 140 and 280 g ai/ha with and without 0.25% v/v nonionic surfactant and trinexapac ethyl at 91 g ai/ha. All treatments were applied in 1120 L/ha water at 4 wk intervals throughout the summer. Ratings for turf quality were taken weekly and plots were mown three times weekly with clippings collected on the third mowing each week. Clippings were air dried and weighed. Data were subjected to ANOVA and average clipping weight over 15 weekly mowings were compared using Fisher's Protected LSD test at P=0.05.

Neither PC nor TE injured turfgrasses at any timing in any of the three trials. Both PC and TE improved turf quality at later rating dates when compared to nontreated turf. Addition of NIS seldom affected clipping response at any timing. PC was equivalent to TE for clipping reduction in almost all cases. PC reduced bermudagrass clipping weights faster than TE. Creeping bentgrass response was equivalent to TE in all cases. Based on these data, PC can decrease clippings and improve turf quality of creeping bentgrass, Kentucky bluegrass, and bermudagrass equivalent to TE.

TURFGRASS RESPONSE TO INDAZIFLAM. A.R. Post, J.L. Jester, and S.D. Askew, Virginia Tech Blacksburg VA; L. Norton, and D. Spak, Bayer Environmental Sciences, Clayton NC.

ABSTRACT

Indaziflam is a new preemergence herbicide soon to be registered for use in fine turf, ornamentals and industrial vegetation management. It is a cellulose biosynthesis inhibitor that has preemergent and limited postemergent activity to control annual weeds at low use rates. The turfgrass registration, under the trade name Specticle, will allow use on warm season turfgrass beginning early in 2010. Tolerance to cool season grasses has been variable and only warm season grasses are on the Specticle label. Our objective for this study was to evaluate turfgrass tolerance to indaziflam for three common cool season grasses and two warm season grasses in Virginia.

Six trials conducted in Blacksburg VA in 2007 evaluated turfgrass tolerance to indaziflam. All experiments were randomized complete block designs with three replications. Tall fescue (*Schedonorus phoenix* (Scop.) Holub.), perennial ryegrass (*Lolium perenne* L.), Kentucky bluegrass (*Poa pratensis* L.), bermudagrass (*Cynodon dactylon* (L). Pers.), and zoysiagrass (*Zoysia japonica* Steud.) were evaluated for indaziflam tolerance. Seven rates of indaziflam were evaluated including 25, 50, 75, 100, 150, 200 and 300 g ai/ha. These indaziflam treatments were evaluated against the industry standards of prodiamine (Barricade), dithiopyr (Dimension), oxadiazon (Ronstar), pendimethalin (Pendulum), and pendimethalin (Turf Builder with Haltz), at labeled rates and a nontreated check. These experiments were initiated in April and May 2007. Two studies examined Kentucky bluegrass and perennial ryegrass tolerance to indaziflam with and without the use of an experimental safener. These two trials were initiated in June 2007 and included treatments of indaziflam at 40 and 80 g ai/ha with two rates of an experimental safener as well as a safener only application and a nontreated control. Activated charcoal was also applied to these plots in strips, to evaluate its effects on indaziflam injury to turfgrass seedling establishment.

For the tolerance trials, only the highest rate of indaziflam caused noticeable injury to zosiagrass, and zoysia was more tolerant than bermudagrass. Zoysia and bermudagrasses tolerate indaziflam well even at high rates; however, as expected, cool season grasses are not as tolerant. At the three highest rates of indaziflam, perennial ryegrass is susceptible to carryover when over-seeding in the same year. Higher rates of indaziflam cause unacceptable injury to Kentucky bluegrass with the four highest rates injuring turf 38% or more. Indaziflam also injures tall fescue at 35% or more at the highest three rates by 28 days after treatment.

Based on this research, a rate of 150 g ai/ha could be considered a 2X safety margin as this rate had minimal effects on bermudagrass grow-in and fall establishment of perennial ryegrass and half this rate was enough to control weeds. The rate for zoysia can be increased without injuring turf, but with potential to affect perennial rye when overseeded in the same year. Kentucky bluegrass is injured by all but the lowest rates of indaziflam and its use in Kentucky bluegrass should be limited to rates of no more than 40 g ai/ha. Tall fescue can be treated with a rate 75 g ai/ha while still avoiding significant turf injury but stress tolerance may be reduced at this rate of indaziflam.

For tolerance trials using the safener: Kentucky bluegrass plots receiving the safening agent seemed to have higher turf quality, but results were inconsistent. For perennial ryegrass, at the 40 g ai/ha rate, the safener improved turf quality significantly compared to the nontreated control; however, the 80 g ai/ha rate was too injurious to observe a safening effect. Activated charcoal applied in a band to seeded perennial ryegrass plots significantly increased seedling emergence and improved turf quality. Plots treated with 80 g ai/ha had zero seedling emergence where no charcoal was applied. Based on these results the safener can be used to improve turf quality in cool season turfgrasses treated with indaziflam at rates at or below 40 g ai/ha and activated charcoal could be applied prior to perennial ryegrass over-seeding to improve seedling emergence and establishment.

ADJUVANTS INFLUENCE TRINEXAPAC-ETHYL EFFECTS ON BERMUDAGRASS CLIPPING PRODUCTION. Brendan M.S. McNulty, John B. Willis, and S.D. Askew. Virginia Tech, Blacksburg, VA; and Matt Shipp and David Lindsay, Evonik Goldschmidt Corporation.

ABSTRACT

Trinexapac ethyl (TE) is the most common plant growth regulator in turfgrass management. Cost of plant growth regulator treatments on golf courses can exceed $6000 annually and efforts to reduce costs can significantly impact golf course budgets. Recent advancements in organosilicone surfactant technology have led to new products that can potentially increase foliar and root absorption of plant protection chemicals. T-Nex™ is a commercial formulation of trinexapac-ethyl produced by Quali-Pro. Break-Thru™ is a trisilicone product under evaluation for use in turfgrass. The combination of these two products could allow for lower use rates of PGRs or to better performing formulations of commercial PGR products. Our objective was to evaluate three experimental trisilicone adjuvants used with two rates of TE for effects on turf clipping production and quality.

Field studies were conducted on fairway-height (13 mm) "Patriot" hybrid bermudagrass (*Cynodon dactylon x C. transvalensis*). Treatments were first applied on July 8, 2009 at the Glade Road Research Facility in Blacksburg, VA. Treatments were arranged in a randomized complete block design with 9 treatments and 4 replications. Turf was irrigated as needed throughout the study, fertilized each month with fairway-grade 24-0-10 fertilizer, and core aerated 2 weeks prior to study initiation. Ratings were taken weekly for 12 weeks after initial treatment and consisted of; dry clipping weight in grams (g), injury (%), color (1-9), and cover (%). Treatments were applied on July 8, August 5, and September 7, 2009. Treatments included trinexapac-ethyl (TE) at 48 and 96 g ai/ha alone and with 3 formulations of Break-Thru S200, S233 and S278 at 0.05% v/v. A nontreated check was also included for comparison.

Trinexapac ethyl at 48 g ai/ha never reduced clipping production of hybrid bermudagrass compared to NTC while TE at 96 g/ha always reduced clippings compared to NTC by approximately 50%. TE at 48 g/ha with Break-Thru 233 always reduced clippings compared to NTC by approximately 50% while addition of Break-Thru 200 and 278 reduced clippings compared to NTC significantly on 2 of 5 evaluations. TE at 48 g/ha with the addition of Break-Thru 233, 278, and 200 reduced bermudagrass clipping dry weights equivalent to TE at 96 g/ha without surfactant on 5, 5, and 1 dates, respectively out of five selected evaluation dates. Treatments did not injure bermudagrass at any rating date. Overall turf quality was increased by all TE containing treatments. The addition of the surfactant Break-Thru S233 may reduce the rate of trinexapax-ethyl needed to achieve desired results. Since plant growth regulator applications are applied approximately every 4 weeks, professional turf managers could potentially reduce costs by maximizing PGR effectiveness through use of an appropriate adjuvant.

***Poa annua* RESPONSE TO FOLIAR AND ROOT APPLICATIONS OF AMICARBAZONE AND ATRAZINE.** D.H. Perry and J.S. McElroy; Auburn University, Auburn, AL

ABSTRACT

Amicarbazone is a new photosystem II (PSII) inhibiting triazolinone herbicide being evaluated for weed control in certain cool-season turfgrass species. Susceptible plants are reported to exhibit root and foliar absorption with root uptake being predominant. Selective placement studies were conducted in a greenhouse to determine the relative importance of root versus foliar absorption of postemergence-applied amicarbazone in controlling annual bluegrass (*Poa annua* L.).

Annual bluegrass plants were grown in a Cahaba loamy sand (pH – 6.1) to the 3-4 tiller stage. Treatment placements included soil-only, foliar-only, and soil + foliar applications of amicarbazone (0.53 kg ai/ha) and atrazine (2.25 kg ai/ha). All foliar-only and soil + foliar treatments were applied in an enclosed spray chamber at 280 L/ha with 8002E nozzles. For soil-only applications, the appropriate rate of herbicide was diluted in 10 mLs of water and delivered to the soil surface. All herbicide solutions included a 0.25% v/v non-ionic surfactant. Treatments were organized in a randomized complete block design with six replications. Percent control ratings were assigned and photochemical efficiency (F_v/F_m) was measured (0 – 0.83) weekly using a modulated chlorophyll fluorometer. Measurements and ratings were collected 7, 14, and 21 days after application (DAA) at which time shoot clippings were collected, dry mass determined, and calculated as a percentage of the control. Root clippings were collected and processed as previously described 42 DAA. Data for annual bluegrass control and photochemical efficiency was subjected to ANOVA and means were separated using Fisher's protected LSD test (P = 0.05).

Annual bluegrass control was similar with amicarbazone and atrazine within each placement. Amicarbazone applied soil-only controlled annual bluegrass 71% 7 DAA, greater than foliar-only amicarbazone applications (33%). Amicarbazone applied soil-only significantly reduced photochemical efficiency compared to foliar-only amicarbazone applications 7DAA. Amicarbazone and atrazine applied soil-only and soil + foliar completely controlled annual bluegrass 21 DAA. Amicarbazone and atrazine applied foliar-only had similar shoot dry weights. Root weights were similar among amicarbazone and atrazine treatments 6 WAA. Although photochemical efficiency was similar among amicarbazone and atrazine for each placement 7 DAA, amicarbazone was lower in all cases and may indicate better efficiency at inhibiting PSII. Results of the selective placement study indicate that root absorption of amicarbazone is beneficial for annual bluegrass control.

COMPETITIVE EFFECTS OF CRABGRASS AND GOOSEGRASS ON 'ZENITH' ZOYSIAGRASS (*Zoysia japonica*) ESTABLISHMENT. M.C. Doroh, J.S. McElroy, R.H. Walker, and E.A. Guertal; Auburn University, Auburn, AL.

ABSTRACT

Establishment of zoysiagrass by seed is advantageous due to lower costs compared to vegetative establishment. Weed competition often slows seeded turfgrass establishment. The result of turfgrass-weed competition may be affected by management practices, weed density, and weed species present. In crop production systems, indices have been developed that rate the competitiveness (the ability to reduce crop yield) of weed species. In turfgrass systems, such indices have not been developed. Little is known about how turfgrasses compete with weed species during early developmental stages. Therefore, the objective of this research was to determine the competitive effects of smooth crabgrass [*Digitaria ischaemum* (Schreb. Ex Schweig.) Schreb ex Muhl.] and goosegrass [*Eleusine indica* (L.) Gaertn.] on the seeded establishment of 'Zenith' zoysiagrass (*Zoysia japonica* Steud.).

Competition studies were conducted in Winter 2008 at the Auburn University Weed Science greenhouse in Auburn, AL. The experiment was an additive design with three replications. Experimental units were 0.13 m^2 greenhouse flats. Zoysiagrass seeding rate was constant at 49 kg ha^{-1} pure live seed (PLS) while weeds (neighbor species) per unit area increased. Neighbor seeding rate was based on seed weight and germination percentage. Smooth crabgrass seed was obtained from Estel Farm and Seeds while goosegrass seed was collected from local populations. A sandy-loam soil with pH 6.1 was steam sterilized and subsequently mixed with Pro-mix (Pro-Mix TA, Premier Horticulture Inc., Quakertown, PA 18951) at 5:1 (soil:Pro-mix) to restore soil structure and water holding capacity. Treatments included: zoysiagrass-alon (monoculture); zoysiagrass plus 61, 185, 395, 674, or 898 neighbor plants (PLS) per experimental unit. These densities represent plant counts from preliminary studies using neighbor seeding rates of 4.9 to 49 kg ha^{-1}. Data collected from each experiment included: (i) Plant counts and developmental stage measurements at 2, 4, 6, and 8 weeks after seeding (WAS) from two 104 cm^2 samples per flat, and (ii) plant counts and dry weights of above-ground tissue harvested 8 WAS. Three categories of zoysiagrass developmental stage were organized: 'Leaf' stage represented by one to three leaf plants; 'Tiller 1' represented by one to four tiller plants; and 'Tiller 2' represented by five to eight tiller plants. Zoysiagrass dry weights were expressed as percent drymatter yield of the monoculture. Plant count and developmental stage data were analyzed using SAS® PROC MIXED (SAS Statistical Software. v. 9.1 Cary, NC).

Zoysiagrass development was reduced at all seeding densities by both weed species. No reduction in zoysiagrass development was observed from smooth crabgrass or goosegrass 4 WAS; however, reduction in zoysiagrass developmental stage (Tiller 1 and 2) was observed 8 WAS with increasing neighbor density. Therefore, data discussed hereafter applies to the 8 WAS rating date. Smooth crabgrass and goosegrass reduced Tiller 2 development to <20% at density of 185 neighbor plants. Tiller 1 development however, was not reduced by either species at this neighbor density. At the highest neighbor density, 898 neighbor plants, goosegrass eliminated zoysiagrass tillering entirely, whereas smooth crabgrass allowed >25% zoysiagrass plants to tiller. Neighbor species was significant for plant count and drymatter yield data. Additionally, density of weed species was significant for drymatter yield. Overall, percent zoysiagrass drymatter yield was reduced from 30 to 90% with increasing neighbor density. Goosegrass reduced drymatter yield 80% compared to a reduction of 52% from smooth crabgrass at neighbor density of 185 plants. Both weed species reduced drymatter yield >85% at the highest neighbor density of 898 plants. In agreement with developmental stage data, goosegrass reduced zoysiagrass drymatter yield greater than crabgrass at equivalent seeding density.

THE EFFECTS OF VARIOUS POSTEMERGENCE HERBICIDES ON THE ESTABLISHMENT RATE OF SELECTED EXPERIMENTAL INTERSPECIFIC HYBRID BERMUDAGRASSES. K. Koh[1], J.Q. Moss[1], D.L. Martin[1], K. Su[1], and Y.Q. Wu[2]; [1]Horticulture & Landscape Architecture, [2]Plant & Soil Sciences, Oklahoma State University, Stillwater, OK 74078.

ABSTRACT

Bermudagrass (*Cynodon* spp.) is the most desirable turfgrass for golf courses and other turfgrass areas in Oklahoma. Bermudagrass is widely used because it is aggressive, has good drought tolerance and is resistant or tolerant to many biotic pests. Bermudagrass is commonly propagated vegetatively through sodding, sprigging, or plugging. A high establishment rate is very important for turfgrass managers to utilize the area quickly and to regulate weed population in the area. The objective of this study was to evaluate the effects of various postemergence herbicides on the establishment rate of selected experimental interspecific hybrid bermudagrasses (*Cynodon dactylon* x *C. transvaalensis*) in Oklahoma. This study was conducted in Stillwater, OK at the Oklahoma State University Turfgrass Research Center. Three experimental interspecific hybrid bermudagrasses (OKC 1119, OKC 1134, and OKC 70-18) and one standard cultivar (Tifway) were used for this study. Plots (91 x 91 cm) were established with five 39cm^2 greenhouse-grown plugs on 15 July 2009 with four replications and herbicide treatments were applied at the maximum and double the maximum labeled rate for bermudagrass turf on 29 July 2009. Herbicide treatments were as follows: 1) Untreated control, 2) MSMA at 2.2 kg ai/ha, 3) MSMA at 4.4 kg ai/ha, 4) Quinclorac at 0.8 kg ae/ha, 5) Quinclorac at 1.6 kg ae/ha, 6) Metsulfuron at 0.025 kg ai/ha, and 7) Metsulfuron at 0.050 kg ai/ha. Herbicide phytotoxicity was assessed visually at 1, 2, and 4 weeks after treatment (WAT), and ratings were not significantly different from the untreated control on each rating date. Digital photographs were taken to measure percent bermudagrass coverage at 0, 1, 2, 4, 6, and 8 WAT. There was no significant herbicide x cultivar difference in percent bermudagrass coverage at 0, 1, 2, 4, or 6 WAT. There was a significant herbicide x cultivar difference in percent bermudagrass coverage at 8 WAT where Tifway, OKC 1119, and OKC 1134 were at or near 100% establishment regardless of treatment while OKC 70-18 establishment was significantly reduced in Quinclorac at 1.6 kg ae/ha, Metsulfuron at 0.025 kg ai/ha, and Metsulfuron at 0.050 kg ai/ha treated plots. When compared within a single bermudagrass selection/cultivar, Metsulfuron treatments significantly reduced bermudagrass coverage compared to the untreated control for all bermudagrasses used in this study while Quinclorac treatments significantly reduced bermudagrass coverage of OKC 70-18 only. During this study, the average daily temperatures in Stillwater, OK were below normal and may help to explain why there was no visual evidence of herbicide phytotoxicity in treated plots compared to control plots. This study will be repeated twice during spring and summer 2010 for further data collection and analysis.

COMPETITION BETWEEN KHAKIWEED AND BERMUDAGRASS UNDER SIMULATED COMPACTION. A.J. Hephner and G.M. Henry; Texas Tech University, Lubbock, TX 79409.

ABSTRACT

Khakiweed (*Alternanthera pungens* HBK.) is one of the most troublesome turfgrass weeds throughout the arid and semi-arid regions of the southern United States. Anecdotal evidence suggests that khakiweed prevalence has increased on golf courses, athletic fields, and home lawns due to tolerance of soil salinity, compaction, and traffic. Field experiments were conducted at the Quaker Research Farm in Lubbock, TX during the summer of 2009 to determine the competitive response of khakiweed to increasing levels of simulated compaction. Cup cuttings (10.2 cm) of khakiweed were removed from naturally occurring populations located in the rough of Meadowbrook Golf Course in Lubbock, TX. Cores were transplanted on June 12, 2009 into 'Tifsport' bermudagrass cut to 1.3 cm. Six cores were transplanted (18.3 cm apart) down the center of each plot measuring 1.5 x 3.0 m. Plots were arranged in a randomized complete block design with four replications of treatments. Fertilizer (16N-10.5P-9.9K) was applied at the time of transplant at a rate of 24.4 kg N/ha and monthly thereafter for the duration of the trial. Plants were watered daily with an automated irrigation system calibrated to deliver 5.0 cm/week. Cores were allowed to acclimate for 2 weeks to encourage rooting prior to the initiation of the trial. Compaction treatments were applied using a Brouwer Tr 224 Turf Roller and were initiated on June 26, 2009. Treatments consisted of no compaction, 3,173 N (4 passes), 3,173 N (8 passes), and 3,173 N (12 passes). Plant diameter measurements were recorded bi-monthly for the duration of the trial. Two diameter measurements were taken perpendicular to each other (the first measurement was taken in the largest diameter) and averaged to obtain the reported diameter of a plant at each sampling time. Lowest order curves giving high R^2 values were fit to the data for comparisons of plants subjected to different compaction treatments. Khakiweed plant diameters decreased as competition level increased 4 WAIT. Plants receiving no compaction exhibited diameters of 9.9 cm 4 WAIT. Plants receiving 3,173 N (4 and 8 passes) exhibited diameters of 8.4 cm, while plots subjected to 3,173 N (12 passes) had diameters of 7.0 cm 4 WAIT. Khakiweed plant diameter decreased 12 WAIT regardless of compaction treatment. Plants receiving no compaction exhibited diameters of 6.2 cm 12 WAIT. Plants receiving 3,173 N (4 and 8 passes) exhibited diameters of 5.0 cm, while plots subjected to 3,173 N (12 passes) had diameters of 3.7 cm 12 WAIT. Data suggest that khakiweed is tolerant to relatively high levels of compaction and may be competitive with bermudagrass under those conditions. This experiment will be replicated over time.

BERMUDAGRASS DIVOT RECOVERY IN RESPONSE TO DINITROANALINE PREEMERGENCE HERBICIDES. T. Cooper and G.M. Henry; Texas Tech University, Lubbock, TX 79409.

ABSTRACT

Dinitroanaline herbicides are widely used for preemergence weed control due to long-term soil persistence, low mobility, and high efficacy on small-seeded weed species. However, use of these herbicides may have adverse rooting affects on desirable stoloniferous turfgrass species when applied improperly. Experiments were conducted at the Plant and Soil Science Greenhouse Complex in Lubbock, TX during the fall of 2009 to determine the recovery of simulated bermudagrass divot injury in response to dinitroanaline herbicides. One-year-old ‘Tifway 419’ bermudagrass sod was transplanted on 9/18/2009 into 15.2 cm pots filled with a Brownfield Sandy Clay Loam (loamy, mixed, superactive, thermic Arsenic Aridic Paleustalfs) and allowed to acclimate for six weeks prior to trial initiation to encourage rooting. Bermudagrass was mowed three times weekly with hand-held grass sheers to a height of 1.3 cm to simulate a golf course fairway. Plants were watered daily with an automated irrigation system. Fertilizer (16N-10.5P-9.9K) was applied at transplant at a rate of 24.4 kg N/ha and monthly thereafter for the duration of the trial. A 10.2 cm cup-cutter was used to remove a core from the center of each pot. Cores were replaced with the soil previously described. Herbicide treatments were applied using a CO_2 backpack sprayer equipped with XR8004VS nozzle tips and calibrated to deliver 375 L/ha at 207 kPa. Herbicide treatments were applied on 10/30/2009 and consisted of oryzalin at 1.68 kg ai/ha, prodiamine at 1.05 kg ai/ha, pendimethalin at 2.5 kg ai/ha, and dithiopyr at 0.56 kg ai/ha. A non-treated check was included for comparison. The trial was arranged in a randomized complete block design with four replications of treatments. Digital photographs were taken at trial initiation and every two weeks throughout the duration of the trial (6 weeks) with a Nikon 10.0 megapixel camera mounted on a portable light box. Pictures were analyzed using WinCam 2007 software to determine % regrowth over bare soil. 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 regrowth was recorded for prodiamine, pendimethalin, and oryzalin treatments 2 WAIT. The non-treated check and dithiopyr treatments exhibited 8 and 3% regrowth, respectively, 2 WAIT. Prodiamine and oryzalin treatments still exhibited poor regrowth (3 and 0%, respectively) 6 WAIT. Pendimethalin, dithiopyr, and the non-treated check exhibited similar regrowth (15, 19, and 18%, respectively) 6 WAIT.

POSTEMERGENCE DANDELION CONTROL WITH DPX-MAT28. A.J. Hephner, T. Williams, A. Holbrook, T. Cooper, and G.M. Henry; Texas Tech University, Lubbock, TX 79409.

ABSTRACT

Field experiments were conducted at Meadowbrook Country Club in Lubbock, TX in the summer of 2009 to quantify the efficacy of DPX-MAT28 for the postemergence control of dandelion. Studies were located on established infestations of dandelion 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 375 L/ha at 221 kPa. Treatments were initiated on June 10, 2009 and consisted of liquid applications of DPX-MAT28 at 0.052, 0.078, and 0.105 kg ai/ha; a granular application of DPX-MAT28 at 0.078 kg ai/ha; and carfentrazone + 2,4-D + mecoprop + dicamba at 0.45 kg ai/ha. Visual estimates of percent dandelion control and bermudagrass phytotoxicity were taken 1, 2, 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. Bermudagrass phytotoxicity was greatest (19%) with applications of DPX-MAT28 at 0.105 kg ai/ha 2 WAIT. All other DPX-MAT28 treatments exhibited ≤ 10% phytotoxicity 2 WAIT. Bermudagrass recovery from DPX-MAT28 treatments was observed 4 WAIT. No bermudagrass phytotoxicity was observed in plots treated with carfentrazone + 2,4-D + mecoprop + dicamba throughout the length of the trial. All DPX-MAT28 treatments exhibited 100% dandelion control 4 WAIT, while control with carfentrazone + 2,4-D + mecoprop + dicamba was 95%. Control with carfentrazone + 2,4-D + mecoprop + dicamba decreased to 77% 12 WAIT, while control with DPX-MAT28 ranged from 90 to 96% 12 WAIT regardless of application rate. No differences in dandelion control were observed between liquid and granular applications of DPX-MAT28 throughout the length of the trial.

KUDZU CONTROL IN MISSISSIPPI FIELD TRIALS M.A. Weaver, C.D. Boyette and R.E. Hoagland. USDA ARS Stoneville, MS

ABSTRACT

Herbicidal control of kudzu was evaluated in 2007, 2008 and 2009 at three field sites in Mississippi. Many of the herbicides commonly recommended for kudzu control have substantial non-target toxicity, poor selectivity, high cost, long soil persistence, high soil mobility and / or high use rates. The present study evaluated other herbicides for efficacy in suppressing aboveground kudzu biomass in replicated field trials at three sites over three years. A single application of aminopyralid, triclopyr or metsulfuron resulted in at least 90 % kudzu suppression in the following season in at least two test sites. After a second year of treatment those herbicides and fluroxypyr produced at least 90 % kudzu suppression, however, 100 % kudzu control was reached on only a few test plots. Glyphosate, glufosinate and mesotrione were less effective in controlling kudzu. Given the rapid growth potential of kudzu complete eradication should be pursued. None of the herbicides evaluated here could reliably achieve eradication of mature kudzu with two applications, so additional control efforts would be required.

EVALUATION OF TREEVIX AND OTHER HERBICIDES FOR WEED CONTROL IN CITRUS. M. Singh and M.S. Malik; Department of Horticulture, University of Florida, Citrus Research and Education Center, Lake Alfred, FL – 33850.

ABSTRACT

Saflufenacil is a new pre emergence herbicide with trade name “Treevix”. It can provide both contact and residual weed control. The major objective of this study was to compare the efficacy and phytotoxicity of Treevix and its combinations with other herbicides. The experiment was conducted at Citrus Research and Education Center, Lake Alfred, FL. The citrus crop planted was sweet orange “Valencia” (*Citrus sinensis*). The soil type was Florida chandler fine sand. The major weeds infesting the test site included Florida pusley/Brazil pusley (*Richardia sp*), guinea grass (*Panicum maximum*), spanishneedles (*Bidens bipinatta*), purslane sp (*Portulacca sp*), dogfennel (*Eupatorium capillifolium*), spiny amaranth (*Amaranthus spinosus*), and common ragweed (*Ambrosia artemisiifolia*). The applications were made using tractor mounted sprayer fitted with 8002 nozzle and an off center flat spray nozzle. The sprayer was set to deliver 20 gpa at 40 psi pressure.

The treevix treatments provided minimal grass control (18%) by 56 Days after Treatment (DAT). The tank mix of Treevix and Touchdown HiTech provided higher (88%) guinea grass control compared to Treevix treatments alone. The tank mix of Treevix and Prowl H_2O provided 45 to 81% grass control throughout the duration of trial. Similarly, Rely and Gramoxone provided 70 and 78% grass control at 28 DAT. The grass control was less compared to Touchdown HiTech treatments. Touchdown HiTech (60 oz/A) provided up to 89% grass control. Similarly the tank mix of Envoke with Touchdown provided 73 to 90 % grass control compared to 48 to 66% control by Envoke alone. Tank mix of Touchdown with Princep and Touchdown with Princep and Callisto provided 71 to 90% weed control up to 56 DAT. Similarly, tank mix of Touchdown and Solicam provided up to 88% grass control. The residual control of treevix and other pre emergence herbicides as well as their tank mix with Touchdown started breaking by 56 DAT and the grass control started declining. Similarly, grass control from Rely and Gramoxone started declining by 56 DAT. However, the treatments containing Princep, Callisto, and Solicam still showed >70 % control up to 56 DAT.

The treevix alone provided 56% control of Florida pusley and 83% control of spanishneedles at 28 DAT. The tank mix of Prowl H_2O with treevix provided 68 to 86% control of broadleaf weeds at 28 DAT. Similarly, broadleaf weed control with Rely and Gramoxone varied from 63 to 93% at 28 DAT. The weed control by Rely and Gramoxone was comparable to Touchdown. Envoke alone and tank mixed with Touchdown provided 60 to 73% control of Florida pusley 28 DAT. The broadleaf weed control from tank mix of Touchdown HiTech with Princep, Princep + Callisto, and Solicam provided 75 to 79% Florida/Brazil pusley control at 28 DAT. However, the weed control started declining at 56 DAT with 56 to 65% Florida/Brazil pusley control from Touchdown HiTech, Rely, and Gramoxone. Similarly, all the herbicide treatments also provided as high as 91% spanishneedles control up to 28 DAT. However, the spanishneedles control from Treevix alone declined to 69% at 56 DAT. Other herbicide treatments provided good spanishneedles control (79 to 86%) up to 56 DAT. Similarly, Envoke alone and in combination with Touchdown provided 71 to 93% broadleaf control. Envoke caused some initial injury to valencia trees (5 to 9%) up to 56 DAT. However, valencia plants recovered later and there was no citrus injury by 86 DAT.

IMPACT OF CORN GLUTEN MEAL AS AN ORGANIC HERBICIDE ON SQUASH PLANT SURVIVAL AND YIELDS. C. L. Webber, III, J. W. Shrefler, and L. P. Brandenberger; USDA-ARS-SCARL and Oklahoma State University, Lane, OK.

ABSTRACT

Organic vegetable producers rank weeds as one of their most troublesome, time consuming, and costly production problems. Corn gluten meal (CGM) is an organically approved, non-selective preemergence or preplant-incorporated, herbicide that inhibits root development, decreases shoot length, and reduces plant survival. The challenge with CGM is to control weeds while protecting direct-seeded crops. The development of a mechanized application system for the precise placement of CGM has increased its potential use and safety for organic vegetable production, especially in direct-seeded vegetables. The objective of this research was to determine the impact of banded CGM applications on direct-seeded squash (*Cucurbita pepo* L.) plant survival and yields. All plots were kept weed-free throughout the grow season to isolate the impact of the CGM applications on squash crop safety and yields. Neither CGM formulation (powdered or granulated), nor incorporation method (incorporated or non-incorporated), resulted in significant differences in plant survival or squash yields. However, the banded application resulted in significantly greater crop safety and yields than the broadcast (solid) applications. It was demonstrated that banded applications of CGM may be useful in direct-seeded squash production and other direct-seeded vegetables.

WEED MANAGEMENT AND CROP TOLERANCE WITH V-10142 IN SWEET POTATO. D.K. Miller, T.P. Smith, and M.S. Mathews, LSU AgCenter, Baton Rouge, LA.

ABSTRACT

A field study was conducted in 2009 at the Sweet Potato Research Station near Chase, La. to evaluate crop safety and weed control benefits with V-10142 in sweet potato. The study was conducted in a randomized complete block design with four replications. Treatments were applied at 15 GPA. Treatments evaluated included PRE transplant application of V-10142 at 0.1 or 0.2 lb ai/A alone, V-10142 at 0.2 lb ai/A in combination with Command at 1.3 pt/A or Valor SX at 3 oz/A, Command alone at 1.3 pt/A, Valor SX alone at 3 oz/A; Valor SX at 3 oz/A in combination with Command at 1.3 pt/A applied PRE transplant followed by V-10142 at 0.15 lb ai/A 16 days POST transplant alone or in combination with Dyne-a-Pak at 1% v/v, NIS at 0.25% v/v, or with no surfactant; and Valor SX at 3 oz/A plus Command at 1.3 pt/A and V-10142 at 0.15 lb ai/A applied PRE transplant followed by V-10142 at 0.15 lb ai/A in combination with Dyne-a-Pak at 1% v/v. Variety Evangeline was transplanted on July 14 to a silt loam soil with pH 5.8. Parameter estimates included visual crop injury 14 d after PRE transplant application. In addition, crop injury and weed control 19 and 35 d after POST transplant application was evaluated.

At 14 d after the PRE transplant application, V-10142 at 0.2 lb ai/A in combination with Valor SX at 3 oz/A resulted in 14% visual injury in the form of chlorosis and reduced plant growth. V-10142 applied alone at 0.2 lb ai/A resulted in 9% visual injury, which was greater than injury for the 0.1 lb ai/A rate (2%) and Valor SX alone at 3 oz/A (2%), and equal to that observed with Valor SX at 3 oz/A in combination with Command at 1.3 pt/A (5 to 9%) and V-10142 at 0.2 lb ai/A applied in combination with Command at 1.3 pt/A (6%). At 19 d after the POST transplant application, no treatment resulted in greater than 68% barnyardgrass control. V-10142 at 0.2 lb ai/A applied alone resulted in 84, 95, 100, and 100% control of cutleaf groundcherry, yellow and purple nutsedge, smooth pigweed, and carpetweed, respectively, which was greater than or equal to all other treatments. Browntop millet control with V-10142 applied alone was no greater than 43%. Sweet potato plants had almost completely recovered from PRE transplant application for all treatments (<5 %). Application of V-10142 16 d POST transplant at 0.15 lb ai/A with or without surfactant resulted in injury in the form of chlorosis/purpling and reduced growth ranging from 29 to 48%. At 35 d after POST transplant application, V-10142 applied PRE transplant at 0.2 lb ai/A resulted in 73, 95, 100, and 100% control of cutleaf groundcherry, yellow and purple nutsedge, smooth pigweed, and carpetweed, respectively, which was greater than or equal to all other treatments. Due to poor grass control earlier, a graminicide was applied prior to the 35 d POT transplant rating. Injury following POST transplant application of V-10142 with no surfactant was only 3%, however, addition of surfactant resulted in injury from a range of 11 to 18%. Roots were exposed to prolonged saturated soil conditions due to excessive rainfall received prior to harvest. These conditions resulted in the integrity of roots being compromised and extreme variability in yield, therefore, yield data is not discussed.

Control of weeds evaluated in this study, with the exception of barnyardgrass and browntop millet, and crop tolerance was equal to or better than currently available herbicides in sweet potato with V-10142 at 0.2 lb ai/A PRE transplant. POST transplant application of V-10142 resulted in significant injury to sweet potato plants.

DOUBLE KNOCKOUT ROSE TOLERANCE TO OVERHEAD APPLICATIONS OF SEDGE KILLING HERBICIDES. R.E. Strahan, Y. Chen, J.S. Beasley, and S. Borst; Louisiana State University, Baton Rouge, LA

ABSTRACT

A container study was conducted in 2009 at the Burden Research Station in Baton Rouge, LA to evaluate the tolerance of pink double knockout roses to over-the-top applications of common sedge killing herbicides. Treatments included halosulfuron, sulfosulfuron, imazaquin and an unsprayed check. Herbicides were applied as a spray directly over the top of roses at 1X and 2X labeled rates with a CO_2 pressurized backpack sprayer equipped with 11004 XR flat fan nozzles that delivered 43 GPA or 1 gallon of spray volume per 1000 ft^2. Experiments were conducted on healthy pink knockout roses established in 1 gallon containers. Existing blooms were removed for all treatments prior to herbicide application to more effectively determine the influence of the herbicides on flowering. Data collected included weekly visual ratings of percent foliar injury, plant height, and flower quality and number. The experimental design was a randomized complete block with 3 replications. Each treatment had two subsamples. Data were subjected to analysis of variance (P=0.05) and means were separated using Fisher's Protected LSD.

No herbicide evaluated caused unacceptable levels of chlorosis or leaf malformation. However, imazaquin significantly reduced plant height at 40 days after treatment (DAT) regardless of herbicide rate; whereas, halosulfuron and sulfosulfuron caused no negative effects on height for the duration of the study. No significant differences were observed in flowering 20 DAT. There was a trend of delayed flowering with roses treated with halosulfuron and sulfosulfuron for at least 30 DAT that would probably not be acceptable commercially. Roses treated with halosulfuron and sulfosulfuron produced flower numbers equivalent to the untreated check by 40 DAT. However, imazaquin applied at the 1x rate produced very few flowers and imazaquin applied at the 2x rate did not produce any flowers 40 DAT. Roses treated with imazaquin at the both the 1x and 2x rates fully recovered by 100 DAT and flower production and plant height were equivalent to the untreated check.

UNIVERSITY OF ARKANSAS: THE NEW IR-4 GLP RESEARCH CENTER FOR REGION 4 IN 2009. L. E. Estorninos, Jr. and N. R. Burgos. University of Arkansas, Fayetteville, AR.

ABSTRACT

The IR-4 Project (Interregional Research Project #4) was established through the collaborative program of the United States Department of Agriculture (USDA) and state agricultural experiment stations (SAES) to help specialty crop growers by developing data to support and to expedite registration and clearances for newer, reduced risk products. The Field Research Center (FRC) at the University of Tennessee was decommissioned in 2008 and IR-4 selected the University of Arkansas as the new FRC in 2009. The new FRC is housed at the Department of Crop, Soil, and Environmental Sciences, University of Arkansas in Fayetteville with research sites at the Fruit Research station in Clarksville and Vegetable Research Station in Kibler, AR. The Arkansas FRC conducted a total of 10 field residue trials in 2009 including the carryover residue of acitochlor herbicide on snapbeans for 2010. Included were residue tests of: diflubenzuron insecticide on peach fruits (1); lambda-cyhalothrin insecticide on okra, methoxyfenozide insecticide and quizalofop herbicide on Grain Sorghum; fenfropathrin insecticide on sweet potato and mustard greens; cyhalothrin + fludioxonil fungicide (2) on mustard greens; and acetamiprid insecticide on mustard greens. Greenhouse and field residue trials are planned for 2010.

ECONOMICS OF WEED SUPPRESSION IN PLASTICULTURE TOMATO USING BRASSICACEAE COVER CROPS AS A METHYL BROMIDE ALTERNATIVE. S.K. Bangarwa, J.K. Norsworthy, M.J. Wilson, J. DeVore, E. McCallister; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville. R. Rainey; Department of Agricultural Economics and Agribusiness, University of Arkansas Cooperative Extension Service, Little Rock.

ABSTRACT

Methyl bromide has been an effective foundation of broad-spectrum weed control in polyethylene-mulched tomato production. However, due to its ozone-depleting nature, methyl bromide is to be banned in U.S. agriculture. Thus, an effective and economically viable alternative to methyl bromide is required. A field experiment was conducted to compare the weed control and economics of tomato production associated with Brassicaceae cover crops and methyl bromide under low density polyethylene mulch (LDPE) and virtually impermeable film (VIF) mulches. Three different Brassicaceae cover crops, turnip 'Seventop', oriental mustard 'Pacific Gold', and a blend of white and brown mustard 'Caliente' were evaluated. One half of each plot was kept weed free by hand weeded while the other half was maintained as weedy check. The time to weeding was recorded in weed free half, whereas the second half was rated for crop injury and weed control at biweekly intervals. No injury was observed in tomatoes from any Brassicaceae cover crop, but weed control levels were below satisfactory. Due to high weed infestations, hand weeding cost in cover crop plots increased significantly compared to MeBr. In addition, partial budget analysis was used to evaluate net return from Brassicaceae cover crops as a methyl bromide alternative.

GENE FLOW OF GLYPHOSATE RESISTANCE IN PALMER AMARANTH (*Amaranthus palmeri*). D.N. Ribeiro[1], D.R. Shaw[1], V.K. Nandula[1], B.S. Baldwin[1], K.N. Reddy[2] and J.A. Huff[1]; [1]Department of Plant and Soil Sciences, Mississippi State University, Starkville, MS; [2]Crop Production Systems Research Unit, USDA/ARS, Stoneville, MS

ABSTRACT

The herbicide glyphosate is considered by many as the most important herbicide ever developed. Repeated applications of this highly effective herbicide impose strong selection against susceptible biotypes. Evolved resistance to glyphosate has been reported in sixteen weed species, including Palmer amaranth. Seeds of suspected resistant Palmer amaranth populations were collected across the Mississippi Delta and screened for glyphosate resistance (0.84 kg ae ha^{-1} glyphosate formulated as Roundup® Weathermax, 0.54 kg ae L^{-1}). Subsequently, the populations that confirmed resistance to glyphosate were evaluated by whole-plant dose-response bioassay. The two biotype populations with the highest level of glyphosate-resistance (R-I and R-II) and one susceptible (S) biotype were grown in isolation to facilitate pollination between female and male plants of each biotype, as Palmer amaranth is dioecious. Afterward, with the objective to proceed with studies of resistance segregation patterns, reciprocal crosses were made between the S and R (I and II) biotypes by contact method, and seeds were harvested at maturity. Plants from parental lines and from ♀S X ♂R-I (Female-S X Male-R-I), ♀R-I X ♂S, ♀S X ♂R-II and ♀R-II X ♂S first controlled crosses were allowed to grow and were used for dose-response experiments. Plants at the 4-leaf stage were sprayed with glyphosate: 0.0, 0.42, 0.84, 1.68, 3.36 and 7.04 kg ha^{-1}. Treatment consisted of 18 pots, each with one plant, for each parental biotype and first controlled cross progeny with three replications. Replicates were arranged in a completely randomized design. Two weeks after treatment, shoots were clipped at soil level and fresh weight was determined. The GR_{50} (herbicide rate required to reduce growth by 50%) was calculated from the log-logistic model. The calculated GR_{50} of the S parent was 179 g ha^{-1}, R-I parent was 458 and R-II was 615 g ha^{-1}, which gave a resistance factor of 2.6 and 3.5, respectively. The crosses ♀S X ♂R-I (503.6 g ha^{-1}), ♀R-I X ♂S (932.6 g ha^{-1}), ♀S X ♂R-II (970.1 g ha^{-1}), and ♀R-II X ♂S (442.3 g ha^{-1}) showed resistance response. Variance around each mean was substantial, making clear determinations difficult. Based on the reciprocal crosses, there do not appear to be maternal effects evidenced in this dose-response assay. Nuclear inheritance is confirmed by most others examples of herbicide resistance studied. Based on this, we assumed no maternal effect, and combine the data from reciprocal crosses to double sample number for each treatment. Dosage curves indicate higher resistance levels of first controlled crosses when compared with the paternal glyphosate-resistant biotypes indicating that glyphosate resistance in Palmer amaranth would likely be conferred as a completely dominant trait, or epistatic effects are present. However, these results may also manifest in the hybridization between R and S populations, imparting robustness to the first controlled cross plants making them more resistant than their resistant parent. To ascertain whether glyphosate resistance inheritance is monogenic or polygenic, future studies of segregation of resistance traits in second and third controlled crosses would be performed. Palmer amaranth is dioecious and wind pollinated. Recessive resistance would be less effective in the case of cross-pollinated reproduction, because continuous crossing would mask the recessive mutation. Consequently, continued use of glyphosate will increase R alleles, but maintain S alleles in the population. The increase in allelic frequency coupled with wind dissemination indicates that R gene flow is likely to continue to spread in Palmer amaranth. Maintenance of the S alleles would seem to suggest that reversal of this trend is possible when selection pressure is removed.

DOES LEAF MANIPULATION AFFECT LEAF APPEARANCE IN ITALIAN RYEGRASS? R.D. Williams and P.W. Bartholomew; USDA-ARS-GRL, Langston University, Langston, OK.

ABSTRACT

Mechanical stimuli such as rubbing, shaking, or flexing plants can alter their growth rates and morphologies. Plant response to mechanical stress can result in delayed plant growth, reduced leaf size, shortened and thickened stems, and reduced yields. Repeated measurements, such as leaf counting or measuring leaf length or area, can also affect plant growth. In earlier field and growth chamber studies leaf and tiller appearance rates were greater in Italian ryegrass (*Lolium multiflorum* Lam.) seedlings grown in chambers than in the seedlings grown in the field. Differences between the field and chamber studies may be attributed in part to differences in soil moisture, soil bulk density and temperature. However, the effects of mechanical stimulation due to leaf manipulation during counting or of wind disturbance of plants in the field have not been determined. Here we report the results of a growth chamber study where Italian ryegrass seedlings were undisturbed, periodically disturbed by leaf counting, and shaken for 30-min daily in addition to the periodic leaf counting. There was no significant difference in the leaf or tiller appearance or number between the counted and counted plus shaking treatments. Nor was there a significant difference among the treatments as to total, shoot or root dry weights. We conclude that routine manipulation of ryegrass seedlings is unlikely to produce measurable impact on seedling development and growth.

INTRODUCTION

Plants respond to repeated touching or mechanical stimuli (e.g. wind, rainfall, animal movements) by altering their growth and morphology. This plant response is referred to as thigmomorphogenesis and is well documented in the literature (3, 10). Although these responses are well known they are often ignored in studies where successive leaf counts, plant measurements, or harvests are made (5). In field and growth chamber studies the leaf and tiller appearance in Italian ryegrass (*Lolium multiflorum* Lam.) is consistently higher in the chamber work (1, 2). Part of this difference has been attributed to soil moisture, soil bulk density, and temperature effects. However, two factors have not been considered. These are plant movement in the field due to wind, and the mechanical stimulus provided during leaf counting in both the field and growth chamber studies. Plants exposed to wind develop fewer, smaller leaves with a higher proportion of mechanical tissue, shorter and thicker stems for support, and greater anchorage to the ground with increased root mass (4, 7, 8, 12, 13). Plants respond to periodic stroking or shaking in a similar manner (9, 10). Klaring (11) reported that non-destructive mechanical measurements reduced stem elongation, leaf area and yield in sweet pepper (*Capsium annuum* L.). It could be that some of the differences in the leaf and tiller appearance reported earlier in Italian ryegrass seedling growth are a response to the mechanical stimulus provided by leaf counting. Here we determine the effects leaf and tiller counting and shaking (seismic stress) on Italian ryegrass seedling leaf and tiller appearance. Our hypothesis is that the combination of leaf counting with shaking will reduce the leaf and tiller appearance rate.

MATERIALS AND METHODS

Individual seedlings of Italian ryegrass cv. Marshall were used in all experiments. Seedlings were grown in 358 mL containers filled with Baccto potting medium (Michigan Peat Co., Houston, TX) containing 900 g kg^{-1} reed sedge peat + 100 g kg^{-1} perlite and sand, as the growing medium. Plants were maintained in growth chambers (Percival Scientific Inc., Perry, IA) with a 12-h photoperiod (0600 to 1800 hours) with an average photosynthetic photon flux density (PPFD) of 285 μMol m^{-2} s^{-1} at canopy height. Light input was monitored during the study with a quantum sensor (LI-COR Inc., Lincoln, NE). Chamber temperature was maintained at a constant 20°C. Plants were thinned to the largest plant 3 days after emergence. Containers were watered as necessary to keep the surface of the potting soil moist, and no nutrients were supplied during the study.

Mechanical stress was applied by placing plants on a rotary shaker positioned inside the growth chamber. Plants were shaken for thirty minutes each morning (0700 to 0730) at 102 RPM, which gently moved the plant stems from side to side. At 2 to 3 day intervals over a period of 30 days the total number of leaves visible on the each seedling mainstem was counted and recorded. A separate group of plants were only manipulated during the leaf counting, while a third group of plants received the minimum disturbance during watering and when plants were moved within the chamber every 2 to 3 days to reduce chamber affects. Movement of the plants by air currents within the chambers was negligible. Manipulation of the plants by counting leaves was minimal at the beginning of the study (<2 minutes per plant), but towards the end of the study, when secondary tillers and leaves were counted, the disturbance was greater (> 5 minutes per plant). The plants were harvested after the final leaf count at 30 days.

Roots were carefully washed from the potting soil, and the plants were separated in to root and shoot material, which was dried at 65°C for 72 h. There were four replications for each treatment. The study was repeated three times and the data combined for statistical analysis. Treatment effects on leaf number and plant dry weight were analyzed as a completely randomized design.

RESULTS AND DISCUSSION

There was no significant difference as to the number of leaves, or the rate of appearance, on the mainstems between the shaken and counted treatments (Figure 1). At 30 days the mainstems had a mean of six leaves regardless of treatment. Although the number of higher-order tillers and total number of leaves associated with these tillers (Figure 2) were slightly greater for the shaken + counted treatment these values were not significantly different from the counted-only treatment. There was no visible difference in the control plants as compared to the shaken +counted and counted-only plants.

Mean total dry weight of plants that received the shaken + counted treatment was 621± 49 mg (mean ± SE), which was slightly greater than the control (579±32 mg) and counted only (579±44 mg) treatments, but these differences were not significant. There was also a non-significant increase in the shoot dry weight for the treatments with the mechanical stimuli as compared to the control. Mean shoot dry weights for the control, counted-only and shaken + counted treatments were 414±20 mg, 424±31 mg, and 440±37 mg, respectively, but the differences were not significant. Mean root weight of the plants that were shaken +counted was slightly greater (172±18 mg) than either the control (165±15 mg) or the counted only (155±14 mg) treatments, but these differences were not significant. Other studies have reported increases in root structure and dry matter due to mechanical stimuli. In a field study (4) noted that non- supported wheat (*Triticum aestivum* L.) plants had greater anchorage, 'coronal', roots than the supported plants. Goodman and Ennos (6) found that flexing sunflower (*Helianthus annuus* L.) and corn (*Zea mays* L.) stems increased the root dry weight as compared to the untreated control, which was associated with only a slight decrease in shoot weight and height, and similar results in root dry weight difference were observed in a field study (7).

Plants that received the mechanical stress in addition to manipulation for counting were slightly larger than plants receiving the manipulation due to counting only. However, there was no significant difference between these two treatments, nor was there a difference between the plants that received some form of manipulation during the growing period and the control plants. Based on these results we reject our earlier hypothesis and suggest that mechanical disturbance during leaf counting did not affect leaf or tiller appearance in Italian ryegrass seedlings.

CONCLUSIONS

De Boeck et al. (5) suggest that the "observer effect" is often neglected in plant science studies and the continuous sampling or measurements may affect the outcome of the experimental results. In other studies, shaking or stroking plants reduced plant height, delayed leaf elongation, and caused thickening of the stem tissues (3, 10). In the present study, mechanical stimulation of Italian ryegrass did not alter either the number of leaves, time of appearance, or dry weight. A more pronounced mechanical stimulus (wind, or animal disturbance or rubbing) might affect Italian ryegrass leaf and tiller appearance and those factors will be evaluated in future research.

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INFLUENCE OF SAFLUFENACIL ON THE ABSORPTION AND TRANSLOCATION OF ^{14}C GLYPHOSATE IN GLYPHOSATE-RESISTANT AND -SUSCEPTIBLE HORSEWEED (*Conyza canadensis*). T. W. Eubank[1], V. K. Nandula[1], K. N. Reddy[2], and D. R. Shaw[3]: [1]Delta Research and Extension Center, Mississippi State University, Stoneville, MS 38776. [2]USDA-ARS, Stoneville, MS 38776. [3]Mississippi State University, Mississippi State, MS 39762.

ABSTRACT

Glyphosate-resistant (GR) horseweed has become a widespread problem in many row crop production systems across the United States. Saflufenacil is protoporphyrinogen oxidase inhibitor being marketed by BASF under the trade name Kixor. Saflufenacil has shown promise has an alternative control option for GR horseweed. Previous field research has shown that 0.025 kg ai/ha saflufenacil and 0.84 kg ae/ha glyphosate applied separately to GR horseweed gave 85% and 71% control, respectively. A tank-mix of saflufenacil and glyphosate improved GR horseweed control to 97%. Further greenhouse research found that the combination of saflufenacil and glyphosate were additive under Colby analysis on both glyphosate-resistant (MDOT) and -susceptible (S102) horseweed. The objective of this study was to determine if saflufenacil influenced the uptake and translocation of glyphosate.

Individual horseweed plants from MDOT and S102 were grown to 10 to 15 cm in diameter in a greenhouse with supplemental lighting. Treatments included: glyphosate at 0.4 kg ae/ha; saflufenacil at 0 and 0.0125 kg ai/ha; and COC at 0 and 1% v/v. The youngest fully expanded leaf was covered with foil to prevent contamination from pre-treatments. Pre-treatments were applied using an air-pressurized indoor spray chamber equipped with an 8002E flat-fan nozzle calibrated to deliver a spray volume of 140 L/ha. Four solutions, which corresponded to their respective mixture, were prepared containing ^{14}C-phosphonomethyl-labeled glyphosate acid (54 mCi mmol^{-1} specific activity, and 99% purity). Within 30 minutes after pre-treatment a 10 µl volume of each respective solution was applied to the adaxial surface of the previously foil-covered leaf with a micro-syringe. Plants were harvested at 24, 48 and 72 h after treatment (HAT). Treated leaves were washed in 10 ml of methanol then partitioned into treated leaf, all other leaves, crown and roots. Plants were oven dried, weighed and combusted in a biological oxidizer and evolved CO_2 was captured and quantified by liquid scintillation spectrometry. Recovery of ^{14}C-glyphosate was 97% of total applied.

Results indicate that there was a significant difference in absorption of ^{14}C-glyphosate by horseweed population in that S102 absorbed 9% more glyphosate than MDOT. There were no significant differences in ^{14}C-glyphosate absorption due to the addition of saflufenacil. No significant differences in translocation of ^{14}C-glyphosate were seen across horseweed populations; however, translocation was significantly less in treatments which contained saflufenacil. The reduction in translocation was likely due to the rapid action of saflufenacil and the necrosis of plant tissues thereby limiting timely translocation to other plant parts. These results suggest that the absence of saflufenacil effect on ^{14}C-glyphosate absorption may have resulted in an additive interaction of glyphosate and saflufenacil.

MORPHOLOGICAL CHARACTERIZATION AND GERMINATION BEHAVIOR OF ITALIAN WEEDY RICE. S. Fogliatto, F. Vidotto and A. Ferrero; Università degli Studi di Torino, Grugliasco, TO , Italy.

ABSTRACT

Weedy rice (*Oryza sativa* L.) is one of the most troublesome weeds in rice production worldwide. Infestations are widespread in all European rice cultivation countries, reaching about 40-75% of the total area of rice cultivation. In Italy which has more than 50% of the total European rice area, weedy rice infestations are becoming more and more severe since the early ‘60s because of shifting from transplanting to direct sowing, the introduction of semi-dwarf Indica type varieties and the presence of the weed seeds in commercial rice seeds. Weedy rice shows diverse anatomical, biological and physiological traits that make the weed more competitive with cultivated rice. Moreover, a large number of weedy rice populations have dormant seeds that contribute to build up of thesoil seed bank. The objective of this study was to investigate the biological diversity of Italian weedy rice through morphological characterization and an assessment of dormancy of the most prevalent populations. Seed collection of weedy rice was conducted during the summer of 2008 from a rice area of about 130,000 ha in North- West Italy. The surveyed area was divided into 40 zones and one or two representative fields were selected per zone. Seed collection was based on different plant morphological traits, identifying 151 populations. In spring 2009, the collected populations were sown in the field to avoid confounding with environmental effects. Germination test and a morphological characterization were conducted. The germination test was carried out immediately after harvest (0 Day of After-Ripening), at 10 DAR and at 30 DAR in Petri dishes at constant temperature (25°C). Evaluation of plant traits was performed in the field, recording the following characteristics: stem length, node color, tillering ability, flag leaf length, angle of flag leaf blade, distribution of awned grains in panicle, panicle length, panicle angle, angle of panicle branches and time of maturity. Seed traits were evaluated in the laboratory. The following seed traits were measured: hull color, grain length, grain width, awn length, seeds per panicle, weight of 1000 seeds and on dehulled grains: length, width and color. The results of the germination test showed that the awnless seeds exhibited a higher germination capacity compared to mucronate and awned populations. Moreover, blackhulled and brownhulled seeds, that are usually awned, have a higher dormancy. After-ripening influenced dormancy breaking process, even if the maximum germination at 30 DAR was still low for many populations (about 20%). Within the same populations, the different biotypes presented a wide range of germination capacity at the end of the after-ripening period. Different collection zones did not show a clear effect on dormancy behavior of the populations, however the Southern areas displayed a significant higher germination. Within each zone a variability in the germination capacity was recorded according to the presence of different populations. The morphological assessment showed that weedy rice plants were usually taller than cultivated rice, but no differences among weedy rice populations were showed when they were grouped by seed traits. Brownhulled populations showed the highest values on awn length, grain length and width. The results of this study confirmed that Italian weedy rice populations have a large variability in term of dormancy behavior and morphological characteristics, that results in a high adaptability to different cultivation environments and makes the management of the weed quite difficult.

ABSORPTION OF PARAQUAT IN CORN AS INFLUENCED BY PSII INHIBITORS. R.A. Salas[1], N.R. Burgos[1], N. Polge[2], K. Smith[1], and J. Mattice[1]; [1]University of Arkansas, Fayetteville, AR and [2]Syngenta Crop Protection Inc., Vero Beach, FL

ABSTRACT

Paraquat , a quick-acting and non-selective contact herbicide, is used to desiccate vegetation prior to planting and eliminate remnants of a failed corn crop. However, corn treated with paraquat oftentimes regenerates from the tissue below ground. It was observed by previous studies that paraquat efficacy can be enhanced by adding a PSII inhibitor. This study aimed to evaluate the effects of PSII inhibitors, such as atrazine and diuron, on the absorption of paraquat into corn leaves at various times after herbicide application. Ten herbicide treatments composed of paraquat (0.313 and 0.625 lb ai/A) alone, or in combination with atrazine (0.5 and 1.0 lb ai/A), or diuron (0.25 and 0.50 lb ai/A), were used. The amount of paraquat in the leaf rinsates at 1, 3, 6 and 24 h after treatment were determined using UV-VIS spectrophotometer at 255 nm. Paraquat absorption occurred very quickly and approached steady state within 3-6 HAT. More paraquat was absorbed at higher rate of the herbicide. Paraquat absorption at 0.313 lb ai/A was higher when applied alone than when combined with atrazine or diuron, however, percent paraquat absorption at 0.625 lb ai/A was lowest when applied alone. Paraquat absorption at 0.313 lb ai/A was not significantly affected by atrazine, but was reduced by diuron. Lowest paraquat recovery from the leaf rinsate was observed at 0.625 lb ai/A + diuron 0.25 lb ai/A, or + atrazine 1.0 lb ai/A, suggesting the highest possible paraquat uptake with these treatments. These treatments also showed the highest corn injury 2 WAT. Overall results suggested that PS II inhibitors enhanced the absorption of higher rates of paraquat.

MOVING TARGETS: WEED CONTROL IN OKLAHOMA'S CHANGING AGRICULTURAL SYSTEMS.
J.J.Q. Armstrong; Department of Plant and Soil Sciences, Oklahoma State University, Stillwater.

ABSTRACT

Winter wheat accounts for over 50% of all crop production acreage in Oklahoma. However, weed control is becoming a more difficult task due to the development and spread of herbicide resistant weeds. To address these issues in winter wheat production, producers have shown increased interest in rotating to other crops, including winter canola. Two weeds, Italian ryegrass (*Lolium multiflorum*) and cheat (*Bromus secalinus*), have become especially problematic in winter wheat because of suspected resistance to ALS-inhibiting herbicides. Several Italian ryegrass populations in Oklahoma have been confirmed as ALS-resistant, with some populations showing 8-fold resistance to mesosulfuron. Resistance to ACCase inhibiting herbicides or glyphosate in Italian ryegrass has not been found at this time in Oklahoma. Similarly, two populations of cheat were found to have 4-fold resistance to propoxycarbazone and sulfosulfuron in 2009. As adoption of no-till production practices increases, concerns with weeds such as marestail (*Conyza canadensis*) have also increased. Though herbicide-resistant marestail is suspected to be present in Oklahoma, no herbicide-resistant populations have been confirmed at this time.

DEMONSTRATING USE OF HIGH-RESIDUE, COVER-CROP CONSERVATION-TILLAGE SYSTEMS TO CONTROL GLYPHOSATE-RESISTANT PALMER AMARANTH. J.A. Kelton[1], A.J. Price[2], K.S. Balkcom[2], A.S. Culpepper[3], C.L. Main[4], M.W. Marshall[5], C.D. Monks[1], R.L. Nichols[6], M.G. Patterson[1], L.E. Steckel[4]; [1]Auburn University, Auburn, AL; [2]USDA-ARS, Auburn, AL; [3]University of Georgia, Tifton, GA; [4]University of Tennessee, Jackson, TN; [5]Clemson University, Blackville, SC; [6]Cotton, Inc., Cary, NC.

ABSTRACT

Conservation agriculture has been highly effective in reducing soil erosion, increasing water holding capacity, and minimizing surface water contamination. The adoption of herbicide resistant crops facilitated successful implementation of conservation agriculture practices throughout the Southeast due to the effective weed control achieved with these cropping systems; however, the continuation of conservation tillage practices is jeopardized with recent development of herbicide resistant weed species including Palmer amaranth (*Amaranthus palmeri*). Along with maximizing environmental benefits achieved through conservation practices, including the possibility of long-term increases in soil organic matter and consequent carbon fixation, the utilization of high residue cover crops can also provide substantial weed suppression and aid weed control for problematic weeds which limited herbicide options are available. Moreover, populations of glyphosate-resistant Palmer amaranth have reached such extremely high levels in some areas that some producers are resorting to deep turning of the soil to achieve control. With this collaborative project, funded through an NRCS Conservation Innovation Grant and Cotton, Inc., we will demonstrate that planting a cover crop following fall inversion can still reduce soil losses and create a cultural system wherein glyphosate-resistant weeds can be controlled. It is also designed to help educate farmers throughout the southern United States about the benefits of these high residue cover crops as well as effective strategies for incorporation into current production practices. This will be achieved through on-farm demonstration sites throughout the southern United States region offering a comparison between conservation tillage systems with high-residue cereal cover crops and a traditional inversion tillage system followed by a high residue winter cover crop. The primary summer cash crop will be cotton. During harvest, crop yields will be quantified to examine the agronomic and economic benefits of the conservation systems. Production inputs and costs will be recorded to account for changes in capital and labor intensity and will provide further insight into the economic benefits attributed to adopting conservation technologies. The objective is to demonstrate tenable production systems adaptable to local resistant pigweed conditions that have reduced profitability and threaten sustainability in the Southeast. Direct producer contact through this project is designed to promote the beneficial aspects of and adoption of conservation technologies and high-residue winter annual cover crops in order to ensure effective Palmer amaranth control strategies in sustainable conservation tillage systems.

DOW AGROSCIENCES HERBICIDE TOLERANCE TRAITS (DHT). L.B. Braxton*, C. Cui, M.A. Peterson, J.S. Richburg, D.M. Simpson and T.R. Wright, Dow AgroSciences LLC, Indianapolis, IN

ABSTRACT

Dow AgroSciences is developing a family of herbicide tolerance traits, commonly referred to as Dow AgroSciences Herbicide Tolerance (DHT) traits, that provide tolerance to various broadleaf and grass herbicides, including the phenoxy auxins (e.g., 2,4-D, MCPA) as well as the aryloxyphenoxypropionate grass herbicides (e.g., quizalofop, haloxyfop)1. Two traits, DHT1 and DHT2, have been introduced recently that were developed from the gram-negative soil bacteria *Sphingobium herbicidovrans* and *Delftia acidovorans*, respectively. The basis for herbicide tolerance for each trait is a codon-optimized gene encoding for an α-ketoglutarate-dependent dioxygenase enzyme catalyzing, *in plant*a, a rapid, single-step metabolic detoxification of the herbicides of interest. Tolerance to glyphosate and glufosinate will be enabled through breeding or molecular stacking with commonly known tolerance traits for these herbicides. The DHT traits have demonstrated robust herbicide tolerance in multiple broadleaf and grass crop species including cotton, soybean and corn. Candidate herbicide systems enabled by the traits have broad utility in enhancing the performance of current weed control systems and in improving the durability of the glyphosate cropping system.

GRASP® *XTRA* - A NEW WEED MANAGEMENT TOOL FOR SOUTHERN U.S. RICE. R.B. Lassiter, A.T. Ellis, R.A. Haygood, R.K. Mann, J.S. Richburg, and L.C. Walton; Dow AgroSciences, Indianapolis, IN

ABSTRACT

Grasp® *Xtra* is a new broad spectrum penoxsulam based weed control product for postemergence foliar applications in rice to be launched in the southern US rice growing states in 2010. Grasp® *Xtra* is a 2.31 lb ai/gallon SC (Suspension Concentrate) formulation premix containing 0.25 lb ai penoxsulam + 2.06 lb ai (1.5 lb ae) triclopyr triethylamine salt per gallon. Grasp® *Xtra* will provide the same postemergence broad spectrum weed control of barnyardgrass (*Echinochloa crus-galli*), annual sedges (*Cyperus* spp), aquatic weeds such as ducksalad (*Heteranthera limosa*) and many broadleaf weeds that Grasp®SC provides, but with the improved control of alligatorweed (*Alternanthera philoxeroides*), morningglory (*Ipomoea* spp), Texasweed (*Caperonia palustris*), redstem (*Ammannia* spp) and annual smartweed (*Polygonum* spp.) in one easy to use formulation. Use rates for Grasp® *Xtra* will be 16-22 fl oz product/acre. These results will summarize data from field trials conducted during 2007 to 2009 from preflood and postflood application timings comparing Grasp® SC and Grasp® *Xtra* across a broad range of weed species in rice grown in the Southern U.S.

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NEW REBELEX™ HERBICIDE - FILLING THE GAPS IN RICE WEED CONTROL. A.T. Ellis*, R.A. Haygood, R.B. Lassiter, R.K. Mann, J.S. Richburg, and L.C. Walton Dow AgroSciences LLC, Indianapolis, IN.

ABSTRACT

RebelEX is a pre-mixture of cyhalofop-butyl (Clincher®) + penoxsulam (Grasp®) and will be launched in 2010 for use in Southern US rice for control of broadleaf, aquatic, and grass weeds. In 2008 and 2009 RebelEX trials were conducted in Arkansas, Louisiana, and Mississippi using small plot research methods. Studies were conducted in both water- and direct-seeded rice programs. Results from this study provided information on the crop safety, efficacy of weed control, and target application rates of RebelEX when applied POSTFLOOD. Control of barnyardgrass (ECHCG) with RebelEX was; 88% at 285 g ai/ha (16 fl oz/a), 89% at 320 g, and 90% at 356 g (20 fl oz/a). ECHCG control was slightly lower (82 to 87%) with Grasp and Clincher alone treatments at equivalent active ingredient rates. RebelEX at 284, 320, and 356 g/ha controlled Amazon sprangletop (LEFPA) 79 to 82%, respectively. Control of LEFPA with Clincher alone was 80 to 86%. Broadleaf weeds included alligatorweed, hemp sesbania, northern jointvetch, and Texasweed. Broadleaf weed control was excellent (>81%) with all treatments (except with Clincher). Crop safety was excellent with all treatments. Overall, the efficacy of RebelEX was similar to or slightly better than the stand alone treatments of Clincher or Grasp therefore, proving market viability.

COGONGRASS RESPONSE TO AMINOCYCLOPYRACHLOR. J. L. Belcher and R. H. Walker; Agronomy and Soils Department, Auburn University, Auburn, AL 36849.

ABSTRACT

Cogongrass (Imperata cylindrical) is a warm-season, perennial grass species introduced into the United States in 1912. It is considered one of the greatest invasive plant threats in the southeastern United States. Many herbicides have been tested on this invasive grass with glyphosate and imazapyr being considered the most effective. Aminocyclopyrachlor is a new compound under development by DuPont and has been shown to have activity on cogongrass. Studies were conducted to evaluate seedhead suppression and cogongrass control with aminocyclopyrachlor. The first study was initiated September 18, 2008 near Stockton, AL. Treatments and rates were: untreated; aminocyclopyrachlor 80 WG at 0.10, 0.15, 0.20, and 0.25 lb ai/A; imazapyr at 1.0 lb ae/A; and glyphosate at 4 lb ae/A. Additional treatments were aminocyclopyrachlor at 0.10 and 0.20 lb ai/A applied twice, September 18, 2008 and again May 28, 2009. All treatments received methylated seed oil (MSO) as an adjuvant. Cogongrass seedheads were suppressed 98% or greater with all herbicides 202 days after application (DAA). Bahiagrass (Paspalum notatum) injury 272 DAA was less than 24% for any treatment containing aminocyclopyrachlor, 40% with imazapyr, and 97% with glyphosate. Control of cogongrass 322 DAA was 94 and 96 % for glyphosate and imazapyr, respectively. Aminocyclopyrachlor applied twice at 0.20 lb ai/A provided the highest control, 73%, while a single application at 0.25 lb ai/A controlled cogongrass 72%. All other rates of aminocyclopyrachlor controlled cogongrass less than 53%. A second study was initiated October 15, 2009 to further investigate aminocyclopyrachlor activity on cogongrass. This research was conducted at Auburn University in a greenhouse setting. Aminocyclopyrachlor 50 WG was applied alone at rates of 0.60, 0.125, 0.25, and 0.50 lbs ai/A. Additionally, 0.25 lbs ai/A of aminocyclopyrachlor was combined with either nicosulfuron at 0.0625 lbs ai/A, Distinct (dicamba + diflufenzopyr) at 0.382 lbs ai/A, or glyphosate at 0.375 lb ae/A. Methylated seed oil was added as an adjuvant and all treatments were applied once. An untreated control was included for comparison. Cogongrass rhizomes were harvested October 15, 2009 and placed into 12 ounce Styrofoam cups containing a native sandy-loam soil. Each cup contained one section of rhizome with five nodes. Treatments were applied November 12, 2009. Shoots were clipped to a height of 3 inches December 2, 2009 in order to evaluate regrowth. Cogongrass control was rated January 7, 2010 (56 DAA) at which point all green shoot tissue was harvested from cups and dried. Control of cogongrass was greater than 95% for all combinations and the 0.50 lb ai/A rate of aminocyclopyrachlor applied alone. Aminocyclopyrachlor rates of 0.125 and 0.25 lb ai/A both provided 83% control while the control with 0.06 lb ai/A was 71%. Shoot dry weight was significantly reduced with all treatments when compared to the untreated. Shoot dry weight averaged 335 milligrams (mg) in untreated cups. Shoot dry weight in cups for all other treatments was 37mg or less. Glyphosate and imazapyr are nonselective compounds that are injurious to desirable vegetation such as bermudagrass (*Cynodon dactylon*) and bahiagrass, species often found on highway rights-of-way. Because aminocyclopyrachlor has cogongrass activity and is less injurious to desirable grasses it has the potential to become an important tool for use on roadsides and other non-improved areas where cogongrass may occur.

INTERACTIONS OF QUINCLORAC AND THE BIOHERBICE *Myrothecium verrucaria* ON WEEDS. R.E. Hoagland, C.D. Boyette and K.C. Vaughn; USDA-ARS, Stoneville, MS.

ABSTRACT

The fungus, *Myrothecium verrucaria* (MV) IMI Accession No. 3601690, is being developed for bioherbicidal control of kudzu [*Pueraria lobata* (Willd.) Ohwi] and other invasive weeds. MV spore or mycelial formulations can rapidly injure the foliage of these weeds, however, by combining the herbicide glyphosate [*N*-(phosphonomethyl)glycine] with MV formulations weed control is enhanced or synergized. Several synthetic auxin-type herbicides are labeled for the control of kudzu. The auxin-type herbicide quinclorac (3,7-dichloro-8-quinolinecarboxylic acid) provides excellent control of some grass and broadleaf weeds including hemp sesbania [*Sesbania exaltata* (Raf.) Rybd. ex. Hill], but is not labeled for kudzu control. Quinclorac activity is highly selective, but the basis for selectivity remains obscure. Its molecular mode of action is controversial and different in broadleaf weeds and grasses. In bioassays with hemp sesbania and sicklepod (*Senna obtusifolia* L.) seedlings and in greenhouse tests using kudzu seedlings, sub-lethal concentrations of both MV and quinclorac (purity-98%) applied together caused additive and/or synergistic effects on seedling growth and mortality. In ultrastructural studies, we have found that MV alone caused a rapid (~ 1 h after treatment) detachment of the protoplast from the cell wall, accompanied by plasmodesmata that were broken off from the walls, but that remained in the walls of kudzu tissues. These symptoms occurred prior to the appearance of fungal growth structures. We are continuing *in planta* and ultrastructural studies to characterize quinclorac and MV interactions to elucidate their roles in the infection process, and the necrosis and death of weeds.

DIQUAT ADSORPTION IN SOILS USED FOR WATERCRESS PRODUCTION. R. Jain, E. W Palmer, J. L. Glasgow, D. C. Drost, and M. U. Dixon. Syngenta Crop Protection, Inc. Greensboro, NC 27419.

ABSTRACT

Diquat dibromide is a bipyridylium herbicide for broad-spectrum weed control in landscape and aquatic environments, and has proven effective for controlling old world diamond -flower [*Hedyotis corymbosa* (L.) Lam.] in watercress when applied before the crop is seeded. In studies supported by IR-4, diquat applied at 1.12 kg ai/ha three times at 30-day intervals, with the crop seeded 14 days after the last application, provided excellent control of old world diamond-flower. Adsorption of diquat in four different soils from Florida and Tennessee was investigated using a wheat bioassay developed by Syngenta Crop Protection, Inc.

Wheat is very sensitive to diquat in water with a GR_{50} value of 0.02 ppm (diquat concentration that inhibits root growth by 50%). Two hundred millilitres of solutions containing 50 to 4800 ppm diquat dibromide by weight of soil were mixed with 10 g of soil. The soil slurries were shaken on a wrist-action shaker for 16 hours, then water and soil were separated by centrifugation at 5000 *g* for 15 minutes. The amount of diquat left in the water was estimated by growing wheat seedlings hydroponically. Pre-germinated wheat seeds were placed on plastic nets covering the containers filled with the water solutions. There were two containers for each diquat concentration. The containers were kept in a growth chamber set at 20/24 ^{0}C night/day and a 14-hour photoperiod to allow wheat seedling growth. Two weeks after bioassay initiation, root lengths of the wheat seedlings were measured. Root length data were converted into percent of control and plotted against nominal diquat concentration in the water and GR_{50} values of diquat were determined in each soil using linear regression. Results indicated that negligible concentrations of diquat remained present in the water after shaking with the soils to inhibit root growth of wheat at the tested rates. This indicates that diquat is rapidly and strongly adsorbed to soil such that the bioavailability to the wheat seedlings is minimal. Diquat dibromide is not currently registered for use on watercress and these data do not constitute a recommended application.

SURVEY OF HERBICIDE-RESISTANT JOHNSONGRASS IN ARKANSAS. D.B. Johnson and J.K. Norsworthy; Department of Crop, Soil, and Environmental Sciences University of Arkansas, Fayetteville, AR.

ABSTRACT

Prior to glyphosate-resistant soybean being brought to market by Monsanto in 1996, johnsongrass (*Sorghum halepense*) had long been one of the most troublesome grass weeds to control. Because of the large acreage of glyphosate-resistant crops and the effectiveness of glyphosate on this weed it has not been a problem in recent years. In the fall of 2007, a population of johnsongrass located in a field near West Memphis, AR, in Crittenden County was confirmed to be glyphosate resistant. This was the first documented case of glyphosate-resistant johnsongrass in Arkansas. Later that year populations of glyphosate-resistant johnsongrass were reported in Mississippi and Louisiana. The purpose of this study was to determine the geographical distribution of glyphosate-resistant johnsongrass in Arkansas and screen for resistance to several other herbicides. In the fall of 2008 and 2009, johnsongrass panicles were collected from seven counties in Arkansas along the Mississippi River. Samples were collected from the following counties in Arkansas: Mississippi, Crittenden, St. Francis, Lee, Phillips, Desha, and Chicot. A total of 131 samples were collected but due to poor germination only 94 of the samples could be screened. Seeds were planted in a greenhouse in Fayetteville, AR, and seedlings sprayed with glyphosate (0.39 lb ae/A), clethodim (0.061 lb ai/A), imazethapyr (0.063 lb ai/A), and fluazifop (0.188 lb ai/A). Plants were sprayed inside a spray chamber at 20 gal/A at the 2- to 3-leaf stage. Visual control ratings were taken at 14 and 21 days after treatment (DAT). At 21 DAT, average johnsongrass control across accessions was 97% for glyphosate, 95% for imazethapyr, and 99% for both fluazifop and clethodim. The J47 accession appeared to have higher tolerance to glyphosate compared to the other accessions, with only 58% control at 21 DAT. Additionally, J49 appeared to have reduced sensitivity to imazethapyr, with only 75% control at 21 DAT. A dose response experiment was conducted to further evaluate the J47 and J49 accessions. Twenty seedlings from J47 and J49 and a susceptible biotype were sprayed at the 3-leaf stage with a range of glyphosate or imazethapyr rates to produce a dose response curve based on death of the treated plants at 21 DAT. The lowest rate corresponded to 1/128X the normal use rate and the highest rate was 16X the normal use rate. The lethal dose needed to kill 50% of the plants of each population (LD_{50}) was determined using Probit analysis. The J47 accession had an LD_{50} of 0.923 lb/A glyphosate, which was 6.4-fold greater than the susceptible population, which was 0.14 lb/A glyphosate. The J49 accession had an LD_{50} of 0.04 lb/A imazethapyr, which was 2.9-fold greater than the susceptible, which was 0.14 lb/A imazethapyr. An additional accession (J123) was exhibited a low level of control when treated with clethodim at 0.06 lb/A, but because of poor germination it was unable to be studied further at this time. In the future, johnsongrass panicles from different areas in the state will be collected and evaluated for herbicide resistance in addition to the J123 accession.

EFFICACY OF SELECTED HERBICIDES ON EIGHT PALMER AMARANTH POPUALTIONS. A. Chandi, D. Jordan, J. Burton, and A. York, North Carolina State University, Raleigh; J. Whitaker, University of Georgia, Statesboro; and S. Culpepper, University of Georgia, Tifton.

ABSTRACT

Development of herbicide resistant weed biotypes has increased in the southern United States, with Palmer amaranth (*Amaranthus palmeri*) becoming perhaps the most economically damaging species possessing this trait. While a variety of weed management tactics are implemented to manage this weed, the primary method to control glyphosate-resistant Palmer amaranth is to apply herbicides with a different mode of action than that of glyphosate. Determining if herbicides other than glyphosate perform differently on Palmer amaranth biotypes, especially those expressing resistance to glyphosate, will be important in developing management strategies for this weed.

In separate experiments, with either preemergence herbicides or postemergence herbicides, control of eight Palmer amaranth biotypes, six collected from Georgia and two from North Carolina, was compared. Four glyphosate resistant and four glyphosate susceptible biotypes were included in the experiment. Preemergence herbicides included atrazine, fomesafen, flumioxazin, *S*-metolachlor, pendimethalin, and pyrithiobac. Herbicides in the postemergence experiment included atrazine, dicamba, glufosinate, glyphosate, lactofen, paraquat, and trifloxysulfuron. Seed from the eight palmer amaranth biotypes were planted in rows two inches apart in flats containing a sandy loam soil and treated with preemergence herbicides at 0.25 and 1.0 times the manufacturer's suggested use rate for field applications. Palmer amaranth seed for individual biotypes were planted in separate pots in the postemergence experiment and were thinned to three plants per pot prior to herbicide application. Herbicides were applied at 0.25 and 1.0 times the manufacturers suggested use rate. Plants were watered as needed with overhead sprinkler irrigation beginning two days after application. Visual estimates of percent Palmer amaranth control and fresh weight reduction were determined 6 weeks after treatment (WAT) (preemergence experiment) and 3 WAT (postemergence) The experimental design was a split plot (preemergence herbicides) with herbicide and herbicide rate combinations serving as whole plot units and Palmer amaranth biotype serving as the split plot unit. The experimental design in the postemergence herbicide experiment was a randomized complete block. Treatments were replicated four times in both experiments and the experiments were repeated. Data were subjected to ANOVA appropriate for the factorial arrangement of treatments (herbicide X herbicide rate X Palmer amaranth biotype) in both experiments.

Various interactions for percent control and percent reduction in fresh weight were noted among herbicides, herbicide rates, and Palmer amaranth biotypes in both the preemergence and postemergence experiments. When analyzed by herbicide, there was no difference in control among Palmer amaranth biotypes when atrazine, flumioxazin, or fomesafen were applied regardless of rate. Efficacy of *S*-metolachlor, pendimethalin, and pyrithiobac was affected by biotype. In the postemergence experiment, Palmer amaranth control by dicamba, glufosinate, glyphosate, lactofen, and trifloxysulfuron was affected by biotype; control by paraquat was not affected. When glyphosate-resistant and glyphosate-susceptible biotypes were pooled and compared within an herbicide treatment, in some instances herbicide efficacy varied due to presence or absence of glyphosate resistance. Although these data suggest that Palmer amaranth response to preemergence and postemergence herbicides can vary depending upon biotype, and that in some instances presence or absence of glyphosate resistance may be a factor, additional research comparing many more populations or using reciprocal crossing techniques are needed to clearly determine if presence of glyphosate resistance influences efficacy of herbicides with other modes of action. In our study differences in efficacy observed across biotypes may have been associated with characteristics within a population other than glyphosate resistance.

UPDATE ON GLYPHOSTE-RESISTANT PALMER AMARANTH (*Amaranthus palmeri*) IN SOUTH CARLOLINA. M.W. Marshall*[1] and H.D. Gunter[2], [1]Clemson University, Blackville, SC and [2]Clemson University, Florence, SC.

ABSTRACT

Glyphosate-resistant Palmer amaranth (*Amaranthus palmeri* S. Wats.) has emerged as one of the most severe threats to reduced tillage cotton production in South Carolina. A survey of the distribution of ALS- and glyphosate-resistant Palmer amaranth in South Carolina was initiated in South Carolina. In addition, field studies were conducted at Edisto Research and Education Center (EREC) and Pee Dee Research and Education Center (PDREC) in 2009 to evaluate different combinations preemergence and postemergence herbicides for glyphosate-resistant Palmer amaranth control in South Carolina. County extension agents collected seed from suspected grower fields in fall of 2008. Seedheads from each location were composited, dried, and cleaned. Palmer amaranth seed was planted in the greenhouse and grown to the 4-leaf stage. At the 4-leaf stage, plants were sprayed with glyphosate at 0, 22, and 44 oz/A, and thifensulfuron at 0, 0.33, and 0.66 oz/A. At 21 days after treatment, plants were scored to determine activity of glyphosate and thifensulfuron. In the field studies, preemergence (PRE) treatments included pendimethalin at 2.0 pt/A, diuron at 1.0 pt/A, and fomesafen at 1.0 pt/A. Postemergence (POST) treatments included glyphosate at 22 oz/A, s-metolachlor at 1.3 pt/A, glufosinate at 29 or 43 oz/A, and pyrithiobac at 1.7 or 2.5 oz/A. Preemergence treatments were applied shortly after planting. Early POST treatments were applied at the 2 to 3 and the late POST treatments were applied at the 6 to 7 leaf stage. An untreated check was included for comparison. The study was arranged as a randomized complete block design with 4 replications. A significant number of survey sites were confirmed to have both ALS- and glyphosate-resistance (18 out of 22 fields sampled). At PDREC, all PRE treatments at 2 weeks after treatment showed excellent Palmer amaranth control (>95%). All treatments received an activating rainfall 3 days after application (1.0" rainfall event). No differences were noted between the irrigated and rain-fed plots; therefore, data were combined across environments. At 2 WAT following the EPOST treatments, pendimethalin + diuron combinations in the glyphosate-only plots showed significant decrease in Palmer amaranth control (70%). This indicated that fomesafen at 1.0 pt/A is active longer in the soil compared to the 1.0 pt/A of diuron. In future research, diuron at 1.5 pt/A may provide similar levels of control as 1.0 pt/A of fomesfen. S-metolachlor plus glyphoste provided good to excellent control (in plots where fomesafen was the foundation soil treatment). In the glufosinate-based programs, two applications were typically needed to control glyphosate-resistant Palmer amaranth. Although glufosinate-alone controls Palmer amaranth (>95%), a tank mix of s-metolachlor or pyrithiobac plus glufosinate is recommended for residual control of Palmer amaranth At EREC, Palmer amaranth control was similar to treatments at PDREC; however, significant cotton injury was observed with over-the-top applications of glufosinate on Phytogen 485 cotton variety (15-20% injury). Phytogen 485 variety did grow out of the injury, but some plots that received an early application of glufosinate were stunted compared to the later applications. Overall, a foundation program of fomesafen or diuron plus pendimethalin improved Palmer amaranth control in cotton. Glufosinate-based systems will control glyphosate-resistant Palmer amaranth, but growers cannot rely exclusively on glufosinate, especially considering the fast growth habit of Palmer amaranth (up to 2" per day). Future research will examine the utility of adding pyrithiobac to the PRE program. In addition, a sequential program of glufosinate followed by glyphosate or vice versa to determine the best time to position glufosinate application during the growing season while taking advantage of glyphosate's ability to control larger susceptible weeds.

ALS RESISTANCE IN GLYPHOSATE-RESISTANT PALMER AMARANTH BIOTYPES FROM MISSISSIPPI. R.C. Bond[1], V.K. Nandula[1], and K.N. Reddy[2]; [1]Delta Research and Extension Center, Mississippi State University, Stoneville; [2]Crop Production Systems Research Unit, USDA-ARS, Stoneville.

ABSTRACT

Glyphosate resistance in Palmer amaranth biotypes from Mississippi has been documented in 2008. These glyphosate-resistant (GR) biotypes responded variably to pyrithiobac, an acetolactate synthase (ALS)-inhibiting herbicide, applied preemergence (PRE) at 70 g ai/ha and postemergence (POST) at 110 g/ha with control ranging from 20 to 100% and 48 to 98%, respectively. Replicated greenhouse experiments were conducted to confirm resistance to pyrithiobac, applied PRE and POST, in selected GR biotypes. A glyphosate-susceptible (GS) biotype was included for comparison. Percent emergence of GR biotypes following a PRE application of pyrithiobac, at 70 g/ha, ranged from 54 to 100%, whereas the GS biotype recorded only 16% emergence. Dose response experiments were conducted with POST applications of pyrithiobac on a GR biotype, designated as C1B1. The GS biotype used in the PRE studies was included for dose response assessment as well. GR C1B1 and GS plants at 8- to 10-cm height (3- to 6-leaf stage) were treated with pyrithiobac at 0, 55, 110, 220, 440, and 880 g/ha and percent control recorded 3 wk after treatment. GR_{50} values (pyrithiobac dose required to cause a 50% reduction in above ground shoot growth) of the GR C1B1 and GS biotypes were 60 and 9 g/ha, respectively. This indicates that the C1B1 biotype is 7-fold more resistant to pyrithiobac compared to the GS biotype. Further studies are planned to characterize the biochemical, physiological, and molecular mechanisms of resistance to pyrithiobac in the C1B1 and other selected GR biotypes.

MULTIPLE RESISTANCE TO GLYPHOSATE AND ALS-INHIBITING HERBICIDES IN PALMER AMARANTH IN GEORGIA. L.M. Sosnoskie, R. Wallace, A.S. Culpepper, University of Georgia, Tifton, GA; J. Kichler, University of Georgia, Olgethorpe, GA.

ABSTRACT

In 2004, a glyphosate-resistant (GLY-R) biotype of Palmer amaranth was discovered at a 250 ha field site in Macon County, Georgia, where glyphosate-tolerant cotton had been produced in a monoculture for at least seven years. In 2005, an increase in the number of Palmer amaranth control failures in peanut associated with ALS herbicides prompted a state-wide survey to determine the geographical distribution of ALS-resistance (ALS-R) in Georgia. In 2006, a population of Palmer amaranth in Macon County, Georgia, with confirmed resistance to glyphosate, was unable to be effectively controlled using the labeled rate of pyrithiobac. The objective of this study was to determine the level of resistance to glyphosate and pyrithiobac in a known GLY-R Palmer amaranth population.

Field studies were conducted in 2007 and 2008 to evaluate the suspected GLY/ALS-R biotype's response to glyphosate and pyrithiobac applied singly and tank mixed. Sixteen herbicide treatments were included in the study: glyphosate applied at 870, 1730, 3470 and 6930 g ha; pyrithiobac applied at 70, 140, 280, 420 g/ha; and glyphosate + pyrithiobac at 870 + 70, 1730 + 140, 3470 + 280 and 6930 + 420 g/ha. A non-treated check was also included for comparison. The herbicide treatments were arranged in a randomized complete block design with four replicates. Visual control ratings for each plot (represented as percentage of the non-treated check, where 0 equals no weed control and 100 equals complete weed control) were taken at 1, 5 and 8 weeks after treatment (WAT). Data were analyzed using the PROC MIXED procedure in SAS.

Results demonstrated that the GLY/ALS-R biotype was ineffectively controlled (5-28 % control, 1 to 8 WAT) by both glyphosate a pyrithiobac at labeled use rates (870 and 70 g/ha, respectively). When applied as a tank mixture, glyphosate + pyrithiobac at 870 + 70 g/ha provided less than 41% control of GLY/ALS-R Palmer amaranth 1 to 8 WAT. Glyphosate and pyrithiobac applied either singly or together at 2- and 4-times the labeled rates controlled GLY/ALS-R Palmer amaranth between 17 and 76%. Glyphosate applied at 6-times the labeled use rate (6930 g/ha) provided between 76 and 89% control 1 to 8 WAT; pyrithiobac at 6-times the labeled rate (420 g/ha) provided between 47 and 65% control. Eighty-nine to 92% control of GLY/ALS-R Palmer amaranth was achieved when glyphosate + pyrithiobac were applied at 6930 + 420 g/ha.

In 2008, a greenhouse study was conducted to compare the responses of the GLY/ALS-R Palmer amaranth biotype to glyphosate and pyrithiobac with the responses of known GLY/ALS-S, GLY-R and ALS-R populations. Glyphosate was applied to greenhouse-grown 10-15 cm tall S and the ALS-R plants at rates of 0, 39, 79, 118, 197, 236, 315, 3151 g/ha. The GLY-R and the GLY/ALS-R biotypes were treated with glyphosate at rates of 0, 39, 315, 630, 945, 1260, 1576, 2363, 3151 g/ha. Pyrithiobac was applied to the S and the GLY-R biotypes at 0, 2, 5, 9, 18, 35, 70, 140, 1680 g/ha and to the ALS-R and GLY/ALS-R populations at rates of 0, 2, 70, 140, 280, 420, 560, 1120, 1680 g /ha. Visual control and relative fresh weight (FW, expressed as a percent of the non-treated control) were determined 3 to 4 WAT. Each biotype-by-herbicide rate combination was replicated 5-times; the study was conducted twice in time. Data were regressed over herbicide dose using log-logistic analysis.

Analyses indicated that the glyphosate rates required to produce 50% injury (I_{50}) for the GLY-R (1450 g/ha) and ALS/GLY-R (1100 g/ha) biotypes were significantly greater than those for the S (90 g/ha) and ALS-R (100 g/ha) biotypes. With respect to pyrithiobac, the ALS-R and GLY/ALS-R biotypes had I_{50} values that were up to or greater than 130-fold greater than the I_{50} value for the S biotype (4 g/ha). Results for the FW data were similar. Both field and greenhouse analyses suggest that the Palmer amaranth biotype evaluated in these studies is resistant to both glyphosate and an ALS inhibiting herbicide. The development of multiple resistance to two important classes of herbicides for cotton production will force growers to use alternate methods, such as tillage and residual at-plant herbicides, to control Palmer amaranth. Growers should ensure that Palmer amaranth plants in a production field do not reach reproductive maturity to prevent the local and long-distance spread of the resistance traits by seed and pollen.

SURVIVAL AND FECUNDITY OF GLYPHOSATE-RESISTANT PALMER AMARANTH BIOTYPES AS INFLUENCED BY LATE-SEASON HERBICIDE APPLICATIONS. Prashant Jha, Jason K. Norsworthy, Michael J. Wilson, and Leopoldo E. Estorninos; University of Arkansas, Fayetteville, AR

ABSTRACT

Experiments were conducted in 2008 and 2009 at the University of Arkansas in Fayetteville to determine the effectiveness of late-season herbicide applications for control and seed suppression of glyphosate-resistant Palmer amaranth. Glyphosate-resistant biotypes from Mississipi County (MC) and Lincoln County (LC) were evaluated. Seedlings of both biotypes were transplanted in the field and sprayed with glyphosate, dicamba, 2,4-D amine, glufosinate, and pyrithiobac when inflorescence began to appear. Experiments were conducted as a factorial arrangement of treatments (biotype by herbicide) with an untreated check and four replications. Percent control of treated plants was visually evaluated at 7, 14, and 28 days after treatment (DAT). Individual plant survival was recorded at 28 DAT. Seed production, viability, and seed weight were estimated. Seeds were planted in pots in the greenhouse and seedling emergence was recorded and biomass data was collected at 28 days after planting (DAP). Control of the MC biotype was superior to the LC biotype due to smaller size of the MC plants at the time of application. Among all herbicides, 2,4-D amine, and glufosinate provided the greatest control 28 DAT, which averaged 74 and 66%, respectively, for the MC biotype. Control of both biotypes with pyrithiobac was unsatisfactory (<5%). Glufosinate and 2,4-D resulted in 65% average mortality of MC biotype compared to <20% mortality of the LC biotype. 2,4-D, glufosinate, and dicamba resulted in >90% reduction in seed production of glyphosate-resistant Palmer amaranth plants. All herbicides in 2008 reduced seed viability of the LC biotype; however, viability of the MC progeny was reduced only when sprayed with glufosinate and pyrithiobac. The LC biotype had higher seed weight and seedling vigor and plants emerged 7 to 10 days earlier than the MC biotype. Averaged over herbicide treatments, the LC progeny produced greater biomass than the MC progeny. In conclusion, 2,4-D and glufosinate were the superior late-season herbicides for glyphosate-resistant Palmer amaranth control; however, no herbicide applied alone will prevent seed production and future infestation of glyphosate-resistant Palmer amaranth, if plants are allowed to set seeds.

PALMER AMARANTH AND *Ipomoea* SPECIES CONTROL WITH DICAMBA AND GLUFOSINATE AS INFLUENCED BY WEED SIZE AND HERBICIDE RATE. R.C. Doherty, K.L. Smith, J.A. Bullington and J.R. Meier; University of Arkansas Division of Agriculture, Monticello, AR.

ABSTRACT

Two trials were established in Rohwer, AR, on the Southeast Research and Extension Center in a Hebert silt loam soil in 2009 to evaluate Palmer amaranth and Ipomoea spp. control. The trials were arranged in a randomized complete block design with four replications. Parameters evaluated were visual ratings of Palmer amaranth and Ipomoea spp. control, based on weed size at application. The objective was to provide data that would support the use of dicamba and glufosinate-resistant crops to gain optimum control of glyphosate-resistant Palmer amaranth and Ipomoea spp. Two rates of each herbicide were applied at four timings in the Palmer amaranth trial and two timings in the Ipomoea spp. trial. Dicamba was applied at 0.25 and 0.5 lb ae/A and glufosinate was applied at 0.53 and 0.73 lb ai/A. The application timings were 3-6, 6-9, 9-12, and 24-28 inch Palmer amaranth. *Ipomoea* spp. applications were made at 3-6 inch plant height and 6-9 inch runner length. At 40 DAT (day after treatment) dicamba applied at 0.25 and 0.5 lb ae/A to 3 inch Palmer amaranth and dicamba at 0.5 lb ae/A applied to 6 inch Palmer amaranth provided 99 to 100% control. Dicamba applied at 0.25 and 0.5 lb ae/A to 9 and 12 inch Palmer amaranth provided less than 85% control, but did suppress seed production. Dicamba at 0.25 and 0.5 lb ae/A provided less than 40% control of 24-28 inch Palmer amaranth and did not suppress seed production. Glufosinate applied at 0.53 and 0.73 lb ai/A provided 100% control of 3 and 6 inch Palmer amaranth and greater than 90% control of 9, 12, 24, and 28 inch Palmer amaranth. All glufosinate treatments suppressed Palmer amaranth seed production. Dicamba and glufosinate can be used to control and suppress seed production of glyphosate –resistant Palmer amaranth. At 40 DAT dicamba applied at 0.25 and 0.5 lb ae/A and glufosinate applied at 0.53 and 0.73 lb ai/A to 3-6 inch plant and 6-9 inch runner provided 100% control of Ipomoea spp. Dicamba and glufosinate can be used to control *Ipomoea* spp.

GLYPHOSATE-RESISTANT PALMER AMARANTH CONTROL IN ROUNDUP READY SOYBEANS. L. E. Steckel and M. A. McClure; University of Tennessee, Jackson, TN.

ABSTRACT

Glyphosate-resistant (GR) Palmer amaranth has become a major problem for Tennessee soybean growers. Research designed to examine possible ways to control GR Palmer amaranth in soybeans was established in a soybean producer's field in Shelby county Tennessee. The field was selected due to a very high GR Palmer amaranth population. Studies were conducted in RR soybeans and LL soybeans. Herbicides were applied with a CO2 back pack sprayer. Plot size consisted of 4 rows spaced 30" wide by 30' long. Treatments in both the RR and LL systems consisted of a number of commonly used Pre applied herbicides: Authority MTZ, Envive, Valor, Valor XLT and Boundary applied at the labeled rate. These treatments were followed up with Ignite at 22 oz/A or glyphosate at 22 oz/A or Flexstar at 16 oz/A. Also a check of no pre followed by two applications of glyphosate was used as a check in the RR system. The no Pre application followed by two applications of glyphosate provided less then 10% control. Whether in the LL or RR system the Pre followed by Ignite or Flexstar prior to Palmer reaching the size of 4" provided >90% control. Follow up applications of Flexstar on Palmer larger than 4" or applications of Ignite on Palmer greater than 8" provided control less than 60%. The data gathered from this study would suggest that GR Palmer can be controlled in soybeans in a program that includes a Pre followed by Flexstar and Ignite applied on small Palmer amaranth.

CONTROL OF GLYPHOSATE-RESISTANT PALMER AMARANTH IN DHT COTTON. A. S. Culpepper and J. E. Chafin; University of Georgia, Tifton, GA and L. B. Braxton and J. S. Richburg; Dow AgroSciences, Indianapolis, IN.

ABSTRACT

Glyphosate-resistant Palmer amaranth has changed cotton production forever in Georgia. Prior to resistance, growers relied heavily on glyphosate only programs to manage this pest. Since the development of glyphosate-resistant Palmer amaranth, cotton growers in the most severely infested areas have employed residual herbicides, cultivation, and hand-weeding. A 2009 survey of county extension agents representing 52 Georgia counties (799,000 acres) found that 54% of the Georgia cotton crop was hand weeded. Hand weeding expenses ranged from $3 to $100 per acre with an average expense of $26 per acre. Growers are in desperate need of new herbicide chemistry that can be applied topically to cotton while improving control of emerged Palmer amaranth. With cotton resistant to 2,4-D in development, two experiments were conducted to aid in the understanding of managing glyphosate-resistant Palmer amaranth with 2,4-D and 2,4-D systems.

The first experiment was conducted at 3 locations during the summer of 2009 to understand Palmer amaranth response to a single application of 2,4-D alone and in mixtures with glufosinate. The experimental herbicide programs included 2,4-D at 0, 0.5, 0.75, 1.0 lb/A applied alone or in combination with glufosinate at 0.42 lbs/A. All treatments were replicated 4 times. Herbicides were applied POST to 8 inch tall Palmer amaranth at 15 gal/A using a backpack sprayer with Drift Guard T-Jet 11002 VS nozzles.

Glufosinate alone controlled Palmer amaranth 73% at 20 d after treatment when combined over the three locations. 2,4-D alone controlled Palmer amaranth 69 to 79%. Tank-mixtures of glufosinate plus 2,4-D controlled glyphosate-resistant Palmer amaranth 91 to 96%, regardless of 2,4-D rate.

A second experiment was conducted in DHT cotton in Macon County during the summer of 2009 to initiate the development of 2,4-D herbicide systems for the control of glyphosate-resistant Palmer amaranth. Twelve herbicide systems and a non-treated control were replicated four times. Eight systems included pendimethalin (0.95 lb/A) or pendimethalin plus fomesafen (0.25 lb/A) applied PRE followed by no POST or POST applications of 2,4-D (0.75 lb), glufosinate (0.33 lb/A), or glufosinate plus 2,4-D; diuron (1 lb/A) plus MSMA (2 lb/A) was directed at layby for all systems. Four total POST programs included sequential 2,4-D applications, sequential glufosinate applications, sequential 2,4-D plus glufosinate applications or no POST application; again diuron plus MSMA was directed at layby for all systems. Rainfall occurred within 5 days of PRE applications and all POST applications were made to 4- to 6- inch Palmer amaranth; thus, POST applications dates differed for each system including pendimethalin, pendimethalin plus fomesafen, or no PRE. Palmer amaranth size ranged from 2- to 12-inches at layby depending on previous herbicide applications. PRE and POST herbicide applications followed procedures noted with experiment one while directed applications were applied no higher than 4 inches up the cotton stalk. Palmer amaranth populations ranged from 150 to 200 plants per square yard.

At harvest, pendimethalin PRE followed by 2,4-D or glufosinate POST and diuron plus MSMA at layby controlled Palmer amaranth only 50%. Mixing glufosinate with 2,4-D in this system improved control 31%. Greater control was noted in systems including fomesafen. Pendimethalin plus fomesafen PRE followed by 2,4-D, glufosinate, or glufosinate plus 2,4-D POST and diuron plus MSMA directed controlled Palmer amaranth 90 to 93%. Total POST programs including sequential glufosinate or 2,4-D applications followed by diuron plus MSMA controlled Palmer amaranth only 50%; however, sequential applications of glufosinate plus 2,4-D followed by diuron plus MSMA controlled Palmer amaranth 85%.

Seed cotton yield was directly influenced by Palmer amaranth control. Greatest yields were noted with all systems that included glufosinate plus 2,4-D POST as well as the two systems that had pendimethalin plus fomesafen PRE followed by 2,4-D or glufosinate POST and diuron plus MSMA directed.

DHT cotton with resistance to 2,4-D will offer growers an effective herbicidal tool that can be applied topically to cotton while improving control of glyphosate-resistant Palmer amaranth. However, this research noted that 2,4-D will only be effective when included in a total systems management approach.

MANAGEMENT OF GLYPHOSATE-RESISTANT PALMER AMARANTH WITH FLUMIOXAZIN IN TRANSGENIC COTTON SYSTEMS. J.D. Smith, J.R. Cranmer and J.A. Pawlak; Valent U.S.A. Corporation, Walnut Creek, CA.

ABSTRACT

The presence of glyphosate-resistant Palmer amaranth (*Amaranthus palmeri* S. Wats.) (GRPA) has been documented in most cotton producing counties of Georgia. Residual herbicides are critical for management of GRPA in transgenic cotton. However, control of GRPA has been particularly difficult in dry-land cotton production due to the absence of timely rainfall needed to activate the herbicide prior to weed emergence. As a result, some growers have used conventional-tillage operations in fields severely infested with GRPA, allowing the use of pre-plant incorporated herbicides. Most cotton producers would like to preserve the advantages associated with conservation-tillage and not revert back to conventional-tillage practices. Therefore, research was conducted to determine if flumioxazin, when used pre-plant burndown (PPBD) as part of a comprehensive program, might allow conservation-tillage to remain an option for dry-land cotton producers.

Field experiments were established in 2008 and 2009 at field research locations in Macon County, GA and the University of Georgia Ponder Farm near Tifton to evaluate several variables regarding the use of flumioxazin PPBD in conservation-tillage cotton programs including: 1) impact of previous or established cover crop residues on efficacy; 2) effect of strip-tillage operation on efficacy; and 3) replant interval needed to provide cotton safety. Trial results were then used to develop improved flumioxazin use directions for GRPA control in conservation-tillage.

In a 2008 trial to evaluate the impacts of cover crop on efficacy, flumioxazin was applied at 0.063 lb ai/A on January 18th, March 25th, and April 11th to a 15, 30 and 35-inch tall wheat cover crop, respectively. For each application, the wheat was either killed two weeks prior to application, or green at the time application. The green versus dead cover scenario was used to determine any differences in binding affinity for flumioxazin. For the March and April application timings, 100% control of GRPA was achieved until cotton was planted on April 24th regardless of cover crop status. For the January timing, GRPA control was 25% and 100% in the dead cover and green cover, respectively. This difference was probably due to opening of the wheat canopy too early allowing sunlight and soil warming to occur.

In 2008, trials were conducted to evaluate the impact of tillage on flumioxazin control of GRPA and cotton safety. Flumioxazin was applied at 0.063 lb ai/A as a broadcast treatment to a stale seedbed. Half of the plots were then strip-tilled with a standard two-row strip-till implement, which included sub-soil shanks and rolling baskets, creating a no-till versus strip-till comparison. At 30 and 40 days after treatment, GRPA control was reduced by 25% and 35% respectively, with the strip-till program compared to the no-till program. To evaluate cotton safety, flumioxazin was applied up to 3 days PPBD to a stale seedbed with and without a strip-till operation occurring after application but prior to planting. Minimal cotton injury was observed at 3 days PPBD in the strip-till program (5-10%) while significant injury was observed (51-73%) in the no-till program. It should be noted that treatments were applied to a bare ground sandy loam soil, absent of crop and weed residue. A trial conducted in 2009 demonstrated good cotton safety without tillage when flumioxazin was applied 21 days PPBD in to a heavy cover crop.

In 2009, a trial was initiated to evaluate the best timing for PPBD applications of flumioxazin (0.063 lb ai/A) in conservation-tillage. Two strip-till timings were evaluated in a heavy rye cover: 1) strip-tillage operation conducted prior to applying flumioxazin 21, 14 and 7 days PPBD, and 2) strip-tillage operation conducted after applying flumioxazin up to 7 days PPBD. Adequate cotton safety was only achieved at the 21-day PPBD interval when the strip-till operation occurred before flumioxazin application, while no cotton significant injury was observed at any interval when the strip-till operation occurred after the flumioxazin application. The 21-day post strip-till timing and the 7-day pre strip-till timing provided 100% control of GRPA at planting. However, the post strip-till application timing provided more in-row residual control compared to the pre strip-till application timing after planting.

A new Special Local Need (SLN) 24(c) label will be available for GA in 2010 allowing flumioxazin to be applied PPBD after a strip-tillage operation up to 21 days prior to planting cotton in fields where crop or weed residue equals or exceeds 30%. The label will also allow flumioxazin to be applied up to 7 days prior to planting cotton with the requirement that a strip-till operation occur between application and planting.

REGIONAL RESEARCH ADDRESSING GLYPHOSATE-RESISTANT PALMER AMARANTH CONTROL IN COTTON. J.A. Bond, K.L. Smith, D.O. Stephenson, IV, J.K. Norsworthy, L.E. Steckel, J.K. Manning, and J.B. McDuffie. Mississippi State University, Stoneville; University of Arkansas, Monticello; Louisiana State University AgCenter, Alexandria, University of Tennessee, Jackson.

ABSTRACT

Roundup Ready and Flex production systems and the historical effectiveness of glyphosate have led to decreased use in residual herbicides to control problem weeds. However, this reduction has conversely led to a need for multiple glyphosate applications for control comparable to residual herbicides in cotton. Furthermore, glypohosate-resistant Palmer amaranth has developed into a tremendous problem in the midsouthern United States. Research was in initiated in 2009 at multiple sites in Arkansas, Louisiana, Mississippi, and Tennessee to address management of glyphosate-resistant Palmer amaranth using sequential applications of residual herbicides.

Treatments were replicated four times in a randomized complete block experimental design with a factorial arrangement of four preplant (PP) and four preemergence (PRE) herbicide applications. Preplant treatments included no PP treatment (Utilized to evaluate control from PRE-only applications), flumioxazin (Valor;0.064 lb ai/A) applied 30 days PP, fomesafen (Reflex; 0.25 lb ai/A) applied 14 days PP, and diuron (Direx; 0.8 lb ai/A) applied 0 day PP. Preemergence herbicides were applied immediately after planting and included no PRE (Included to evaluate control from PP-only applications), fluometuron (Cotoran; 1 lb ai/A), prometryn (Caparol; 0.75 lb ai/A), and pendimethalin (Prowl H2O; 1 lb ai/A). Visual estimates of Palmer amaranth control and cotton injury were recorded 7, 14, and 28 d after PRE application.

Multiple problems were encountered at the different research sites in 2009. Excessive rainfall hindered treatment application at most sites and appropriate application timings were not achieved. Palmer amaranth control with flumioxazin (47 to 93%) or fomesafen (64 to 97%) alone varied across sites 14 days after planting. Following flumioxazin with an at-planting application improved control 14 days after planting. At Rohwer, AR, and Stoneville, MS, injury from diuron-based treatments was severe. Control at three of four sites was higher 28 days after planting when flumioxazin or fomesafen were followed with at-planting applications.

In most cases, sequential programs using residual herbicides controlled Palmer amaranth early in the season. Diuron-based treatments provided most consistent early-season control and lint yields across sites. However, additional control measures would be required for season-long control.

THE EFFECT OF WINTER COVER CROP PLANTING DATE ON PALMER AMARANTH (*Amaranthus palmeri*) SUPPRESSION IN COTTON AND PEANUT. T.M. Webster[1], B.T. Scully[1], and T.L. Grey[2]. [1]Crop Protection and Management Research Unit, USDA-ARS, Tifton, GA; [2]Department of Crop and Soil Science, University of Georgia, Tifton.

ABSTRACT

Herbicide resistant Palmer amaranth has rapidly become the dominant weed management issue in agronomic crops of the Southeast U.S. The small size of Palmer amaranth seeds relative to other common weeds may provide an opportunity for physical weed control through high-residue, rolled cover crop mulches. Field studies were conducted at the USDA-ARS Jones Farm near Chula, GA to evaluate the influence of high residue cover crop mulches on Palmer amaranth control and crop growth and yield. Treatments were a 3X4 factorial in both cotton and peanut, with three levels of rye planting dates and four levels of weed control programs. Rye was drilled (100 kg/ha) in the first year on 17 October, 1 November, and 15 November 2007 and in the second year on 7 November and 4 December 2008 and 5 January 2009. Following rye anthesis, plots were rolled forming a horizontal mulch mat; plots were then sprayed with glyphosate at 1.1 kg ae/ha. Cotton and peanut were planted in spring 2008 and 2009. Peanut programs included: P1) nontreated control, P2) pendimethalin + flumioxazin PRE followed by (fb) paraquat + 2,4-DB at-crack (AC) fb imazapic POST, P3) pendimethalin + flumioxazin PRE fb paraquat + *S*-metolachlor AC fb lactofen POST, and P4) banded applications of pendimethalin + flumioxazin PRE fb paraquat + *S*-metolachlor AC fb lactofen POST. The cotton treatments included C1) nontreated control, C2) pendimethalin + fluometuron PRE fb glyphosate POST fb MSMA + diuron POST-directed (PD), C3) pendimethalin + fluometuron PRE fb glyphosate + *S*-metolachlor POST fb MSMA + diuron PD, and C4) banded application of pendimethalin + fluometuron PRE fb glyphosate + *S*-metolachlor POST fb MSMA + diuron PD. Rye produced 9,250 to 12,250 kg/ha of dry biomass in the first year and 3,470 to 11,370 kg/ha in the second year. Maximum biomass in both years occurred with the early November planting date. Broadcast applications in both crops (P2, P3, C2, and C3) controlled Palmer amaranth >90%; there were no treatment by mulch interactions. Banded applications in both crops were not adequate in controlling Palmer amaranth. In the nontreated control of both crops, Palmer amaranth densities, just prior to crop harvest, were 6.0 to 9.0 plants/m^2. Palmer amaranth plant biomass in the nontreated controls were 6,500 to 10,900 kg/ha in peanut and 13,500 to 16,000 kg/ha in cotton. The apparent difference in Palmer amaranth growth when grown in competition with cotton and peanut was reflected in crop growth and yield. Crop canopy volume (calculated using crop canopy width and height) in the nontreated control was reduced 14 to 46% relative to the best Palmer amaranth control treatment in peanut (P3), while in cotton, crop canopy volume was reduced 92 to 94% relative to the C3 treatment. Similarly, Palmer amaranth reduced peanut yield in the nontreated control 44% in both years, while the nontreated control in cotton did not produce a harvestable yield. Peanut yield in P2 and P3 were equivalent, but greater than the nontreated control and banded treatments. Cotton yield in C3 was greater than C2 in the first year, but equivalent in the second year; both were superior to yields in the nontreated control and banded treatment. Herbicide programs in this study were effective in controlling Palmer amaranth due to the low-level of naturalized herbicide resistance, to both glyphosate and ALS chemistries) in the Palmer amaranth population at this farm. This high level of control likely masked some of the benefits of high-residue cover crop mulches that have been observed in related companion studies in Georgia.

BENCHMARK STUDY: VARIATION IN WEED MANAGEMENT TACTICS IMPLEMENTED IN GLYPHOSATE-RESISTANT CROPPING SYSTEMS. B.G. Young and J.L. Matthews, Southern Illinois University, Carbondale; D.L. Jordan, R. Seagroves, and J. Hinton, North Carolina State University, Raleigh; M.D.K. Owen, Iowa State University, Ames; D.R. Shaw, Mississippi State University, Starkville; S.C. Weller, Purdue University, West Lafayette; and R.G. Wilson, University of Nebraska, Scottsbluff.

ABSTRACT

During 2006 and 2007 a total of 155 commercial fields in Illinois, Indiana, Iowa, Nebraska, North Carolina, and Mississippi were the foundation for comparing weed management tactics implemented by growers versus management practices recommended by a state university weed specialist for deterring the selection of glyphosate-resistant weed species. Each field was divided into two sections with half managed as typical for the grower and the other half managed following university recommendations. Fields were categorized into three cropping systems: 1) a single continuous glyphosate-resistant (GR) crop, 2) a rotation of two GR crops, and 3) a GR crop rotated with a non-GR crop.

The frequency of glyphosate applications used for weed management was greatest in a single continuous GR crop (2 applications/year) followed by a rotation of two GR crops (1.6 applications/year) and least with a GR crop rotated with a non-GR crop (1 application/year). In almost all instances the university recommendation did not reduce the frequency of glyphosate applications compared with grower practices. Growers used 3 applications of glyphosate on an annual basis in GR cotton compared with an average of 2 and 1.2 applications, respectively, for GR soybean and corn. The average rate of glyphosate used per application was similar between grower and university sides near the commonly used rate of 840 g ae/ha of glyphosate. However, the application rate of glyphosate increased from 763 to 913 g/ha, respectively, as the cropping system moved from a GR crop rotated with a non-GR crop to a continuous monoculture of a GR crop. Averaged over all crops and fields, the growers used glyphosate as the only herbicide for weed management in 40% of the sites compared with only 3% on for the university side of the field. Instead of excluding glyphosate as a weed management tool the university side included soil residual herbicides or tank-mixtures with glyphosate twice as often as the grower side. The additional herbicides under university recommendations were most frequently (68% of the sites) applied as preplant residual herbicides.

BENCHMARK STUDY - GROWER'S ATTITUDES TOWARDS HERBICIDE RESISTANCE MANAGEMENT STRATEGIES AND PERCEIVED OBSTACLES TO THEIR IMPLEMENTATION.

W.A. Givens, D.R. Shaw, and J.W. Weirich, Mississippi State University, Mississippi State, MS; 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 nearly 1,200 growers in six states (Illinois, Indiana, Iowa, Mississippi, Nebraska, and North Carolina) in 2005. In the survey, growers were asked to rank the effectiveness of seven practices aimed at minimizing the development of glyphosate resistance in weeds. On a 1-10 scale of effectiveness, growers ranked tillage the lowest (5.5), and using the correct label rates of herbicides at the proper timing for the size and type of weeds present highest (8.6). Growers in Mississippi ranked the practices as more effective (7.3) than growers in other states, while Indiana growers ranked the practices the lowest (6.9).

These data suggest that growers perceptions of the effectiveness of practices aimed at minimizing the development of glyphosate resistance often are not correct. Growers that have had personal experience with glyphosate-resistant weeds were more educated about practices that could be used to mitigate them. With respect to obstacles to adopting the practices aimed at minimizing the development of glyphosate resistance in weeds, the most frequent response was "nothing" (67%), followed by "cost" (14%) and "weed control" (8%). Among individual practices, the biggest obstacle other than "nothing" was "cost" for each of the practices: rotating herbicide chemistries from one year to the next (12%), tillage (17%), rotating crops (11%), using more than one herbicide chemistry in a given year such as glyphosate and a residual herbicide (24%), and using more than one herbicide chemistry in a given year such as glyphosate and another post-applied herbicide (26%). The two exceptions to this were the practices of: using the correct label rates of herbicides at the proper timing for the size and type of weeds present with weather being the biggest obstacle (20%), and rotating away from a Roundup Ready crop to a non-Roundup Ready crop with weed control being the biggest obstacle (15%).

These data suggest that growers perceptions of practices aimed at minimizing the development of glyphosate resistance may not be based on reality. Growers appear to become more educated concerning these practices after they have had personal experience woth glyphosate-resistant weeds. Growers may have an unrealistic perception of the costs of each of these practices, particularly in the light of the cost of not preventing the development of glyphosate-resistant weeds. Using this information, we as researchers must remain viligant, and consistant in our education efforts in conveying the correct information about glyphosate resistant management and preventative practices.

BENCHMARK STUDY: PERSPECTIVES ON GLYPHOSATE-RESISTANT CROPS AND THE SUSTAINABILITY OF CHEMICAL WEED MANAGEMENT. David R. Shaw, Mississippi State University, Mississippi State, MS; Micheal D. K. Owen Philip Dixon, Iowa State University, Ames, IA; Bryan G. Young, Southern Illinois University, Carbondale, IL; Robert G. Wilson, University of Nebraska, Scottsbluff, NE; David L. Jordan, North Carolina State University, Raleigh, NC; and Stephen C. Weller, and Purdue University, West Lafayette, IN.

ABSTRACT

A six-state field-scale project was initiated to study methods that may help glyphosate-resistant (GR) systems remain sustainable in terms of grower economics and the evolution of weed resistance. The four-year study was initiated following a farmer survey on weed management practices and their views on GR weeds and management. The findings included: 1) 30% of farmers thought GR weeds were or would become a serious problem; 2) few farmers thought tillage and/or using a non-GR crop in rotation would help prevent or manage GR weed evolution and 3) most farmers underestimated the role of herbicide selection pressure on the evolution of herbicide resistance. These results suggest major challenges facing agriculture and the weed science communities with regard to establishing sustainable systems within the GR-crop agroecosystems. Paramount is the need to develop and communicate clear science-based management recommendations that minimizes current rhetoric and convinces farmers to change long-held bias about weed control thus reducing the evolution of weed populations resistant to herbicides. Without a proactive and integrated approach to manage weeds in GR crops, the continued and wide-spread evolution of GR weeds is inevitable. This will be problematic in all crop systems and endanger the economics of GR technology which dominates current agriculture globally. Furthermore, lack of action on the part of the weed science communities increases the likelihood of regulatory intervention. Given present systems where alternatives to chemical weed control are essentially impractical, anything that compromises GR technology will significantly damage global agricultural productivity if effective solutions are not identified.

GROWER SURVEY OF GLYPHOSATE-RESISTANT WEED MANAGEMENT PRACTICES IN THE MISSISSIPPI DELTA. V.K. Nandula and R.C. Bond; Delta Research and Extension Center, Mississippi State University, Stoneville.

ABSTRACT

In Mississippi, four weed species, horseweed, Italian ryegrass, Johnsongrass, and Palmer amaranth, have been reported to be resistant to glyphosate. Poor control with glyphosate of a few other weeds such as giant ragweed and waterhemp has also been observed. Some of these species could also be multiple resistant to one or more modes of herbicide action over and above glyphosate further complicating management of GR weeds. Firsthand information on herbicide (including glyphosate)-resistant weeds management issues faced by growers can be obtained through surveys. Such information would be valuable to university (research and extension) and industry personnel in designing suitable control options. A written survey was distributed to growers, consultants, and others comprising scientists, staff, and industry representatives at the Delta Research and Extension Center annual field day on July 16, 2009. There were 34 respondents with 10 growers, 1 consultant, and 23 others. Based on number of acres farmed or consulted, there were 3 replies for less than 1000 acres, 4 for 1000-2500 acres, 5 for 2500-5000 acres, and 13 for >5000 acres. Among major crops involved with, there were 20 responses for corn, 14 for cotton, 18 for rice, 28 for soybean, and 11 for wheat. Most problematic weeds to manage during the 2008-2009 growing seasons were pigweed (Palmer amaranth and waterhemp, 19 replies), horseweed (18), barnyardgrass and ryegrass (17), Johnsongrass (8), other (2), and giant ragweed (1 reply). All 34 survey participants indicated that they were familiar with the issue of herbicide (glyphosate) resistance. Herbicide (glyphosate) resistance in the respective affiliated farm was suspected by 28 respondents with 4 ‘not sure’ replies. Most resistant weeds were horseweed (21 answers), ryegrass (20), pigweed (16), barnyardgrass (7), giant ragweed (3), and Johnsongrass (1 answer). Non-glyphosate herbicides being used include 2,4-D (26 replies), Valor (25), Dual (21), Gramoxone (20), Command (19), Select and Prowl (18), Ignite (13), Clarity (13), and Treflan (6 replies). A similar survey will be conducted next year and attempts will be made to reach a broader audience. This survey information will supplement an ongoing comprehensive herbicide resistance screening program.

SURVEY OF GLYPHOSATE-RESISTANT WEEDS IN THE MISSISSIPPI DELTA. V.K. Nandula and R.C. Bond; Delta Research and Extension Center, Mississippi State University, Stoneville.

ABSTRACT

In Mississippi, glyphosate resistance has been documented in horseweed (2003), Italian ryegrass (2005), Johnsongrass (2008), and Palmer amaranth (2008). Over the past two years, various growers, university personnel, and industry representatives have observed poor control of several weed species including barnyardgrass, giant ragweed, and waterhemp with glyphosate, and suspect resistance in these species. It is necessary to have a thorough estimate of spread and distribution of glyphosate-resistant (GR) weeds, which will enable extension personnel, private and public land managers, and the public at large to devise and support sound GR weed management programs. The primary objective of this research was to establish a comprehensive database of GR as well as other herbicide-resistant weeds in the Mississippi Delta. In summer and fall of 2009, seed samples from weed populations suspected to be resistant were collected from across the 17-county Mississippi Delta region. The following weed species were sampled: Italian ryegrass (100 populations), Palmer amaranth (60 populations), barnyardgrass (20 populations), waterhemp (8 populations), Johnsongrass (6 populations), redroot pigweed (4 populations), and giant ragweed (2 populations). Additionally, seed from horseweed (10 populations), red rice (10 populations), and sprangletop (1 population) was collected to screen for resistance to non-glyphosate herbicide chemistries. Greenhouse studies were conducted to screen for resistance to glyphosate at a 0.84 kg ae/ha rate. Among the 100 Italian ryegrass populations, one-third were considered resistant to glyphosate with at least one resistant population existing in 12 counties. There were one or more GR Palmer amaranth populations in 9 counties. All waterhemp populations were sampled from a single county and 4 of the 8 populations were resistant to glyphosate. All barnyardgrass populations were highly susceptible to glyphosate. Glyphosate resistance screening studies with giant ragweed and Johnsongrass populations are currently ongoing.

CURRENT SITUATION WITH HERBICIDE RESISTANCE IN OKLAHOMA. R.G. Haxton*, T.F. Peeper, J.J.Q. Armstrong, A.E. Stone, M. C. Boyles, J. A. Bushong; Plant and Soil Sciences, Oklahoma State University, Stillwater, OK

ABSTRACT

Italian ryegrass (*Lolium multiflorum* L.) infestations continue to increase in winter wheat across the state of Oklahoma. In replicated research conducted annually on various Oklahoma State Univ. Experiment Stations, herbicide resistant ryegrass has not been found. However, increasing grower complaints concerning difficulty in controlling ryegrass suggested that herbicide resistance could be hindering control efforts. Therefore, during May and June, 2008 ryegrass seed samples were collected from 23 Oklahoma counties. Of the 103 samples collected, 79 were randomly collected by the authors as they were encountered while driving, 16 were collected by growers and/or county Cooperative Extension personnel and five were collected by grain elevators as they recleaned wheat delivered to them in 2008. A few samples submitted were too immature to germinate, but 98 of the 103 were satisfactory for seeding. Each sample was seeded in a single row 30.5 m long at the Cimarron Valley Research Station near Perkins, OK in a Norge loam soil on September 9, 2008. Row spacing was 0.8 m. Nine herbicide treatments were applied to 3 m segments of each row and one segment was left unsprayed. Activating rainfall was received soon after the two preemergence treatments were applied. Seven postemergence treatments were applied 29 days after planting at which time the ryegrass had begun to tiller. All herbicides were applied at label- recommended rates using a CO_2 backpack sprayer in 187 L ha^{-1} water carrier with appropriate additives. Control was visually estimated 34 days after the postemergence treatments were applied. To simplify presentation to growers, ryegrass samples were categorized as controlled, suppressed, or resistant corresponding to visual control ratings of 90 to 100%, 50 to 89%, or less than 50% control, respectively. Using this classification, only 35% of the ryegrass samples were effectively controlled by Group 2 (ALS inhibiting) herbicides (chlorsulfuron + metsulfuron, mesosulfuron, pyroxsulam, and imazamox) and over 50% were resistant. None of the samples were resistant to the four Group 1 (ACCase inhibiting) herbicides (diclofop-methyl, pinoxaden, quizalofop, and clethodim), but diclofop-methyl only suppressed 20% of the samples, indicating that resistance to these herbicides may be developing. All of the ryegrass samples were controlled with flufenacet + metribuzin and glyphosate. Growers often fail to apply herbicides in the fall as recommended because of concerns over later emergence of additional ryegrass plants. Some late emergence (emergence more than 63 days after seeding) occurred in 88% of the lines. Seed of two locally purchased cultivars exhibited no herbicide resistance. This year a larger set of samples is being evaluated for resistance and the results to date are similar.

PARAQUAT SYNERGISM WITH PHOTOSYSTEM II INHIBITING HERBICIDES FOR REMOVAL OF PARTIAL CORN STANDS. J.A. Bullington[1], K.L. Smith[1], J.K. Norsworthy[2], 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 Division of Agriculture; Fayetteville, AR

ABSTRACT

When a corn crop fails to establish or is severely injured, those plants that are present must be removed in order for proper replant. Historically, that has been an easy task using a simple non-selective herbicide; but with Round Ready and Liberty Link corn along with the RR2/LL Stack technology now present in almost all production fields; that task has become much more complex.

A field study was conducted at the University of Arkansas Southeast Research and Extension Center branch station near Rohwer, AR, on a Sharkey / Desha silt loam to evaluate whether PSII-inhibiting herbicides (diuron, metribuzin, and atrazine) added to paraquat or glufosinate would increase control of glyphosate-resistant corn over that with paraquat alone. In this study we are also looking at other herbicides that could be used for stand removal, other than the recommend standard of clethodim. The study was conducted in 2008 and repeated in 2009 using a randomized complete block design with four replications. Dekalb DKC 67-71 was planted in two-row plots at 33,000 seeds per acre on 38-inch beds using a twin-row Monosem planter. All treatments were applied using a four-nozzle boom and CO2 -propelled backpack sprayer calibrated to apply 15 gal per acre. All treatments were applied at 5 inch / V3 corn. This study consisted of 23 treatments each with necessary adjutants: untreated check, clethodem (Select Max) 0.0455 lb ai/A, paraquat (Gramoxone Inteon) 0.625 lb ai/A, Gramoxone Inteon 0.625 lb/A + metribuzin (Sencor) 0.14 lb ai/A, Gramoxone Inteon 0.625 lb/A + diuron (Direx) 0.5 lb ai/A, Gramoxone Inteon 0.625 lb/A + atrazine (Aatrex) 1.0 and 0.5 lb ai/A, glufosinate (Ignite 280) 0.53 and 0.73 lb ai/A, Ignite 280 0.53 and 0.73 lb/A + Sencor 0.14 lb/A, Ignite 280 0.53 and 0.73 lb/A + Direx 0.5 lb/A, Ignite 280 0.53 and 0.73 lb/A + Aatrex 1.0 and 0.5 lb/A, Gramoxone Inteon 0.625 lb/A + dicamba (Clarity) 0.25 lb ae/A, cyhalofop (Clincher) 0.149 lb ai/A, fenoxaprop (Ricestar) 0.124 lb ai/A, propanil (Stam M4) 3.0 and 4.0 lb ai/A, and MSMA 2 lb ai/A. In this study, phytotoxcity ratings were made 7, 14, 21, 27, and 54 days after application. Live / dead counts were made 7 and 14 days after application.

Seven days after application, Gramoxone Inteon at 0.625 lb/A showed 65% necrosis with 2.1 plants per row foot alive and 0.3plant per row foot dead .Gramoxone Inteon at 0.625 lb/A + Sencor 0.14 lb/A or Direx 0.5 lb/A or Aatrex 1.0 or 0.5 lb/A showed greater than 97% necrosis with 0.1 plants per row foot alive and 2.2 plants per row foot dead. Also at 7 days after application Select Max at 0.0455 lb/A showed 64% necrosis with 2.4 plants per row foot alive and 0 plants per row foot dead; and Ignite 280 at 0.53 and 0.73 lb/A showed 75% necrosis with 2.1 plants per row foot alive and 0.5 plants per row foot dead. Fourteen days after application, Gramoxone Inteon at 0.625 lb/A showed 60% necrosis with 2.2 plants per row foot alive and 0.1 plants per row foot dead, while Gramoxone Inteon at 0.625 lb/A + Sencor 0.14 lb ai/A or Direx 0.5 lb/A or Aatrex 1.0 or 0.5 lb/A increased necrosis to greater than 98% with 0.1 plants per row foot alive and 2.3 plants per row foot dead. Again at 14 days after application Select Max at 0.0455 lb/A showed 87% necrosis with 0.6 plants per row foot alive and 1.74 plants per row foot dead; and Ignite 280 at 0.73 lb/A showed 83% necrosis with 0.54 plants per row foot alive and 2.01 plants per row foot dead. The trend continued until 21 days after application, with the combination of PSI- and PSII-inhibiting herbicides causing 99% necrosis, while Select Max and Ignite 280 caused greater than 90% necrosis. All of the reaming treatments did not provide adequate control of partial corn stand.

In conclusion, our data showed that the addition of a photosystem II-inhibiting herbicide to Gramoxone Inteon increased necrosis and corn death over Gramoxone Inteon applied alone. Our data also showed that Select Max can be used, but requires more time to provide good control. Ignite 280 can also be used in non-Liberty Link corn situation, but has poorer control. We concluded that Gramoxone Inteon + a photosystem II- inhibiting herbicide could be used to remove failed or partial corn stands.

USE OF PSII-INHIBITING HERBICIDES IN COMBINATION WITH PARAQUAT FOR IMPROVED BURNDOWN WEED CONTROL. J.K. Norsworthy, K.L. Smith, and J. Still; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

ABSTRACT

Paraquat is an effective, broad-spectrum herbicide that can be applied prior to crop establishment for rapid desiccation of weeds. Unfortunately, this rapid desiccation limits the movement of paraquat in plants, often resulting in regrowth of weeds following application. It was hypothesized that use of PSII-inhibiting herbicides with paraquat would reduce electron transport and the rapid destruction of plant tissue, allowing for greater paraquat translocation and ultimately improved efficacy. Research was conducted in 2009 to evaluate the burndown efficacy of PSII-inhibiting herbicides applied alone and in combination with paraquat. In the first experiment, the PSII-inhibiting herbicides were atrazine at 0, 0.5 and 1.0 lb ai/A, diuron at 0.5 and 1 lb ai/A, and metribuzin at 0.25 and 0.5 lb ai/A. Paraquat was applied at 0, 0.2, 0.4, and 0.6 lb ai/A for a total of 27 experimental combinations replicated four times. The herbicides were applied in mid-March at Clarkedale, AR, to horseweed that was in rosette stage at application. Horseweed control was evaluated at 14 and 25 days after treatment (DAT). The second experiment was conducted at Pickens, AR, using the same rates of paraquat and metribuzin along with propanil applied at 0, 1, and 2 lb ai/A. Horseweed, annual bluegrass, and henbit control was evaluated at 12 and 19 DAT. For both experiments, crop oil concentrate was applied with all treatments at 1% v/v. At Clarkedale, none of the PSII-inhibiting herbicides alone provided more than 33% control at 25 DAT. Synergy occurred from most combinations of the PSII herbicides with paraquat. Horseweed control from paraquat at 0.6 lb/A plus atrazine at 1 lb/A, diuron at 0.5 and 1 lb/A, or metribuzin at 0.25 and 0.5 lb/A was at least 94% at 25 DAT. At Pickens, the horseweed had bolted prior to application. Control at 19 DAT was no more than 56% with either PSII herbicide alone. Horseweed control often improved with the addition of either PSII herbicide to paraquat; however, the extent of the improvement was not as large as that observed at Clarkedale. This may partially be a result of the larger plant size at application as well as shorter duration between application and assessment of control. Paraquat applied alone or with the PSII herbicides, regardless of rate, was effective in controlling henbit and annual bluegrass >95%.

COMPARISION OF PREPLANT BURNDOWN PROGRAMS IN SOYBEAN. J.A. Still, J.K. Norsworthy, G.M. Griffith, E. McCallister, T. Jones, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR, and R.M. Edmund, Dupont Agricultural Products, Little Rock, AR

ABSTRACT

Roundup Ready® soybean makes up the majority of soybean planted in the United States. The exclusive use of glyphosate with this crop has lead to increased selection for the evolution of glyphosate-resistant (GR) weeds. The use of multiple modes of action (MOA's) decreases selection for GR weeds. GAT® (glyphosate and acetolactate synthase (ALS) tolerant) technology by DuPont® will allow the use of multiple MOA's and broad-spectrum, residual ALS herbicides. Three herbicides intended to be used with GAT® technology are Traverse™ (chlorimuron + rimsulfuron), Freestyle™ (chlorimuron + thifensulfuron + tribenuron), and Diligent™ (chlorimuron + rimsulfuron + flumioxazin). The objective of this study was to evaluate the effectiveness of these herbicides in burndown programs for weed control in soybean. The experiment was a split-plot design with 3 replications where the main plot was either a winter burndown (WBD) application or a spring burndown (SBD) application. Both WBD and SBD applications were followed by a late burndown (LBD) application 1 month prior to planting soybean. Herbicide programs were 1) Traverse™ + 2,4-D ester + Roundup PowerMax™ fb Enlite, 2) Freestyle™ + 2,4-D ester + Roundup PowerMax™ fb Diligent™, and 3) Diligent™ + 2,4-D ester + Roundup PowerMax™. 'AG4703RR' soybean was planted May 20, 2009. Four weeds, annual bluegrass (*Poa annua*), broadleaf signalgrass (*Brachiaria platyphylla*), pitted morningglory (*Ipomoea lacunosa*), and Palmer amaranth (*Amaranthus palmeri*) were evaluated. Programs 1 and 2, applied either WBD or SBD, provided effective control of all weeds through soybean planting, except for broadleaf signalgrass. Program 3 when applied at SBD provided significantly less control of broadleaf signalgrass at soybean planting. Despite planting non-STS soybean, there was less than 3% injury to soybean plants, and yields from the three programs were similar to the nontreated control. Herbicide programs containing Traverse™, Freestyle™, and Diligent™ provided up to 6 months of effective weed control, which can provide flexibility at the time of the first application of glyphosate or glufosinate in Liberty Link® soybean. These programs also offer additional control options when GR weeds such as horseweed and Palmer amaranth are present.

IMPACT OF DICAMBA/GLYPHOSATE COMBINATIONS ON WEED CONTROL. J. A. Huff*,[1]D. R. Shaw,[1] J. W. Weirich,[1]M. B. Wixson,[2]; [1]Mississippi State University, Mississippi State, MS, [2]Helm Agro, Memphis, TN.

ABSTRACT

With the development of dicamba-resistant crops nearing commercialization, interest and research surrounding this technology has increased dramatically. While this new technology provides producers with an alternative production practice, questions have also arisen regarding possible interactions between glyphosate and dicamba herbicide combinations. The objective of this research is to determine the potential for synergistic or antagonistic effects of various rates of glyphosate/dicamba combinations on a variety of monocot and dicot weeds. Four monocots, johnsongrass *(Sorghum halepense* (L.) Pers.*)*, barnyardgrass *(Echinochloa crus-galli* (L.) Beauv.*), and* broadleaf signalgrass *(Urochloa platyphylla* (Nash) R.D. Webster*)*, and four dicots, sicklepod *(Senna obtusifolia* (L.) H.S. Irwin & Barneby*)*, hemp sesbania *(Sesbania herbacea* (P. Mill.) McVaugh*)*, prickly sida *(Sida spinosa* L.*)*,and pitted morningglory *(Ipomoea lacunosa L.)*, were chosen to represent troublesome weed species. Seed for all species was planted in plastic pots that contained a 1:1 v/v mixture of soil/peat. Plants were grown in the greenhouse and treated at the 4-6 leaf stage with various rates of dicamba, glyphosate, and combinations of the two herbicides. Rates were determined to encompass the LD_{50} for the plant species chosen. Fresh weight was taken at 21 days and converted to percentage reduction based on the untreated check. Antagonistic effects were observed in all species tested when low rates of dicamba were applied with glyphosate at all rates. As rates increased, antagonistic effects were no longer observed.

EFFECT OF HERBICIDE RATE AND TIMING ON JOHNSONGRASS CONTROL. D.B. Johnson, J.K. Norsworthy, J.A. Still, and M.J. Wilson University of Arkansas Department of Crop, Soil, and Environmental Sciences

ABSTRACT

Johnsongrass (*Sorghum halepense*) is one of the most difficult to control grass weeds. It is especially difficult to control once it becomes large enough to produce rhizomes, usually 3 to 4 weeks after emergence. Herbicide application timing is critical to achieve effective control. The purpose of this study was to determine the effect of herbicide rate and timing on johnsongrass control. Research was conducted in the summer of 2009 in Fayetteville, AR, at the University of Arkansas Agricultural Research and Extension Center. The herbicides tested were glyphosate (Roundup Weathermax), glufosinate (Ignite), clethodim (Select Max), and nicosulfuron (Accent). In this study, glyphosate was applied at 0.945 lb ae/A and nicosulfuron was applied at 0.031 lb ai/A. Multiple rates of glufosinate and clethodim were tested in this study. The three rates of glufosinate tested were 0.40, 0.53, and 0.66 lb ai/A, and clethodim was applied at 0.061- and 0.121 lb ai/A. Each herbicide treatment was applied to 6-, 12-, 18-, and 24-inch johnsongrass. Visual control ratings were taken weekly for 4 weeks after treatment. Glyphosate provided at least 95% johnsongrass control at the 6-, 12-, and 18 inch application timings 14 days after treatment (14 DAT). Glyphosate was less effective on 24-inch johnsongrass providing only 79% control 14 DAT. Control of johnsongrass with glufosinate at 14 DAT did not differ among the three rates applied to the 6-and 12-inch johnsongrass (84 to 97% control). None of the three rates effectively controlled 18-or 24-inch johnsongrass. Both rates of clethodim controlled 6-,12-,and 18 inch johnsongrass, 92 to 99% 14 DAT. Clethodim applied at 0.121 lb ai/A controlled 24-inch johnsongrass 88%, but the lower use rate controlled only 71%. Control of 6-inch johnsongrass with nicosulfuron was ineffective (86% control). Nicosulfuron provided less than 75% control of johnsongrass at all the other application timings. Glyphosate and clethodim provided the most effective johnsongrass control at each application timing. However, clethodim seemed to allow less regrowth from rhizomes than glyphosate. Glufosinate was effective in controlling the johnsongrass at the earlier application timings, however was not as good as glyphosate or clethodim on the 18-to-24 inch johnsongrass.

INFLUENCE OF PREMIX TIMING ON EFFICACY OF HERBICIDES. P.M. Eure*, D.L. Jordan, L.R. Fisher, G.S. Chahal, J.S. Bacheler, R. Seagroves, J. Hinton, and A.C. York; North Carolina State University. Raleigh, NC.

ABSTRACT

Weather, equipment failure, and other unforeseen events can prevent or delay application of pesticides. Although chemicals are often left in the spray tank for numerous days, there is little information available to growers concerning the effects of delayed applications on efficacy. The objective of this research is to determine the influence of premix timing on efficacy of herbicides. Experiments were conducted in North Carolina during 2009 to determine the influence of premix timing on efficacy of seven preemergence and seven postemergence herbicides. Treatments included four timings; mixing the day of the application (0 day) and 3, 6, and 9 days prior to application. Herbicides were stored in plastic bottles in the dark at room temperature. Herbicide solutions were agitated adequately to ensure uniform herbicide distribution in spray solution at the time of application. All herbicide treatments were applied on the same day. Three trials were conducted with preemergence herbicides including diclosulam, dimethenamid, flumioxazin, fomesafen, imazethapyr, pendimethalin, and *S*-metolachlor. Weed species included broadleaf signalgrass (*Brachiaria platyphylla*), common lambsquarters (*Chenopodium album*), entireleaf morningglory (*Ipomoea hederacea*), and Palmer amaranth (*Amaranthus palmeri*). In separate experiments, postemergence herbicides included atrazine, dicamba, glufosinate, glyphosate, imazethapyr, lactofen, and paraquat. The most common weed species in the postemergence herbicide trials were broadleaf signalgrass, common ragweed (*Ambrosia artemisiifolia*), entireleaf morningglory, and Palmer amaranth. Herbicides were applied at the manufactures suggested use rate. When considering preemergence herbicides, time of premixing did not affect efficacy of diclosulam, dimethenamid, flumioxazin, fomesafen, imazethapyr, pendimethalin, and *S*-metolachlor on broadleaf signalgrass. However, in the postemergence herbicide study, atrazine, lactofen, and paraquat efficacy was affected by premix timing. Atrazine controlled entireleaf morningglory less as mixing time was delayed. However, lactofen mixed 6 or 9 days prior to the application controlled Palmer amaranth better at two of three locations than mixing closer to application. However, at one location the 0 day mix controlled Palmer amaranth better than mixing 3, 6, or 9 days prior to application. Paraquat mixed 3 days prior to application controlled Palmer amaranth less effectively than mixing 0, 6, or 9 days prior to application at one of three locations. While these data suggest that growers should be aware of possible inconsistent weed control with certain herbicides that sit in the spray tank several days prior to application, additional research is needed to clearly define the scope of this potential issue.

EFFICACY OF CARFENTRAZONE AND PYRAFLUFEN AS INFLUENCED BY WATER pH AND ELAPSED TIME IN SPRAY SOLUTION. J.R. Meier[1], K.L. Smith[1], J.A. Bullington[1], R.C. Doherty[1], and P.B. Francis[2]; [1]University of Arkansas Division of Agriculture, Monticello, AR, [2]University of Arkansas-Monticello, Monticello, AR.

ABSTRACT

A field study was conducted in 2009 at the Southeast Research and Extension Center near Rohwer, AR, to evaluate the effects of water pH and elapsed time in solution on efficacy of carfentrazone and pyraflufen. Carfentrazone at 9 and 17 g ai ha and pyraflufen at 2 and 4 g ai ha were mixed with tap water adjusted to pH 5 and pH 8, and applications were made to hemp sesbania immediately one hour, and four hours after mixing. Control of hemp sesbania 7 days after application (DAA) with pyraflufen at 2 g was greater at pH 5 (98%) than at pH 8 (91%) when applied immediately after mixing, but control was greater at pH 8 (100%) than pH 5 (95%) after one hour elapsed time in solution. By 14 and 21 DAA control was equal with pyraflufen at 2 g regardless of water pH or elapsed time in solution. Control of hemp sesbania 7 DAA increased over elapsed time with 9 g carfentrazone at pH 5 (85% immediately after mixing, 91% one hour later, and 98% four hours after mixing) but was equal in control over elapsed time by 14 and 21 DAA. At pH 8, control 7 and 21 DAA with carfentrazone at 9 g increased when applied four hours after mixing compared to being applied immediately after mixing (88% immediately after mixing and 95% four hours after mixing). Control with pyraflufen at 4 g and carfentrazone at 17 g was not affected by water pH or elapsed time in solution 7, 14, and 21 DAA. Although differences in hemp sesbania control between pH and elapsed time in solution were significant with lower rates of carfentrazone and pyraflufen, they were considerably minute, and these effects were overcome by increasing product amounts in this trial.

IMPACT OF STARTER FERTILIZER APPLICATION ON RICE RESPONSE TO CLOMAZONE. J.B. McDuffie, J.A. Bond, J.K. Manning, and T.W. Walker, Mississippi State University, Stoneville

ABSTRACT

Clomazone (Command) has been used in southern dry-seeded rice since 1999, and today many rice weed control programs are designed around clomazone applications. Although rice tolerance to clomazone is acceptable in most cases, rice injury can occur under certain conditions. Rice injury is a concern following clomazone applications, especially when rice is seeded early in the season (prior to April 1 in Mississippi). Inbred rice cultivars can respond differently to clomazone applications; furthermore, practitioners report that clomazone injury is more severe on hybrid than inbred rice cultivars. Agronomic research conducted in Mississippi demonstrated a positive rice response to early-season (starter) nitrogen (N) fertilizer applications. Following clomazone with a starter N fertilizer application may reduce the injury often observed from clomazone. Research was conducted in 2008 and 2009 at the Mississippi State University Delta Research and Extension Center in Stoneville to 1) compare the response of hybrid and inbred rice cultivars to applications of clomazone and 2) determine if starter N applications reduce clomazone injury on rice seeded early in the growing season.

Treatments were arranged as a three-factor factorial within a randomized complete block design with four replications. Factor 1 was two rice cultivars, 'XL723' (hybrid) and 'Cocodrie' (inbred). Factor 2 included three rates of clomazone (0, 0.375, and 0.6 lb ai/A). Factor 3 was starter N applied as ammonium sulfate (AMS; 21:0:0) at 0 or 21 lb N/A. Rice was seeded on March 24 and emerged April 14 both years. All clomazone treatments were applied immediately after seeding, and AMS was applied approximately 2 weeks after emergence (WAE) when rice reached the two-leaf growth stage. Visual estimates of rice injury were recorded 1, 2, 3, and 4 WAE; rice seedling density was determined at 3 WAE; and rice yields were converted to 12% moisture content at season's end. All data were subjected to ANOVA, and means were separated using Fisher's protected LSD at $p \leq 0.05$.

Clomazone at 0.375 and 0.6 lb ai/A injured XL723 more than Cocodrie 1 WAE. Starter N applications did not influence rice injury. For both cultivars, injury was greatest following clomazone at 0.6 lb ai/A before and after AMS application. Differences in early-season rainfall may have caused differences in rice injury between 2008 and 2009. XL723 seedling density was not impacted by clomazone or AMS applications. Seedling density of Cocodrie was higher in one of two years in plots where no clomazone was applied but AMS was applied at the one- to two-rice stage. Heat unit accumulation was 12% greater in 2008 compared with 2009. Cocodrie yield was not impacted by clomazone application in either year. XL723 yield was reduced in one of two years in following clomazone at 0.375 and 0.6 lb ai/A. Pooled across year and cultivar, yield was lower following both clomazone rates in plots receiving no AMS. However, when AMS was applied, yield was not negatively impacted by clomazone application.

Clomazone injured the hybrid cultivar XL723 more than the inbred cultivar Cocodrie. No positive early-season response to AMS was detected where clomazone was applied. Rice yield can be reduced by clomazone. However, the yield loss can be overcome with starter fertilizer.

WATER CONDITIONERS AND SPRAY ADDITIVES WITH RICE HERBICIDES. E.P. Webster, S.L. Bottoms, J.B. Hensley, and J.A. Bond; School of Plant, Environmental, and Soil Sciences, Louisiana State University Agricultural Center, Baton Rouge; Mississippi State University, Stoneville.

ABSTRACT

It is common for producers to add spray additives to mixtures to aid in herbicide uptake through the use of surfactants and/or water conditioners in the form of ammonium sulfate (AMS) or AMS substitutes. Studies were established at the Louisiana State University Agricultural Center Rice Research Station and at the Mississippi State University Delta Research and Extension Center to evaluate several AMS substitutes compared with dry sprayable AMS. Preliminary data indicates the addition of AMS to Ricestar increases activity of the herbicide on target species and aid activity under adverse conditions.

A study was established to evaluate two liquid AMS substitutes, Choice and Quest, and a dry sprayable formulation of AMS. Preliminary pH values were obtained from all spray solutions. The tap water used in both studies had a base pH of approximately 8.2. The addition of dry AMS reduced the pH to 7.0. The two liquid formulations, Choice and Quest, reduced pH to 5.5 and 3.5, respectively. Choice and Quest were applied at 0, 4, 8, 12, 16, and 32 oz/A mixed with Ricestar at 17 oz/A. A comparison treatment of 2 lb/A of AMS plus Ricestar at 17 oz/A was also evaluated. At 14 DAT, barnyardgrass control was 70 to 84% with no differences observed, regardless of additive, compared with Ricestar with no AMS added in Louisiana; however, Ricestar alone performed better than 8, 12, 16, and 32 oz/A of Quest or dry AMS in Mississippi. At 28 DAT, control of barnyardgrass in Mississippi was 70 to 88%. All Ricestar plus Quest mixtures controlled barnyardgrass below 80%. The addition of Choice, AMS, or no AMS provided 83 to 88% control of barnyardgrass. The later rating in Louisiana resulted in reduced control compared with Mississippi; however, trends were similar. Data indicate that the addition of dry AMS preformed slightly better or equal to AMS substitutes.

In another study, the previously mentioned AMS formulations plus Alliance were evaluated in mixture with Newpath. Alliance is a liquid formulation of AMS and has the same effect on water pH as the dry formulation of AMS. ‘CL 131’ rice was treated with two applications of Newpath applied at 4 oz/A at early postemergence followed by a second application 2 weeks later. Each application of Newpath had 1% crop oil concentrate plus no AMS, Choice at 8 oz/A, Quest at 12 oz/A, Alliance at 19.2 oz/A, or dry AMS at 2 lb/A. Red rice control was 90 to 92% at 14 days after the second application for all Newpath AMS combinations.

These studies indicate that the addition of AMS or AMS substitutes to Ricestar is not consistent across treatments or locations. The added costs of a spray additive to Ricestar or Newpath may not be justified. Growers must determine if the addition of an AMS additive is needed or justified.

RICE TOLERANCE TO HERBICIDES. S.L. Bottoms, E.P. Webster, and J.B. Hensley; Louisiana State University Agricultural Center, Baton Rouge.

ABSTRACT

A study was conducted in 2009 at the Louisiana State University Agricultural Center Rice Research Station near Crowley, Louisiana to evaluate the effects of Ricestar HT on several rice cultivars and hybrids. The experimental design was a three-factor factorial arrangement of treatments in a randomized complete block with four replications. The long grain rice conventional cultivar 'Catahoula', aromatic cultivar 'Jazzman', hybrids 'CLXL 745' and 'Arize', the medium grain cultivars 'Bengal', 'Jupiter', and 'Nepture', and the short grain rice cultivar 'Pirogue' were evaluated. Each cultivar or hybrid was treated with 0, 17, and 24 oz/A of Ricestar HT. Applications of both herbicide rates were applied at two application timings, early postemergence (EPOST) on May 12, 2009 and late postemergence (LPOST) on May 19, 2009. All applications were applied at a spray volume of 15 GPA with a CO_2-pressurized backpack sprayer. Rice plant height and visual injury for the EPOST treatments were evaluated 8 d after (DA) EPOST and all treatments were evaluated 10 and 21 DALPOST. Rice plant height at harvest and rough rice yield were also obtained.

The rice plant height and visual injury of each cultivar or hybrid was not affected by Ricestar HT applications when evaluated at 8 DAEPOST or 10 DALPOST. At 21 DALPOST, visual injury was 10 and 13% when 17 and 24 oz/A of Ricestar HT, respectively, were applied to Arize hybrid. However, no reduction in rice plant height was observed at any evaluation date for any rice cultivar or hybrid treated with Ricestar HT. Also, for all rice cultivars and hybrids evaluated, Ricestar HT applications did not affect rough rice yield.

While the potential for visual injury to a rice crop from Ricestar HT exists, the injury appears to be only cosmetic and rice plant height and yield are not affected.

SEQUENTIAL APPLICATIONS OF QUINCLORAC AND FENOXAPROP FOR BARNYARDGRASS CONTROL IN RICE. J.A. Bond, J.K. Manning, and J.B. McDuffie, Mississippi State University, Stoneville

ABSTRACT

Weed control programs in rice are often designed around management of barnyardgrass. Quinclorac (Facet) and fenoxaprop (Ricestar HT) are widely utilized in midsouthern USA rice fields for barnyardgrass control. The two are often applied in combination for postemergence and residual control. Recently, questions have arisen about the efficacy of sequential applications of quinclorac and fenoxaprop. Research was conducted in 2009 at the Mississippi State University Delta Research and Extension Center in Stoneville, MS, to evaluate annual grass control with different sequential applications of quinclorac and fenoxaprop applied before and after surface irrigation.

The study was designed as a randomized complete block with four replications. Quinclorac (0.375 lb ai/A) and fenoxaprop (0.109 lb ai/A) were applied as tank-mixtures or in sequential applications 1 or 5 days prior to surface irrigation followed by application 1 or 5 days after surface irrigation. A sequential treatment of clomazone (Command; 0.5 lb ai/A) applied preemergence followed by propanil (SuperWham; 4 lb ai/A) plus pendimethalin (Prowl H2O; 1 lb ai/A) and a nontreated control were included for comparison. Visual estimates of rice injury and barnyardgrass (Echinochloa crus-galli) and browntop millet (Urochloa ramosa) control were recorded 14, 28, and 49 days after the final application (DAT). At maturity, plots were harvested and rice grain yields were adjusted to 12% moisture content. All data were subjected to ANOVA and means were separated using Duncan's multiple range test.

No rice injury was observed at the three evaluations. Differences in control of barnyardgrass and browntop millet were detected with the tank-mixture application timings and the different sequential applications. Barnyardgrasss was controlled 66 to 80% 49 DAT with all quinclorac plus fenoxaprop tank-mixtures. Barnyardgrass control was lower when quinclorac plus fenoxaprop was applied prior to surface irrigation compared with applications following surface irrigation. Conversely, browntop millet control was greater from applications made following surface irrigation. Herbicide sequence impacted barnyardgrass and browntop millet control more than the interval between applications. Regardless of the interval between sequential treatments, barnyardgrass and browntop millet were controlled better 14 and 49 DAT when fenoxaprop was applied before quinclorac. All fenoxaprop followed by quinclorac sequential applications controlled barnyardgrass better than tank-mixtures applied 1 or 5 d following surface irrigation.

Soil moisture may not have been low enough to limit the effectiveness of fenoxaprop applied 1 or 5 d prior to surface irrigation. Futhermore, quinclorac injury may have reduced uptake of fenoxaprop and caused lower control when quinclorac preceded fenoxaprop. Although tank-mixtures of quinclorac and fenoxaprop are recommended in many rice-growing areas, results of the current research indicate that control of barnyardgrass and browntop millet may be improved with sequential treatments of fenoxaprop followed by quinclorac. In situations requiring sequential applications of quinclorac and fenoxaprop, our results suggest that best annual grass control will be achieved with fenoxaprop followed by quinclorac.

F7275: BROADHEAD™ A NEW HERBICIDE FOR DELAYED PRE-EMERGENCE AND POST-EMERGENCE WEED CONTROL IN RICE. H.R. Mitchell, J.S. Wilson, and J.P. Reed, FMC, Philadelphia, PA

ABSTRACT

Broadhead™ (F7275) is a new herbicide in developed by FMC Corporation for weed control in both conventional and Clearfield© rice production systems. It is a premix of carfentrazone and quinclorac (1:16.7 ratio) and can be applied pre-emergent or early post-emergent for control of difficult to manage grass and broadleaf weeds of rice. Broadhead will be formulated as a 70 percent dry flowable (DF) and can be used in either a dry-seeded or water-seeded rice production system. In a dry-seeded production system, Broadhead may be applied pre-emergent, delayed pre-emergent (prior to crop emergence) or post-emergent when rice has at least two true leaves. In a water-seeded system, Broadhead may be applied only as a post-emergent treatment when rice has at least two true leaves.

Registered rates of Broadhead will range from 0.175 to 0.53 lb ai/a (4 to 12.1 oz/A formulated, respectively) with specific use rates based on soil texture and in the case of post-emergence applications, target weed size. At these rates and application methods, Broadhead should prove to be a valuable new weed control tool in rice through its multiple modes of action, rapid activity and excellent broadleaf and grass weed efficacy. Where applications are made post-emergent targeting existing grass and broadleaf weeds, a non-ionic surfactant at 0.25% v/v or crop oil concentrate at 0.5 to 1.0 % v/v is required.

Broadhead has been evaluated in private and university rice weed management research programs during the past three years for its potential fit as a grass and broadleaf weed control herbicide in rice. Results presented herein are a compilation of experiments conducted in 2009 by private and university personnel with Broadhead 70 DF applied early-post (EPOST) at a rates ranging from 0.175 to 0.53 lb ai/A for crop tolerance, weed efficacy and subsequent effects on yield.

FMC received U.S. EPA registration on September 23, 2009 and state registrations in AR, MS, LS, MO and TX in January of 2010.

PERFORMANCE OF WEED-SUPPRESSIVE RICE CULTIVARS IN UPLAND AND FLOODED PRODUCTION SYSTEMS IN ARKANSAS. D. R. Gealy and M. M. Anders; USDA-ARS-DBNRRC, Stuttgart, AR and University of Arkansas, Stuttgart, AR.

ABSTRACT

Asian indica rice lines such as PI 312777 can suppress barnyardgrass (*Echinochloa crus-galli*) effectively in traditional drill-seeded, flood-irrigated (FLI) production systems, but their weed suppression potential in upland (furrow irrigation; FUI) production systems is unknown. FUI systems are gaining popularity because of their potential for water savings and their suitability for improved productivity on steeply sloped fields. Thus, weed-suppression potential of selected indica and commercial tropical japonica rice cultivars was compared under FLI and FUI production systems and three weed management levels. Following preparatory tillage in late May, 2009, plots to be managed under FUI were bedded using a modified Brandt FR-21. Rice was then planted 1.9 cm deep into 10 rows spaced 19 cm apart using an Almaco HDGD10R drill. FUI plots had alternating deep furrow and raised bed sections (2 rows furrow-2 rows raised-2 rows furrow-2 rows raised-2 rows furrow). Barnyardgrass seed was broadcast uniformly at planting. Weed suppression by PI 312777 and Rondo (indicas), and Lemont, Wells, Bengal, and CL 171AR (commercial cultivars), was evaluated under 'low', 'medium', and 'high' weed management levels (LWM, MWM, and HWM, respectively). Plots were flush-irrigated as necessary after emergence to maintain healthy rice plants. FLI plots were flushed by adding water until soil surfaces were completely submerged, and were drained after ~20 h. FUI plots were flushed by adding water until such time that soil on top of the beds became saturated. Prior to establishment of permanent flood on FLI plots on June 30, 110 kg/ha nitrogen was applied to FLI and FUI plots as urea and Agrotain-treated urea, respectively. FUI plots were flushed after N application and seven additional times during the crop season—a low frequency due to excessive natural rainfall. Based on anticipated weed pressure, HWM and MWM plots were sprayed pre-emergence with 0.44 kg/ha clomazone, and LWM plots were sprayed post-emergence with 1.1 kg/ha propanil. The FUI, HWM plots were also sprayed post-emergence with 0.36 kg/ha quinclorac + 0.55 kg/ha bentazon + 0.28 kg/ha aciflourfen + 1% oil. The experimental design was a split, split plot, with irrigation methods as main plots, cultivars as sub plots, weed management levels as sub sub plots, and four replications. Averaged over cultivars and management levels, FLI yields were about 3 times higher and weed biomass production about half of that for FUI. Yield losses in FUI plots may have been worsened by delayed initial emergence and growth, and the substantial clomazone injury to rice that sometimes occurred in deep furrows. Broadleaf weeds were absent from FLI plots, but represented about 10% of the weed biomass in FUI plots, particularly under MWM, where herbicides controlled competing grass weeds. Weed control and yields were greatest under HWM and lowest under LWM. HWM and MWM frequently produced similar results, particularly in FLI plots where the combination of crop competition and moderate herbicide inputs reduced weed growth greatly for most cultivars. Overall, weed control and yields were greatest for PI 312777 and least for Lemont, while other cultivars were intermediate. Total weed biomass in PI 312777 was only 14%, 26%, and 33% of that in Lemont, Wells, and Rondo, respectively. From these initial results, it is clear that weeds can be a major challenge in FUI systems, and that weed suppression potential of the rice cultivar can strongly influence crop productivity. PI 312777 performed better than commercial tropical japonica cultivars under FUI, suggesting that improved indicas may prove to be useful in these systems.

WEED EFFICACY AND COTTON TOLERANCE TO SAFLUFENACIL. J.D. Reed,[1] J.W. Keeling,[1] and P.A. Dotray[2]; [1]Texas AgriLife Research, Lubbock, TX, [2]Texas Tech University, Lubbock, TX

ABSTRACT

In 2009, BASF registered the new active ingredient saflufenacil for use in corn, soybeans, sorghum and cotton. Saflufenacil is a protoporphrinogen-IX-oxidase (PPO) inhibitor with potential for use in cotton as a preplant burndown or layby treatment to control troublesome spring weeds. Field studies were conducted in 2009 to 1) evaluate saflufenacil applied postemergence (POST) prior to planting for control of several annual and perennial weeds, 2) evaluate saflufenacil applied postemergence for volunteer glyphosate-resistant cotton and ivyleaf morningglory control, and 3) determine cotton tolerance to saflufenacil applied 42 days before planting.

In all trials treatments were arranged in a randomized complete block design with three replications. Treatments were made with a backpack CO_2 sprayer calibrated to deliver 10 GPA. Crop oil concentrate or methylated seed oil were added at 1% v/v to all treatments. Annual weeds evaluated in the preplant burndown trials included Russian thistle (*Salsola iberica*), and kochia (*Kochia scoparia*). Perennial weeds included woollyleaf bursage (*Ambrosia grayi*), Texas blueweed (*Helianthus ciliaris*), and field bindweed (*Convolvulus arvensis*). Saflufenacil was applied POST to kochia and Russian thistle at 0.022 lb ai/A and 0.067 lb ai/A and compared to glyphosate at 0.77 lb ae/A. Visual control ratings were made 7 and 14 days after treatment (DAT). Saflufenacil was applied POST at 0.022, 0.045, 0.067, and 0.134 lb ai/A and compared to glyphosate at 1.125 lb ae/A for the three perennial weeds. Visual control ratings were made 7, 14, 28 and 42 DAT. In the volunteer glyphosate-resistant cotton trial, saflufenacil at 0.022 – 0.045 lb ai/A was compared to carfentrazone-ethyl (0.016 lb ai/A) and pyraflufen-ethyl (0.002 lb ai/A) applied at the 4-6 and 6-8 leaf growth stages. POST ivyleaf morningglory (*Ipomoea hederacea*) control with saflufenacil (0.017 lb ai/A), prometryn (1.2 lb ai/A) and diuron (1.0 lb ai/A) tank-mixed with glyphosate (0.77 lb ae/A) was compared glyphosate (0.77 lb ae/A) alone. Cotton tolerance to saflufenacil applied at 0.017 - 0.045 lb ai/A 42 days before planting (DBP) was evaluated for cotton injury, stand loss, and lint yield.

Saflufenacil controlled kochia and Russian thistle >98% at 0.022 lb ai/A. Saflufenacil at 0.022 lb ai/A also controlled field bindweed, woollyleaf bursage, and Texas blueweed 80-95% at 7 and 14 DAT. At 42 DAT, control declined to <30%. Saflufenacil controlled volunteer glyphosate-resistant cotton >90% when applied at either the 4-6 or 6-8 leaf stage. Ivyleaf morningglory control was similar with saflufenacil, prometryn, or diuron applied in combination with glyphosate. When applied 42 DBP, saflufenacil at 0.017 or 0.022 lb ai/A did not injure cotton, reduce stands, or affect yield. Saflufenacil at 0.033 lb ai/A or 0.045 lb ai/A injured cotton and reduced stands, but did not reduce lint yield.

RYE RESIDUE AND TILLAGE AFFECT PIGWEED EMERGENCE AND COTTON SEED YIELD. A.J. Price[1], K.S. Balkcom[1], C.D. Monks[2], M.G. Patterson[2]; [1]USDA-ARS, Auburn, AL [2]Auburn University, Auburn, AL.

ABSTRACT

Winter cover crop residue and tillage has previously been shown to influence weed establishment. An experiment was conducted at two locations in Alabama from 2007 through 2009 evaluating pigweed response to four levels of winter cover crop residue amounts compared to a conventional surface tillage system. Additionally, four levels of herbicide application intensity: 1) PRE broadcast followed by (fb) POST fb LAYBY, 2) PRE banded fb POST fb LAYBY, 3) POST fb LAYBY and 4) LAYBY alone were evaluated for each of the five previously mentioned systems. Results revealed a dramatic decline in pigweed emergence and biomass in conservation systems containing cover crop residue regardless of herbicide intensity at the Tennessee Valley location. At E.V. Smith a similar relationship was observed except the broadcast preemergence application across surface tillage treatments provided equivalent emergence as in the conservation tillage treatments. In all years, the winter fallow conservation system contained the highest pigweed emergence at Tennessee Valley whereas the surface tillage system contained the highest pigweed emergence at E.V. Smith. At E. V. Smith in 2007 and 2008 and Tennessee Valley in 2007, seed cotton yield generally was highest in conservation treatments. At Tennessee Valley in 2008 and E.V. Smith in 2009, the highest yield was attained in the surface tillage treatments. At both locations across all years, increasing herbicide use maximized seed cotton yield.

ITALIAN RYEGRASS (*Lolium perenne* ssp. *multiflorium*) CONTROL WITH POWERFLEX® HERBICIDE (PYROXSULAM) IN SOUTHERN U.S. SOFT RED WINTER WHEAT. L.C. Walton*, L. B. Braxton, R.A. Haygood, R.B. Lassiter, R.E. Gast and J.S. Richburg; Dow AgroSciences, Indianapolis, IN.

ABSTRACT

PowerFlex® (pyroxsulam) herbicide, a member of the trizolopyrimidine sulfonamide chemical family, is a new post emergence grass and broadleaf herbicide developed by Dow AgroSciences for use in spring and winter wheat. Previous research has shown excellent activity on several grass and broadleaf species important in the global small grain markets. PowerFlex® is selective in wheat (including durum), rye and triticale but not selective in barley, oats, rice, maize or broadleaf crops. It has both foliar and soil activity; however most of its herbicidal activity is through foliar uptake.

PowerFlex® is an acetolactate synthase (ALS)-inhibitor herbicide and can be applied postemergence (fall or spring) to an actively growing crop from 3 leaf to tiller stage, when grass weeds are 2 leaf to 2 tiller stage and broadleaf weeds are 2 inches tall or 2 inches in diameter. PowerFlex® is formulated as a dry granule (7.5% WG) with a use rate of 3.5 oz product/A (0.016 lbs ai/A).

Dow AgroSciences has conducted research during 2007-2009 in the southern and southeastern United States to determine the efficacy of PowerFlex® on Italian Ryegrass (*Lolium perenne ssp. multiflorium*) compared to commercial herbicides when applications were made in the fall or during the late winter/early spring after green-up of the wheat; and to determine the impact that Italian Ryegrass has upon soft red winter wheat yields. This research includes 26 experiments for both fall and spring applied protocols in 2007/2008 and 2008/2009 seasons.

The experimental design was a randomized complete block with 3 or 4 replications. The plot size was approximately 6 ft. by 20 ft long. The targeted Italian Ryegrass stage of growth for the fall application was 1 to 4 inches with spring applied Italian Ryegrass stage of growth from 2 to 8 inches in height. Treatments were applied with either a CO_2 backpack or small plot tractor sprayer calibrated to deliver 10 to 15 GPA.

The data from these 2 years of research indicates that PowerFlex® herbicide at 3.5 oz product/acre (0.016 lbs ai/A) will provide excellent control of non ALS resistant Italian Ryegrass with either a fall or spring applied application. Soft red winter wheat yields were increased 47 to 54% with either a fall or spring applied application of PowerFlex® vs the untreated weedy check. Yields from fall applied application vs spring applied were increased due to less competition from Italian ryegrass throughout the season.

UTILIZING WINTER CANOLA AS A WEED MANAGEMENT TOOL FOR WINTER WHEAT PRODUCTION. J.B. Bushong and T.F. Peeper. Oklahoma State University, Stillwater

ABSTRACT

Limited control options and herbicide resistance have increased winter rye (*Secale cereale*) and Italian ryegrass (*Lolium multiforum*) problems in wheat production in Oklahoma. A rotation with winter canola would increase control options. Field experiments were established in the fall of 2007 at four sites in Oklahoma to evaluate herbicide programs for controlling these two grasses in a wheat–canola rotation. The sites were overseeded with rye and ryegrass (CV Marshall) to achieve uniform weed densities. The experimental design at each site is a randomized block with a factorial arrangement of treatments. Factors include the herbicide treatment applied to wheat in year one (i.e. untreated, imazamox + MCPA, or pinoxaden) and the crop-herbicide combination for the second year. Crop-herbicide combinations in year two include a second year of wheat with the same herbicide treatments as the first year or winter canola with eight herbicide treatments within each factor from year one. Herbicide treatments on winter canola include 1: untreated, 2-4: trifluralin PPI alone or followed by clethodim or quizalofop, and 5: clethodim, 6-7: glyphosate (once or twice) or 8: quizalofop postemergence. All herbicides were applied at labeled rates with appropriate additives. During both of the fallow periods the studies were maintained using glyphosate and tillage. Wheat was planted in all plots in the third crop year to determine treatment effects on final weed densities.
First-year pinoxaden treatments reduced harvested Italian ryegrass 90 to 99% and reduced harvested rye 8 to 19%. First-year imazamox + MCPA treatments reduced harvested ryegrass 38 to 66% and reduced harvested rye 57 to 97%. Wheat yields increased 11 to 14% with pinoxaden and 21 to 37% with imazamox. Rye densities in the second year were very sparse in all treatments. Ryegrass control was visually rated in late May to early June in 2009. Ryegrass control in treatments with continuous wheat was higher with any pinoxaden treatment applied one or both years at two of the four sites. Ryegrass control with imazamox + MCPA was inconsistent across locations. All of the herbicide treatments in canola effectively controlled the ryegrass except trifluralin PPI without a sequential POST treatment.

LAUDIS AND CAPRENO TANK-MIXTURES IN MIDSOUTH CORN. J.K. Manning, J.A. Bond, D.O. Stephenson, IV, J.B. McDuffie, and R.L. Landry, Mississippi State University, Stoneville; Louisiana State University AgCenter, Alexandria.

ABSTRACT

Laudis (tembotrione) and Capreno (tembotrione plus thiencarbazone) are two new herbicides which recently received registration for application to corn. Laudis is an HPPD-inhibiting herbicide while Capreno has a dual mode of action with HPPD- and ALS-inhibitor components. Laudis may be applied at 0.082 lb ai/A from to emergence to V8 on field corn. Capreno may be applied from emergence to V6 on field corn at 0.081 lb ai/A. Additional herbicide modes of action are needed in Midsouth corn production systems due to increasing problems with glyphosate-resistant weed species and enhanced atrazine degradation. Research was conducted in 2009 at the Mississippi State University Delta Research and Extension Center in Stoneville and at the Louisiana State University Dean Lee Research and Extension Center in Alexandria to evaluate weed control with Laudis and Capreno co-applied with other herbicides.

Treatments were arranged as a two-factor factorial within a randomized complete block design with four replications. Factor 1 included Laudis (0.082 lb/A), Capreno (0.081 lb/A, and no HPPD-inhibiting herbicide. Factor 2 included Aatrex (atrazine; 2 lb ai/A), Roundup PowerMax (glyphosate; 0.77 lb ae/A), Ignite 280 (glufosinate; 0.4 lb ai/A), and no tank-mix herbicide. Herculex corn hybrids were planted in early April at both sites. Herbicide treatments were applied when corn reached the V4 growth stage. Visual estimates of corn injury and weed control were recorded 7, 28, and 110 days after application (DAT), and corn yields were converted to 15.5% moisture content at season's end. Palmer amaranth (*Amaranthus palmeri*), entireleaf morningglory (*Ipomoea hederacea* var. *integriuscula*), and barnyardgrass (*Echinochloa crus-galli*) were evaluated at both sites. Additionally, johnsongrass (*Sorghum halepense*) control was evaluated at Alexandria. All data were subjected to ANOVA, and means were separated using Fisher's protected LSD at $p \leq 0.05$.

All treatments controlled Palmer amaranth and entireleaf morningglory at least 93% 28 DAT. Laudis and Capreno alone controlled entireleaf morningglory and Palmer amaranth as well as atrazine. Laudis and Capreno controlled all species ≥88% when tank-mixed with Roundup PowerMax or Ignite 280. Capreno was more effective than Laudis for johnsongrass control. Roundup PowerMax or Ignite 280 were required with Laudis ≥90% johnsongrass control 28 DAT.

Laudis and Capreno can be effective weed management tools in Midsouth corn. Co-applications of Roundup Powermax, Ignite 280, or atrazine with Laudis or Capreno were not required for Palmer amaranth or entireleaf morningglory control. Capreno should be utilized in areas where johnsongrass is a primary target.

VALUE OF PARAQUAT HARVEST AID IN SOYBEAN IPM PROGRAMS. J.M. Boudreaux, J.L. Griffin, B.R. Leonard, R.W. Schneider, and M.E. Salassi; School of Plant, Environmental, and Soil Sciences, Louisiana State University Agricultural Center, Baton Rouge, LA 70803.

ABSTRACT

Traditionally harvest aids have been used to desiccate weeds and improve crop quality and harvest efficiency. In recent years, harvest aids have become especially important to production of early-maturing soybean in Louisiana where delay in harvest attributed to green soybean stems and pods and leaf retention has been linked to insect and disease problems. A study was conducted over two years at the Ben Hur Research Station in Baton Rouge to determine the value of harvest aid when used in conjunction with fungicide and insecticide IPM programs. Fungicide treatments included none and 1 application of Headline + Topsin M at R3 and stinkbug control treatments were none and Orthene + Baythroid as needed to keep red banded stinkbug below threshold level. Superimposed on the fungicide and insecticide treatments was the harvest aid Gramoxone Inteon (paraquat) applied at 16 oz/A at R6.5 or not applied. The day soybean was harvested plants in each plot were visually rated for leaf retention and occurrence of green stems and green pods. Soybean yield was determined and seed samples collected from the combine were graded for percent moisture, foreign material, and seed damage using USDA procedures. Comparisons were made among the four IPM insecticide (I) / fungicide (F) programs: -I/-F, +I/-F, -I/+F, and +I/+F. In addition, pair-wise comparisons were made within each IPM program as to the value of Gramoxone Inteon harvest aid application.

Compared with the -I/-F program (nontreated control), fungicide application increased leaf retention when insecticide was not applied and decreased seed damage when insecticide was applied. Insecticide application decreased incidence of green pods when fungicide was not applied and decreased seed damage whether or not fungicide was applied. Leaf retention, incidence of green stems, and increased seed moisture associated with fungicide and/or insecticide application was reduced when harvest aid was applied. Economic loss due to deductions in seed quality for foreign material and seed damage were also determined. For foreign material, a grower is allowed up to 1% with no discount and anything above 1% is deducted by that percent from the gross weight of the load. For seed damage, a grower is allowed up to 2% and as percentage increases, a discount scale is used. Deductions were calculated based on soybean market price of $10.00 per bushel. For the -I/-F program, total loss due to deductions for foreign material and seed damage was $23.95/A. Use of harvest aid reduced loss by $9.20. Total loss due to foreign material and seed damage was $8.94 for +I/-F, $12.19 for -I/+F, and $9.13 for +I/+F. When harvest aid was applied losses were reduced $5.56 for +I/-F, $5.08 for -I/+F, and $5.80 for +I/+F. Using current prices, costs for Gramoxone Inteon at 16 oz/A, surfactant, and application would total $9.57. For all of the IPM programs evaluated, economic loss due to foreign material and seed damage would not cover total cost of the harvest aid application. A significant yield increase associated with harvest aid use was observed only when insecticide and fungicide were both applied (2.3 Bu/A increase). A yield increase of around 1 Bu/A would be needed to cover the cost of the harvest aid application.

To maximize soybean seed quality and yield potential, an effective IPM program that includes insect control and management of diseases should be implemented. This research shows that issues at soybean harvest with leaf retention and occurrence of green stems and pods are linked to level of red banded stinkbug control and fungicide application. Use of Gramoxone Inteon harvest aid can help lessen green plant problems leading to earlier harvest and improved harvest efficiency.

THE ROLE OF RESEARCH AND EXTENSION IN THE ADOPTION OF NO-TILL WHEAT IN KENTUCKY. L.W. Murdock, J.H. Herbek, and J.R. Martin; Department of Plant and Soil Sciences, University of Kentucky, Princeton, KY

ABSTRACT

During the last 30 years, no-till wheat acres in Kentucky increased from less than one percent to 69 percent. Kentucky growers became interested in no-till wheat in the early 1980's, largely because technology of wheat drills at that time made it possible to plant seed directly through crop residue. Since many growers had already adopted no-tillage practices for corn and soybeans, it seemed logical to move wheat into a no-tillage system. However, grower acceptance of no-till wheat was much slower and more difficult than for corn or soybeans.

The adoption of no-till wheat in Kentucky was largely due to the research and Extension efforts of the University of Kentucky Wheat Science Group (UKWSG). Although private consultants were initially very hesitant to adopt the concept of no-till, some of them gradually accepted it and have worked with the UKWSG on a number of research projects involving no-till.

University of Kentucky Extension specialists initiated research in the mid-1980's to determine the feasibility, yield potential, and management practices required for no-till wheat production. Although initial studies showed favorable results for no-till wheat, many growers remained skeptical. There was a strong perception that yield potential would be reduced due to irregular stand establishment, and increased weeds, insects, and diseases. There was also a concern higher production costs would result in reduced profitability. To respond to these concerns, additional studies were conducted over 20 years to help define parameters that would sustain no-till wheat as a part of the corn and soybean rotation system over the long-term. The Kentucky Small Grains Promotion Council became a partner in this effort by funding several research projects and setting a goal to increase the adoption of no-till wheat in Kentucky.

Research focused on several aspects of the production system including yield comparisons of no-till versus conventional till wheat, stand comparisons, crop residue management, profitability of no-till wheat, planting date, varieties, nitrogen fertility, cold injury, pest control, and long-term rotational effects. Results of these research efforts were published annually in the UK Wheat Science Research Report. Several years of research helped resolve many of the questions and concerns growers had regarding no-till wheat.

No-till wheat would probably not have been adopted in Kentucky without the efforts of Extension. It was the only force which moved the practice forward during the early adoption phase. Some of the initial research on no-till wheat was published in 1986 in the Extension publication "No-till Small Grain Production" (AGR-113) and updated in 2000 as "No-till Small Grain Production in Kentucky (ID-136). In 2009 the UKWSG developed the Extension publication "Comparing No-till and Tilled Wheat" (ID 177) in order to summarize University of Kentucky research over the last 20 years. Many specialists made countless presentations, radio tapes, popular press articles, scientific presentations, and carried out several research projects. Several members of the UKWSG, as well as wheat growers, have discussed the benefits of no-till at the annual winter wheat meeting and spring wheat field day. The UK Wheat Science Newsletter and the Kentucky Pest News also played a role in the education of growers on issues related to no-till wheat.

Acknowledgements: Appreciation is expressed to Kentucky Small Grains Promotion Council for helping support this research.

INITIAL EVALUATION OF OPTIMUM GAT® (GLYPHOSATE/ALS TOLERANCE) TECHNOLOGY IN CORN AND SOYBEAN. M.T. Bararpour, L.R. Oliver, and C.G. Bell; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR

ABSTRACT

Weed management programs are an essential component of corn and soybean production. Field studies were conducted in 2009 at the Northeast Agricultural Experiment Station in Keiser, AR, to compare weed control in GAT corn and soybean herbicide programs related to common practices in the mid-south. Land preparation for a sandy clay loam prior to test initiation was fall bedding for corn and flat no-till for soybean. Both sites had a natural weed population. The corn field contained Palmer amaranth (*Amaranthus palmeri*), pitted (*Ipomoea lacunosa*) and entireleaf (*Ipomoea hederacea var. integriuscula*) morningglory, prickly sida (*Sida spinosa*), velvetleaf (*Abutilon theophrasti*), and broadleaf signalgrass (*Urochloa platyphylla*), and the soybean field contained curly dock (*Rumex crispus*), Italian ryegrass (*Lolium perenne ssp.multiflorum*), cutleaf evening-primrose (*Oenothera laciniata*), annual bluegrass (*Poa annua*), horseweed (*Conyza canadensis*), prairie cupgrass (*Eriochloa contracta*), henbit (*Lamium amplexicaule*), mayweed (*Anthemis cotula*), Carolina geranium (*Geranium carolinianum*), Palmer amaranth, large crabgrass (*Digitaria sanguinalis*), barnyardgrass (*Echinochloa crus-galli*), and horse purslane (*Trianthema portulacastrum*). The experiments were designed as a randomized complete block with ten treatments and four replications. Plots were 13 ft wide (four rows) by 24 ft long with 6-ft alleys between replications. The preplant (PPL) treatments were applied on April 16. Corn and soybean were planted on May 19 and destroyed on July 13. All herbicide rates were in lb ai/A except for glyphosate (Roundup PowerMax = RPM) which was lb ae/A. Treatments for corn were: 1) rimsulfuron + chlorimuron (Traverse) at 0.041 + RPM at 0.77 + 2,4-D LVE at 0.75 PPL followed by (fb) rimsulfuron + chlorimuron + mesotrione (Instigate) at 0.261 + NIS (Induce) at 0.25% (v/v) preemergence (PRE) fb RPM at mid-season postemergence (V5); 2) Traverse at 0.061+ RPM + 2,4-D LVE PPL fb Instigate at 0.175 + NIS PRE fb RPM at V5; 3) tribenuron + thifensulfuron (Firstshot) at 0.016 + RPM + 2,4-D LVE PPL fb Instigate at 0.175 + S-metolachlor + atrazine (Cinch ATZ) at 1.93 + NIS PRE fb RPM at V5; 4) Firstshot at 0.016 + RPM + 2,4-D LVE PPL fb Instigate at 0.261 + Cinch ATZ + NIS PRE fb RPM at V5; 5) Traverse at 0.041 + RPM + 2,4-D LVE PPL fb rimsulfuron + tribenuron + mesotrione (Trigate) at 0.105 + atrazine (Aatrex) at 2 + RPM at V5; 6) same as trt 5 except Traverse at 0.061 PPL; 7) Firstshot at 0.016 + RPM + 2,4-D LVE PPL fb Trigate + Aatrex + RPM at 2" weeds; 8) RPM + 2,4-D LVE PPL fb S-metolachlor + atrazine + mesotrione (Lexar) at 3.24 + NIS PRE fb RPM at V5; 9) RPM + 2,4-D LVE PPL fb Lexar + RPM at 2" weeds; and 10) untreated check. Treatments for soybean were: a) rimsulfuron + chlorimuron + flumioxazin (Diligent) at 0.142 + RPM + 2,4-D LVE PPL fb Traverse at 0.041 + NIS PRE fb RPM at V5; b) Traverse at 0.061 + RPM + 2,4-D LVE PPL fb Diligent at 0.094 + NIS PRE fb RPM at V5; c) Firstshot at 0.016 + RPM + 2,4-D LVE PPL fb Diligent at 0.094 + NIS PRE fb RPM at V5; d) Diligent at 0.142 + RPM + 2,4-D LVE PPL fb RPM at V5; e) Traverse at 0.041 + RPM + 2,4-D LVE PPL fb chlorimuron + thifensulfuron + tribenuron (Freestyle) at 0.041 + RPM + Dual Magnum at 0.95 at V2-V3; f) Traverse at 0.061 + RPM + 2,4-D LVE PPL fb Freestyle at 0.021 + RPM + Dual Magnum at V2-V3; g) Firstshot at 0.016 + RPM + 2-4-D LVE PPL fb Freestyle at 0.021 + RPM + Dual Magnum V2-V3 fb Freestyle at 0.041 + RPM at V5-V6; h) RPM + 2,4-D LVE PPL fb flumioxazin (Valor SX) at 0.0625 + NIS PRE fb RPM at V5; i) RPM + 2,4-D LVE PPL fb RPM + S-metolachlor + fomesafen (Prefix) at 1.32 V2-V3 fb RPM at V5; and j) untreated check.

No corn injury was observed. Soybean was injured 10 to 14% from trt d, e, f, and g, and 29 to 23% from trt h and i at 4-weeks-after emergence (WAE). There was no soybean injury by 6 WAE. At 3 WAE of corn trt 7 and 9 provided the highest control (95 to 100%) of broadleaf signalgrass, Palmer amaranth, and pitted and entireleaf morningglory while trt 5 and 6 gave the least control of the weed spectrum. All corn herbicide treatments provided 90 to 95% control of pitted morningglory; 99% prickly sida; 100% Palmer amaranth and velvetleaf; and 98% of broadleaf signalgrass [except trt 5 and 6 (86%)] by the final rating at 6 WAE. In soybean trt e, f, g, and i provided the best control (95 to 100%) of Palmer amaranth, barnyardgrass, and prairie cupgrass at 3 WAE. Burndown control of curly dock was only 80 to 90% for trt a, b, and c. Treatment h did not control Palmer amaranth and horse purslane. By 7 WAE all treatments completely controlled curly dock, prairie cupgrass, large crabgrass, and barnyardgrass. Palmer amaranth and horse purslane were the most difficult-to-control weeds in no-till soybean. From initial findings, early application (at 2" weeds in corn and at V2-V3 in soybean) was better than mid-season postemergence (V5) application. The GAT technology allows multiple herbicide modes of action to be applied to broaden the weed control spectrum.

PERFORMANCE AND VALUE OF OPTIMUM® GAT® CORN AND ALS-TOLERANT SORGHUM IN TEXAS CROPLANDS. M.E. Matocha, P.A. Baumann, and T.W. Janak. Texas AgriLife Extension Service, College Station, TX.

ABSTRACT

Weed management in corn and sorghum becomes ever more challenging with issues such as herbicide resistant weeds. Therefore, field studies were conducted in 2008 and 2009 to evaluate the performance of Optimum® GAT® corn and ALS-tolerant sorghum using varied rates and combinations of ALS-inhibitor herbicides (and premixes) for combating common weeds in the Central Texas Blacklands. The treatment regime employed allows a broader spectrum of weeds controlled, and provides both postemergent and residual control necessary for the management of herbicide resistant species. Studies were conducted at the Stiles Farm Foundation located in Thrall, TX. Weed species evaluated included Texas panicum (*Panicum texanum*), Johnsongrass (*Sorghum halepense*), and Palmer amaranth (*Amaranthus palmeri*). Visual weed control ratings were made and crop injury was assessed (none observed in corn). Corn yields were not taken due to crop destruction requirements. Sorghum yield was not taken due to the earliness of development of the sorghum hybrid utilized in the study. Applications were made with either a CO_2 Backpack or tractor- mounted CO_2 sprayer with a spray volume of 15 gallons per acre (GPA).
The products that were evaluated for the premixes in the corn studies included Instigate™(Resolve™ + Classic® + mesotrione), Trigate™(Resolve™ + Express® + mesotrione) and Freestyle™(Harmony®GT XP + Express®+ Classic®). Treatments that were evaluated in corn in 2008 either included a preemergence (PRE) alone, a PRE followed by a late-post (LP), or a single mid-post (MP) treatment. PRE treatments included were Harness® Xtra (1.53 or 2.3 qt/A), Resolve™ (1 or 1.5 oz/A), Classic® (2 or 3 oz/A), Harness® (1.5 pt/A), and Atrazine 90 DF (1.38 lb/A). Mid-post treatments consisted of Touchdown® Total (1.5 pt/A) applied alone, and Touchdown® Total (1.5 pt/A) tank-mixed with Freestyle™ (1.5 oz/A), Resolve™ (1 oz/A), Classic® (1 oz/A), and Callisto®. In addition, a mid-post treatment of Freestyle™ (1.5 oz/A) and Callisto® (2.5 oz/A), and Liberty® (32 oz/a) + Freestyle™ (1.5 oz/A) was utilized. Late-post treatments included a tank-mix of Touchdown® Total (1.5 pt/A) and Freestyle™ (1.5 oz/A), Liberty® (32 oz/a) + Freestyle™ (1.5 oz/A). Herbicides evaluated in corn in 2009 included PRE treatments of Instigate™ (6.9 oz/A) tank-mixed with Bicep II Magnum® (1.4 qt/A), , Instigate™ (6.9 oz/A) + Atrazine 90 DF (1.38 lb/A), and Bicep II Magnum® (2.1 qt/A) and Dual II Magnum (1pt/A) applied alone.

Herbicides evaluated in the ALS-tolerant sorghum applied at the PRE timing were Atrazine 90 DF (1.11 lb/a) and Bicep II Magnum (2.1 qt/A) as a stand alone. Those treatments that received Atrazine 90 DF were followed by an early-post application of various combinations of Accent® (0.66 oz/A) tank-mixed with either Atrazine 90 DF (1.11 lb/A), Ally® XP (0.10 oz/A), or Resolve™ (0.75 oz/A), and a synthetic auxin (Barrage® 8 oz/A, Clarity® 8 oz/A, or Starane® 4oz/A).

Results from the 2008 corn study revealed that all treatments that received a mid-post application of Freestyle™ tank-mixed with either Touchdown® Total or Callisto® provided excellent (>95%) early season control of Texas panicum and Palmer amaranth. Likewise, soil applied treatments followed by a late-post application of Touchdown® Total alone or Freestyle™ tank-mixed with either Touchdown® Total or Liberty® provided very effective control of Texas panicum and Palmer amaranth at 27 days after the late-post timing.

In the 2009 corn study, treatments receiving a mid-post application of Touchdown® Total tank-mixed with either Trigate™ and Atrazine 90 DF, or Bicep II Magnum® or Freestyle™, provided excellent (>93%, 23 DA-MP) control of Texas panicum and Palmer Amaranth with or without a soil applied treatment. Soil applied treatments of Instigate™ + Bicep II Magnum® (or Atrazine 90 DF) resulted in excellent control of both Texas panicum and Palmer amaranth when followed by a mid-post application of Touchdown® Total.

Data from the 2009 ALS-tolerant sorghum study revealed that all early-post applications of Accent® plus a tank-mix partner provided excellent control (>93%, 14 DA-EP) of Johnsongrass and performed significantly better than Bicep II Magnum® alone, applied PRE. At 58 DA-EP Johnsongrass control ranged from 81 to 93%. Furthermore, all treatments provided excellent late-season control of Palmer amaranth at 58 DA-EP. At the 14 DA-EP rating date the sorghum exhibited substantial crop injury (lodging) wherever the synthetic auxin herbicides were included in the treatments, however, these effects were dramatically reduced by 27 DA-EP and continued to diminish over time.

OPTIMUM® GAT® CROPS – HERBICIDE PROGRAMS WITH BURNDOWN PLUS RESIDUAL ACTIVITY FOR NO-TILL CROPPING SYSTEMS IN THE SOUTH. D. W. Saunders*, J. D. Smith, M. T. Edwards, and R. M. Edmund, DuPont Crop Protection, Johnston, IA.

ABSTRACT

Weed control programs designed for use in no-till cropping systems for corn and soybeans containing the Optimum® GAT® trait are under development. Integrated herbicide programs making use of burndown, preemergence, and postemergence weed control strategies were evaluated by DuPont, university, and contract investigators in 2009. Data will be presented supporting the use of herbicides designed for use on Optimum® GAT® trait crops as new tools for managing weed control problems in reduced tillage fields across the Southern United States. Seed products with the Optimum® GAT® trait will be available for sale pending regulatory approvals and field testing. New DuPont herbicides for the Optimum® GAT trait® are not currently registered for sale or use in the United States.

OPTIMUM® GAT® CORN – HERBICIDE PROGRAMS FOR THE SOUTHERN STATES. M. T. Edwards*, E. P. Castner, R. W. Williams, and D. W. Saunders. DuPont Crop Protection, Pierre Part, LA.

ABSTRACT

Weed control programs designed for use on corn containing the Optimum® GAT® trait are under development. Integrated herbicide programs making use of preemergence, postemergence, and 2-pass weed control strategies were evaluated by DuPont, university, and contract investigators in 2009. Data will be presented supporting the use of Optimum® GAT® trait crops as new tools for managing weed control problems including herbicide resistance weeds across the Southern United States. Seed products with the Optimum® GAT® trait will be available for sale pending regulatory approvals and field testing. New DuPont herbicides for the Optimum® GAT trait® are not currently registered for sale or use in the United States.

OPTIMUM® GAT® SOYBEANS – HERBICIDE PROGRAMS FOR THE SOUTHERN STATES. M. T. Edwards*, G. G. Hammes, S. Royal and D. W. Saunders. DuPont Crop Protection, Pierre Part, LA.

ABSTRACT

Weed control programs designed for use on soybeans containing the Optimum® GAT® trait are under development. Integrated herbicide programs making use of preemergence, postemergence, and 2-pass weed control strategies were evaluated by DuPont, university, and contract investigators in 2009. Data will be presented supporting the use of Optimum® GAT® trait crops as new tools for managing weed control problems including herbicide resistance weeds across the Southern United States. Seed products with the Optimum® GAT® trait will be available for sale pending regulatory approvals and field testing. New DuPont herbicides for the Optimum® GAT® trait are not currently registered for sale or use in the United States.

ECONOMICS OF HERBICIDE PROGRAMS ASSOCIATED WITH LIBERTY LINK® AND ROUNDUP READY FLEX® COTTON SYSTEMS. T.W. Griffin[1], G.M. Griffith[2], and J.K. Norsworthy[2]; [1]Department of Agricultural Economics and Agribusiness and [2]Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR

ABSTRACT

A shift to conservation tillage systems in the mid-South in the mid 1990's was facilitated by the introduction of glyphosate-resistant crops and the ability to use a total postemergence (POST) herbicide program consisting of glyphosate only. Weed species shifts have been observed in various environments and attributed to farm decision makers' intervention regarding tillage system, cropping production rotation, and chemical weed control practices. The actions of the farm manager in a given year impact the conditions that they confront during subsequent years. This study evaluated in-field choices of the farm manager relative to rotation of cotton production systems and three chemical weed control programs. An economic evaluation of agronomic results was subjected to dynamic optimization methodology. We evaluate the optimal control decisions of herbicide use and cotton production practices over time by explicitly modeling the species shift resulting from a total POST herbicide program in both Liberty Link® (LL) and Roundup Ready Flex® (RRF) cotton systems. Resistance has been evaluated by weed scientists and agronomists; however, research addressing the economic and farm management implications of weed control have been less prevalent. Research was conducted at the Northeast Research and Extension Center in Keiser, AR, in 2007, 2008, and 2009 to evaluate the effect of herbicide programs in LL and RRF 3-year cotton rotations. A 15-A cotton field was used with 8-row (38-in) plots that were 600 feet in length, with three replications. The experimental design was a split-plot with cotton rotation as the main plot and herbicide program as the sub-plot. There were four 3-year cotton rotations: (1) LL-LL-LL, (2) LL-RRF-LL, (3) RRF-RRF-RRF, and (4) RRF-LL-RRF. Each year, either ST 4554 B2/RRF or Fibermax 955 B2/LL was planted. The three herbicide programs were: (1) a total POST (P-P-P) consisting of either glufosinate at 0.53 lb ai/A or glyphosate at 0.78 lb ae/A (1X rate) applied to 1- to 3-lf cotton, followed by (fb) 5- to 6-lf cotton, fb ≥10-lf cotton at LAYBY, (2) a residual PRE (R-P-P) of *S*-metolachlor at 1.25 lb ai/A + fluometuron at 2.0 lb ai/A, fb either glufosinate or glyphosate at the 1X rate at 5- to 6-lf cotton, fb ≥10-lf cotton at LAYBY, (3) a residual PRE + LAYBY (R-P-R) consisting of *S*-metolachlor + fluometuron PRE, fb either glufosinate or glyphosate at the 1X rate at 5- to 6-lf cotton, fb flumioxazin at 0.063 lb ai/A + MSMA at 2.0 lb ai/A at ≥10-lf cotton at LAYBY. To estimate the soil seed bank before initiating the experiment, soil cores were taken to a depth of 4 inches in April 2007 using a 4-inch-diameter cup cutter. Eight subsamples, consisting of five soil cores taken from between rows 3 and 4, and rows 5 and 6, at distances of 100, 200, 300, and 400 feet (40 cores/plot). Soil cores were returned to Fayetteville and placed in flats where they were allowed to germinate throughout the summer for species identification and counting. Seed traps were made using 6-in X 9-in flats containing 580 μm mesh screen small enough to catch all seeds, yet porous enough for water penetration. Traps were placed in the exact locations of original soil cores in early August each year and allowed to sit through harvest in order to catch any seed rain resulting from experimental treatments. Traps were brought back to Fayetteville for identification and counting. Seedcotton yields were taken each year. The dynamic herbicide-resistance problem was defined such that soil seed bank was the state variable, the cotton production system and herbicide program were each a control variable, and profitability was the benefit function in the dynamic programming model. Data on initial soil core seed bank counts were used as initial conditions in the search for the steady state solution.

GLUFOSINATE AND GLYPHOSATE APPLICATION TIMINGS IN GLUFOSINATE- AND GLYPHOSATE-RESISTANT SOYBEAN. D.O. Stephenson, IV, D.K. Miller, J.L. Griffin, R.L. Landry, M.M. Mathews, and J.M. Boudreaux; LSU AgCenter, Alexandria, St. Joseph, and Baton Rouge, LA

ABSTRACT

Research was conducted at the LSU AgCenter Dean Lee Research and Extension Center in Alexandria, LA and the Northeast Research Station in St. Joseph, LA in 2009. Experiments were designed to compare and contrast glyphosate and glufosinate application timings in a glyphosate- or glufosinate-resistant soybean weed management program. Experiments were implemented as a 2 x 3 x 3 factorial arranged in a randomized complete block design with four replications. Factor 1 was either glyphosate- or glufosinate-resistant soybean. First application timings of 10, 15, or 20 d after emergence constituted the second factor. Factor 3 consisted of sequential application timings of 10, 15, or 20 d after the first application. Glyphosate and glufosinate were applied at 0.9 and 0.5 kg ae/ha, respectively, at each application timing interval. Weeds rated at Alexandria included barnyardgrass (*Echinochloa crus-galli*), goosegrass (*Eleusine indica*), Palmer amaranth (*Amaranthus palmeri*), and entireleaf morningglory (*Ipomoea hederacea* var. *integriuscula*). Weeds rated at St. Joseph were barnyardgrass, tall morningglory (*Ipomoea purpurea*), hemp sesbania (*Sesbania herbacea*), and redroot pigweed (*Amaranthus retroflexus*). Weed control observed at harvest in Alexandria and 42 d after the sequential application timing at St. Joseph, as well as soybean yield, are presented. In Alexandria, LA, applying glyphosate 10, 15, or 20 d after emergence (DAE) provided excellent control of barnyardgrass, goosegrass, and Palmer amaranth; however, glufosinate needed to be applied 10 DAE to provide control of these weeds at harvest. At St. Joseph, LA, barnyardgrass control was greatest 42 d after treatment (DAT) when both glyphosate and glufosinate were applied 10 or 15 DAE. For entireleaf morningglory at Alexandria, LA, no differences were observed among first glyphosate application timings; however, glufosinate applied 10 or 15 DAE maximized control. Glyphosate applied 10 DAE followed by any sequential application timing provided excellent tall morningglory control 42 DAT at St. Joseph, LA. Control of hemp sesbania and redroot pigweed was excellent for all treatments 42 DAT. At Alexandria, soybean yield was greater for glyphosate-resistant soybean compared to glufosinate-resistant soybean. At St. Joseph, the glufosinate resistant variety yielded greater than the glyphosate-resistant variety and yields were reduced by waiting until 20 DAE to apply the first glyphosate or glufosinate application.

IMACT OF SIMULATED HERBICIDE DRIFT ON RICE GROWN FOR SEED. J.B. Hensley, E.P. Webster, D.L. Harrell, S.L. Bottoms, T.P. Carlson, J.C. Fish, and J.A. Bond. Louisiana State University Agricultural Center, Baton Rouge, LA; Mississippi State University, Stoneville, MS.

ABSTRACT

Four studies were conducted at the LSU AgCenter Rice Research Station near Crowley, Louisiana to evaluate the effects of simulated herbicide drift on ‘Cocodrie’ rice. The experimental design was an augmented two-factor factorial arrangement of treatments in a randomized complete block with four replications. Factor A consisted of herbicides being applied at 6.3 and 12.5% of the labeled usage rate of 863 g ae/ha of glyphosate, 70 g ai/ha of imazethapyr, 493 g ai/ha of glufosinate, and 44 g ai/ha of imazamox. Factor B consisted of application timings at different growth stages: one-tiller, panicle differentiation (PD), boot, and physiological maturity. Spray volume varied proportionally to herbicide dosage and was 15 L/ha for the 6.3% herbicide rate and 29 L/ha for the 12.5% herbicide rate using 234 L/ha as the target spray volume and were applied with a tractor-mounted CO2-pressurized sprayer. One-hundred count rice seed weight, seed germination, and seedling vigor were evaluated. Data were evaluated using SAS PROC MIXED.

The germination potential of seed collected from grain harvested in the simulated glyphosate drift field study at primary crop harvest, 2005 through 2007, and at ratoon crop harvest, 2005 and 2007, was evaluated at 13, 16, 19, 22, and 25 C. Seed collected from each plot were air-dried and stored at 8 C. One hundred seeds from each field plot were prepared by soaking for 30 min in a 50:50 (v/v) solution of chlorine bleach and distilled water to decrease seedling diseases. After soaking, seeds were triple rinsed with distilled water. After seed preparation, seeds were placed in a Petri dish between two germination blotters. Next, 10 ml of a fungicide plus distilled water solution was applied in each Petri dish to reduce seedling diseases. Petri dishes were sealed to prevent moisture loss and placed in a constant-temperature growth chamber in total darkness. Germination counts were taken 5, 9, and 14 d after initiation (DAI) of the study. A seed was considered germinated if the radical had reached a length of 1 mm.

Vigor of seedlings from grain collected at primary crop harvest in the simulated glyphosate drift field study in 2006 and 2007 was examined. Approximately 100 seeds were prepared as described in the seed germination study. Following seed preparation, seeds were pre-germinated by soaking in distilled water for 24 h. Ten pre-germinated seeds from each field plot were placed along the center of single sheet of moistened germination paper cut to fit a 12 by 23 by 0.3 cm acrylic sheet. Seeds were oriented with the radical end of the seed toward the lower half of the sheet. A one-ply paper towel strip was placed over the seed, and 5 ml of a fungicide plus distilled water solution was applied on top of the strip to reduce seedling diseases. The plated seeds were then placed vertically in a rack and then placed in a glass dish with 1,420 ml of distilled water to allow for evaporation. The dish and racks of plates were wrapped in plastic wrap to prevent desiccation. The glass dish was placed in a growth chamber at 21 C for 12 d in total darkness. At the end of 12 d, shoot lengths were measured and an average of the 10 shoot lengths was obtained for data analysis.

Glyphosate had no effect on primary crop rice seed weight; however ratoon crop rice seed weight was reduced when glyphosate was applied at boot. Primary crop rice seed germination was reduced by glyphosate at 22 and 25 C; however, ratoon crop seed germination was not reduced. Glyphosate had no effect on primary crop seedling vigor.

Imazethapyr applied at boot reduced primary crop seed weight. Primary crop rice seed germination was reduced by imazethapyr at 19 to 25 C. Ratoon crop rice seed germination was reduced at 19 and 22 C by imazethapyr applied at PD. Imazethapyr had no effect on primary crop seedling vigor.

Glufosinate had no effect on rice seed weight. Glufosinate applied at either rate reduced primary crop rice seed germination at 19 C and reduced primary crop seedling vigor; however, ratoon crop rice seed germination was not affected.

Imazamox had no effect on rice seed weight. Primary crop rice seed germination was reduced by imazamox at 19 to 25 C. Ratoon crop rice seed germination was not affected by imazamox. Primary crop seedling vigor was reduced with imazamox applied at boot.

Since glyphosate, imazethapyr, glufosinate, and imazamox have the potential to reduce rice seed germination, applicators should use caution when applying these herbicides near susceptible seed rice fields.

SULFONYLUREA HERBICIDE SAFETY ON NEWLY SPRIGGED BERMUDAGRASS AND SEASHORE PASPALUM. A.J. Patton*,[1] J.M. Trappe,[1] J.W. Boyd,[1] R.E. Strahan,[2] and J.S. Beasley[2]; [1]University of Arkansas Cooperative Extension Service, Fayetteville, AR; [2]Department of Horticulture, Louisiana State University Agriculture Center, Baton Rouge, LA

ABSTRACT

Several sulfonylurea herbicides are labeled for use on established bermudagrass or seashore paspalum, but label recommendations for many of these chemicals vary for sprigged turf. The objective of this study was to determine the safety of various sulfonylurea herbicides on newly planted 'Tifway' bermudagrass and 'Aloha' seashore paspalum sprigs. Treatments were arranged as a 5 by 2 by 2 factorial with five herbicides (foramsulfuron at 29 and 59 g/ha, halosulfuron at 35 and 70 g/ha, metsulfuron at 21 and 42 g/ha, sulfosulfuron at 59 and 131 g/ha, and trifloxysulfuron at 28 and 56 g/ha), two herbicide rates (low and high), and two application timings at 2 or 4 weeks after sprigging (WAS). There was no discernable herbicide injury to or reduction in Tifway bermudagrass coverage in Arkansas regardless of herbicide, application timing, or application rate. Trifloxysulfuron and metsulfuron were more injurious than other herbicides in Louisiana when applied 2 WAS to Tifway bermudagrass, but injury levels were acceptable (<15%) and there was no long term reduction in establishment. Metsulfuron or halosulfuron applied at 2 or 4 WAS, and sulfosulfuron applied at 4 WAS allowed >90% establishment of Aloha seashore paspalum at both locations. Both trifloxysulfuron and foramsulfuron were injurious to seashore paspalum and reduced establishment. These results suggest that sulfonylurea herbicides can be safely applied shortly after sprigging Tifway bermudagrass and that metsulfuron, halosulfuron, and sulfosulfuron could be useful herbicides for establishing Aloha seashore paspalum from sprigs.

ALTERNATIVE APPROACHES TO SOIL FUMIGATION FOR REDUCED WEED COMPETITION DURING TURFGRASS ESTABLISHMENT. J.A. Hoyle, J.S. McElroy, J.J. Rose and E.A. Guertal; Department of Agronomy and Soils, Auburn University, Auburn, AL 36849.

ABSTRACT

Emerging weeds are highly competitive during turfgrass establishment; therefore, soil fumigants are often used to reduce weed seed populations. Alternative methods to soil fumigants are being explored because applications such as methyl bromide are being phased out. Soil sterilization by solarization and soil-heating are possible alternatives for chemical fumigation. Traditionally soil sterilization techniques utilize transparent plastic mulch to cover the soil surface. This process confines radiant-heat below the plastic, consequently transferring heat to the soil. Our alternative methods utilize intense heat from propane burners to raise soil temperatures and potentially reducing seed viability of weed seed populations.

Soil-solarization and flame-heating experiments were conducted at Auburn University Turfgrass Research Unit to evaluate soil sterilization effectiveness prior to turfgrass establishment. Treatments for 'Zenith' zoysiagrass (*Zoysia japonica* Steud.) and tall fescue (*Lolium arundinaceum*) research trials were initiated on June 1, 2009 and September 2, 2009, respectively. Marvyn loamy sand soil was tilled and prepared for turfgrass seeded establishment. Treatments included soil-solarization, dazomet (389 kg ha^{-1}), flame-heating, and emerged-weed flaming (covered with germination cloth or uncovered). Germination cloth was applied or not-applied to soil surface of emerged-weed flaming plots. Germination cloth was used to stimulate weed emergence. Soil-solarization utilized 6 mm, clear, polyethylene plastic applied by hand. Flame-heating and emerged-weed flaming utilized a PL-8750 flame sanitizer (Flame Engineering Inc., LaCrosse, Kansas, USA) commonly employed for soil sanitation of poultry production houses. Flame-heating is direct soil flaming to increase soil temperature to kill weed seed. Emerged-weed flaming is employed in the same fashion as flame-heating but allows weeds to emerge before treatment; thereby potentially depleting the weed seed bank by killed emerge weeds and seed heating. Dazomet was applied at 29 days before turfgrass establishment. Soil-solarization treatment was applied 29 days prior to establishing tall fescue and 42 days prior to 'Zenith' zoysiagrass establishment. Flame-heating and emerged-weed flaming treatments were conducted 1 day prior to establishing tall fescue and 'Zenith' zoysiagrass. Visual percent weed cover, percent turfgrass cover, and plant counts were conducted 1, 22, and 43 days after seeding (DAS). Uniform weed species included carpetweed (*Mollugo verticillatta*), old world diamond flower (*Oldenlandia corymbosa*), and spotted spurge (*Chamaesyce maculata*). All weed species present in research plots were combined for data analysis as total weed coverage.

All treatments reduced weed cover relative to the non-treated in the tall fescue research trial. Weed cover was less than 10 % for all treatments other than dazomet and non-treated at all rating dates. Soil-solarization resulted in 3, 7, and 9 % weed cover at 1, 22, and 43 DAS, respectively. Dazomet resulted in 4, 20, and 16 % weed cover at 1, 22, and 43 DAS. Flame-heating resulted in 0, 0, and 1 % weed cover at 1, 22, and 43 DAS, respectively. Emerged-weed flaming (uncovered) at 1, 22, and 43 DAS resulted in 0, 2, and 4 % weed cover, respectively. Emerged-weed flaming (covered) produced 0 % weed cover for all rating dates following application. Non-treated resulted in a 61, 89, and 53 % weed cover at 1, 22, and 43 DAS, respectively. Reductions in weed cover from 22 to 43 DAS by non-treated and dazomet treatments may be attributed to the increasing competition from establishing turfgrass.

Weed cover for all treatments in 'Zenith' zoysiagrass research trial was greater than tall fescue. All treatments reduced weed cover relative to the non-treated. Soil-solarization resulted in 2, 11, and 47 % weed cover at 1, 22, and 43 DAS, respectively. Dazomet resulted in 1, 14, and 65 % weed cover for 1, 22, and 43 DAS, respectively. Flame-heating resulted in 6, 28, and 86 % weed cover at 1, 22, and 43 DAS, respectively. Emerged-weed flaming (uncovered) at 1, 22, and 43 DAS resulted in 0, 11, and 57 % weed cover, respectively. Emerged-weed flaming (covered) obtained the least amount weed cover at 0, 2, and 23 % at 1, 22, and 43 DAS, respectively. Non-treated resulted in 11, 58, and 98 % weed cover at 1, 22, and 43 DAS, respectively.

These results indicate soil sterilization by flaming and solarization is an acceptable means of reducing weed seed populations before seeded turfgrass establishment. Obvious differences exist in the results between the two studies that could be accredited to the timing of the applications, temperature achieved by treatments, life cycles of weed species present, establishment rates, and growth habit of turfgrass. Both studies demonstrate a high potential for reducing weed populations through emerged-weed flaming covered with germination cloth.

PREEMERGENCE HERBICIDES INFLUENCE ESTABLISHMENT OF BERMUDAGRASS AND SEASHORE PASPALUM PUTTING GREENS. P.E. McCullough and B. Schwartz, University of Georgia.

ABSTRACT

Field experiments were conducted to investigate the influence of preemergence herbicides on bermudagrass and seashore paspalum putting green establishment. Experiments were conducted in Griffin, GA and Tifton, GA from June to December 2009. ‘Champion’, ‘MiniVerde’, and ‘TifEagle’ bermudagrass were sprigged on June 15 and June 16, 2009 in Tifton and Griffin, respectively. At both locations, grasses were sprigged in a randomized complete block with three replications, topdressed, rolled, and irrigated. Ten treatments were applied per grass immediately after planting, including dimethenamid at 0.84, 1.68, or 3.36 kg ai/ha, metolachlor at 1.1, 2.2, or 4.4 kg ai/ha, and oxadiazon at 1.1, 2.2, or 4.4 kg ai/ha, plus an untreated check. In Griffin, these treatments were applied on June 24 to ‘Sea Isle Supreme’ seashore paspalum approximately five days after sprigging. In another experiment, dimethenamid in a granular or liquid formulation was applied at 1.68 kg/ha approximately five days after sprigging the five aforementioned cultivars. Turf cover was visually rated on a percent scale every four weeks in all experiments.

All herbicides reduced bermudagrass establishment after four weeks ranging 20 to 74% from the untreated. Reductions in bermudagrass cover increased with herbicide rate but treatment effects were consistent across cultivars. After eight weeks in Griffin, dimethenamid at 3.36 kg ai/ha reduced bermudagrass cover 10% from the untreated while other treatments did not reduce turf cover. In Tifton, all treatments except the two high rates of dimethenamid and the highest rate of metolachlor had more bermudagrass cover than the untreated. Greater bermudagrass cover in herbicide treated plots resulted from weed control relative to the untreated turf. By 16 WAT, untreated bermudagrass had 84% cover but turf treated with all herbicides had greater cover, ranging 92 to 100%.

On the seashore paspalum putting green, oxadiazon at 2.2 and 4.4 kg/ha reduced turf cover by 40 and 45% from the untreated, respectively, after eight weeks. Turf treated with other herbicides had similar turf cover to the untreated. By sixteen weeks after sprigging, oxadiazon at 4.4 kg/ha reduced seashore paspalum cover by approximately 30% from the untreated while turf treated with other herbicides had similar cover to the untreated.

In other experiments, differences between granular and liquid dimethenamid formulations were not detected in the establishment of ‘Champion’, ‘MiniVerde’, and ‘TifEagle’ bermudagrass and ‘Sea Isle 1’ and ‘Sea Isle Supreme’ seashore paspalum. Dimethenamid reduced seashore paspalum and ‘Champion’ bermudagrass cover by 10 to 20% from the untreated by four weeks after sprigging but turf recovered similar to the untreated after eight weeks.

Overall, low to moderate rates of dimethenamid, metolachlor, or oxadiazon appear to have potential for use during establishment of bermudagrass and seashore paspalum putting greens. These treatments have potential to temporarily inhibit turf growth but weed control from these herbicides may allow quicker establishment from the untreated.

SWINECRESS CONTROL IN BENTGRASS PUTTING GREENS. G.M. Henry, T. Cooper, A.J. Hephner, and T. Williams; Texas Tech University, Lubbock, TX 79409.

ABSTRACT

Lesser swinecress (*Coronopus didymus* (L.) Sm.) is a summer annual or biennial broadleaf weed that emerges from February to October with peaks of emergence in April and September. Tolerance to low mowing, heavy traffic, and prolific seed production has increased the prevalence of this weed in turfgrass environments. Field experiments were conducted at the Pecos County Municipal Golf Course in Fort Stockton, TX in the summer of 2009 to examine the postemergence control of lesser swinecress. Studies were located on established infestations of lesser swinecress present in a 'L-93' creeping bentgrass putting green cut to a height of 0.3 cm. Plots measured 1.5 x 1.5 m and were arranged in a randomized complete block design with three replications of treatments. Treatments were applied using a CO_2 backpack sprayer equipped with XR8004VS nozzle tips and calibrated to deliver 375 L/ha at 221 kPa. Treatments were initiated on June 19, 2009 and consisted of single or sequential applications of MCPP + 2,4-D + dicamba at 0.5 kg ae/ha, sulfentrazone at 0.14 kg ai/ha, and carfentrazone at 0.017 kg ai/ha. Sequential applications of MCPP + 2,4-D + dicamba were made on July 17, 2009. Visual estimates of percent lesser swinecress control and creeping bentgrass phytotoxicity were taken 1, 2, 4, 6, and 8 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 creeping bentgrass phytotoxicity was observed throughout the length of the trial regardless of treatment or application timing. Carfentrazone treatments exhibited 0% control throughout the length of the trial. MCPP + 2,4-D + dicamba and sulfentrazone treatments exhibited 82 to 84% control 2 WAIT. Control with sulfentrazone decreased to 11% 8 WAIT. Control remained constant (83%) with single applications of MCPP + 2,4-D + dicamba, while sequential applications increased control to 91% 8 WAIT.

AMINOCYCLOPYRACHLOR FOR WEED MANAGEMENT IN WARM-SEASON TURFGRASS. B. J. Brecke, J. B. Unruh and D. E. Partridge-Telenko, University of Florida, West Florida Research and Education Center, Jay, FL 32565.

ABSTRACT

Aminocyclopyrachlor is a new herbicide under development by DuPont as either the methyl-ester (DPX-KJM44) or as the free acid (DPX-MAT28). KJM44 is being evaluated both as a wettable powder (WP) and as a granular (GR) material and MAT28 as a liquid (SL) formulation. Studies were conducted with aminocyclopyrachlor at the University of Florida West Florida Research and Education Center to determine warm-season turfgrass tolerance and postemergence weed management at rates of 30 to 320 ga a.i./ha. KJM44 (both WP and GR) and MAT28 at 50 to 80g a.i./ha provided excellent (95%) pennywort (dollarweed) (*Hydrocotyle* spp.) control. The KJM44 WP formulation provide more rapid control (95% by 4 wk after treatment (WAT) than the GR formulation (95% by 6 WAT) but both eventually controlled the pennywort. Pennywort control remained excellent for at least 14 WAT. Virginia buttonweed (*Diodia viginiana*) control required a higher rate of aminocyclopyrachlor (80 to 100 g/ha) and control ranged from 85 to 90% 3 to 4WAT. Control declined over time and was only 50 to 70% by 6 to 7 WAT. Aminocyclopyrachlor also controlled Florida betony (*Stachys floridana*), chamberbitter (*Phyllanthus niruri*) and white clover (*Trifolium repens*) 85 to 100% when applied postemergence at 50 to 70 g/ha. Aminocyclopyrachlor did not control Florida pusley (*Richardia scabra*) or torpedograss (*Panicum repens*). When applied at 80 g/ha, St. Augustinegrass injury was less with the KJM44 GR (25%) than with the WP (75%) formulation 4 WAT. Zoysiagrass and bermudagrass were injured 20% or less 3WAT when aminocyclopyrachlor was applied at 80 g/ha. Centipedegrass was the most tolerant of the turfgrass species evaluated and exhibited less than 20% injury following aminocyclopyrachlor application at rates up to 220 g/ha.

PERFORMANCE OF CELSIUS FOR MANAGING WEEDS IN TEXAS TURF GRASS. P.A. Baumann, M.E. Matocha, and T.W. Janak, Texas AgriLife Extension, College Station, TX.

ABSTRACT

Celsius (dicamba + thiencarbazone-methyl + iodosulfuron) was evaluated in 2009 to determine its' effectiveness for controlling dallisgrass (Paspalum dilitatum), dichondra (Dichondra carolinensis), slender aster (Aster subulatus), and sprawling horseweed (Calyptocarpus vialis). All are common weeds in central Texas turf grass. When Celsius was applied POST to dallisgrass at 4, 5.33, and 6.0 oz./A on 4-6 inch perennial plants, initial activity (26 DAT) ranged from 38 to 70 % control, but dissipated to 7 to 25% by the 55 DAT rating date. When applied POST to dichondra at rates of 4 and 5.33 oz./A, control at the 35 DAT rating ranged from 92 to 95%. This activity diminished by 71 DAT to 68 to 88% control, however, sequential applications applied at the 71 DAT evaluation date elevated control back to greater than 99% by late season. Celsius provided excellent season-long control of slender aster when treated at rates ranging from 2.46 to 5.33 oz./A. Applications were made when the slender aster was 2-3 in. and in the leafy stage of growth. At 14 DAT, control ranged from 75 to 87%, but increased to 99 to 100% by the 42 DAT rating date and was maintained at this level throughout the season (> 90 DAT). Celsius provided good-excellent (72 to 88%) control of sprawling horseweed when applied to 1-3 in. plants at rates ranging from 4 to 6 oz./A and evaluated 26 DAT. By 55 DAT, control had increased to greater than 93% from all treatments. In a separate study conducted on sprawling horseweed, Celsius efficacy was evaluated when applied alone at 3.97 and 4.92 oz./A ,with 0.5% or 1.0% (v/v) of MSO, or 0.25% (v/v) of NIS. Control of this specie ranged from 25 to 40% at 12 DAT up to 75 to 89% at 56 DAT. No significant differences in efficacy were seen between any of the treatments, suggesting no positive benefit from the surfactants when Celsius was applied at these rates on this species. In all of these experiments, weed infestations were severe enough to make turf tolerance assessments non-feasible.

WEED CONTROL AND TURFGRASS RESPONSE TO THIENCARBAZONE METHYL, IODOSULFURON, AND DICAMBA. A.R. Post, J.L. Jester, and S.D. Askew, Virginia Tech Blacksburg VA; L. Norton, and D. Spak, Bayer Environmental Sciences, Clayton NC.

ABSTRACT

Thiencarbazone-methyl, iodosulfuron and dicamba are now available as a premixture from Bayer. These active ingredients constitute a broad spectrum postemergence product with activity against annual and perennial broadleaf and some grassy weeds. It is labeled in fine turf under the trade name Celsius and is safe on warm season turfgrasses. Thiencarbazone-methyl + iodosulfuron + dicamba (TID) can be applied at several use rates during periods of optimal turf growth, even at high temperatures. It provides contact and systemic activity for maximum weed control and has a soil residual of up to 60 days. Our objectives for this study were to evaluate turfgrass tolerance and weed control efficacy of TID compared to industry standards.

TID was evaluated at four locations near Blacksburg VA in 2007. Experiments were arranged in a randomized complete block design with four replicates per location. Treatments included TID at 16 and 32 g ai/ha + MSO and ammonium sulfate, metsulfuron at 21 g ai/ha + NIS, and 2,4-D + dicamba + MCPP (DDM) at 1130 g ai/ha as well as a nontreated check. Bermudagrass (*Cynodon dactylon* (L.) Pers.) cover ranged from 45 to 89% at two sites and Kentucky bluegrass (*Poa pratensis* L.) ranged from 39 to 60% at one site. The fourth site was chosen as a weed control site due to its diversity and cover of broadleaf weeds with minimal turf cover. Data were taken 6, 15, 28, and 50 days after treatment (DAT). Weeds evaluated for percent control included black medic (*Medicago lupulina* L.), white clover (*Trifolium repens* L.), yellow woodsorrel (*Oxalis stricta* L.), vochin knapweed (*Centaurea nigrescens* Willd.), smooth crabgrass (*Digitaria ischaemum* (Schreb.) Schreb. Ex Muhl.), buckhorn plantain (*Plantago lanceolata* L.), prickly lettuce (*Lactuca serriola* L.), American burnweed (*Erechtites heiraciifolia* (L.) Raf. Ex DC.), and common dandelion (*Taraxicum officianale* F.H. Wigg).

Bermudagrass injury varied between sites at 6 DAT and one site had unacceptable injury (30%) at the high rate of TID. By 28 DAT the bermudagrass recovered and no location or treatment exhibited injury significantly different from the control. The high rate of TID caused unacceptable injury greater than 30% at all rating dates for Kentucky bluegrass, and the low rate caused unacceptable injury at 15 and 28 DAT, but Kentucky bluegrass recovered to only 7.5% injury by 50 DAT. Based on these results, TID can be used in bermudagrass at 16 g ai/ha with no undesirable effects but should not be used in Kentucky bluegrass since it causes unacceptable injury even at low rates.

For white clover, buckhorn plantain, and prickly lettuce, TID performed well against industry standards controlling them 95-100% at 15 and 28 DAT. By 50 DAT, prickly lettuce control was still not significantly different from the standards, and buckhorn plantain had recovered from treatments with metsulfuron and DDM, but was still controlled by TID 73-94%. White clover control with TID declined by 50 DAT to 52-92%, significantly lower than the standards. At 28 DAT TID controlled common woodsorrel, smooth crabgrass and American burnweed significantly better than the industry standards at both rates. The high rate of TID also performed equal to the industry standards for common dandelion and black medic. Vochin knapweed, however, was controlled consistently better with DDM compared to all other treatments.

Based on these results TID is superior to metsulfuron and DDM for control of American burnweed and common woodsorrel. It also controls smooth crabgrass better than metsulfuron and DDM. The high rate of TID was required to control common dandelion and black medic equivalent to industry standards and this rate may cause transient discoloration to bermudagrass.

EFFICACY OF FLAZASULFURON FOR CONTROL OF ANNUAL BLUEGRASS AND PERENNIAL RYEGRASS AS INFLUENCED BY NITROGEN. J.T. Brosnan, A.W. Thoms, G.K. Breeden, G.R. Armel, and T.C. Mueller; University of Tennessee, Knoxville, TN and P.E. McCullough; University of Georgia, Griffin, GA.

ABSTRACT

Flazasulfuron is a new sulfonylurea herbicide used to remove overseeded cool-season species from bermudagrass during spring transition. Field and laboratory studies were conducted in 2008 and 2009 evaluating the effects of nitrogen (N) fertilization on the efficacy of flazasulfuron for control of overseeded perennial ryegrass (*Lolium perenne* L.) contaminated with annual bluegrass (*Poa annua* L.).

Field studies were conducted on mature bermudagrass (*Cynodon dactylon*) fairway at Egwani Farms Golf Course in Rockford, TN (2008 & 2009) and replicated at an additional location (University of Georgia Experiment Station; Griffin, GA) in 2009. At all locations, plots were arranged in a randomized complete block design with three replications. Treatments included flazasulfuron applied at 4.4, 8.8, and 17.5 g ha^{-1} alone, and in between sequential applications of N fertilizer (46-0-0) at 73 kg N ha^{-1}. N fertilizer was applied granularly immediately prior to herbicide treatment and 4 weeks (wk) later. A non-ionic surfactant was included with all flazasulfuron treatments at a 0.25% v/v ratio. At both locations herbicide treatments were applied with CO_2- powered backpack sprayers calibrated to deliver >280 L ha^{-1} of spray volume

By 6 wk after treatment (WAT) in 2008, annual bluegrass control with flazasulfuron at 4.4, 8.8, and 17.5 g ha^{-1} was improved 73, 59, and 35% by two applications of N at 73 kg N ha^{-1}. In both years, the level of annual bluegrass control following treatment with flazasulfuron at 4.4 g ha^{-1} and N at 73 kg N ha^{-1} was greater than that which was achieved following treatment with flazasulfuron at 17.5 g ha^{-1} alone. Improvements in perennial ryegrass control due to applications of N were less substantial than those observed for annual bluegrass, as perennial ryegrass control by 3 WAT in 2009 following treatment with flazasulfuron at 4.4, 8.8, and 17.5 g ha^{-1} was only improved 18, 11, and 9% by application of N at 73 kg N ha^{-1}.

Annual bluegrass plants were harvested from the same TN location used for the field study and thinned to one tiller. Plants were transplanted into a peat moss growing medium and placed in a growth chamber (Knoxville, TN) configured to provide a 12/9 C day/night temperature and a 12 h photoperiod. After a 3 wk acclimation period, plants were divided into two groups. The first group received an application of N at 73 kg N ha^{-1} and a broadcast application of flazasulfuron at 8.8 g ha^{-1} mixed with a non-ionic surfactant at a 0.25% v/v ratio, while the second group only received a broadcast application of flazasulfuron and non-ionic surfactant at the same rates as the first. A single 1 μL droplet of a radioactive solution containing 35 μL ^{14}C-flazasulfuron (specific activity, 4.18 MBq/mg; radiochemical purity 94%) stored in acetonitrile, 64 μL of distilled H_20, and 2.5 μL of non-ionic surfactant was applied to the adaxial surface of the first subtending leaf from the budleaf. Each 1 μL droplet of radioactive solution delivered approximately 5 kBq of ^{14}C-flazasulfuron to the treated leaf of each plant

Non-absorbed ^{14}C-flazasulfuron was quantified by excising the treated leaf and rinsing it in 5 ml of a 50:50 methanol:water solution at 1, 4, 8, 24, 48, and 72 hours after treatment (HAT). Rinsate was analyzed using liquid scintillation spectrometry (LSS). Immediately after rinsing the treated leaf of each sample, plants were removed from the growing medium and divided into three: treated leaf, shoot tissue other than the treated leaf, and root tissue. Tissues were weighed and combusted in a sample oxidizer configured to trap evolved $^{14}CO_2$ using a carbon dioxide absorbent. This solution was analyzed using LSS to determine the distribution of radioactivity over time.

Significant differences in foliar absorption of ^{14}C-flazasulfuron due to N fertility were not detected. However, treatment with N fertilizer at 73 kg N ha^{-1} increased translocation of ^{14}C-flazasulfuron (and any potential metabolites) from the treated leaf to other shoot tissues by 18% at 1 HAT and 22% at 4 HAT compared to plants not treated with N fertilizer. This increase in translocation may explain the increased level of annual bluegrass control observed in the field.

***Poa annua* CONTROL AND PERENNIAL RYEGRASS RESPONSE TO AMICARBAZONE IN PERENNIAL RYEGRASS OVERSEED.** D.H. Perry, J.S. McElroy, and R.H. Walker; Department of Agronomy and Soils, Auburn University, Auburn, AL

ABSTRACT

Perennial ryegrass (*Lolium perenne* L.) is a cool-season turfgrass commonly utilized in overseeding golf courses and sports fields in order to maintain playability during winter dormancy. The popularity of perennial ryegrass as a playing surface is attributed to its fine texture and dark green color. Annual bluegrass (*Poa annua* L.) is a cool-season annual grassy-weed common in turfgrass systems across the U.S. In the southern U.S., annual bluegrass germinates in early fall, grows vegetatively in a bunch-type growth habit during the winter, and displays prolific seedhead production in the spring. Annual bluegrass infestations cause light-green patches with abundant seedheads resulting in an aesthetically inferior turf. Germination of annual bluegrass in conjunction with perennial ryegrass overseeding in the fall complicates chemical control options for turfgrass managers. Products currently available to users for postemergence-annual bluegrass control have displayed certain phytotoxic effects resulting in narrow application windows.

Amicarbazone is a new photosystem II (PSII)-inhibiting herbicide being evaluated in various agronomic systems, including turfgrass weed control. Treated plants display root and shoot uptake with root uptake being predominant. Recent studies have reported the ability of amicarbazone to control annual bluegrass in certain cool-season turfgrasses. The objective of this study was to evaluate amicarbazone application timing on perennial ryegrass injury and annual bluegrass control.

Research was conducted at the Turfgrass Research Unit in Auburn, AL. Perennial ryegrass was overseeded (897 kg/ha) on 22 October, 2008. Treatments included amicarbazone (0.37 and 0.74 kg ai/ha) at 1, 2, 4, 8, and 16 weeks after overseeding (WAOS) and a non-treated check. All treatments contained 0.25% v/v non-ionic surfactant and were applied using a CO_2-pressurized backpack sprayer at 280 L ha^{-1} with 8002VS nozzles. Treatments were organized in a randomized complete block design with four replications. All plots were fertilized with 0.22 kg $N/93m^2$/mo and adequate soil moisture was maintained. Plots were rated visually for perennial ryegrass injury and cover (%) and turf quality (1-9 with 9 = optimal turf and 1 = dead turf). Annual bluegrass control was determined by performing plant counts in late spring and calculating control as a percent of the nontreated. Perennial ryegrass and annual bluegrass control data was subjected to ANOVA and means were separated using Fisher's protected LSD test ($P = 0.05$).

Amicarbazone applied 1 to 8 WAOS injured perennial ryegrass ≥ 58% 2 weeks after application (WAA). Conversely, 16 WAOS applications injured perennial ryegrass <10%. Applications prior to 16 WAOS decreased perennial ryegrass density. Perennial ryegrass cover at 18 WAOS was lowest (20%) in plots treated with 0.74 kg ai/ha 8 WAOS. Amicarbazone applied 16 WAOS did not reduce perennial ryegrass cover. Turf quality was significantly reduced by all treatments except the 16 WAOS applications. Annual bluegrass populations were low throughout the study area and in most cases an increase in annual bluegrass was observed in treated plots. Sixteen WAOS applications at 0.37 and 0.74 kg ai/ha however, resulted in annual bluegrass control of 49 and 35%, respectively.

Amicarbazone applied ≤ 8 WAOS is unacceptably injurious and results in a significant perennial ryegrass cover reduction. This and other preliminary studies have observed less perennial ryegrass injury with amicarbazone when applied at least 16 WAOS. Amicarbazone applications which significantly reduce perennial ryegrass cover may promote germination of annual bluegrass by reducing inter-specific competition. This study demonstrated the detrimental effects of amicarbazone to perennial ryegrass when applied ≤ 8WAOS compared to later applications (≥ 16WAOS) which favor reduced perennial ryegrass injury and increased annual bluegrass control.

***Poa annua* CONTROL IN CREEPING BENTGRASS GREENS AND OVERSEEDED FAIRWAYS.** J.W. Marvin, A.G. Estes and L.B. McCarty Clemson University, Clemson SC

ABSTRACT

Poa annua is a problematic winter annual in both creeping bentgrass greens and overseeded bermudagrass fairways. *Poa annua* is a prolific seed head producer, causing unsightly and inconsistent playing conditions. In recent years, biotypes have exhibited resistance to many of the conventional chemical controls. The purpose of this study was to evaluate rates and timings of new chemical control products. Various timings and rates were applied starting in September 29, 2008. Repeat applications were made on a 3 week interval, with the exception of the Cumyluron and Amicarbazone treatments. Cumyluron was applied either preventatively on September 29, 2008 or as a split treatment on September 29, 2008 followed by January 12, 2009. Amicarbazone was applied either postemergent on April 6, 2009, or as a split application April 6, followed by April 27, 2009. Product rates were: Trimmit (Paclobutrazol) applied at 4 oz ai/A, Legacy (Trinexapac-ethyl + Flurprimidol) applied at 1.9 oz ai/A, Primo + Proxy (Trinexapac-ethyl + Ethephon) applied at 0.625 oz ai/A + 1.25 oz ai/1000 ft^2, Cumyluron applied at 1.56 oz ai/1000 ft^2, Cumyluron applied at 1.56 oz ai/1000 ft^2, Cutless (Flurprimidol) applied at 3 oz ai/A, Cumyluron applied at 1.56 oz ai/1000 ft^2 followed by Amicarbazone at 1.82 oz ai/A, Amicarbazone applied at 0.91 oz ai/A and Amicarbazone applied at 0.91 oz ai/A. Applications were made using a CO_2 powered sprayer calibrated at 20 GPA. Creeping bentgrass treatments were replicated one time on the practice green of the Walker Golf Course located in Clemson South Carolina. Cumyluron, Cumyluron split application and Trimmit all provided >90 percent control 213 days after initial application (DAI), May 5, 2009, while Cutless provided >80 percent control. Primo + Proxy, Legacy and Velocity all provided < 20% control on May 5, 2009. Split application of Amicarbazone applied April 6 followed by 27, 2009 provided >50 percent control on May 5, 2009. Single application of Amicarbazone applied April 6, 2009 and Cumyluron applied September 29, 2008 followed by Amicarbazone April 6, 2009 provided ~ 40 percent control on May 5, 2009. Treatments of Primo + Proxy, Trimmit and Legacy all yielded unacceptable turf quality (< 7 on a scale of 1-9 where 9 = best turf) on the rating date of January 12, 2009. Primo + Proxy continued to yield unacceptable turf quality through May 5, 2009, while other treatments returned to acceptable levels, at this time.

PREEMERGENCE CONTROL OF ANNUAL BLUEGRASS WITH AE 1170437. G.M. Henry, A.J. Hephner, A.T. Holbrook, T. Cooper, and T. Williams; Texas Tech University, Lubbock, TX.

ABSTRACT

Annual bluegrass (*Poa annua* L.) is one of the most problematic weeds in high maintenance turfgrass. Its lime green color contrasts that of desired turfgrass species, giving the turf a blotchy, mottled appearance and disrupting the overall color uniformity. Field experiments were conducted at Lake Ridge Country Club in Lubbock, TX during the fall of 2009 to determine the efficacy of AE 1170437 (indaziflam) for the preemergence control of annual bluegrass. Studies were located in a hybrid bermudagrass fairway cut to a height of 1.3 cm with a history of annual bluegrass infestation. 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 XR8003VS nozzle tips and calibrated to deliver 304 L/ha at 276 kPa. Treatments were initiated on September 16, 2009 and consisted of AE 1170437 at 0.030, 0.040, 0.050, and 0.060 kg ai/ha; and prodiamine at 0.56 and 0.84 kg ai/ha. Visual estimates of percent annual bluegrass control and bermudagrass phytotoxicity were taken 1, 2, 3, 4, 6, 8, and 10 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 trial regardless of treatment. Indaziflam treatments exhibited 100% annual bluegrass control 4 and 10 weeks after initial treatment (WAIT) regardless of application rate. Prodiamine treatments exhibited 91 to 96% control 4 WAIT and 95 to 96% control 10 WAIT regardless of application rate.

APPLICATION TIMING AFFECTS ANNUAL BLUEGRASS CONTROL WITH INDAZIFLAM. S.D. Askew and J. L. Jester, Virginia Tech, Blacksburg; L. Norton, and D. Spak, Bayer Environmental Sciences, Clayton, NC.

ABSTRACT

Indaziflam (BCS-AA10717, formerly AE 1170437) is a new herbicide pending registration for turfgrass, ornamentals, and industrial vegetation management. The proposed trade name for turfgrass is Specticle Herbicide and is expected to be marketed in spring 2010. Indaziflam is a cellulose biosynthesis inhibitor that is active at lower use rates than similar products currently marketed. Indaziflam is primarily a preemergence herbicide but has exhibited postemergence control of selected annual weeds, including annual bluegrass. Due to superior tolerance, only warm-season turfgrasses will be on the initial Specticle Herbicide label. Indaziflam effects on annual bluegrass vary with annual bluegrass growth stage and indaziflam rate. Indaziflam can have residual activity on some weeds up to one year after application if excessive rates are applied. At label use rates, activity normally lasts about six months. Postemergence activity on annual bluegrass is unique among traditional preemergence turfgrass herbicides. Data are needed to determine optimal application timing to maximize annual bluegrass control with indaziflam. Our objectives to were evaluate annual bluegrass control and turfgrass response from indaziflam when applied at monthly intervals during fall and winter.

A randomized complete block experiment was conducted twice with three replications each on two sites at the Virginia Tech Golf Course at Blacksburg, VA in 2006 and 2007. The first site contained 'Riviera' bermudagrass and the second site contained 'Zenith' zoysiagrass. Turf was three years old and maintained at 1.5 cm at both sites. Annual bluegrass ranged from 1 to 5% cover on the bermudagrass site and 11 to 25% on the zoysiagrass site. The first 18 treatments consisted of indaziflam applied at 25, 50, and 75 g ai/ha in August, September, October, November, December, and February. The last 5 treatments consisted of prodiamine at 730 g ai/ha applied in August, simazine applied at 1120 g ai/ha applied in November or in February, glyphosate at 420 g ai/ha applied in February, and a nontreated check. Data were subjected to analysis of variance to determine significant main effects or interactions and regression analysis to explain trends over time.

Indaziflam did not injure bermudagrass or zoysiagrass. Indaziflam rate and the interaction of rate and application time was not significant. The main effect of application time was significant at all evaluation times and the interaction of trial by application time was significant at a four of seven evaluations. When assessed in April of the following season (32 wk after treatment), annual bluegrass cover was 96% correlated to indaziflam application time, expressed as the number of months after normal annual bluegrass germination in August. Annual bluegrass cover increased 8% for each month indaziflam application was delayed from August. Regardless of rate, indaziflam applied in August or September reduced annual bluegrass cover equivalent to glyphosate applied in February and better than simazine applied in November or February and prodiamine applied in August. Indaziflam applied in October or later did not reduce annual bluegrass cover to acceptable levels.

PREEMERGENCE ANNUAL BLUEGRASS AND CRABGRASS WITH INDAZIFLAM. A.G. Estes and L.B. McCarty;. Department of Environmental Horticulture, Clemson University, Clemson, SC.

ABSTRACT

Annual Bluegrass (*Poa annua*) a widely distributed prolific seed producing winter annual plant, with a tufted growth habit and non-uniform color which makes for an unsightly appearance in highly maintained turf areas. Crabgrass (*Digitaria spp*.) is a summer annual grass weed common in home lawns and golf courses. Crabgrass is a tufted type grass that produces unsightly seedheads, which disrupts the uniformity of the turf. The purpose of this research was to investigate the efficacy of indaziflam at various fall timings for annual bluegrass and evaluate residual crabgrass control from these previous fall application timings.

The study was conducted on the 'Tifway' Bermudagrass research plots located on the campus of Clemson University. Plot size for each treatment measured 2.0 m by 2.0m, replicated three times. Treatments were applied using a CO_2 backpack sprayer calibrated at 40 GPA. Treatments for the study included: Prodiamine (Barricade 65 WG) at 454 g ai/A applied in September; Indaziflam 1.7 SC at 32.4 g ai/A applied in September, October, November, and December; Indaziflam at 32.4 g ai/A plus foramsulfuron (Revolver 0.19 SC) at 11.66 g ai/A and Revolver at 11.66 g ai alone applied in December. Initial treatment was applied September 4, 2008 with sequential timings applied monthly

Visual ratings were taken throughout the study. Percent annual bluegrass and crabgrass were rated on a 0 - 100% scale with 0% representing no control and 100% representing no annual bluegrass or crabgrass present. In addition percent bermudagrass green-up was measured on a 0 - 100% scale, with 0% representing no bermudagrass green-up and 100% representing complete bermudagrass green-Up.

On April 29, 2009 all treatments containing indaziflam and Barricade resulted in excellent (>95%) annual bluegrass control. Revolver alone applied in December resulted in 80% annual bluegrass control. No significant difference in bermudagrass green-up was observed from any of the treatments. Crabgrass control on June 4, 2009 resulted in all Barricade and indaziflam treatments providing 70% - 90% with no significant difference between treatments. On September 22, 2009, Barricade provided 80% crabgrass control while indaziflam treatments provided 50-80% control, again no significant differences occurred between treatments.

Future research at Clemson University will be to continue to evaluate fall rates and timings of herbicides for optimal annual bluegrass control. Evaluate indaziflam in winter weed control programs for residual preemerge crabgrass and goosegrass control. Investigate further the use of indaziflam for other preemerge grassy and broadleaf weeds.

UTILIZING NICOSULFURON – HERBICIDE MIXTURES FOR MSMA REPLACEMENT WEED CONTROL IN TURFGRASS. J.S. McElroy[1], J.J. Rose[1], and P.E. McCullough[2]; [1]Auburn University, Auburn, AL; [2]The University of Georgia, Griffin, GA.

ABSTRACT

MSMA usage in turfgrass is being phased out through 2013; therefore, replacement herbicides are being explored. Nicosulfuron has shown potential as a herbicide replacement for MSMA. Nicosulfuron controls many common turfgrass weeds such as crabgrass (*Digitaria* spp.) and goosegrass (*Eleusine indica*). Our objective was to evaluate nicosulfuron control of turfgrass weeds when applied alone and in combination with other herbicides with potential MSMA weed species control. Smooth crabgrass- (*Digitaria ischaemum;* 3 trials; initiated 1 May, 20 May, or 12 June), goosegrass- (1 trials; initiated 9 July), and dallisgrass (*Paspalum dilatatum*; 1 trial; initiated 24 Aug)-control trials were conducted at the University of Georgia, Griffin, GA (UGA); Auburn University, Auburn, AL (AU); or Auburn University Plant Breeding Unit, Tallassee, AL; (PBU) in unimproved bermudagrass (*Cynodon dactylon*) turf. Smooth crabgrass and goosegrass treatments included nicosulfuron-alone (0.10 kg/ha) or in combination with quinclorac (0.84 kg/ha), rimsulfuron (0.04 kg/ha), sulfentrazone (0.42 kg/ha), imazethapyr (0.07 kg/ha), or imazaquin (0.56 kg/ha) which were applied at one and/or two application timings. Repeat applications were made 3-weeks after initial treatment. Dallisgrass treatments included nicosulfuron-alone (0.10 kg/ha) or in combination with imazapic (0.04 kg/ha), rimsulfuron (0.04 kg/ha), foramsulfuron (0.03 kg/ha), imazethapyr (0.07 kg/ha), and imazaquin (0.56 kg/ha) which were applied twice at 3-week intervals. Smooth crabgrass, goosegrass, dallisgrass control, as well as bermudagrass (*Cynodon dactylon*) injury, were visually rated on a 0 to 100% control/injury scale. Treatments and visual ratings were conducted as previously described. In both experiments, treatments were arranged as a randomized complete block (reps=3). Data for all studies was subject to ANOVA (P = 0.05) and means separated by Fisher's protected LSD (P = 0.05). Overall, repeat applications of nicosulfuron plus other herbicides applied twice were more effective than single applications. At 8 weeks after application (WAA), quinclorac applied once alone, once in combination with nicosulfuron, and twice in combination with nicosulfuron, resulted in 84%, 63%, and 81% crabgrass control, respectively, at the UGA location. Smooth crabgrass control with quinclorac applied once alone and once in combination with nicosulfuron at AU and PBU was less than 60%. Quinclorac applied twice in combination with nicosulfuron controlled smooth crabgrass 70-81% at all locations. Nicosulfuron plus imazaquin and imazethapyr applied once or twice controlled smooth crabgrass >70% at AU and PBU, but not UGA. At 8 WAA, all twice-applied treatments controlled goosegrass greater than 78% at UGA. All nicosulfuron combinations twice applied controlled goosegrass greater than equal to MSMA-alone (78%). At 8 WAA, nicosulfuron plus imazaquin controlled dallisgrass 75% at AU. Few herbicide combinations were effective for dallisgrass control. At 8 WAA, nicosulfuron plus imazapic or imazethapyr controlled dallisgrass 75 or 82%, respectively. Nicosulfuron alone or nicosulfuron plus imazaquin controlled dallisgrass 63 and 58%, respectively; greater than MSMA (53%). Nicosulfuron plus imazaquin injured bermudagrass 27% 1 WAA, the highest observed; however, bermudagrass recovered. In conclusion, beneficial herbicides for combination with nicosulfuron for control of smooth crabgrass, goosegrass, and dallisgrass control include: quinclorac, imazapic, imazaquin, and imazethapyr. Further research will be conducted to define ideal rates, timing, and combinations.

EFFECTS OF AMBIENT MOISTURE ON AMINOCYCLOPYRACHLOR EFFICACY. D.F. Lewis, T.W. Gannon, F.H. Yelverton, R.J. Richardson, and M.D. Jeffries; Department of Crop Science, North Carolina State University, Raleigh, NC 27695

ABSTRACT

Synthetic auxin herbicides are used for selective broadleaf weed control in turfgrass settings. Aminocyclopyrachlor (DPX-MAT28) is a recently discovered pyrimidine carboxylic acid herbicide belonging to the synthetic auxin family. Aminocyclopyrachlor has a broad spectrum of weed control with low use rates and a favorable environmental profile. Preliminary reports indicate aminocyclopyrachlor is stable in aqueous environments but rapid photodecomposition can occur when exposed to sunlight. In golf course management, most herbicide applications are made in the morning when dew is present. If aminocyclopyrachlor applications were made to dew covered turf, there could be a potential for efficacy loss due to photodegradation. Research was conducted to determine the effects of ambient moisture on aminocyclopyrachlor efficacy.

Research was conducted in 2009 at the North Carolina State University Lake Wheeler Turfgrass Unit in Raleigh, NC on ‘Tifway 419’ bermudagrass [*Cynodon dactylon* (L.) Pers. X *C. transvaalensis* Burtt-Davy]. ‘Tifway 419’ bermudagrass displays an intermediate tolerance to aminocyclopyrachlor and retains dews well compared to other turfgrasses. Experimental design was a randomized complete block with four replications in a factorial arrangement (five herbicide treatments by two moisture scenarios). Herbicide treatments included: DPX-MAT28 (79 grams a.e/ha); DPX-MAT28 (105 g/ha); DPX-MAT28-70 (84 g/ha); DPX-MAT28-71 (84 g/ha); aminopyralid (70 g/ha); and a nontreated check. Moisture scenarios included DRY plots (no dew present) vs. WET plots (dew present). DRY plots were covered overnight with tent structures to prevent dew formation. WET plots were left uncovered so natural dew could form. Structures were removed the following morning and herbicide applications were made with a CO2 pressurized spray boom calibrated to deliver 304 L/ha. Bermudagrass injury was visually rated on a 0-100% scale (0%=no visible turfgrass injury; 100%=complete turfgrass death). In addition, turfgrass quality ratings were taken using a Field Scout TCM 500 NDVI Turf Color Meter on a 0-9 scale (0=poorest quality; 9=highest quality).

All herbicide treatments applied to WET plots showed greater injury than those applied to DRY plots 11 days after treatment (DAT). Applied to WET plots DPX-MAT28 (79 g/ha), DPX-MAT28 (105 g/ha), DPX-MAT28-70, DPX-MAT28-71, and aminopyralid injured 30, 38, 15, 14, and 36%, respectively. Applied to DRY plots, injury reduced to 25, 27, 10, 5, and 30%, respectively, for the same treatments. Turfgrass quality ratings for DPX-MAT28 (79 g/ha), DPX-MAT28 (105 g/ha), and aminopyralid on WET plots were 6.7, 6.5, and 6.4, respectively, compared to 6.8, 6.7, and 6.6, respectively, on DRY plots.

DPX-MAT28 (79 and 105 g/ha) provided greater injury and reduced turfgrass quality more when applied to WET vs. DRY plots 21 DAT. Applied to WET plots, DPX-MAT28 (79 and 105 g/ha) injured 35 and 40%, respectively. Applied to DRY plots, injury reduced to 28 and 30%, respectively. Turfgrass quality ratings for DPX-MAT28 (79 and 105 g/ha) on WET plots were 5.9 and 5.5, respectively, compared to 6.4 and 5.9, respectively, on DRY plots.

NON-SELECTIVE AND PREEMERGENCE HERBICIDE MIXTURES FOR WINTER ANNUAL BROADLEAF WEED AND PREEMERGENCE CRABGRASS (*Digitaria* Spp.) CONTROL. G.K. Breeden, J.T. Brosnan, and M.T. Elmore; University of Tennessee, Knoxville, TN.

ABSTRACT

Non-selective herbicides can be used to control annual bluegrass (*Poa annua*) and various winter annual broadleaf weeds in dormant bermudagrass (*Cynodon dactylon*) turf. Tank mixtures of non-selective and preemergence herbicides could be an economical strategy for controlling both winter and summer annual weeds like smooth crabgrass (*Digitaria ischaemum*). Field research was initiated in the spring of 2009 to evaluate the efficacy of tank mixtures of non-selective and preemergence herbicides for postemergence control of winter annual weeds and preemergence smooth crabgrass control.

All trials were conducted on a mature stand of bermudagrass maintained as a golf course fairway at the East Tennessee Research and Education Center in Knoxville, TN. Plots (1.5 by 3 m) were arranged in a randomized complete block design with three replications. Herbicide treatments included glufosinate (1120 g ai/ha) + oxadiazon (2240 g ai/ha), glufosinate (1120 g ai/ha) + oxadiazon (2800 g ai/ha), glufosinate (1120 g ai/ha) + oxadiazon (3360 g ai/ha), glyphosate (1120 g ai/ha) + oxadiazon (3360 g ai/ha), glyphosate (1120 g ai/ha) + pendimethalin (3360 g ai/ha), glyphosate (1120 g ai/ha) + dithiopyr (560 g ai/ha), glyphosate (1120 g ai/ha) + prodiamine (560 g ai/ha), and an untreated control. All treatments were applied on 6 March 2009 with a CO_2 powered boom sprayer calibrated to deliver 281 L/ha utilizing four, flat-fan, 8002 nozzles at 124 kPa, configured to provide a 1.5-m spray swath. Weed control and turf injury were evaluated visually utilizing a 0 (no weed control or turf injury) to 100 (complete weed control or turf injury) % scale, relative to an untreated control. Data were collected at 7, 14, 21, 28, 42, 56 days after treatment (DAT) and monthly after 56 DAT until 167 DAT.

All treatments reduced bermudagrass green-up, relative to the untreated control, at 28 DAT; however, no differences in green-up were detected at 42 DAT. All treatments controlled henbit (*Lamium amplexicaule*) and mouse-ear chickweed (*Cerastium vulgatum*) ≥ 88% at 28 DAT. Glyphosate + oxadiazon, glyphosate + pendimethalin, and glyphosate + prodiamine controlled purple deadnettle (*Lamium purpureum*) ≤75% at 28 DAT. All other treatments controlled purple deadnettle (*Lamium purpureum*) ≥80% at 28 DAT. All treatments controlled purple deadnettle (*Lamium purpureum*) ≥94% at 42 DAT. Glyphosate + dithiopyr and glyphosate + prodiamine controlled smooth crabgrass 85 and 83%, respectively, at 111 DAT. All other treatments controlled smooth crabgrass ≥90 until 111 DAT. Control for all treatments decreased to ≤83% at 167 DAT, except for glufosinate + oxadiazon (3360 g ai/ha) and glyphosate + oxadiazon (3360 g ai/ha), which measured ≥90% at 167 DAT. These data suggest that tank mixtures of non-selective herbicides + preemergence crabgrass herbicides can provide postemergence control of winter annual weeds and preemergence control of smooth crabgrass in established bermudagrass turf.

PREEMERGENCE CONTROL OF GOOSEGRASS [ELEUSINE INDICA (L.)] IN BERMUDAGRASS TURF. R.S. Landry, A.G. Estes, and L.B.McCarty; Department of Horticulture, Clemson University, Clemson.

ABSTRACT

Goosegrass and green kyllinga continue to be major weed problems for turfgrass managers. Two studies were conducted at The Rock at Jocassee Golf Course in Pickens, South Carolina on preemergence control of these weeds. Herbicides used in the first study were Dismiss (Sulfentrazone), Dismiss South (Sulfentrazone plus Imazethapyr), Echelon (Sulfentrazone plus Prodiamine), Ronstar (Oxadiazon), Free Hand (Dimethenamid plus Pendamethalin) and Pendulum plus Tower (Pendamethalin plus Dimethenamid). Rates for the first study were as follows: Dismiss – 0.375 lbs ai/ac, Dismiss South – 0.45 lbs ai/ac, Echelon – 1.125 lbs ai/ac, Ronstar - 3 lbs ai/ac, Free Hand – 2.25 lbs ai/ac, and Pendulum + Tower – 3 + 1.5 lbs ai/ac. Ratings were taken on April 22 for green up, and July 14 and September 7, 2009 for preemergence control. Dismiss South and Pendulum plus Tower delayed bermudagrass green up on April 22, but turf fully recovered thereafter. On July 14, all treatments except Dismiss alone provide > 70% control. On September 7, control was similar between herbicides.

In the second study, Specticle (Indaziflam) and Prodiamine (Barricade) were used for preeemergence control of goosegrass at the following rates: 0.02 G, 0.04 G, 0.07 G, 0.02 L, 0.04 L, 0.07 L, and Barricade at 1.0 L. All treatments were on ils ai/ac. Ratings were taken on August 4 and September 8, 2009. In this second study, preemergence control of green kyllinga was also noted as well as goosegrass. On August 4, Indaziflam (0.04 G) and A717 (indaziflam L) treatments provided best preemergence goosegrass control. On September 8, 2009, all treatments except Indaziflam (0.02 G) and prodiamine provided > 80% control. Green kyllinga control, on August 4 - Indaziflam 0.04 G, Indaziflam 0.07 G, and all A 717 (Indaziflam L) treatments provided > 90% control. On September 8, Indaziflam 0.04 G, Indaziflam 0.07 G and all Indaziflam (L) treatments provided > 80% control.

In conclusion, by September most herbicides used in the treatments provided atleast 70% control except for Dismiss in the first study and Barricade in the second study. Also, in the second study all he treatments provided >70% control of green kyllinga. Future research will be conducted by evaluating new experimental herbicides for pre and postemergence control on goosegrass in bermudagrass turf as well as continuing research with Indaziflam using different rates and timing of applications.

USING GROWING DEGREE DAY APPLICATION TIMINGS TO MAXIMIZE EFFICACY OF FLUAZIFOP AND TRICLOPYR FOR CONTROL OF BERMUDAGRASS (*Cynodon* Spp.) IN ZOYSIAGRASS M.T. Elmore, J.T. Brosnan and G.K. Breeden; University of Tennessee, Knoxville, TN

ABSTRACT

Common bermudagrass (*Cynodon dactylon*) commonly invades zoysiagrass throughout the southern United States. Research was conducted in 2009 at the East Tennessee Research and Education Center to evaluate mixtures of fluazifop-p-butyl (fluazifop) and triclopyr applied at multiple timings for selective postemergence bermudagrass control in zoysiagrass (*Zoysia japonica*) turf.

Plots measuring 1 x 1 meters were arranged in a 4 x 5 factorial design replicated three times. Herbicide treatment and application timing served as factors in this study. The 4 herbicide treatments evaluated were single applications of fluazifop + triclopyr applied at rates of 0.10 + 1.13 kg ai/ha, 0.21 + 1.13 kg ai/ha, 0.32 + 1.13 kg ai/ha, respectively and an untreated check. All treatments were applied with a CO_2 powered boom sprayer calibrated to deliver 280 L/ha. The sprayer boom contained four, flat-fan nozzles spaced 25 cm apart. A wheeled aluminum frame maintained the boom height 25 cm above the surface while spraying at 124 kPa. These treatments were applied at 5 timings: 200 growing degree days (GDD_{10C}), 450 GDD_{10C}, 825 GDD_{10C}, 1275 GDD_{10C}, and 1775 GDD_{10C}. Yearly accumulated GDD_{10C} were calculated beginning January 1st using a Celsius scale according to the equation,

$$GDD_{10C} = [(T_{max} - T_{min})/2] - T_{base}$$

where T_{max} represents the daily maximum air temperature, T_{min} represents the daily minimum air temperature, and T_{base} equals 10°C.

Bermudagrass control and zoysiagrass injury were assessed weekly from 1 WAT (weeks after treatment) to 9 WAT using a visual scale from 0 (no control or injury) to 100% (complete control). Bermudagrass and zoysiagrass injury were also assessed by relative chlorophyll index (R840nm/R700nm) with a hand-held chlorophyll meter. Data were subjected to ANOVA in SAS. Fisher's protected LSD values were used to separate means significant at the α=0.05 level.

Treatments of fluazifop + triclopyr applied at 1775 GDD_{10C} provided greater bermudagrass control than all other treatments 7,8 and 9 WAT. Control following fluazifop + triclopyr applied at 200 GDD_{10C} was greater 6 and 7 WAT than treatments applied at 450 GDD_{10C}, 825 GDD_{10C} and 1275 GDD_{10C}. All treatments except the 450 GDD_{10C} application of fluazifop + triclopyr at 0.32 + 1.13 kg, respectively, provided greater than 60% bermudagrass control 2 WAT. By 9 WAT control was below 15% for all treatments except those applied at 1775 GDD_{10C} for which control was greater than 80%. Zoysiagrass injury was less than 10% for all treatments applied at 1775 GDD_{10C} at all ratings dates. Zoysiagrass injury 7 DAT for all treatments applied at 200 GDD_{10C} ranged from 10-20%. No zoysiagrass injury was detected for any treatment 5-9 WAT.

EVALUATION OF HERBICIDES AND TANK-MIXES FOR SUPPRESSION OF BERMUDGRASS IN ZOYSIAGRASS. A.J. Patton*,[1] J.M. Trappe,[1] M.C. Doroh,[2] and J.S. McElroy[2]; [1]University of Arkansas Cooperative Extension Service, Fayetteville, AR; [2]Department of Agronomy & Soils, Auburn University, Auburn, AL

ABSTRACT

Zoysiagrass is a popular turfgrass species for use on golf courses. One common problem in managing zoysiagrass on golf courses is the removal of bermudagrass. The objectives of this experiment were to 1) determine whether aminocyclopyrachlor could be useful for suppressing bermudagrass, 2) compare the performance of aminocyclopyrachlor tank-mixed with aryloxyphenoxypropionate (AOPP) herbicides to AOPP herbicides tank-mixed with triclopyr on various bermudagrass and zoysiagrass cultivars, and 3) determine how various herbicide or herbicide tank-mixes affect the turf quality and turf color of various zoysiagrass cultivars. Bermudagrass suppression was highest for fluazifop 0.10 kg/ha, but this application caused unacceptable injury to zoysiagrass as well as a reduction in turfgrass quality. Tank-mixing fluazifop or fenoxaprop 0.14 kg/ha with triclopyr 0.56 kg/ha reduced zoysiagrass injury and improved turf quality over fluazifop or fenoxaprop applications. Overall, fluazifop + triclopyr and fenoxaprop + triclopyr were the only two herbicide treatments tested that had zoysiagrass turf quality and zoysiagrass injury similar to untreated plots yet provided > 24% bermudagrass suppression. Fluazifop + triclopyr provided more bermudagrass suppression than fenoxaprop + triclopyr. Aminocyclopyrachlor (0.026 or 0.071 kg/ha) did not reduce herbicide injury from fluazifop or fenoxaprop applications to zoysiagrass and did not provide significant bermudagrass suppression.

POSTEMERGENCE CONTROL OF PURPLE NUTSEDGE (*Cyperus rotundus*) IN BERMUDAGRASS TURF. R.L. Blanton, A.G. Estes, and L.B. McCarty: Department of Horticulture, Clemson University, Clemson, SC

ABSTRACT

Purple nutsedge is considered the most troublesome weeds in the world. Native to Eurasia, it is a low-growing perennial with three-ranked leaves, triangular stems, and reddish to purple inflorescence. Its leaf tips are thicker and more rounded than yellow nutsedge. Fibrous roots connect numerous tubers or nutlets, forming a massive underground tuber and rhizome system, which gives it great capacity for reproducing and spreading. Purple nutsedge thrives in wet soil.

Historically, control consisted of repeat applications of 2,4-D, MSMA, DSMA, imazaquin and culturally, ensuring adequate drainage. With the loss of availability of MSMA however, alternate products are needed. The purpose of this research was to evaluate various postemergence herbicide combinations for purple nutsedge control in bermudagrass turf.

In 2009, two studies were conducted to evaluate the efficacy of several postemergent herbicides for purple nutsedge control. The studies were located at Clemson University, Pickens County, SC in common bermudagrass turf plots with a history of heavy purple nutsedge infestation. Plots were tilled several months prior to the studies in order to enhance purple nutsedge stands. 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. All treatments were made on August 7, 2009 and included a 0.25% V/V non-ionic surfactant.

Treatments for study one included: Certainty 75 WG (sulfosulfuron) at 0.06 lb ai/A; Certainty 75 WG at 0.0035 lb ai/A + Dismiss 4L (sulfentrazone) at 0.19 lb ai/A; Monument 75 WG (trifloxysulfuron) at 0.03 lb ai/A; Monument 75 WG at 0.015 lb ai/A + Dismiss 4L at 0.19 lb ai/A; Sedgehammer 75 WG (halosulfuron) at 0.06 lb ai/A; Sedgehammer 75 WG at 0.03 lb ai/A + Dismiss 4L at 0.19 lb ai/A; Sedgehammer 75 WG at 0.03 lb ai/A + Dismiss 4L at 0.38 lb ai/A; and Dismiss South 4SC (sulfentrazone + imazethapyr) at 0.38 lb ai/A.

Treatments for study two included: Dismiss South 4SC at 0.29 lb ai/A; Dismiss South 4SC at 0.38 lb ai/A; Dismiss South 4SC at 0.45 lb ai/A; Image 70 DG (imazaquin) at 0.5 lb ai/A; Certainty 75 WG at 0.06 lb ai/A; Sedgehammer 75 WG at 0.06 lb ai/A; and Monument 75 WG at 0.026 lb ai/A.

Ratings taken throughout the studies included purple nutsedge 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.

From study one, on October 19, 2009 (73 DAT), Monument at 0.03 lb ai/A, Certainty at 0.06 lb ai/A, and Monument at 0.015 lb ai/A + Dismiss at 0.19 lb ai/ A provided > 90% control of purple nutsedge in bermudagrass turf. Certainty at 0.035 lb ai/A + Dismiss at 0.19 lb ai/A produced > 86% control. All other treatments resulted in 62% or less control.

In study two, on October 19, 2009 (73 DAT), Dismiss South at 0.38, Dismiss South at 0.45 lb ai/A, and Certainty at 0.06 lb ai/A provided > 90% purple nutsedge control. Dismiss South at 0.29 lb ai/A and Monument at 0.026 lb ai/A provided > 85% control. All others provided 75% or less control. Although bermudagrass injury was evaluated throughout the study, no significant injury was noted.

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

AEROPONICS AS A MEANS TO ELUCIDATE HERBICIDE EFFECTS ON TURFGRASS ROOT REGENERATION. Brendan M.S. McNulty and S.D. Askew, Virginia Tech, Blacksburg, VA

ABSTRACT

Aeroponics is the process of growing plants in an air or mist environment without the use of an aggregate or liquid medium to support plant roots. Aeroponics differs from hydroponics in that plant roots are suspended in air and sprayed with nutrient solution rather than free floating in nutrient solution. Aeroponics is important for turfgrass culture in the laboratory because it allows for a more oxygen rich environment compared to hydroponics. Growing turgrass and other plants in an aeroponics system allows for repetitive and accurate measurement of root responses that would be more difficult to obtain when plants are grown in soil. Annual bluegrass (*Poa annua* L.) is a common winter annual grassy weed found in creeping bentgrass (*Agrostis stolinifera* L.) golf course putting greens. Many turf managers struggle with control of this weed due to it being a prolific seed producer, an invasive species, as well as containing many biotypes within the species. There are currently two pre-emergence products that are labeled for annual bluegrass control on creeping bentgrass putting greens; bensumec and oxidiazon. Neither of these products offer post emergence activity on annual bluegrass. Cumyluron is a new herbicide under evaluation by the Helena Chemical Company. It offers pre and post emergence control of annual bluegrass in creeping bentgrass putting greens with safety to the desired turf. Through previous trials at Virginia Tech, it was observed that control of annual bluegrass by cumyluron occurs slowly. Annual bluegrass population reductions are often noted in the second year of cumyluron treatments. We hypothesized that cumyluron had a differential effect on root regeneration of annual bluegrass and creeping bentgrass, thus, granting a competitive advantage to creeping bentgrass over time. An experiment was devised to test this hypothesis using aeroponics units to directly deliver concentrations of cumyluron to the roots of creeping bentgrass and annual bluegrass plants.

The trial was initiated in April of 2009 and repeated in June and December the same year at the Glade Road Research Center in Blacksburg, VA. Eight aeroponics units were constructed and placed in a greenhouse with supplemental lighting to provide a minimum of 400 $\mu mol/m^2/sec$ photosynthetically active radiation on a 14 hour photoperiod. Each aeroponics unit consisted of 16 plants, 8 annual bluegrass and 8 creeping bentgrass, that were supplied nutrient from a 38 L sump dedicated to each chamber. Upon initiation, all foliage was cut to 39 mm and all roots were cut to 52 mm. Herbicides were applied directly to each sump containing nutrient and thoroughly mixed. The eight treatments included a nontreated check, a bensulide comparison at the label rate of 9000 g ai/ha, and 6 rates of cumyluron including 1720, 860, 172, 86, 17.2, and 1.72 g ai/ha. The trial continued for 17 days after initial treatment with ratings taken at 3, 10, and 17 days after initiation to evaluate root regeneration and foliar response after the initial cutting. Assessments included root and foliar dry weight in grams (g), normalized difference vegetative index (NDVI) (fraction of 1), and root length (cm).

The interaction of species with herbicide treatment was never significant and data were pooled over species for discussion of herbicide treatment differences. At 17 days after treatment (DAT) there were no differences in dry foliar biomass and visually-evident foliar responses were seldom observed. NDVI differed significantly with decreasing values as cumyluron rate increased but these trends were poorly correlated with correlation coefficients of less than 0.4. Root length and root weight however, exhibited a strong correlation to the rate of cumyluron applied. Overall, increasing the concentration of cumyluron applied directly to roots of creeping bentgrass and annual bluegrass will decrease both the root biomass and length of both species. Root length of bensulide treated plants was equivalent to the highest rates of cumyluron at 10 DAT but were significantly longer at 17 DAT. Presumably, bensulide either had less residual activity in the nutrient solution or plants of both species were able to recover from bensulide more quickly. From these data we can reject our hypothesis and conclude that cumyluron does not exhibit interspecific differences in root response between creeping bentgrass and annual bluegrass. Our future work will evaluate seasonal root fluctuations of annual bluegrass and creeping bentgrass and vertical profiling of cumyluron on putting greens to determine if annual bluegrass is simply more exposed to cumyluron in the field due to interspecific differences in seasonal root fluctuations.

NEW TECHNOLOGIES FOR TURFGRASS WEED SCIENCE. P.E. McCullough, W. Hudson, A. Martinez, and C. Waltz, University of Georgia

ABSTRACT

Mobile phones with email, internet, and application programs help superintendents communicate and access information. Advanced “smart” phones, such as the Blackberry and iPhone, have become important tools for industry professionals and allow greater work flexibility while traveling or away from the office. Downloadable applications are relatively new features to mobile devices with potential to become tools for turf managers to access information and recommendations. An application for turfgrass management and weed control has been developed by the University of Georgia. The program contains information about turf weeds, diseases, and insects with pictures, information, and management recommendations. The program also contains a pesticide database for users to search for information by product common or trade name. Application design, development, and distribution will be presented.

EVALUATION OF NAPIERGRASS (*Pennisetum purpureum*) RESPONSE TO HERBICIDES DURING ESTABLISHMENT IN GEORGIA. G.S. Cutts[1], R.D. Lee[1], W.K. Vencill[2], T.M. Webster[3], and T.L. Grey[1]; [1]Crop and Soil Science Department, University of Georgia, Tifton, GA, [2]Crop and Soil Science Department, University of Georgia, Athens, GA, [3]Crop Protection and Management, USDA-ARS, Tifton, GA.

ABSTRACT

Napiergrass (*Pennisetum purpureum* Schum.) is noted for its especially high biomass yields, and is being considered for a possible feedstock for cellulosic ethanol production. Napiergrass response to pre-emergent herbicide applications during establishment has not been previously studied. A field herbicide screening study evaluating napiergrass establishment was initiated in October of 2008. Field studies were conducted at the University of Georgia Research Station in Plains, GA and the Ft. Valley State University Research Farm in Ft. Valley, GA. New field plantings of napiergrass are established vegetatively using cut nodal stems that are buried in trenches in rows spaced at 1.8 m. Planting stock was taken from an established napiergrass stand at the Coastal Plains Experiment Station in Tifton, GA. Herbicides selected in this study have varying modes of action and are commonly used for selective weed control in numerous grass crops. Treatments included atrazine, atrazine plus crop oil concentrate, clomazone, clomazone plus disulfoton, diuron, diuron plus non ionic surfactant, pendimethalin, pendimethalin plus atrazine, metribuzin, sulfentrazone, flumioxazin, ametryn, s-metolachlor, mesotrione, tembotrione, hexazinone, terbacil, and a non-treated control. Herbicide treatments were applied at labeled rates prior to napiergrass emergence in March 2009. Napiergrass plants emerged 2 to 3 wks after application (WAA). Data collection included napiergrass stand counts, plant heights, and final biomass yields. At 12 WAA, pendimethalin (Prowl H_2O) allowed for 39% greater napiergrass height than the non-treated control, suggesting less weed interference with napiergrass emergence due to effective weed control. Terbacil (Sinbar) treatments had a 6% reduction in height relative to the non-treated control at 12 WAA. By 15 WAA, all plants recovered from any height reduction sustained from weed competition or possible herbicide injury. Stand counts and biomass yields were not affected by treatment, but differed by location. All treatments in this study would be reasonable options for initial establishment of napiergrass. Further analysis on other establishment and economic factors could determine the best option.

SANDBUR CONTROL IN BERMUDAGRASS PASTURES WITH DUPONT™ PASTORA™ HERBICIDE.
Eric P. Castner, Jeff H. Meredith, Robert N. Rupp, and Case R. Medlin; DuPont Crop Protection, Wilmington, DE.

ABSTRACT

DuPont™ Pastora™ is a new herbicide for the control of troublesome grass and broadleaf weeds in bermudagrass pastures and hay fields. DuPont™ and university trials were conducted from 2005-09 to evaluate the efficacy of Pastora™ herbicide for the control of field (*Cenchrus incertus*) and longspine (*Cenchrus longispinus*) sandbur in bermudagrass. Results from 20 DuPont and university trials demonstrated good control (80-84%) of both field and longspine sandbur with DuPont™ Pastora™ herbicide at use rates of 1 to 1.5 ounces per acre. Sequential applications of Pastora™ at 1 ounce per acre improved sandbur control under adverse environmental conditions and on large sandbur (> 1.5") while also providing control of subsequent flushes. In conjunction, 33 weed-free trials were conducted from 2005-09 to evaluate the impact of Pastora™ herbicide on bermudagrass forage yields. Visual symptoms included chlorosis and/or stunting of bermudagrass following the application of Pastora™ herbicide; however, these symptoms were generally transient in nature and were rarely observed at later evaluations. The addition of liquid nitrogen fertilizer at rates of 50, 75 and 100% of the carrier reduced both chlorosis and bermudagrass stunting. Across 33 weed-free trials, bermudagrass forage yields following an application of Pastora™ herbicide at 1 ounce per acre were reduced by 9%. Yield studies that included two harvest dates (cuttings) demonstrated an increase in second cutting yields that compensated for the reduction observed in the first cutting following the application of Pastora™ herbicide.

GRASS AND BROADLEAF WEED CONTROL IN BERMUDAGRASS PASTURES WITH DUPONT® PASTORA™ HERBICIDE. Michael T. Edwards, Jeff H. Meredith, J. Dan Smith, and Glenn H. Hammes; E. I. DuPont, Wilmington, DE.

ABSTRACT

DuPont® Pastora™ herbicide is a new product for broadleaf and grass weed control in bermudagrass pastures. Pastora™ is a combination of nicosulfuron and metsulfuron-methyl, formulated as a 71.2% active dry flowable. Use rates are 1.0 – 1.5 oz product per acre (2.5 oz product seasonal maximum), applied with crop oil concentrate or non-ionic surfactants. Full registration is expected in early 2010. From 2004 thru 2009 seventy-seven trials were conducted in the mid-south and southeast states for control of johnsongrass, vasseygrass, dallisgrass and fourteen other winter and summer annual grass species. Johnsongrass control was 83-85% with Pastora™ applied at 1.0, 1.25, 1.5 and 2.0 ounces product per acre at 30-120 DAT – equal to Outrider® and Plateau® and superior to Journey®. Sequential applications of Pastora™ at 60-90 days increased Johnsongrass control levels to 87-94%. Tankmixes with 2.4-D did not change johnsongrass control levels, mixtures with 75% nitrogen fertilizer solution as the carrier increased control 11% (71% vs. 82% johnsongrass control). Control with Pastora™ applied at 1.0, 1.25 and 1.5 ounces product per acre was 86 – 88% on vasseygrass control; rescuegrass control was 89-99% control at 60-120 DAT. Dallisgrass control was 67% with Pastora™ applied at 1.0 ounce product per acre and 78% control with Pastora™ applied at 1.5 ounces product per acre at 60-120 DAT. Six weeks fescue, goosegrass and signalgrass control was > 85% with Pastora™ applied at 1.0 ounce product per acre, ratings at 30-120 DAT. Suppression was achieved on crabgrass (82%) with Pastora™ applied at 1.5 ounces product per acre. Poor control was found on bristlegrass (41%) and broomsedge (0%) with Pastora™ applied at 1.5 ounces product per acre. Control of winter annual grasses (ryegrass, little barley and bluegrass) was > 85% with Pastora™ applied at 1.0 ounce product per acre, downy brome control required Pastora™ to be applied at 1.5 ounce product per acre – ratings at 30-120 DAT. The addition of 2,4-D did not change control levels on ryegrass, little barley, dallisgrass, barnyardgrass or crabgrass. The addition of nitrogen fertilizer as the carrier (25-75% solution) did not change control levels on ryegrass, little barley, vasseygrass or crabgrass, but there appeared to be the potential for antagonism on dallisgrass (-12%) and barnyardgrass (-39%). The following University and DOT investigators contributed data to this summary : Dr. Stephen Enloe – Auburn University, Dr. Dearl Sanders – Louisiana State University, Dr. John Byrd – Mississippi State University, Dr. F. Yelverton – North Carolina State University, Dr. B. McCarty – Clemson University, Dr. Tim Murphy – University of Georgia, Dr. Neil Rhodes – University of Tennessee, Dr. Angela Thompson – University of Tennessee, Dr. Barry Sims – University of Tennessee, Dr. Paul Baumann – Texas AgriLife Extension, Dr. James Grichar – Texas AgriLife Extension and Dr. John Mason – Texas DOT.

WINTER ANNUAL WEED CONTROL IN FORAGE BERMUDAGRASS WITH PASTORA. T.R. Murphy and D.W. Hancock; Crop and Soil Sciences Department, University of Georgia, Griffin.

ABSTRACT

Various annual weeds readily infest dormant forage bermudagrass during the winter and early spring months. If not controlled dense infestations of winter annual weeds can decrease bermudagrass hay yields and/or quality at the first hay harvest in late spring or early summer. Recently DuPont announced their intentions to register Pastora™ for postemergence weed control in forage bermudagrass. Pastora contains 56.2% nicosulfuron and 15.0% metsulfuron and is formulated as a dry flowable granule.

In 2009, experiments were conducted at the Central Georgia Research and Education Center in Eatonton, Georgia to determine the efficacy of nicosulfuron and metsulfuron combinations for winter annual grass and broadleaf weed control in dormant bermudagrass (site contained both common and 'Coastal' cultivars). Nicosulfuron at 0.035 + metsulfuron at 0.009 lbs. ai/ac was applied alone or tank-mixed with 2,4-D at 1.0 lb. ai/ac with a water carrier, or applied alone in a 75/25% v/v 32% UAN/water solution. Additional treatments consisted of nicosulfuron at 0.053 + metsulfuron at 0.014, sulfosulfuron at 0.0625 and nicosulfuron + metsulfuron fb nicosulfuron + metsulfuron at 0.035 + 0.009 lbs. ai/acre. The initial application was made on March 24, 2009 at the 10% green-up growth stage of bermudagrass. The fb (followed by) application made on April 20 at the 30% green-up growth stage. In a separate experiment, nicosulfuron + metsulfuron at 0.035 + metsulfuron at 0.009 lbs. ai/ac in a water carrier or 75/25% v/v 32% UAN/water solution was applied to 'Russell' bermudagrass at the 50% green-up growth stage on April 15, 2009. In both experiments, nonionic surfactant at 0.25% v/v was added to all treatments except when UAN was part of the spray carrier. Treatments were replicated three times in a RCBD. Individual plot size was 10 by 30 ft.

When applied with water as the spray carrier, nicosulfuron + metsulfuron effectively controlled (> 90%) little barley (*Hordeum pusillum* Nutt,), rattail fescue [*Vulpia myuros* (L.) K.C. Gmel.], little quakinggrass (*Briza minor* L.) and Italian ryegrass [*Lolium perenne* L. ssp. *multiflorum* (Lam.) Husnot]. The addition of UAN at 75% v/v to nicosulfuron + metsulfuron as part of the spray carrier dramatically reduced little barley, rattail fescue and little quakinggrass control to < 10%. UAN had no effect on Italian ryegrass control, and control was >95% regardless of spray carrier. Sulfosulfuron did not control little barley, rattail fescue or little quakinggrass.

Nicosulfuron + metsulfuron controlled field pansy (*Viola bicolor* Pursh), Carolina geranium (*Geranium carolinianum* L.), sticky chickweed (*Cerastium glomeratum* Thuill) and corn speedwell (*Veronica arvensis* L.). UAN had no effect on control of these annual broadleaf weeds. Additionally, these broadleaf weeds were not controlled by sulfosulfuron.

Nicosulfuron + metsulfuron injured bermudagrass approximately 20%. However, Russell bermudagrass hay yields were not decreased by nicosulfuron + metsulfuron.

ANNUAL GRASS CONTROL WITH PASTORA IN BERMUDAGRASS HAYFIELDS. J. Tredaway Ducar, S. F. Enloe, G.L. Thompson, M. K. Stanford, and H.D. Dorough. Auburn University, Sand Mountain Research and Extension Center, Crossville, AL; Auburn University, Auburn, AL; Alabama Cooperative Extension System, Belle Mina, AL; Alabama Cooperative Extension System, Crossville, AL; and Alabama Cooperative Extension System, Talladega, AL.

ABSTRACT

Pastora is a new broad spectrum herbicide labeled for pastures and hayfields. It contains the active ingredients nicosulfuron and metsulfuron. Field studies were conducted in 2009 to evaluate annual grass control in hayfields in central and northeast Alabama. Studies were conducted in Eastaboga and Oxford, Alabama to evaluate the efficacy of Pastora on little barley (*Hordeum pusillum*) and in Crossville, Alabama to evaluate the efficacy on large crabgrass (*Digitaria sanguinalis*). Treatments included Pastora at 1 and 1.5 ounces per acre, glyphosate at 8 fluid ounces per acre, Pastora at 1 ounce per acre plus a 32% Nitrogen carrier, Pastora at 1 ounce per acre plus 2,4-D amine at 1 quart per acre, and an untreated check. An additional treatment for the large crabgrass study included a second application of Pastora at 1 ounce per acre 30 DAT (days after initial treatment); an additional treatment for the winter annual study included glyphosate at 10 fluid ounces per acre. All Pastora treatments included a non-ionic surfactant at 0.25% v/v. Pastora applied twice at 1 oz/acre controlled large crabgrass 99%, 49 days after initial application (DAA). Pastora at 1.5 oz/acre provided 70% control of large crabgrass 49 DAA. Glyphosate provided 13% control of large crabgrass at 49 DAA. At 90 DAA, the Pastora at 1 oz/acre repeated application continued to provide 99% large crabgrass control. At all locations, little barley control ranged between 94-99% with Pastora regardless of rate at 41 DAA with glyphosate providing 96-98% control. In conclusion, Pastora at the 1 oz/acre rate with two applications provided residual activity resulting in season-long large crabgrass control which was better than the control provided by glyphosate. Pastora at either rate (1 or 1.5 oz/acre) provided equivalent control of little barley to glyphosate at either 8 or 10 fl. oz/acre. Further evaluations should be conducted to determine if control of additional annual species will be controlled with Pastora.

PASTURE BERMUDAGRASS RESPONSE TO HERBICIDE AND FERTILIZER TREATMENTS.
A.N. Brewe [1], D.S. Murray [1], N.C. Talley [1], and R.N. Rupp [2]. Oklahoma State University [1], Stillwater, OK and DuPont Crop Protection [2], Wilmington, DE.

ABSTRACT

Warm season forages are essential to livestock production in Oklahoma. With 17.5 million acres of summer pasture, approximately 3.5 million acres consist of established bermudagrass pasture. With infestations of field sandbur (*Cenchrus incertus*), the quality and value of bermudagrass decreases the use for hay and livestock producers. In previous studies, Prowl H_2O applied PRE and Accent+Ally XP (Pastora) applied POST have provided excellent control with minimal yield reductions compared to Journey applications. Previous studies have shown that Journey can decrease yields up to 50%. With spring and summer rainfall occurrences often being erratic, Prowl H_20 applied PRE can be an ineffective treatment for producers if not activated. Studies have also shown that increased fertilizer applications can also increase yield and decrease crop injury. Three studies were conducted in the summer of 2009 at various locations in Oklahoma to evaluate bermudagrass response to fertilizer and herbicide treatments. All three experiments utilized randomized complete block design with four replications in established bermudagrass pastures. Treatments were tractor applied with 15 GPA water carrier. Location one evaluated bermudagrass response by measuring yield, and location two evaluated crop response 3 weeks after treatment (WAT). At locations one and two rates of 0, 100, 200, 300 lbs N as NH_4NO_3 (34-0-0) were included and were designed as a factorial arrangement of treatments with herbicide applications. Treatments locations one and two included Prowl H_2O PRE applied alone or with Accent+Ally XP, Accent+Ally XP, Journey and an untreated check. Location three evaluated bermudagrass yield response to PRE and POST applications at various timings beginning 30 days before emergence (DBE). Accent+Ally XP 30 DBE, Accent+Ally XP+2,4-D amine, Accent+Ally XP applied alone or with 50, 75, or 100 pt/a of Urea Ammonium Nitrate solution $(CO(NH_2)_2+NH_4NO_3)$ 40 days after emergence (DAE), Accent+Ally XP 60 DAE, and an untreated check. At location one and two, Journey had the lowest yield compared to all other treatments and had nearly 50% crop injury. All other treatments at locations one and two had no significant difference in yields. The Prowl H_2O+Accent+Ally XP and Accent+Ally XP treatments had 9 to 10% injury and were different than the untreated check. The Prowl H_2O and the untreated check were not significantly different with no visual injury. The fertilizer response at location one increased proportionally over all the treatments and at location two, the bermudagrass exhibited less injury with 100, 200 and 300 lbs/a nitrogen than 0 lbs/a. At location three, all treatments yielded the same as the untreated check except for the Accent+Ally XP 40 DAE which yielded higher. Bermudagrass treated with Accent+Ally XP resulted in minimal to no injury and exhibited no influence of application timing where as Journey decreased yields 68% regardless of fertilizer application. Increased fertilizer rates increased yields and decreased crop injury. Future evaluation of these herbicide and fertilizer combinations will be evaluated for control along with field sandbur ecology.

NEW PRODUCTS FOR FIELD SANDBUR CONTROL IN TEXAS PASTURES. T.W. Janak, P.A. Baumann and M.E. Matocha, Texas AgriLife Extension Service, College Station, TX.

ABSTRACT

Field Sandbur (*Cenchrus incertus*) is a troublesome annual weed in Texas pastures, being a nuisance to people and causing reduced performance in grass fed livestock. By detracting from forage quality and production, this weed costs Texas forage producers millions of dollars annually. Field studies were conducted in 2008 and 2009 to evaluate Prowl H_2O (pendimethalin) and Pastora (nicosulfuron + metsulfuron methyl) for field sandbur control and bermudagrass tolerance. Weed control studies were conducted in southern Brazos Co., TX, while tolerance studies were completed in central Lavaca Co., TX. Bermudagrass tolerance work was performed on Tifton 85, Coastal, Jiggs and Common bermudagrass varieties.

To evaluate sandbur control, Prowl H_2O was applied PRE singularly and sequentially at rates of 1, 2, 3, 4, 1+1, 2+1, and 2+2 lbs ai/acre. A postemergence application of Prowl H_2O at 1 lb ai/acre + Accent (nicosulfuron) at 0.66 oz/acre was also applied. These treatments were also applied to Tifton 85 bermudagrass to assess tolerance. In a separate study, Pastora was applied to 1-3" sandbur at 1 and 1.5 ozs/acre alone and 1 oz + 1 lb ae 2,4-D ester. Three additional 1 oz treatments were applied using UAN as 50, 75, and 100% of the carrier. These Pastora treatments were applied to all four bermudagrass varieties at initial greenup in the spring and again following the first forage harvest to assess bermudagrass tolerance. In a third study, Pastora was applied at 1, 1.5 and 2 oz/acre to sandbur immediately after mowing.

In 2009, Prowl H_2O provided between 30% and 78% control of sandbur at 69 days after the initial application. It should be noted that the experimental site was a monoculture of field sandbur, containing 20-30 plants/ft^2. Prowl H_2O applied at 2 f.b. 2 lbs ai returned 78% control at 69 DAT, significantly greater than the 1, 2, 3, and 1+1 rates. The single postemergence treatment with Accent provided 58% control at 16 DAT. No phytotoxicity or yield reduction was observed from any of these treatments when applied to Tifton 85 bermudagrass. All Pastora treatments controlled 1-3" sandbur from 83% to 93% at 61 DAT, with the exception of Pastora at 1 oz + 100% v/v UAN, where control was significantly reduced. When Pastora was applied to sandbur immediately after mowing (tillered, 4-6" diam.), 1, 1.5, and 2 oz/acre rates gave 80% to 87% control at 30 DAT. The use of UAN as partial to complete spray carrier for Pastora resulted in a significant reduction in chlorosis and stunting to all bermudagrass varieties, with injury decreasing at higher UAN rates. No yield reduction was observed at either the first or second harvest with any treatment on all varieties examined.

EFFECT OF ENVIRONMENTAL CONDITIONS ON SMUTGRASS SEED GERMINATION. N. Rana[1], B.J. Wilder[2], B.A. Sellers[1] and J.A. Ferrell[2]; [1]University of Florida, Range Cattle REC Ona, FL and [2]University of Florida, Gainesville, FL.

ABSTRACT

Smutgrass is an aggressive non-native bunch type grass that affects many perennial grass pastures throughout the southeastern United States, particularly in the sandy soils of central and south Florida. The two varieties of smutgrass in Florida are small smutgrass (*Sporobolus indicus*) and giant smutgrass (*Sporobolus indicus* var. *pyramidalis*). Regardless of variety, smutgrass is considered a troublesome pasture weed due to its low palatability, rapid spread and ability to out compete desirable forages. Seed germination experiments were conducted to determine the effect of temperature, light, pH, osmotic potential and depth of burial on both smutgrass varieties. The average germination rate for both the varieties was 88% at 30:20 C. No germination was observed for either species at 10 C or 15 C. Small smutgrass had a maximum germination rate of 68% at 30 C, but the germination rate decreased at 40 C. However, giant smutgrass had a maximum average germination rate of 60% at 40 C. Both the varieties were subjected to four simulated Florida temperature fluxes consisting of: average spring (27:15 C), average summer (33:24 C), average fall (29:19C) and average winter (22:11 C). For small smutgrass, the average seed germination rate when subjected to temperature fluxes similar to fall (89%), spring (89%), and winter (87%) was not significantly different. However, the germination rate was lowest when seeds were subjected to the summer temperature flux regime. For giant smutgrass, the average germination rate of seeds subjected to temperature fluxes similar to fall (85%), spring (88%) and summer (82%) was not significantly different. However, average germination rate for giant smutgrass was lowest (53%) under the winter temperature flux regime. The average germination rate of giant and small smutgrass seeds under dark conditions was 53% and 27%, respectively. Both smutgrass species germinate over a wide range of pH values. Under pH 6 and 8 giant and small smutgrass had the highest germination rate of 87% and 68%, respectively. At -0.2 Mpa the germination rates of small and giant smutgrass were 91% and 86%, respectively, but no germination of either species was observed at water potentials greater than -0.2 Mpa. Small smutgrass seeds only germinated on the soil surface, whereas giant smutgrass seed germinated at 3 cm or above. The effect of temperature; constant and diurnal flux, have a pronounced effect on smutgrass seed germination. At high constant temperatures giant smutgrass showed an increase in germination rate while the average germination rate decreased for small smutgrass. Diurnal temperature flux is playing a major role in smutgrass seed germination, but the average rate of seed germination for both the varieties was not significantly different in various simulated temperature flux regimes. Therefore, it was concluded that smutgrass varieties are capable of year-round germination. However, during summer and winter seasons, temperature and rainfall can be a limiting factor.

WESTERN RAGWEED CONTROL WITH PASTURE HERBICIDES. J.M. Locke and E.R. Funderburg; Agricultural Division, Samuel Roberts Noble Foundation, Inc., Ardmore, OK.

ABSTRACT

Western ragweed is one of the primary weed species in pastures throughout the Noble Foundation's 47-county service area in north Texas and south central Oklahoma. It is often considered an indicator species for poor grazing or pasture management. It is most commonly observed in overgrazed warm season perennial pastures in areas where there is soil disturbance and sparse stands of primary forage, such as feeding locations. Inadequate soil fertility and the resulting loss of grass vigor can also predispose a pasture to western ragweed infestation. Post-emergence pasture herbicides have been effectively used for many years to manage western ragweed infestations. The herbicides most commonly used in our area are 2,4-D and/or dicamba, along with mixtures of these products with picloram (Grazon P+D) and metsulfuron-methyl (Cimarron Max). The lack of significant soil residual activity on western ragweed has led many producers to delay application until most of the western ragweed has emerged. This delay often results in waiting until desirable crops in the area, such as cotton, soybean, pecan and peaches have leafed out and are susceptible to herbicide drift.

In 2006, Dow AgroSciences introduced a new active ingredient, aminopyralid, which was reported to have equivalent or superior post-emergence activity, as well as superior residual activity on broadleaf weeds than the currently registered pasture herbicides. The objective of these trials was to evaluate the pre-emergence and post-emergence efficacy of aminopyralid containing herbicides compared to common industry standards for control of western ragweed.

In the spring of 2008, two trials were initiated on Noble Foundation properties (NF Pasture Demonstration Farm, Chickasaw loam soil and NF McMillan Research Farm, Bastrop fine sandy loam soil) to evaluate these herbicides for control of naturally occurring infestations of western ragweed. These trials were repeated in 2009 on the same properties. The trials were placed in pastures with a weak bermudagrass stand without any added fertilizer or irrigation. Trial design was a Randomized Complete Block with 4 replications. Pre-emergence treatments were Milestone (aminopyralid) at 3, 5 and 7 fluid ounces per acre. Post-emergence treatments included Milestone at 3, 5 and 7 fluid ounces per acre, Forefront (aminopyralid + 2,4-D) at 1.5, 2.0 and 2.5 pints per acre, Cimarron Max (metsulfuron-methyl + 2.4-D + dicamba) at Rate I, Grazon P + D (picloram + 2,4-D) at 1.5 pints per acre, Range Star (2.4-D + dicamba) at 1.5 pints per acre and a 3.8 pound per gallon formulation of 2,4-D amine at 2.0 pints per acre. All post-emergence treatments included SurfKing non-ionic surfactant at 0.25% volume/volume. The post-emergence treatments were applied to western ragweed with an average height of 6 inches. An untreated control was included for comparison. Trials were visually rated for percent western ragweed control periodically from 12 to 161 days after the post-emergence applications. Data were subjected to ANOVA and means separated by LSD at a 5% level of significance.

In the 2008 trial at the Pasture Demonstration Farm, the control from the pre-emergence treatments was poor at 46% or less. However in the 2008 McMillan Farm trial, 76% to 100% control was obtained. In both 2009 trials, the pre-emergence treatments provided excellent control of 93% to 100%. The reduced efficacy in the 2008 trial at the Pasture Demonstration Farm could be due to the higher density of residual foliage cover at this site coupled with a high intensity first rainfall event (4.80 inches of precipitation, 3-4 days after application). The 2008 McMillan Farm site had a thinner foliage cover and the first rainfall event was not as intense (3.47 inches of precipitation, 3-5 days after application). Both 2009 trials had thinner foliage cover and the first rainfall event was less intense (1.36 to 1.97 inches of precipitation, 12-14 days after application).

In both years, the activity from all the post-emergence treatments was excellent, exceeding 90% control for the full season. The results of the post-emergence treatments confirm that the aminopyralid containing compounds perform at a level at least equal to the current industry standards. These results also reinforce the importance of proper application timing which confirms that season long control of western ragweed is possible using the lowest cost herbicides available.

In summary, the results of these trials indicate that the aminopyralid products have potential to provide pre-emergence control of western ragweed. The level of pre-emergence control may vary depending on soil deposition and intensity of rainfall activation. These products are at least equivalent to the current industry standards for post-emergence control of western ragweed.

PERENNIAL WEED CONTROL IN COOL-SEASON GRASS PASTURES. W.W. Witt. University of Kentucky, Lexington KY.

ABSTRACT

Perennial weeds that inhibit grazing by beef animals can present a major problem in cool-season grass pastures in Kentucky. Tall ironweed, horsenettle, Canada thistle, and to a lesser extent, smooth groundcherry are the species most commonly found in tall fescue and orchardgrass beef pastures. The control of these species was evaluated over the past several years. Herbicides evaluated were 2,4-D, dicamba, metsulfuron, aminopyralid and triclopyr applied alone or in various combinations. Data collected included percent visual control, weed populations before and after treatment, and grass injury. Tall ironweed control greater than 80% was obtained with triclopyr, triclopyr + 2,4-D, aminopyralid and aminopyralid + 2,4-D. Horsenettle control greater then 80% was obtained with aminopyralid + 2,4-D, aminopyralid + metsulfuron, and dicamba + 2,4-D. Canada thistle was the most difficult species to control and the greatest control was with aminopyralid + 2,4-D but control never exceeded 80%.

PASTURE WEED AND BRUSH CONTROL WITH HERBICIDE MIXTURES. P.L. Burch, G.N. Rhodes, W.W. Witt, E.S. Hagood, W.N. Kline, Dow AgroSciences LLC, Christiansburg, VA, University of Tennessee, Knoxville, TN, University of Kentucky, Lexington, KY, Virginia Tech, Blacksburg, VA, Dow AgroSciences LLC, Duluth, GA.

ABSTRACT

Aminopyralid is a systemic herbicide developed by Dow AgroSciences specifically for use on rangeland, pasture, rights-of-way, such as roadsides, for vegetation management on Conservation Reserve Program acres, non-cropland, and natural areas. The product, ForeFront® R&P herbicide is formulated as a liquid containing 0.33 lbs ae aminopyralid + 2.67 lbs ae 2,4-D/gal. Chaparral™ specialty herbicide is a new Dow AgroSciences LLC herbicide product for use in rangelands and pastures. It is a novel, water dispersible granule containing two active ingredients, aminopyralid and metsulfuron. This herbicide product provides postemergence control of broadleaf plants and residual control of susceptible plants that emerge after application. ForeFront R&P and Chaparral are very effective broad spectrum herbicides for controlling most broadleaf weeds and some woody plants in pasture management programs. Depending on the management history for a given pasture, the complex of weeds and/or brush may require additional herbicides to renovate a pasture to improve forage production. Once the pasture renovation process is underway, other options to manage encroaching brush species can be integrated into pasture management programs. The objective of this study was to evaluate the efficacy of herbicide mixes to control complexes of herbaceous weed and brush species in degraded pastures.

Remedy® Ultra is the butoxyethyl ester formulation of triclopyr in a vegetable oil solvent system. This herbicide product is an effective brush herbicide useful in pasture vegetation management programs. Remedy Ultra herbicide was evaluated as tank-mix partner with ForeFront R&P and Chaparral at multiple locations. ForeFront R&P and Chaparral provide excellent control of many herbaceous broadleaf weeds found in southeast US pastures. Where early succession woody plants have invaded the pasture, a combination with Remedy Ultra applied with ForeFront R&P or Chaparral broadens the spectrum of herbaceous weed and woody plant control. Control of weed and brush species with these herbicide tank mixtures will increase forage production of desirable forage grasses and pasture carrying capacity. Pasture management programs designed to improve yield and quality of pasture forages can be optimized by integrating use of these herbicide mixtures with cultural practices such as fertilization, liming, and appropriate grazing management systems. Aminopyralid-containing products (ForeFront R&P and Chaparral) provide an excellent foundation upon which build integrated programs to rejuvenate degraded weed and brush-infested pastures.

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RANGELAND AND PASTURE WEED CONTROL WITH AMINOPYRALID + 2,4-D.

V. B. Langston, D. C. Cummings., W. N. Kline and P. L. Burch, Dow AgroSciences LLC. Indianapolis, IN

ABSTRACT

Aminopyralid is a new systemic herbicide developed by Dow AgroSciences specifically for use on rangeland, permanent grass pasture, such as Conservation Reserve Program acres, and wildlife management areas. A formulated product (GrazonNext™ herbicide) has been developed as a liquid containing 40 g ae/L (0.33 lbs ae/gal) aminopyralid + 320 g ae/L (2.67 lbs ae/gal) 2,4-D. Standard broadcast use rates of this herbicide product range from 1.2 to 3.1 L/ha (1 to 2.6 pints/acre). This herbicide has postemergence activity on established broadleaf plants and provides residual control of susceptible plants that emerge after application. Broadleaf weeds reduce rangeland and pasture carrying capacity by competing with forage grasses and desirable forbs. The control of later emerging weeds can lead to improved access to forage by grazing animals. GrazonNext provides broad spectrum control required to manage weed species complexes in rangeland and pastures. GrazonNext controls many weeds in these complexes including musk thistle (*Carduus nutans*), plumeless thistle (*Carduus acanthoides*), horsenettle (*Solanum carolinense*), annual broomweed (*Gutierrezia dracunculoides*), western ragweed (*Ambrosia psilostachya*), common ragweed (*Ambrosia artemisiifolia*), spiny amaranth (*Amaranthus spinosus*), wild carrot (*Daucus carota*), buckhorn plantain (*Plantago coronopus*), woolly croton (*Croton capitatus*), and bitter sneezeweed (*Helenium amarum*). Once broadleaf weeds are controlled with this herbicide forage legumes can be successfully established following appropriate revegetation guidelines. 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 GrazonNext is applied. In many cases improved varieties of forage legumes can be established after weeds are controlled by delaying planting until the growing season following a spring application. GrazonNext is a useful rangeland improvement tool because it provides excellent broadleaf weed control that can lead to increased forage availability and utilization by livestock. GrazonNext is also a useful pasture renovation tool.

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WEED CONTROL WITH AMINOCYCLOPYRACHLOR IN ALABAMA PASTURES. S.F. Enloe, J. Tredaway Ducar, and H.D. Dorough. Auburn University, Auburn, AL, Auburn University Sand Mountain Research and Extension Center, Crossville, AL, and Alabama Cooperative Extension System, Talladega, AL.

ABSTRACT

Aminocyclopyrachlor is a new auxin type herbicide that has excellent activity on many broadleaf weed species. Previous research has found that aminocyclopyrachlor controls many weeds in non-crop environments. However, its role as a potential tool for weed control in pastures is still unclear. In Alabama, pasture weed control practices may entail intensive annual herbicide and fertility applications, infrequent mowing, or even doing nothing for several years. In the latter cases, farmers and landowners eventually resort to herbicide treatments to reclaim pastures from undesirable early successional and invasive species. Therefore our objective was to evaluate aminocyclopyrachlor efficacy within a range of pasture situations on several key weed species including bitterweed (*Helenium amarum*), Carolina horsenettle (*Solanum carolinense*), highbush blackberry (*Rubus argutus*), Japanese honeysuckle (*Lonicera japonica*), and Chinese tallowtree (*Triadica sebifera*). Additionally, our second objective was to evaluate injury on typical forage grasses in these situations including common Bermuda grass and Pensacola bahiagrass. Eight studies were conducted in 2008 and 2009 across central and northeast Alabama (Crossville, Eastaboga, Opelika, Talladega, and Waugh, AL) on a range of warm season pastures with the target species. In each study, aminocyclopyrachlor was tested across a range of rates from 35 to 210 gram per hectare and was compared to commercial standards. Commercial standards varied by species and included aminopyralid + 2,4-D, metsulfuron, and triclopyr. The DPX-MAT28 formulation was used in each study and a nonionic surfactant was added to each treatment at 0.25%v/v. Treatments were applied at key timings for each species. These included vegetative to early flower for bitterweed (late spring), fruit set for Carolina horsenettle (early summer), full bloom to early fruit set for highbush blackberry (late spring), vegetative for Japanese honeysuckle (late spring), and seed set for Chinese tallowtree (early fall). Percent visual control evaluations for each target species were taken within the growing season and twelve months after treatment (MAT). Additionally, visual evaluations of injury to forage grasses were taken at each study during the year of treatment. In general, aminocyclopyrachlor provided excellent season long bitterweed control at rates of 70 g/ha and higher and was comparable to aminopyralid at 0.11 kg/ha. However, no control was evident twelve MAT with any treatment. For Carolina horsenettle, treatments provided variable control between locations. At Eastaboga, aminocyclopyrachlor at 70 g/ha and higher provided >90% control during the season of treatment and was comparable to aminopyralid plus 2,4-D (0.11 + 0.97 kg/ha). However, at Crossville, no treatment provided 90% control during the season of treatment. For Chinese tallowtree, aminocyclopyrachlor provided 99-100% control at 125 g/ha and higher and was comparable to picloram plus triclopyr (0.56 + 0.56 kg/ha). For Japanese honeysuckle, no treatments were effective for control either within season or at 12 MAT. For highbush blackberry, aminocyclopyrachlor efficacy was variable among rates within season and at 12 MAT for the 2008 study. However, aminocyclopyrachlor at 210 g/ha was comparable to metsulfuron (28 g/ha) and triclopyr (1.1 kg/ha) at 12 MAT. Across studies, aminocyclopyrachlor caused variable injury to common bermudagrass (0-24% within the year of treatment) but was very low for Pensacola bahiagrass. These studies demonstrate that aminocyclopyrachlor is effective on several key weed species in pastures. However, based upon injury data to common bermudagrass, additional research should be conducted to better understand the factors contributing to this injury.

WEED CONTROL AND FORAGE TOLERANCE WITH MAT-28. B.A. Sellers and J.A. Ferrell; Department of Agronomy, University of Florida, Gainesville.

ABSTRACT

Aminocyclopyrachlor (MAT28) is a new active ingredient that is currently under investigation for weed control and forage tolerance in pastures and rangeland. Dogfennel and tropical soda apple (TSA) are the most problematic broadleaf weeds in Florida. These weeds are found throughout Florida and infest bahiagrass, bermudagrass, and limpograss pastures. Experiments were conducted in 2008 and 2009 to examine the efficacy of MAT28 on dogfennel and TSA as well as forage tolerance. In 2008, MAT28 was applied at 1, 2, 3, 4, and 6 oz/acre to 12" dogfennel in a bahiagrass ('Pensacola') pasture and 30-36" TSA plants in a mixed limpograss-bermudagrass pasture. Aminopyralid was utilized as a standard comparison and was applied at 5 and 7 oz/acre. Bahiagrass injury ranged from 2 to 13% 14 days after treatment (DAT), but no injury was detected 30 DAT. However, MAT28 at 6 oz/acre resulted in 18% stunting 30 DAT. Bermudagrass (common) and limpograss were more sensitive to MAT28 applications. No injury was observed following 1 oz/A MAT28 on either species, however, 4 and 6 oz/acre resulted in 28% injury of bermudagrass 14 DAT. At 30 DAT, bermudagrass injury ranged from 14 to 41%, with the highest levels of injury resulting from MAT28 at 4 and 6 oz/acre. Limpograss was most sensitive and 75 and 76% injury was recorded following MAT28 applications of 4 and 6 oz/acre 14 DAT. At 30 DAT, limpograss was injured by at least 23% following all rates of MAT28, with the highest level of injury (84%) at 6 oz/acre. Dogfennel control ranged from 64 to 95% 14 DAT, and control was at least 96% for all treatments 30 DAT. Complete dogfennel control was recorded 90 DAT, but some regrowth was observed 365 DAT in plots treated with MAT28 at 2 and 4 oz/acre. Tropical soda apple control with MAT28 was less than 50% 14 DAT following an application of 2 oz/acre or lower. Control of TSA 14 DAT with at least 3 oz/acre increased to 59 to 76%. By 30 DAT, all treatments provided at least 74% control and at least 90% control was observed in plots treated with 3 oz/acre or greater MAT28. All treatments provided >80% control 90 DAT. Some regrowth and new seedlings were present 365 DAT in all treatments, but poor control of TSA was observed at this evaluation when 1 oz/acre was applied. Milestone provided excellent control of TSA plants initially, and residual control was similar to that of MAT28. In 2009, MAT28 was applied at 1, 2, 4, and 6 oz/acre and was compared to GrazonNext at 2 pt/acre (aminopyralid + 2,4-D at 0.08 + 0.67 lb ai/acre) for TSA control. Control of TSA plants 30 DAT was 27, 33, 73, and 93% for 1, 2, 4, and 6 oz/acre MAT28, respectively; GrazonNext provided 89% control. By 60 DAT, only 6 oz/acre MAT28 and GrazonNext provided >90% control. A second study in 2009 evaluated the effects of 1, 2, 3, 4, and 6 oz/acre MAT28 on dogfennel control at 18- and 36-in compared with industry standard GrazonNext + Cleanwave (fluroxypyr + aminopyralid) at 2 pt + 14 oz and 2 pt + 20 oz/acre. Bahiagrass injury in 2009 was much less than that observed in 2008 following MAT28 applications, and is likely due to the difference in fertility regimes between the pastures. Dogfennel control was influenced by both time of application and herbicide treatment 60 DAT. Control of 18-in dogfennel was at least 90% following MAT28 at all application rates, but control of 36-in dogfennel did not exceed 90% control at MAT28 rates lower than 4 oz/acre. These data provide evidence that aminocyclopyrachlor may be a useful active ingredient for weed control in Florida pastures. However, its use may be limited to bahiagrass pastures or reduced rates in bermudagrass pastures. The use of this product in limpograss pastures will likely not be recommended.

UTILITY OF DPX MAT-28 IN COOL-SEASON GRASS PASTURE WEED MANAGEMENT SYSTEMS.

G.N. Rhodes, Jr; Plant Sciences Department, University of Tennessee, Knoxville

ABSTRACT

Tennessee's forage base consists largely of cool season grasses. Eighty-five percent of the pasture and grass hay acreage is tall fescue, 10 percent is orchardgrass, and less than 2 percent is bluegrass. Approximately 25 percent of the acreage has been improved through the addition of desirable legumes such as red and white clover. Our cattle producers spend large amounts of time and money each year in the production of hay. Rotational grazing, one of the most practical ways to improve the cost effectiveness of forage utilization, is largely underutilized in our state. UT Extension and NRCS are promoting increased use of rotational grazing, pasture improvement, and better pasture management, as ways to reduce the overall cost of producing forage. A major component of pasture improvement is better management of troublesome broadleaf weeds. DPX MAT-28 (aminocyclopyrachlor), hereafter referred to as MAT-28, is a new broadleaf herbicide from DuPont which being developed for use in broadleaf and woody plant management systems in rights-of-way, cool- and warm-season grass pastures and other markets. The compound is a pyrimidine carboxylic acid and it is very low in volatility. We began research in Tennessee in 2008 to determine the efficacy of MAT-28 on key winter and summer broadleaf weeds and to determine how best to use MAT-28, once registered, in cool-season grass pastures in Tennessee. The research was conducted on naturally occurring broadleaf weed infestations in 2008 at Alcoa, Madisonville and Sweetwater and in 2009 at Alcoa and Fork Creek. Herbicides were applied in a water carrier at 15 gal/A. All treatments were applied with nonionic surfactant at 0.25% v/v. MAT-28 was found to be highly active on hairy buttercup (*Ranunculus sardous* Cranz.) and musk thistle (*Carduus nutans* L.), two of Tennessee's most troublesome winter broadleaf weeds. Rates as low as 0.5 oz ai/A gave excellent (90 percent or greater) control of both weeds. This level of control is what we commonly expect from 2,4-D ester at 1 lb ai/A in producer applications. More difficult-to-control weeds in Tennessee are two warm-season perennials, horsenettle (*Solanum carolinense* L.) and tall ironweed (*Vernonia gigantea* (Walt.) Trel.). Rates of 1 oz ai /A or greater were required to give excellent control of horsenettle. It appears that 1.5 oz ai/A may be required for excellent control of tall ironweed. Horsenettle and tall ironweed control with MAT-28 was equal to that provided by aminopyralid at 1.25 oz ai/A. White clover, where present, was completely eliminated by MAT-28. Therefore, clover replant studies were initiated to determine the length of time a producer would need to wait to re-establish clovers following MAT-28 application. A preliminary study initiated in 2008 with red clover indicated that survival was reduced by over 50 percent when planting occurred the year following application of 0.5 or 1.0 oz ai/A. A second study, currently underway, was initiated with red and white clover in 2009.

INTEGRATED SYSTEMS OF WEED MANAGEMENT IN ORGANIC 'VIDALIA®' ONION.
W.C. Johnson, III, D.B. Langston, and R.L. Torrance. USDA-ARS and University of Georgia, Tifton, GA and Reidsville, GA.

ABSTRACT

Vidalia® dry-bulb onion are a multi-million dollar crop grown exclusively in a twenty county region in southeastern Georgia, as defined by a Federal Marketing Order issued in 1989. Plantings in 2009 were 11,500 harvested acres, with an estimated gross value of $9,440/A. Acreage of certified organic Vidalia® onion is driven by strong consumer demand and prices received for organic Vidalia® onion are often double the value of conventional Vidalia® onion. Currently, weed control is the primary challenge for organic Vidalia® onion, with producers frequently investing up to $1,000/A for handweeding.

Field experiments were initiated in 2007 to develop integrated systems of weed management in organic Vidalia® onion. Trials were conducted at the Vidalia Onion and Vegetable Research Farm near Lyons, GA. Treatments were a factorial arrangement of summer solarization, cultivation, and herbicides appropriate for use in certified organic production systems. Plots were solarized with clear plastic during the summer months prior to transplanting onion, with the mulch removed in October. Cultivation treatments used an Einbock® tine weeder, with cultivation twice at 2-wk intervals, four times at 2-wk intervals, and non-cultivated. Herbicides were clove oil (Matratec®) plus vinegar, clove oil plus a petroleum oil insecticide (Saf-T-Side®) used as an adjuvant, and a non-treated control. Vidalia® onion ('Savannah Sweet') were transplanted in December of 2007 and 2008, with cultivation and herbicide application events occurring the following January and February both seasons. Onion were harvested and graded in April each year. Sub-samples of onion bulbs were collected from each plot and stored in a controlled atmosphere storage facility at the University of Georgia Tifton Campus. After 120 days, the sub-samples were rated for fungal and bacterial diseases that developed during storage.

Weeds present in the trials were cutleaf eveningprimrose and swinecress. Preplant solarization during the previous summer did not control the cool-season weeds present in these trials, along with no effect on onion yield. It is theorized that dormant, cool-season weed seed are immune from solarization during the previous summer. However, effects of solarization on disease incidence in stored onion are inconclusive.

Cultivation with a tine weeder twice at two-week intervals was equally effective in controlling cutleaf eveningprimrose and swinecress as four cultivations, with both cultivation regimes increasing onion yield compared to the non-cultivated control. Cultivating onion with a tine weeder did not injure onion, provided that the cultivator was carefully adjusted prior to each cultivation event. To date, cultivation with a tine weeder neither damaged nor bruised onion bulbs sufficiently to increase incidence of diseases in stored onion.

Clove oil treatments provided minimal weed control and had no effect on onion yield. Previous experience with clove oil showed contact activity on warm-season dicot weeds, under summer conditions. This was not the case with cool-season weeds under winter conditions. Efforts were made to apply the clove oil herbicide treatments during periods of mild temperature in January and February. However, visual estimates of weed control and weed counts indicated minimal benefit of clove oil for weed control in transplanted Vidalia® onion.

These data conclusively show that cultivation with a tine weeder effectively controlled weeds in transplanted Vidalia® onion and protected onion yields without the need for handweeding. Cultivation with the tine weeder did not cause physical damage to the onion bulbs and there was no increase in diseases of stored onion. A tine weeder has been a proven implement for mechanical weed control in other organic crop production systems and overall results with transplanted onion are similar. Cultivation with a tine weeder can be immediately adapted by organic growers for use in transplanted onion.

EVALUATION OF GLYPHOSATE FORMULATIONS AND TANK MIXTURES FOR WEED CONTROL IN CITRUS. M.S. Malik and M. Singh; Department of Horticulture, University of Florida, Citrus Research and Education Center, Lake Alfred, FL

ABSTRACT

Glyphosate has been the most widely used herbicide in citrus groves from past many years because of its low price per acre. However, due to continued use, some weed species have developed tolerance to this herbicide. The major objective of this study was to evaluate efficacy and phytotoxicity of various glyphosate formulations and tank mixtures with other herbicides. The experiments were conducted at Conserv II near Orlando and Polk City, FL. Glyphosate formulations included Roundup weathermax (Potassium salt), Glyfos-Xtra (Isopropylamine salt), and Hoss Ultra (Isopropylamine salt). The common broadleaf weeds infesting the test sites included Florida/Brazil pusley (*Richardia sp*), spanishneedles (*Bidens bipinatta*), common dayflower (*Commelina communis*), and common purslane (*Phytolacca americana*). Grass weeds included guinea grass (*Panicum maximum*) and goosegrass (*Eleusine tristachya*). Adjuvants quest and dyne-amic were added to enhance the activity of these herbicides. The citrus trees were three years old at the time of application. The applications were made using tractor mounted sprayer fitted with 8002 nozzle and an off center flat spray nozzle. The sprayer was set to deliver 20 gpa at 40 psi pressure. At Orlando site, all the treatments provided 78 to 86% control of Florida/Brazil pusley at 14 DAT. However, the treatments including Aim and Rage provided 76 to 83% common dayflower control compared to 68 and 69% control with glyphosate treatments alone. The tank mix of Aim at 0.031 lb ai/A + Roundup at 2 lb ai/A improved Florida/Brazil pusley and common dayflower control from 3 to 15% compared to glyphosate treatments alone. Similarly Rage at 2.95 lb ai/A and tank mix of Rage + Landmaster II at 0.5 lb ai/A improved the broadleaf control such as common dayflower by as high as 14% by 28 DAT. The weed control by glyphosate treatments alone started declining by 42 DAT. The glyphosate treatments provided 73 to 76% control by 42 DAT. However, tank mix of Rage + Landmaster II provided 78 to 83% control of Florida/Brazil pusley and common dayflower at 42 DAT . Similarly, Aim + Roundup + Landmaster II were still the best treatments providing broadleaf control as high as 85% at 42 DAT. This treatment provided 80 and 85% control of common dayflower and Florida/Brazil pusley respectively. This combination also provided up to12% greater broadleaf control compared to glyphosate treatments alone. All the treatments provided excellent control of guinea grass (>80%) throughout the duration of experiment.
At Polk city site, all the herbicide treatments including tank mix of Aim and Rage provided excellent control of spanishneedles (83 to 90%) and common purslane (89 to 95%) at 14 DAT. However, the tank mix of Aim and Roundup at 2 lb ai/A provided 85 to 88 % control of spanishneedles and common purslane compared to 73 to 81% control with roundup treatments alone at 28 DAT. Similarly Rage and tank mix of Rage with Landmaster II provided 81 to 86% control of these weeds at 28 DAT. The weed control by Roundup treatments alone declined to 60% by 42 DAT. However, tank mix of Rage + Landmaster II and Aim + Roundup + Landmaster II were still the best treatments and provided up to 85% weed control at 42 DAT. This combination provided up to 20% greater control of spanishneedles and common purslane compared to glyphosate treatments alone. These treatments provided excellent control of goosegrass (>85%). There was no injury to citrus trees from any of these treatments. There was no difference among the weed control by glyphosate formulations except some initial weed control. Hoss Ultra and glyfos X-tra containing isopropylamine salts had greater grass, Florida/Brazil pusley and common purslane control at 14DAT compared to roundup weathermax. However, weed control by all glyphosate formulations was similar by 42 DAT.

DIFFERENCES IN CLOMAZONE TOLERANCE AMONG SWEETPOTATO GENOTYPES. H.F. Harrison, Jr. and D.M. Jackson, U.S. Vegetable Laboratory, ARS-USDA, Charleston, SC.

ABSTRACT

Clomazone (Command 3ME) is registered for use in sweetpotato [Ipomoea batatas L. (Lam.)] at 0.56 to 1.68 kg ai/ha depending on soil type. Clomazone is very important in U.S. sweetpotato production, because it controls several important annual broadleaf weeds that are not controlled by the other sweetpotato herbicides. State crop profiles for sweetpotato indicate that it has been used on well over half of the acreage for all reporting states except California where the herbicide is banned. Following clomazone application for weed control in a field containing approximately 300 genetically unique sweetpotato lines from the U.S. Vegetable Laboratory breeding program, we observed differences in injury among the lines. Susceptible lines exhibited severe foliar chlorosis and reduced growth; whereas, the most tolerant lines were not injured. All lines in the field were rated for injury. Twelve lines chosen based on these ratings were included in a greenhouse experiment designed to quantify the differences in clomazone tolerance. Vine cuttings of each line were grown in 1 L pots filled with a potting mixture (50% sand/Metro Mix 360, v/v) into which clomazone was incorporated at 0, 0.75, 1.5, 3.0, 6.0 and 12.0 mg ai/kg. After 3 weeks growth, plants were rated for injury, shoots were excised at the soil surface and shoot fresh and dry weights measured. Concentration response curves generated from the greenhouse experiment demonstrated that the clomazone concentration that caused moderate injury to the most tolerant lines was approximately 10 times higher than the concentration that caused similar injury to the most susceptible clones. Shoot fresh and dry weight response curves demonstrated similar differences between lines; however, dry weights reduction was greater than fresh weight reduction. These observations indicate that while most sweetpotato lines are at least moderately tolerant to clomazone, some are highly susceptible. Since clomazone is an important component in sweetpotato weed management, susceptibility is an undesirable trait that should be eliminated from sweetpotato breeding programs. The discovery of substantial differences in tolerance indicates that cultivars with increased tolerance to clomazone can be developed using conventional sweetpotato breeding approaches. Future research will be focused on identifying or developing sweetpotato cultivars with high levels of clomazone tolerance.

SWEETPOTATO TOLERANCE TO *S*-METOLACHLOR. S.L. Meyers, K.M. Jennings, D.W. Monks, P.J. Dittmar; Department of Horticultural Science, North Carolina State University, Raleigh.

ABSTRACT

Field studies were conducted at the Horticultural Crops Research Station, Clinton, NC in 2009 to determine the influence of *S*-metolachlor rate and application time on 'Covington', 'Hatteras', 'Murasaki-29' and 'DMS02-180' sweetpotato yield and quality. Treatments were a factorial arrangement of three *S*-metolachlor rates (1, 2, or 3 pt/A) by two applications times (1 or 14 days after planting, DAP) and a nontreated check. Plots were irrigated with 0.75 in of water 1 and 4 d following treatment. Main plots were arranged in a randomized complete block design with four replications. All plots were maintained weed-free throughout the growing season. Sweetpotato was harvested 121 DAP and graded into jumbo, no. 1, and canner.

S-metolachlor at 1, 2, and 3 pt/A applied 14 DAP caused less than 5% stunting across all sweetpotato varieties. Generally, under high irrigation conditions, *S*-metolachlor applied 1 DAP resulted in yield reduction and rounder marketable sweetpotato storage roots. Delaying *S*-metolachlor application until 14 DAP resulted in no yield or quality reductions in sweetpotato.

EFFICACY AND SAFETY OF HERBICIDES APPLIED PREPLANT AND PREEMERGENCE ONCOWPEA. L. E. Estorninos, Jr., N. R. Burgos, V. K. Shivrain, E. L. Alcober, T. M. Tseng, P. Sapkota, and D. R. Motes. University of Arkansas, Fayetteville, AR.

ABSTRACT

Cowpea has limited options for weed control. Hand weeding is expensive therefore herbicide options are needed to manage the weeds effectively and economically. The experiment was conducted in 2008 and 2009 at the Vegetable Research Station, Kibler, AR to evaluate the efficacy and crop safety of various herbicides when applied preplant (PP) or preemergence (PRE). Flumioxazin, fomesafen and sulfentrazone were applied alone at 0.188 and 0.375 lb ai/A. Halosulfuron was applied at 0.024 and 0.048 lb ai/A. The low rates of these herbicide were tank-mixed with s-metolachlor (0.75 lb ai/A) for herbicide combination treatments. Imazethapyr (0.063 lb ai/A) + s-metolachlor (0.75 lb ai/A) was used as the standard herbicide program. Cowpea stand was comparable between the two timings of application in both years. Stand was reduced by both rates of sulfentrazone in 2008 and 0.048 halosulfuron in 2009. Fomesafen and sulfentrazone at 0.188 and 0.375 lb ai/A in 2008 and 0.375 lb ai/A flumioxazin in 2009 stunted the growth of cowpea when applied PP. All herbicides, except halosulfuron (0.024 lb ai/A) alone or in combination with metolachlor and fomesafen (0.188 lb ai/A) in 2008 and both rates of fomesafen and halosulfuron in 2009, caused stunting when applied PRE. Both rates of halosulfuron in 2008 and the low rate of fomesafen in 2009 did not have sustained weed control until 4 wks after planting when applied PP. All herbicides had better weed control than the standard herbicide program in 2008 while both rates of flumioxazin had better weed control when applied PRE in 2009. Barnyardgrass was the predominant weed. PRE application of herbicides in 2008 and high rates of flumioxazin and sulfentrazone in 2009 delayed the flowering of cowpea. High soil moisture reduced cowpea yields in 2008 and caused harvest failure in 2009. Yields were greater when herbicides were applied PP than PRE. Overall, both rates of halosulfuron were safe to use in cowpea but did not control barnyardgrass. Flumioxazin controlled branyardgrass better but was injurious to cowpea.

EVALUATION OF ALL COMPONENTS OF THE 3-WAY FUMIGANT SYSTEM IN A TOMATO PRODUCTION FIELD IN CENTRAL FLORIDA. Andrew W. MacRae*, Richard O. Kelly, and Gray Vallad, Univ. of Florida/IFAS/GCREC, Wimauma, FL

ABSTRACT

With the reduction in availability of methyl bromide for mulch production systems, Florida growers are in need to transition into an alternative. One of the alternatives Florida growers are leaning towards is the 3-WAY fumigant system consisting of 1,3-dichloropropene, chloropicrin, and metam potassium. Florida tomato production systems will allow for some flexibility on the choices of fumigants depending on the pest pressures present in the fields. The objective of this study was to determine what components of the 3-WAY fumigant system are necessary for control of purple nutsedge in Florida tomato grown during the spring season.

An experiment was conducted in the spring of 2009 at the University of Florida – Gulf Coast Research and Education Center. The trial was organized in a randomized complete block design with four replications. Treatments consisted of all possible combinations of currently used products in the 3-WAY system and covered with either VIF (FilmTec 1.2 mil) or LDPE (Pliant 1.25 mil) plastic mulches. Treatments are listed below:

	Fumigant	Rate (broadcast)	Depth of placement	Plastic
1	Telone II	12 gal/A	12 inches	VIF & LDPE
2	Chloropicrin	150 lbs/A	8 inches	VIF & LDPE
3	KPam	60 gal/A	Applied in Drip	VIF & LDPE
4	Chloropicrin KPam	150 lbs/A 60 gal/A	8 inches Applied in Drip	VIF & LDPE
5	Telone II KPam	12 gal/A 60 gal/A	12 inches Applied in Drip	VIF & LDPE
6	Telone II Chloropicrin	12 gal/A 150 lbs/A	12 inches 8 inches	VIF & LDPE
7	Telone II Chloropicrin KPam	12 gal/A 150 lbs/A 60 gal/A	12 inches 8 inches Applied in Drip	VIF & LDPE
8	PicClor 60	250 lbs/A	8 inches	VIF & LDPE
9	PicClor 60 KPam	250 lbs/A 60 gal/A	8 inches Applied in Drip	VIF & LDPE
10	Telone C35	35 gal/A	8 inches	VIF & LDPE
11	Telone C35 KPam	35 gal/A 60 gal/A	8 inches Applied in Drip	VIF & LDPE
12	Non-treated Control			VIF & LDPE

Due to space restraints only the combinations of 1,3-Dichloropropene and chloropicrin (Pic) with and without KPam will be discussed.

Purple nutsedge counts: For the 2-WAY treatments (1,3-Dichloropropene plus Pic), Telone II + Pic and PicClor 60 under LDPE mulch had nutsedge counts similar to the non-treated control. All other 2-WAY treatments were similar and reduced nutsedge 70% or greater compared to the non-treated control. For the 3-WAY treatments (2-WAY plus KPam), all treatments were similar and provided 87% or greater control of purple nutsedge.

Marketable yield: For the 2-WAY treatments, Telone II + Pic and PicClor 60 under LDPE mulch had marketable yield similar to the non-treated control. Telone C35 under VIF mulch produced 1827 boxes/A with only Telone II + Pic under VIF and PicClor 60 under VIF producing similar yields. For the 3-WAY treatments, yield was compromised by injury from KPam. Tomato plants were transplanted too soon after KPam application and caused moderate stunting and increased variability in the trial. VIF treatments were injured greater than LDPE. Despite the injury all 3-WAY treatments had similar yields with only the VIF covered treatments found similar to the VIF control. LDPE treatments ranged from 1538 to 1568 boxes/A. All treatments including KPam provided good to excellent control of nutsedge. A similar trial will be conducted with disease and nematode pressure enhanced to determine the full effect of these pests on yield of tomato. The addition of halosulfuron will also be included to determine if removal of the nutsedge will allow some treatments to be successful even if nutsedge escapes the fumigant treatment.

BIOFUMIGATION POTENTIAL OF BRASSICACEAE COVER CROPS FOR WEED CONTROL IN PLASTICULTURE TOMATO AND BELL PEPPER. S.K. Bangarwa, J.K. Norsworthy, J. Still, G.M. Griffith, P. Jha, and B. Johnson; University of Arkansas, Fayetteville.

ABSTRACT

Weed control is very challenging in vegetable crops in the absence of the preplant soil fumigant, methyl bromide. Brassicaceae plants are gaining interest among vegetable growers as biofumigation cover crops for pest management including weeds. Brassicaceae plants synthesize a number of secondary metabolites, known as glucosinolates, which upon tissue decomposition produce biologically active isothiocyanates. Field experiments were conducted to evaluate the biofumigation potential of Brassicaceae cover crops against yellow nutsedge and other weeds in plasticulture tomato and bell pepper. Seven different Brassicaceae cover crops were drill seeded in seven inch rows. At mid-flowering stage, the cover crops were flail mowed and incorporated into the top 3 inches of soil. Plots were rated for crop injury and weed control at biweekly intervals. No visual injury was observed in tomato and bell pepper at any rating, indicating the tolerance of tomato and pepper seedlings to isothiocyanates released by the cover crops. Early-season yellow nutsedge control from Brassicaceae cover crops was less than 53% at 2 weeks after transplanting and declined to ≤18% later in the season. This research demonstrates that Brassicaceae cover crops have marginal potential for early-season weed control, and cannot be used as stand-alone methyl bromide alternative in commercial tomato and bell pepper production.

CONTROL OF KUDZU AND OTHER VINES USING AMINOCYCLOPYRACHLOR. *R.S. Wright and J.D. Byrd, Jr. Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS

ABSTRACT

Two experiments were conducted to evaluate aminocyclopyrachlor for control of kudzu and trumpetcreeper. Kudzu applications were made using a set of Boominator® 1870 nozzles delivering 287 L/ha in the first year, and a CO_2 pressurized backpack sprayer with a nine nozzle boom delivering 236 L/ha in the second year. Applications for trumpetcreeper control were made with a CO_2 pressurized backpack sprayer with a four nozzle boom delivering 236 L/ha. Visual evaluations were made on a scale ranging from 0 to 90% (0% = no visual control; 90% = complete control visually) for both experiments.

The first experiment was initiated September 22, 2008 and each treatment was reapplied October 1, 2009. The treatments were as follows: metsulfuron 60DF at 0.17 kg ai/ha, aminocyclopyrachlor 80DF at 0.14 or 0.28 kg ai/ha, picloram 2L at 1.12 kg ai/ha, clopyralid 3L at 0.55 kg ai/ha or aminopyralid 2L at 0.12 kg ai/ha. Prior to dormancy (in the first year) all treatments provided similar kudzu control between 77 and 90% 30 days after initial treatment (DAIT). All treatments provided excellent levels of kudzu control (90%) 224 DAIT. Control levels were 33% or less with all treatments 374 DAIT. Aminocyclopyrachlor at 0.14 kg/ha provided 90% kudzu control, and similar results were observed with aminocyclopyrachlor at 0.28 kg/ha or picloram at 1.12 kg/ha (83 or 87%).

The second experiment was initiated June 2, 2009. The treatments are as follows: aminocyclopyrachlor at 0.066, or 0.132 kg ai/ha, aminocyclopyrachlor at 0.033 kg ai/ha combined with chlorsulfuron at 0.013 kg ai/ha or metsulfuron at 0.011 kg ai/ha, aminocyclopyrachlor at 0.066 kg ai/ha combined with chlorsulfuron at 0.026 kg ai/ha or metsulfuron at 0.021 kg ai/ha, aminocyclopyrachlor at 0.132 kg ai/ha combined with chlorsulfuron at 0.053 kg ai/ha or metsulfuron at 0.042 kg ai/ha, aminocyclopyrachlor at 0.053 kg ai/ha combined with rimsulfuron at 0.035 kg ai/ha, aminocyclopyrachlor at 0.105 kg ai/ha combined with rimsulfuron at 0.070 kg ai/ha, aminopyralid at 0.123 kg ai/ha combined with metsulfuron at 0.021 kg ai/ha, or aminopyralid at 0.123 kg ai/ha. Aminocyclopyrachlor at 0.066 or 0.132 kg/ha provided 80 or 85% control of trumpetcreeper 72 or 91 days after treatment (DAT). Combining aminocyclopyrachlor with chlorsulfuron, metsulfuron, or rimsulfuron did not result in higher control of trumpetcreeper compared to aminocyclopyrachlor alone 72 or 91 DAT. Aminopyralid at 0.123 kg/ha provided 37% trumpetcreeper control and control was significantly less compared either rate of aminocyclopyrachlor alone 72 DAT.

CHEMICAL CONTROL OF BACCHARIS (*Baccharis halimifolia*) IN AN ESTABLISHED BOTTOMLAND HARDWOOD PLANTATION. B.J. Gann, J.L. Schuler, and L.C. Thompson; University of Arkansas at Monticello, Monticello, AR.

ABSTRACT

Baccharis (*Baccharis halimifolia*) has expanded northward from the coastal marshes of the Gulf of Mexico. Today baccharis commonly dominates newly disturbed areas (i.e. young plantations). In fact, many government-assisted hardwood plantings in Arkansas are dominated by baccharis. Little is known about chemical methods that can be used to control baccharis in these plantings due to the difficulty of targeting certain species of hardwoods in a hardwood stand. Since baccharis is semi-evergreen, four different herbicides were tested in dormant season for baccharis control in an established bottomland mixed species hardwood plantation in south-eastern Arkansas. The mixed species plantation consisted mainly of Nuttall oak (*Quercus texana*) and green ash (*Fraxinus pennsylvanica*) with an occasional water oak (*Quercus nigra*) and willow oak (*Quercus phellos*). The four herbicide treatments were 4 qts per acre of Razor Pro (glyphosate) plus 0.5% (v/v) LI700, 2 qts per acre of Clearcast (imazamox), 6 qts per acre of Tahoe 4E (triclopyr), 7 oz per acre of Milestone (aminopryalid). An additional untreated control was also included as a treatment. Each treatment was replicated four times. Fifteen randomly selected baccharis and 10 planted hardwood stems per treatment plot were assigned one of seven crown damage categories (0, 1-5, 6-34, 35-65, 66-94, 95-99, 100%) at the end of the growing season. Categories were subsequently consolidated into three categories: 0% (undamaged), 1-65% (minor dieback), >65% (major dieback), and dead. Treatments were compared by category using Friedman's nonparametric test. At the end of one growing season, no baccharis crowns exhibited damage on Clearcast, Milestone, or control treated plots. The Razor Pro + LI700 treatment caused minor damage in 87% of the baccharis sprayed, which was significantly greater than the damage exhibited on baccharis in the Clearcast, Milestone, and control treated plots ($P<0.05$). The baccharis sprayed with Tahoe 4E exhibited significantly greater damage that the other treatments causing major damage to 90% of the baccharis stems ($P<0.05$). Tahoe 4E also caused minor crown damage to 18% of the planted hardwood stems sprayed, which was significantly greater than the other treatments ($P<0.05$). The glyphosate + LI700, imazamox, aminopryalid, and control treatments did not damage the crown of the species sprayed. Our results suggest that a dormant season application of Tahoe 4E at 6 qts per acre can effectively control baccharis in an established bottomland hardwood plantation.

BRUSH CONTROL WITH AMINOPYRALID. J. Ferrell, B. Sellers, and W. Kline. University of Florida, Gainesville, FL; Range Cattle Research and Education Center, Ona, FL; Dow Agrosciences, Duluth, GA.

ABSTRACT

Aminopyralid is a selective herbicide that is effective against a number of broadleaf weed species. Though not effective on most woody species when applied alone, it has been suggested that aminopyralid will enhance the activity of other herbicides when applied to woody brush. Experiments were established in October 2008 and evaluated through October 2009. These experiments consisted of broadcast applications to persimmon and sweetgum, individual plant treatments applied to sweetgum foliage, and applications to freshly cut oak and sweetgum stumps. In the foliar applications, aminopyralid was applied with and without various standard herbicide combinations including: triclopyr ester (4 lb/A), glyphosate (5.5 lb/A) + imazapyr (0.25 lb/A), fluroxypyr (0.4 lb/A), and triclopyr ester (4 lb/A) + imazapyr (0.25 lb/A). The most effective herbicides on sweetgum were glyphosate + imazapyr and triclopyr ester + imazapyr with 80 to 85% control, respectively. The addition of aminopyralid did not improve control when applied with any of the herbicides tested. When applied as an individual plant treatment, the highest number of resprouts was observed 1 year after treatment in plots treated with triclopyr ester (2% solution) and triclopyr ester + aminopyralid (2% + 0.5%). The addition of glyphosate (4% solution) greatly reduced sweetgum sprouting, but was not improved by the addition of aminopyralid. Similarly, the addition of aminopyralid did not improve persimmon control over triclopyr ester, fluroxypyr, or triclopyr ester + fluroxypyr when applied alone. However, when aminopyralid (10% solution of Milestone VM – 2 lb/gal formulation) was applied to freshly cut oak and sweetgum stumps (ranging from 4 to 12” in diameter), no resprouting was observed 1 year after treatment. Likewise, no resprouting was observed from stumps treated with triclopyr amine (33% solution) or triclopyr amine + aminopyralid combinations. These data suggest that aminopyralid is likely not an effective addition to foliar applications on woody brush, but may be useful in cut surface applications.

AMINOPYRALID + METSULFURON METHYL (OPENSIGHT™ HERBICIDE) FOR NON-CROPLAND WEED CONTROL. V. B. Langston, Cummings, D. C., Hillger, D. E., Burch, P. L., Kline, W. N., Sleugh, B. B., Halstvedt, M. B., Peterson, V. F., Dow AgroSciences LLC. Indianapolis, IN

ABSTRACT

Aminopyralid is an herbicide developed by Dow AgroSciences for use to control noxious and invasive weeds on non-cropland areas including industrial sites, rights-of-way, such as roadsides, and natural areas. The herbicide product, Opensight™ herbicide, is formulated as a wettable granule containing 525 g ae aminopyralid + 94.5 g ae ai metsulfuron methyl per kg of product. This herbicide has postemergence activity on established broadleaf plants and brush and provides residual control of susceptible plants that emerge after application. Opensight herbicide provides broad spectrum control required to manage weed species complexes common to many industrial sites and rights-of-way sites. These weed species include Canada thistle (Circium arvense), musk thistle (Carduus nutans), plumeless thistle (Carduus acanthoides), horsenettle (Solanum carolinense), annual broomweed (Gutierrezia dracunculoides), western ragweed (Ambrosia psilostachya), common ragweed (Ambrosia artemisiifolia), spiny amaranth (Amaranthus spinosus), wild carrot (Daucus carota), buckhorn plantain (Plantago coronopus), woolly croton (Croton capitatus), knapweeds (Centaurea spp.) bitter sneezeweed (Helenium amarum), blackberry (Rubus spp.), buckbrush (Symphoricarpus orbiculus), roses (Rosa spp.), and honeysuckle (Lonicera japonica).

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Always read and follow the label directions.

OPENSIGHT™ SPECIALTY HERBICIDE FOR ROADSIDE WEED CONTROL. W.N. Kline, P.L. Burch and V.B. Langston; Dow AgroSciences LLC, Duluth, GA; Christiansburg, VA; The Woodlands, TX.

ABSTRACT

Aminopyralid (Milestone® Specialty Herbicide) is a new herbicide developed by Dow AgroSciences for managing broadleaf weeds and brush in rights-of-way, range & pasture, and other non-cropland sites. Aminopyralid has broad range activity on a number of key species and the weed spectrum is broadened even further when combined with certain other active ingredients. A new product with aminopyralid and metsulfuron (Opensight™ Specialty Herbicide) has been developed for control of susceptible weeds and certain woody plants, including invasive and noxious weeds, on non-cropland areas including industrial sites, rights-of-way (such as roadsides, electric utility and communication transmission lines, pipelines, and railroads), non-irrigation ditch banks, natural areas (such as wildlife management areas, wildlife openings, wildlife habitats, recreation areas, campgrounds, trailheads and trails), and grazed areas in and around these sites. It is labeled for use in riparian areas, seasonally dry wetlands and can be applied up to the water's edge of areas such as ponds and streams. There are no haying or grazing restrictions, however label precautions regarding manure and residues in forage must be followed.

Extensive field trials were conducted throughout the US in 2008 and 2009 with Opensight™ Specialty Herbicide. Comparisons between Opensight™ Specialty Herbicide and industry standards were evaluated in over 30 field trials during the 2 year period on important IVM weeds. Based on these results, Opensight™ Specialty Herbicide demonstrates excellent potential for use on sites where the following target weeds are encountered and in most situations the combination of aminopyralid + metsulfuron in Opensight™ Specialty Herbicide will provide better control than either single entity herbicide on goldenrod SOOSS, wild parsnip PAVSA, wild carrot DAUCA, broadleaf plantain PLAMA (& other plantain species, PLASS), arrowleaf sida SIDRH (& other sida species, SIDSS), tall ironweed VENAL, musk thistle CRUNU, and bush-type blackberry RUBSS. The maximum label rate for Opensight™ Specialty Herbicide is 2.02 oz ae/A (3.3 ounces product/acre).

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OVERVIEW OF PRODUCTS CURRENTLY BEING EVALUATED ALONG MISSISSIPPI ROADSIDES.

***R.S. Wright and J.D. Byrd, Jr. Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS**

ABSTRACT

The first experiment was conducted to compare Metcel VMF (60% metsulfuron methyl) to Escort, Sulfomet (75% sulfometuron methyl) to Oust, Sulfomet Extra (56.25%sulfometuron methyl: 15% metsulfuron methyl) to Oust Extra. In a second experiment AmTide MSM (60% metsulfuron methyl) was compared to Escort and in a third experiment Trycera (triclopyr) was compared to Garlon 3A. Visual evaluations were made on a scale ranging from 0 to 90% (0% = no visual control; 90% = complete control visually). All applications were made with a CO_2 pressurized backpack sprayer with a four nozzle boom delivering 236 L/ha. The first experiment compared 0.042 kg ai/ha Metcel VMF to the same rate of Escort, 0.023 kg ai/ha Sulfomet to the same rate of Oust, and 0.07 kg ai/ha Sulfomet Extra to Oust Extra. All herbicides were also applied at equivalent rates in combination with glyphosate at 0.42 kg ae/ha. Applications were made on March 3, 2009. No significant differences were observed between Metcel VMF and Escort for control of field bromegrass (33 or 38%), hop clover (90%), horseweed (70 or 85%), or large crabgrass (48 or 33%) 61 days after treatment (DAT). Metcel VMF provided 70% control of Italian ryegrass, which was significantly lower than Escort (85%) 61 DAT. Oust provided higher control (88%) of hop clover compared to Sulfomet (70%) 61 DAT. No significant differences were observed between Sulfomet and Oust for control of field bromegrass (83 or 88%), horseweed (60%), large crabgrass (70 or 75%), or Italian ryegrass (88 or 85%) 61 DAT. No significance differences were observed between Sulfomet Extra and Oust Extra for control of field bromegrass (88 or 80%), hop clover (90%), horseweed (85 or 75%), large crabgrass (58 or 68%) or Italian ryegrass (90 or 88%) 61 DAT. Overall, with two exceptions, similar weed control was observed between the generic and branded herbicides.

The second experiment focused on AmTide MSM and Escort comparisons. Applications of AmTide MSM or Escort at 0.021, 0.032, or 0.042 kg ai/ha alone or with 0.42 kg ae/ha glyphosate were made March 10, 2009. All treatments provided excellent control (90%) of annual sowthistle 58 DAT. AmTide MSM and Escort at 0.032 kg/ha provided 38 or 13% control of horseweed, respectively, and both products at the same rate combined with glyphosate provide 90% control 92 DAT. Broadleaf plantain control ranged between 28 and 48% with AmTide MSM and Escort 30 DAT. AmTide MSM and Escort at 0.021 kg/ha combined with glyphosate provided 83 or 85% control of broadleaf plantain 30 DAT, respectively. No differences were observed between treatments for Italian ryegrass control (68 to 88%) 92 DAT. All treatments provided 90% control of crimson clover, except glyphosate alone (83%) 58 DAT.

The third experiment was initiated September 4, 2009 to compare Trycera and Garlon 3A at 0.56, 0.84, or 1.12 kg ai/ha, both herbicides at 0.84 kg/ha combined with glyphosate at 0.42 kg ae/ha, or both herbicides at 0.56 kg/ha combined with Matrix at 0.053 kg ai/ha. Applied alone at 0.56 kg/ha Trycera provided 75% control of prostrate knotweed compared to 88% control with Garlon 3A 33 DAT. All treatments provided excellent control of bitter sneezeweed (90%) 33 DAT. Garlon 3A at 0.84 kg/ha provided 55% control of buckhorn plantain which was lower compared to Garlon at 0.84 kg/ha combined with glyphosate 33DAT. Brazilian vervain control ranged from 35 to 53% with Trycera or Garlon 3A 63 DAT. Trycera or Garlon at 0.84 kg/ha combined with glyphosate provided 78% control of Brazilian vervain which was higher compared to 35 or 38% control with Trycera or Garlon 3A 63 DAT, respectively. Trycera or Garlon 3A at 0.84 kg/ha combined with glyphosate provided 90% control of common ragweed and all treatments except Garlon 3A at 0.56 kg/ha provided similar control 33 DAT.

AMINOCYCLOPYRACHLOR DEVELOPMENT AND REGISTRATION UPDATE. J.S. Claus, R.G.Turner, J.H. Meredith, C.S. Williams and M.J. Holliday; Wilmington, DE and Memphis, TN.

ABSTRACT

Aminocyclopyrachlor, an exciting new class of auxin herbicide from Dupont, is under development for non-crop uses such as bareground, brush, right-of-way and turf as well as for range, pasture and invasive weed control. Aminocyclopyrachlor has demonstrated activity on a number of important species such as leafy spurge, mesquite, huisache, field bindweed and brush such as box elder. It also controls a number of glyphosate and ALS resistant weeds such as marestail, Russian thistle, kochia, and prickly lettuce. Aminocyclopyrachlor has exhibited a number of positive stewardship attributes with very low impact to mammals and the environment.

PREEMERGENCE CONTROL OF PALMER AMARANTH AND KOCHIA WITH DPX-MAT28. D.P. Montgomery, C.C. Evans and D.L. Martin; Oklahoma State University, Stillwater.

ABSTRACT

A research study was conducted during 2009 to evaluate the effectiveness of several herbicide treatments for selective preemergence and early postemergence control of Palmer amaranth (*Amaranthus palmeri*) and kochia (*Kochia scoparia*). Treatments were applied to plots on 3 April at which time kochia was 0.25-1.5 inches tall and Palmer amaranth had not yet emerged. Treatments were applied using a CO2 pressurized sprayer calibrated to deliver 20 gallons of water/A and were arranged in a randomized complete block design with three replications. Treatments evaluated included DPX-MAT28 at 0.94 and 1.88 oz. a.i./A alone, and combined with Telar at 0.375 or 0.75 oz. a.i./A, and Escort at 0.3 or 0.6 oz. a.i./A, and DPX-MAT28 at 0.75, 1.13, and 1.5 oz. a.i./A combined with Matrix at 0.5, 0.75, 1.0 oz. a.i./A. Diuron 80 WDG at 2.4 lb. a.i./A was used as a standard treatment for comparison. All treatments included a non-ionic surfactant at a rate of 0.25% V/V. Plots were visually evaluated at 62, 90, and 118 days-after-application (DAA) for percent weed control as compared to untreated plots. This study was conducted under ideal growing conditions including moderate temperatures and good rainfall throughout the duration of the study.

At 62 DAA treatments of DPX-MAT28 alone were producing 82 & 90% early postemergence control of kochia. The addition of either Telar or Escort did not appear to benefit kochia control at this time. Kochia control with DPX-MAT28 and Matrix combinations produced 65-90% control of kochia with lower rates producing lower levels of control. The standard treatment of Diuron was producing 93% control of kochia. At 90 DAA, and after good mid summer rainfall, kochia control increased for all treatments. All treatments were producing and maintaining between 83-95% control of kochia which increased to 93-98% control at the 118 DAA evaluation. All treatments in this study provided excellent early postemergence and preemergence control of kochia through 118 DAA.

At 62 DAA all treatments including DPX-MAT28 were producing poor to moderate preemergence control of Palmer amaranth. Control ranged from 7-47% and combination treatments with Telar, Escort, or Matrix did seem to increase control. The standard treatment of Diuron was producing 50% control at this time. At 90 DAA Palmer amaranth control decreased for all treatments as Palmer amaranth continued to germinate slowly in the test area. By final evaluations, at 118 DAA, and after significant mid to late summer Palmer amaranth emergence, it became evident that DPX-MAT28 treatments were producing low to moderate levels of Palmer amaranth control and suppression. At 118 DAA all treatments including DPX-MAT28 were producing 48-62% control and suppression of Palmer amaranth. The late summer control and suppression was in the form of lower Palmer amaranth densities and Palmer amaranth that did emerge was under moderate growth suppression compared to untreated checks.

POSTEMERGENT CONTROL OF PALMER AMARANTH WITH DPX-MAT28 ON OKLAHOMA ROADSIDES. C.C. Evans*, D.P. Montgomery, and D.L. Martin, Department of Horticulture and LA, Oklahoma State University, Stillwater, OK.

ABSTRACT

A research study was conducted during 2009 to evaluate the effectiveness of several herbicide treatments for selective postemergence control of Palmer amaranth (*Amaranthus palmeri*). The treatments were applied to plots on June 11, 2009 when Palmer amaranth was 1-6 inches tall. This trial received adequate rainfall throughout its duration to provide good weed emergence, growth, and development. Treatments were applied using a CO2 pressurized sprayer calibrated to deliver 20 gallons of water/A. The experimental design was a randomized complete block with three replications of treatment. Herbicide treatments included DPX-MAT28 (aminocyclopyrachlor) at 0.94 and 1.88 oz. a.i./A alone, and combined with Telar (chlorsulfuron) at 0.375 or 0.75 oz. a.i./A, and Escort (metsulfuron) at 0.3 or 0.6 oz. a.i./A. Also included were DPX-MAT28 at 0.75, 1.13, and 1.5 oz. a.i./A combined with Matrix (rimsulfuron) at 0.5, 0.75, 1.0 oz. a.i./A and Vanquish (diglycolamine salt of dicamba) alone at 8.0 oz. a.i./A as a standard treatment for comparison. All treatments included a non-ionic surfactant at 0.25% V/V. Plots were visually evaluated at 32, 61, and 91 days-after-application (DAA) for percent weed control as compared to untreated plots. This study was conducted under good growing conditions including normal rainfall amounts during the first half of the trial and above normal rainfall during the second half of the trial. Temperatures were within normal seasonal ranges throughout the trial.

At 32 DAA treatments of Vanquish were exhibiting poor control (13%) of Palmer amaranth. Treatments of DPX-MAT28 alone at 0.94 oz. a.i./A and 1.88 oz. a.i./A were producing 52 and 77% postemergence control of Palmer amaranth respectively, with rate differences being statistically significant (LSD =16.9, p=0.10). Control provided by the low rate (0.94 oz a.i./A) of DPX-MAT28 alone (52% control) was comparable to that of the low rate of DPX-MAT28 (0.94 oz a.i./A) combined with Telar or Escort (68 & 65% respectively). The addition of the high rates of either Telar or Escort to the high rate of DPX-MAT28 (1.88 oz a.i./A) did not significantly increase Palmer amaranth control at 32 DAA. Weed control with combinations of DPX-MAT28 at 0.75 oz. a.i./A + Matrix at 0.5 oz a.i./A was not significantly better than from low rates of DPX-MAT28 (0.94 oz a.i./A) + Telar or Escort. At 32 DAA, the DPX-MAT28 at 0.75 oz. a.i./A + Matrix at 0.5 oz a.i./A provided better control than DPX-MAT28 alone at the low rate. Weed control from DPX-MAT28 at 1.13 oz. a.i./A + Matrix 0.75 oz a.i./A was not different than that obtained from the lower combination rate of DPX-MAT28 (0.75 oz a.i./A) and Matrix (0.5 oz a.i./A). at 32 DAA, control with DPX-MAT28 at 1.5 oz a.i./A did not differ depending upon whether Matrix or Escort was added. The high rate of DPX-MAT28 (1.88 oz a.i./A) in combination with Escort (0.6 oz a.i./A) provided significantly better control than did DPX-MAT28 (1.88 oz a.i./A) + Telar (0.75 oz a.i./A) at that rating date..

At 61 DAA treatments containing Vanquish were providing 50% control of Palmer amaranth. During that time the 1.88 oz. a.i./A rates of DPX-MAT28 alone and in combination with other herbicides provided good to excellent control (84 -93%) [LSD =17.3, p=0.10]. No statistical differences were present amongst treatments that included the high rate of DPX-MAT28 at 61 DAA. At lower DPX-MAT28 rates (0.94 oz a.i/A) the combination of DPX-MAT28 + either Telar or Escort were providing statistically similar Palmer amaranth control (66 and 65% respectively). Control provided by these specific combinations was also comparable to that from DPX-MAT28 + Matrix (1.13 + 0.75 oz ai./A). The lowest rate of DPXMAT28 + Matrix (0.75 + 0.5 oz ai./A) provided the poorest weed control (45%) at 61 DAA.

At 91 DAA the treatments of Vanquish were still providing poor control of Palmer amaranth (53% control). At that time, weed control achieved by the high rates (1.88 oz a.i./A) of DPX-MAT28 alone, and in combination with Telar or Escort was not different than weed control provided by the tank mix with Matrix at 1.5 or at 1.0 oz a.i./A (88, 80 vs 89 and 76%) [LSD =21.8, p=0.10]. No differences in Palmer amaranth control were present amongst the treatments containing DPX-MAT28 (0.94 oz a.i./A) plus Telar (0.375 oz a.i./A) or Escort (0.3 oz a.i./A) and DPX-MAT28 (0.75 oz a.i./A) + Matrix (0.5 oz a.i./A) and DPX-MAT28 (1.13 oz a.i./A) + Matrix (0.75 oz a.i./A) [43, 37, 46, and 52% respectively]. Palmer amaranth control provided by DPX-MAT28 alone at 0.94 oz a.i./A (7% control) was statistically the poorest performer of all treatments at 91 DAA.

AMINOCYCLOPYRACHLOR OR BLEND PRODUCTS FOR BRUSH AND WEED CONTROL ON UTILITY AND ROADSIDE RIGHTS-OF-WAY. R.G. Turner, J.R. Pitts, M.L. Link, E. Hidalgo and J.S. Claus, DuPont Land Management, Memphis, TN and DuPont Stine-Haskell Research Center, Newark, DE.

ABSTRACT

Utility vegetation managers are constantly looking for ways to control unwanted and potentially hazardous weed and brush vegetation in utility rights-of-way (ROW) and along roadsides. Tests were established in 2007, 2008 and 2009 to evaluate aminocyclopyrachlor and aminocyclopyrachlor plus various DuPont sulfonylurea (SU) herbicides in ROW sites across the United States. The majority of the sites were small plot, replicated tests applied with a CO_2 backpack sprayer. While a small number of larger, one rep trials were installed using commercial spray equipment that would typically be used on these sites. For these ROW field trials, three blend products containing aminocyclopyrachlor were evaluated. Excellent activity was observed across a number of brush species especially on tough to control species like boxelder, red maple, hackberry, sugarberry, mesquite, and huisache. A number of broadleaf weeds were also controlled such as common mullein, tall ironweed, marestail, goldenrod and knapweeds. These studies highlighted the excellent fit these DuPont aminocyclopyrachlor blended products have for vegetation management on rights-of-way and roadsides.

EFFECT OF SIMULATED AMINOCYCLOPYRACHLOR DRIFT ON *NICOTIANA TOBACUM*. D.F. Lewis, R.J. Richardson, F.H. Yelverton, and S.T. Hoyle; Department of Crop Science, North Carolina State University, Raleigh, NC 27695

ABSTRACT

Synthetic auxin herbicides are used for vegetation control in right-of-way and non-cropland settings. Aminocyclopyrachlor (DPX-MAT28) is a recently discovered pyrimidine carboxylic acid herbicide belonging to the synthetic auxin family. Aminocyclopyrachlor has a favorable environmental profile, low vapor pressure, and broad range of weed control. However, past research has shown *Nicotiana tobacum* (Flue-cured tobacco) to be extremely sensitive to synthetic auxin herbicides. Tobacco fields are often located in close proximity of rail and road right-of-ways where these herbicides are applied; therefore, the risk for an off-target application is of great concern. Research was conducted to determine the effect of simulated aminocyclopyrachlor drift on *Nicotiana tobacum*.

Research was conducted in 2009 at the Border Belt Tobacco Research Station in Whiteville, NC on NC 71 flue-cured tobacco. Experimental design was a randomized complete block with four replications in a factorial arrangement (six herbicide treatments by four application timings). Herbicide treatments included: DPX-MAT28 (0.31 grams a.e./ha, 1.6 g/ha, 3.1 g/ha, 15.7 g/ha, and 31.4 g/ha); aminopyralid (6.1 g/ha); and a nontreated check. Rates were selected as 1/1000th, 1/200th, 1/100th, 1/20th, and 1/10th, respectively, of the suggested use for right-of-way weed control for aminocyclopyrachlor and 1/10th of the suggested use rate for aminopyralid. Application timings included: preplant incorporated (PPI); preemergence (PRE); postemergence I (POST I); and postemergence II (POST II). PPI and PRE applications were made three-weeks before transplanting and POST I and POST II applications were made three and six-weeks after transplanting, respectively. Herbicide applications were made with a CO_2 pressurized spray boom calibrated to deliver 187 L/ha. Tobacco injury was visually rated on a 0-100% scale (0%=no visible injury; 100%=complete plant death) and plant heights was recorded each rating date; tobacco fresh weight was recorded at harvest.

At tobacco harvest, PPI applications of DPX-MAT28 (0.3, 1.6, 3.1, 15.7, and 31.4 g/ha) injured 8, 40, 46, 69, and 87% and weighed 1392, 1633, 1812, 1101, and 420 g, respectively; aminopyralid injured 25% and weighed 1668 g. PRE applications of DPX-MAT28 injured 12, 34, 38, 68, and 83% and weighed 1646, 1440, 1693, 1176, and 613 g, respectively; aminopyralid injured 29% and weighed 1451 g. POST I applications of DPX-MAT28 injured 19, 68, 65, 94, and 99% and weighed 1440, 1336, 1016, 230, and 0 g, respectively; aminopyralid injured 99%. POST II applications of DPX-MAT28 injured 46, 50, 61, 83, and 84% and weighed 1342, 1789, 1447, 643, and 460 g, respectively; aminopyralid injured 84% and weighed 655 g. The nontreated check showed 0% injury and weighed 1334 g.

CHLOROPHYLL FLUORESCENCE MEASUREMENT TECHNIQUES FOR WEED SCIENCE. J.D. McCurdy, J.S. McElroy, and D.B. Weaver; Department of Agronomy and Soils, Auburn University, Auburn, AL.

ABSTRACT

Chlorophyll fluorescence measurement is a well-reviewed method of interpreting plant-photochemistry and is an accepted means of quantifying environmental adaptability. In recent years, chlorophyll fluorescence measurement in crop production systems has become more practical, largely due to the availability of smaller, more portable fluorometers. Fluorometers now vary in design, parameters calculated, and ease-of-use. Therefore, our objective was to explore the field-use applicability of four commercially available chlorophyll fluorometers (OS1-FL, Opti-Sciences, Hudson, NH, USA; LI-6400-40, LI-COR, Lincoln, NE, USA; FluoroPen FP-100; and FluorCam HandyCam, Photon Systems Instruments, Brno, Czech Republic).

Utilizing cotton (*Gossypium hirsutum* L.) as a model crop, two simple experiments were conducted in which plants were treated with atrazine or grown under drought-stress conditions. Steady-state and maximal fluorescence of light-adapted plants were measured to determine the quantum yield of photosystem II-mediated photochemistry (Φ_{PSII}). Fluorometers detected lower Φ_{PSII} in atrazine-treated plants compared to non-treated. Drought-stressed cotton Φ_{PSII} did not differ from that of the non-treated, possibly due to moderate temperatures or the lack of high actinic light levels. Despite similar abilities to detect changes in Φ_{PSII}, each fluorometer has distinct advantages and disadvantages to field-application, largely subject to the nature of a researcher's needs.

Various parameters which are useful in detecting plant stress and identifying herbicide efficacy and mode of action can be derived from the shape of the fluorescence transition curve, or Kautsky curve. Parameters can be separated into those that require light-, dark-, or light- and dark-adapted measurements. All fluorometers are capable of dark-adapted leaf measurement; however, this often means taking pre-dawn measurements or adapting experimental techniques to exclude incident light. Both the FlourCam and LI-6400-40 contain an internal light source which provides actinic light to maintain light-adaptation. While this may decrease variability, each measurement requires knowledge of recent light history, adjustment of internal light sources to provide a similar light level, and allowance to re-acclimate (for a period of up to 35 min) before measurement. Only the OS1-FL relies upon incident light for light-adapted leaf measurement, making it susceptible to fluctuations due to cloud cover or diurnal light levels. The FluorPen lacks an actinic light source; therefore, once the external clip encompasses a leaf, that leaf immediately begins to dark adapt. It is unclear whether this impacts the validity of light-adapted measurements such as Φ_{PSII}.

Each fluorometer differs in the number and range of parameters reported on screen, which may limit in-field conclusions, but all are capable of displaying important parameters, including calculated F_v/F_m and Φ_{PSII}. Additionally, each fluorometer logs data that can be easily downloaded and retrieved in tabulated form. There are major differences in size and weight (from 180 g to nearly 10 kg) among instruments. For this reason, not all fluorometers are well-suited to field-survey measurements requiring large data sets. Current technologies offer qualities which make portable fluorometers useful to both crop- and weed- scientists. Therefore, research objectives should dictate which fluorometer best suits the needs for any given experiment.

INTERACTION BETWEEN FLUMICLORAC AND GLYPHOSATE ON GLYPHOSATE-RESISTANT PALMER AMARANTH. R.C. Bond[1], V.K. Nandula[1], K.N. Reddy[2], and V.F.Carey[3]; [1]Delta Research and Extension Center, Mississippi State University, Stoneville; [2]Crop Production Systems Research Unit, USDA-ARS, Stoneville; [3]Valent U.S.A. Corporation, Olive Branch, Mississippi.

ABSTRACT

The widespread adoption of glyphosate resistant (GR) crops has resulted in the evolution of GR weed biotypes. To date, sixteen weed species worldwide, nine species in the US, and four species in Mississippi including Palmer amaranth are reported to be resistant to glyphosate. Research is currently underway at various institutions to devise effective alternative strategies for management of GR weed populations. One such approach is tank-mixing non-glyphosate mode of action herbicides such as flumiclorac with glyphosate for preplant and or selective inseason postemergence applications to manage GR weeds and to broaden the spectrum of weed control. The mode of action of flumiclorac is inhibition of protoporphyrinogen oxidase, leading to bleaching and wilting of leaf tissue. Herbicides such as flumiclorac that cause disruption of cell membranes inhibit absorption and translocation of other herbicides when applied in combination. The effect of flumiclorac on the uptake and distribution of a systemic herbicide such as glyphosate is not clear. The objectives of this research were to investigate interactions between flumiclorac and glyphosate mixtures on control of GR and glyphosate-susceptible (GS) Palmer amaranth and to determine patterns of absorption and translocation of glyphosate applied alone and in combination with flumiclorac to assign possible role of differential absorption and translocation in establishing cause of interaction between flumiclorac and glyphosate in Palmer amaranth. In greenhouse studies, GR and GS Palmer amaranth plants, 10-cm tall and 3- to 6-leaf stage, were treated with glyphosate at 840 g ae/ha and flumiclorac at 60 g ai/ha (this rate is more than 2X higher than the normal use rate used in common glyphosate tank mixes) alone and in combination. All herbicide treatments included ammonium sulfate at 2% w/w. Control of GR and GS Palmer amaranth was ≤61% and 100% with glyphosate and ≤43% and 37% with flumiclorac, respectively. Addition of flumiclorac to glyphosate decreased GR Palmer amaranth control to 50%, but did not adversely affect GS Palmer amaranth, which was completely controlled. Colby analysis indicated that flumiclorac antagonized glyphosate efficacy on GR Palmer amaranth. Further studies were conducted to investigate patterns of absorption and translocation of ^{14}C-glyphosate when glyphosate was applied alone or in mixture with flumiclorac in GR and GS Palmer amaranth. Absorption of ^{14}C-glyphosate in GR and GS Palmer amaranth was not affected by addition of flumiclorac to glyphosate. However, translocation of ^{14}C-glyphosate was reduced at both 24 and 48 h after treatment with a mixture of glyphosate and flumiclorac compared to glyphosate alone. Reduced translocation is shown to be the basis of the antagonism between glyphosate and flumiclorac.

EPSPS GENE SEQUENCE VARIATIONS IN PALMER AMARANTH FROM DIFFERENT GEOGRAPHICS AND FARMING SYSTEMS. E.A.L. Alcober[1], N.R. Burgos[1], A.L. Rauh[2], B. Rauh[2], T.M. Tseng[1] and K.L. Smith[3]; [1]University of Arkansas, Fayetteville, AR ; [2]Clemson University, Clemson, SC; [3]University of Arkansas, Monticello, AR

ABSTRACT

Glyphosate-resistant Palmer amaranth (*Amaranthus palmeri*) has been documented in Georgia, South Carolina, North Carolina, Tennessee, Mississippi and Arkansas. It has been reported and confirmed in 19 counties in Arkansas. Understanding this complexity and the diversification and spread of this species is critical in dealing with the issue of resistance to herbicides, which has become a threat to crop production. The target enzyme, 5-enolpyruvylshikimate-3- phosphate synthase (EPSPS), is one source of information on the impact of this type of selection pressure on weed populations. This project is conducted to determine EPSPS gene variations of Palmer amaranth populations relative to different production systems. Degenerate primers were designed to amplify fragments of the Palmer amaranth EPSPS gene. This information was then used to design specific primers for Palmer. Multiple populations representing different geographics and cropping systems are included in this experiment. Preliminary information from two resistant and one susceptible population indicated that there are multiple alleles/isoforms of EPSPS; at least five were detected in the plants examined thus far. EPSPS clones between population were 98% identical at the nucleotide level. There were 34 nucleotide polymorphisms detected in the susceptible population compared to 14 nucleotide variations in the resistant accession (MIS-B3). This would indicate that tremendous selection pressure resulted in a more homologous EPSPS gene of the resistant population. Most of the mutations were silent such that the translated protein sequence is 99% identical across and within population. The Palmer amaranth EPSPS is 90% homologous in amino acid sequence relative to *Amaranthus rudis*.

LOSS OF RED RICE SEED DORMANCY IN RESPONSE TO FALL FLOODING AND BURIAL DEPTH.
S. Fogliatto[1], N.R. Burgos[2], T.M. Tseng[2], D.R. Gealy[3], H:R. Black[3], and A. Ferrero[1]; [1]Università degli Studi di Torino, Grugliasco, TO , Italy, [2]University of Arkansas, Fayetteville, AR; [3]USDA Dale Bumper National Rice Research Center, Stuttgart, AR.

ABSTRACT

Red rice (*Oryza sativa* L.) is one of the most problematic weeds in rice production in many regions of the Southern United States. Red rice seeds show a variable level of dormancy which contribute to its persistence in the soil seed bank. Duration of dormancy varies according to the populations and seed storage conditions after dispersion. Seed longevity seems to be not correlated with degree of dormancy, but many studies show to contrasting results. Several environmental factors can affect seed longevity such as soil depth and soil moisture, but also the seed characteristics play an important role. The aim of the study was to investigate the loss of red rice dormancy and seed longevity of 6 red rice populations and 1 rice cultivar buried in the soil. Seeds were collected from 3 counties: Lonoke, Lincoln and Desha, in Arkansas. The burial experiment was carried out in Stuttgart and Kibler AR. Red rice seeds were buried in the soil, both in flooded and non flooded conditions, at 3 depths: 0, 3 and 6 inches. In Stuttgart permanent flood was established in the fall by constructing a bay surrounded by levees. In Kibler flooding was simulated using buckets filled with water and burying these in soil at different depths. At the excavation time, germinated and deteriorated seeds were removed and counted and the remaining seeds were incubated in Petri dishes at 30°C for 10 days. After this period, the non-germinated seeds were treated with tetrazolium to assess viability.

Results showed that the lowest germination occurred at the shallower depth and seeds buried deeper maintained highest viability. Total seed viability did not differ significantly between flooded and non flooded conditions. The non-germinated seeds from flooded condition had higher germination than the non-flooded seeds. This result suggests that in flooded situations, the dormancy of red rice seeds was broken but the seeds were not able to germinate until subjected to favorable conditions. A blackhull awned population (LIN 1) showed the greatest dormancy, while among the other populations no significant difference in viability was observed. In Kibler 2 populations, LON 5 and LON 6, showed the lowest viability in every condition. The cultivated rice displayed the lowest viability (60%) compared to red rice populations. In Kibler, no germination occurred in the field and germination in Petri dishes was also lower compared of Stuttgart for all the population. This first findings suggest a probable low degree of red rice seed longevity. According to previous studies, fall soil tillage need to be delayed until the next spring to permit the germination of red rice seeds in the early fall and in the spring, that facilitate the depletion of the soil seed bank. Moreover, red rice control can be more effective if soil tillage is shallow to avoid the weed seed burial deep in the soil.

MULTIPLE RESISTANCE TO ACCASE- AND ALS INHIBITORS IN ITALIAN RYEGRASS . R.A. Salas[1], N.R. Burgos[1], E.A. Alcober[1], R. Lassiter[2] and R.C. Scott[1]; [1]Department of Crop, Soil, and Environmental Science, University of Arkansas, Fayetteville, AR; [2]Dow AgroSciences

ABSTRACT

Italian ryegrass (*Lolium perenne* spp. *multiflorum*) is a troublesome weed that infests wheat fields. This study was conducted to determine the resistance pattern of ryegrass to ACCase (diclofop & pinoxaden) and ALS (imazamox, mesosulfuron and pyroxsulam) herbicides. Twenty-four accessions from the southern United States collected in 2008 and 2009 were tested for resistance. Among the twelve 2008 Arkansas accessions, 11 were resistant to both diclofop and mesosulfuron, 9 of which also showed cross-resistance to pyroxsulam and imazamox. Seedling bioassays conducted on the 2009 accessions from Mississippi, Georgia and North Carolina revealed that 1 accession (NC-01) was resistant to diclofop and mesosulfuron; 8 accessions exhibited resistance to diclofop, mesosulfuron and pyroxsulam; and 2 accessions were resistant to diclofop, pinoxaden, mesosulfuron and pyroxsulam. The NC-05 accession, which is resistant to the four herbicides, has >49- and 2-fold resistance to diclofop and pinoxaden, respectively. The NC-04 accession has 282-fold resistance to pyroxsulam. This indicates that there are different patterns of cross-resistance to ALS inhibitors and there are cases of multiple resistance to ALS- and ACCase inhibitors. Ryegrass management has become more complex. Weed management options have to be planned prior to the growing season.

RESISTANCE OF AMAZON SPRANGLETOP TO CYHALOFOP AND FENOXAPROP. J.K. Norsworthy and N.R. Burgos; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

ABSTRACT

Two Amazon sprangletop samples from Rapides Parrish and St. Landry Parrish, LA, were not controlled with labeled applications of cyhalofop and fenoxaprop in the field in 2008. That fall, panicles were collected and sent to the University of Arkansas to be screened for resistance. In the initial evaluation, progeny from the field samples were nonresponsive to labeled rates of both herbicides under greenhouse conditions. As a result, experiments were conducted to determine the response of both putative resistant biotypes to cyhalofop over a range of rates relative to a susceptible standard and to evaluate the two putative resistant biotypes for cross and multiple resistance. In the first experiment, cyhalofop was applied to 2- to 3-leaf plants at eight rates. The putative resistant biotypes (12-08 and 14-08) were treated with cyhalofop at rates ranging from 0.28 (1X) to 35.7 lb ai/A (128X) and the susceptible biotype with rates ranging from 0.009 (1/32X) to 1.12 lb/A (4X). Twenty plants of each biotype at each rate were evaluated, with live/dead counts determined 21 days after treatment. Probit analysis was used to develop dose response curves. In the second experiment, ten 3- to 4-leaf Amazon sprangletop plants from both resistant biotypes and the susceptible biotype were treated with labeled rates of glyphosate, glufosinate, paraquat, imazethapyr, pyrithiobac, propanil, clethodim, sethoxydim, quizalofop, fluazifop, fenoxaprop, and cyhalofop. In the dose response experiment, cyhalofop at 0.093 lb/A and 0.25 lb/A killed 50 and 90% of the susceptible plants, respectfully. All except two plants of both resistant biotypes survived the highest tested rate of cyhalofop; therefore, the level of resistance of both Louisiana populations is in excess of 385-fold compared to the susceptible standard. Glyphosate, glufosinate, imazethapyr, paraquat, clethodim, and sethoxydim controlled both resistant biotypes and the susceptible biotype at least 80%. The susceptible biotype was effectively controlled by quizalofop, fluazifop, fenoxaprop, and cyhalofop but the resistant biotypes were not. This research demonstrates that two populations of Amazon sprangletop have evolved resistance to the ‘fop’ herbicides but not the ‘dims’, and that postemergence options in rice are limited to imazethapyr in a Clearfield system. Future research is needed to determine the effectiveness of residual rice herbicides on the resistant biotypes as well as the resistance mechanism.

EFFECTS OF HERBICIDE AND MATURATION STAGE ON SUGAR CONTENT OF SWEET SORGHUM. T. M. Tseng, N. R. Burgos, E. A. L. Alcober, V. K. Shivrain, L. E. Estorninos and P. Sapkota; Crop, Soil and Environmental Sciences Department, University of Arkansas, Fayetteville, AR 72704.

ABSTRACT

The effects of different herbicide treatments and maturation stage on sugar content of sweet sorghum 'Dale' were evaluated. Sweet sorghum (*Sorghum bicolor* (L.) Moench) is a C_4 plant with high biomass production potential and high sugar yield. It has a shorter growing season than sugarcane hence can be grown in many geographic areas, and contains about the same quantities of soluble (glucose and sucrose) and insoluble carbohydrates (cellulose and hemicellulose) as sugarcane. It is therefore recommended to plant sweet sorghum for biofuel production in hot and dry countries to help resolve the problems associated with nonrenewable energy usage. Weed control, however, is a problem in sweet sorghum. The cultivation window is limited, the seedlings are tiny, and the crop is sensitive to almost all the herbicides used in grain sorghum. Previous studies showed that metolachlor applied preemergence (PRE) was tolerated by both 'Dale' and 'Sugardrip' cultivars without yield reduction. This could help expand the label for metolachlor with mesotrione as a tank-mix partner. Experiments were carried out at the University of Arkansas, Fayetteville in 2007 and 2008. Four herbicide treatments and two harvest dates, 95 days after emergence (DAE) and 114 DAE, were tested. Treatments applied were metolachlor 0.48 lb ai/A PRE; metolachlor 1.43 lb ai/A PRE; metolachlor 1.43 lb ai/A PRE plus mesotrione 0.188 lb ai/A PRE; and, untreated check. Total solids were measured by Brix meter and sugar components analyzed by HPLC. Irrigation delayed the sugar accumulation in sweet sorghum, but there was no difference in total sugar content between irrigation regimes. In general, it is better to harvest sweet sorghum at the hard dough stage (109 mg/g FW), than at milk stage (88 mg/g FW), to ensure the highest sugar accumulation. Higher sugar content is mainly due to further sucrose accumulation in late harvested plants. Higher herbicide rate did not reduce sugar accumulation. Sugar content was lowest (134 mg/g FW) at the lowest rate of metolachlor (0.48 lb ai/A) without mesotrione; higher rates of metolachlor (1.43 lb ai/A) and mesotrione (0.188 lb ai/A) resulted in higher sugar content (144 mg/g FW), hence suggesting a beneficial effect of mesotrione as a tank-mix partner.

THE CHALLENGES OF TEACHING WEED SCIENCE IN A DIGITAL ENVIRONMENT – EXPERIENCES IN DISTANCE EDUCATION. G.E. MacDonald, C.A. Stokes**.** and E. Roden. Department of Agronomy, University of Florida and Mitts-Off Productions, Gainesville, FL.

ABSTRACT

Distance education is becoming an increasingly popular and important method of delivering educational material. The advantages of distance delivery are the ability to target students that cannot participate in traditional classroom lectures or labs. Many clienteles utilize this method and often include county extension personnel, persons in full-time employment, and international students. There are several methods of delivering information and all include some form of digital transfer; mailed DVD's, web-based learning platforms, or traditional web-site coupled with email connectivity. Our experiences center on the introductory weed science course, which consists of two 50 minute lectures per week and a two hour lab section once per week. There are many challenges with the transfer of more practical based information, particularly with a laboratory portion of the course. We utilize PowerPoint as the primary method of transferring lecture material and this includes lecture style notes with images to emphasize key points and concepts. In addition, the lectures are narrated through the use of 'Articulate', a program that interfaces with PowerPoint to create narrated slide presentations in Flash format. In addition the material is provided in pdf format to facilitate note-taking and for those students that prefer a more print-friendly version. The major problem with this method of delivery is minimal interactivity.

The laboratory sections of the introductory weed science course are much more challenging and require more specific objectives and expected learning outcomes. Moreover, the methods of evaluating student comprehension and understanding are more cumbersome and complex. For example, seedling identification in the traditional sense involves physical handling of the plants and the construction of a seedling notebook. Distance education does not allow for this, so how does one facilitate this important concept? We have made several attempts, from video clips to narrated video clips with imbedded notes. There are pro's and con's of each approach but funding and expertise will likely drive the method used. DVDs are used to assist in mature weed identification and from this and other reference materials, the students are required to develop a weed collection. Other aspects of the laboratory sections have recently been videotaped and will be provided to the students via download or streaming video from a website. The current format is Quicktime and if compatibility issues arise, these will also be provided on a DVD. The final challenge is herbicide symptomology. Once again, several approaches have been utilized, from planting a crop and weed response to videotaping a field crop and weed response, to digital image collection. A combination of delivery venues, from emailed worksheets to digital images to digital video to narrated PowerPoints are often the best approach. However, the underlying factor is clearly defined objectives with measurable outcomes that can be derived from the delivered material.

SAFETY IN THE WORK PLACE, AN INDUSTRY PRIORITY. C.D. Youmans, and T.J. Holt, Biology Dept., BASF Corp., Dyersburg, TN and RTP, NC.

ABSTRACT

The objective of this educational paper is to introduce equipment and methods to improve the safety of agricultural field research graduate students, as well as more experienced agricultural researchers. This report stresses that "just because you were taught (or self-taught) a method to accomplish a feat with equipment, doesn't mean it is the safest method; perhaps not even the most efficient method". The author and co-author have a combined 50+ years of field experience with testing crop protection compounds, driver trainings, trailering trainings, and HazMat training. Safety items mentioned include: steel toed shoes/boots, quick attach tractor hitch, hydraulic top center link, grade-70+ transport chains, binders (including a ratchet binder), determining "center or gravity" of a tractor for proper loading on a trailer, safety chains for a gooseneck, not carrying dangerous/loose items inside the tow vehicle's cab, and being able to operate a trailer brake controller display.

Also during the presentation, a personal story involving a rototiller (with a curved bottom) accident was explained (top of tiller fell backwards, while attached to the tractors two lift arms, resulting in the tiller walking forward). People should conduct a "walk-around" to inspect equipment before using an implement or spray equipment (such as a pressurized tank), because someone else might have altered that equipment for their personal use, making it dangerous even for experienced users.

NEW HIRE'S PERSPECTIVE ON INDUSTRY INTERVIEWS AND FIRST-YEAR EXPERIENCES. A.T. Ellis, Dow AgroSciences LLC, Indianapolis, IN.

ABSTRACT

Observations from an Industry new hire on first year experiences as Research Biologist with Dow AgroSciences (DAS). Experiences presented include the job roles, responsibilities, DAS business culture/organization, and expectations as a scientist in the Crop Protection Research and Development Dept. The presentation will offer the audience an opportunity to understand what the work load and environment is like in Industry. The author will also cover the Interview Methods utilized by most companies and provide in-site on how graduate students can prepare for an interview. The most utilized method is "Behavioral Interviewing" which uses questions that will predict future work behavior based on past results of behavior. Areas such as Leadership, Teamwork, Accountability, Creativity, Communication, and Flexibility are the key non-technical skills that employers are looking for in potential candidates.

THE PUBLICATION PROCESS IN WEED SCIENCE: WHAT TO DO AND WHAT NOT TO DO. W.K. Vencill, University of Georgia, Athens.

ABSTRACT

In 2009, 50% of the manuscripts submitted for publication in Weed Science were accepted for publication. There are several recurrent reasons many manuscripts submitted for Weed Science are rejected. First pay careful attention to the instructions to authors (http://ws.allentrack.net/html/WSSA_Dir_to_Contrib.pdf). Manuscripts are usually rejected based on the scope of the study, experimental design, or statistical analysis. In particular, most experiments should be repeated in time or space and must provide confirming results. Manuscripts that are accepted follow the path of having a stated objective within the focus of the journal, materials and methods that would allow a reader to ascertain the soundness of the methodology, and results and discussion that answer the objectives put forth by the author. Usually, they have been thoroughly proofed before submission for formatting and grammatical errors.

LSD MISUSE WITH HARD AND SOFT DATA. K. N. Harker; Agriculture & Agri-Food Canada, Lacombe, AB.

ABSTRACT

In weed science, as well as most other scientific disciplines, popular statistical techniques flourish, wane, and sometimes resurge. Unfortunately, some techniques flourish when they should be waning. The continued application of the Least Significant Difference (LSD) technique as a multiple range test for data structured as quantitative series of treatments should wane a bit more (*Agronomy J.* 69:205-208, 1977; *Plant Disease* 68:919-921, 1984; *Weed Research* 28:281–289, 1988). For experiments where authors wish to determine optimal herbicide doses (three or more) of a single herbicide, time-of-day effects on herbicide efficacy, critical time of weed removal, critical weed-free periods, or similar studies with treatment structures in quantitative series, “the correct procedure is use of regression or other curve-fitting Techniques” (Directions for Contributors). The fact that the LSD is not suited for large sets of multiple comparisons and will often lead to excessively liberal conclusions (type I errors) is not the most serious problem. The greater issue is that the use of the LSD on quantitative series of treatments is inefficient (*Weed Res.* 50:5-24, 2010) and can suggest incorrect conclusions. For example, in critical time of weed removal studies, regression analyses will usually detect yield losses long before they are significant when using the LSD as a multiple comparison procedure to compare adjacent means. However, there are exceptions to almost all statistical “rules”, and the use of the LSD as a multiple comparison test could be appropriate for discrete herbicide dose studies (e.g. “label” or “2X” rates) depending on experimental objectives. It is always a good idea to consult a qualified Statistician.

USING MIND MAPPING AS AN ORGANIZATIONAL TECHNIQUE. S.A. Senseman, Texas A&M University System, Texas AgriLife Research, College Station, TX.

ABSTRACT

Staying organized is always a challenge for most professionals. As more responsibilities mount, the challenge grows. Mind mapping is an expression of radiant thinking that is a more natural method for making and recalling notes compared with what most of us have been taught. This method employs central themes and images that are connected by a nodal architecture. Mind mapping can be used in any number of aspects for professionals. The author has found this tool to be particularly useful in writing, drafting presentations, teaching, and as a focal point when working with graduate students. Advantages to this type of approach are that the author visualizes a clear start and finish to the writing assignment, the method is easily expandable, key words are clear, and it engages the mind in an exercise of creative thinking compared to the standard linear notes. The author will provide some thoughts on the potential uses and benefits of mind mapping as a student and as a young professional.

V-10233, A NEW HERBICIDE FOR MID-SOUTH SOYBEANS. V. F. Carey, J. R. Cranmer, W. C. Odle, and J. D. Smith; Valent USA, Corp; Olive Branch, MS.

ABSTRACT

V-10233 is a new herbicide being developed by Valent USA Corporation for use in soybean, minimum tillage field corn and industrial vegetation management (IVM). V-10233 is a premix of flumioxazin and pyroxasulfone at a ratio of 1:1.27 in a 76% WDG formulation. V-10233 provides pre-emerge control of a variety of broadleaf and annual grass weeds with excellent crop safety. Use rates vary depending on soil type with the suggested use rate for Roundup Ready soybeans in the mid-south being 3 oz/A. Data from 2009 demonstrated excellent control of Palmer amaranth and common waterhemp at 56 days after treatment (DAT). Other weeds controlled included hemp sesbania and barnyardgrass. Common cocklebur was not controlled. In the IVM market, V-10233 at 10 oz/A controlled horseweed out to 171 DAT. V-10233 has 2 non-ALS modes of action (Group 14 and Group 15). This, combined with excellent control of resistant weed species such as pigweed and horseweed, will make V-10233 an excellent resistance management tool. Valent anticipates registration of V-10233 during the 3rd quarter of 2010.

CANDIDATE WEED MANAGEMENT SYSTEMS IN DHT COTTON.
J.S. Richburg*, L.B. Braxton, A.T. Ellis, R.A. Haygood, R.B. Lassiter, M.M. Sorribas and L.C. Walton; Dow AgroSciences, Indianapolis, IN.

ABSTRACT

Dow AgroSciences has introduced two new herbicide tolerance traits, commonly referred to as Dow AgroSciences Herbicide Tolerance (DHT) traits. One of these traits, DHT2 is currently being developed in cotton (Gossypium hirsutum L.). The DHT2 trait is a synthetic gene developed by Dow AgroSciences from Delftia acidovorans. In plants, this gene produces an enzyme that metabolizes several herbicides having an aryloxy-alkanoate moiety, including phenoxy auxins (e.g., 2,4-D, MCPA). The DHT2 trait may also be stacked with glufosinate and glyphosate tolerance traits in cotton to improve and enhance the performance of glyphosate and glufosinate cropping systems. Candidate herbicide systems enabled by the traits have broad utility in enhancing the performance of current weed control systems and in improving the durability of the glyphosate and glufosinate cropping system.

Dow AgroSciences scientists as well as external university scientists conducted research during 2009 across the southern U.S. cotton belt to determine the efficacy of 2,4-D alone and in combination with glyphosate and glufosinate on key troublesome weeds in cotton. This summary includes representative results from nine single postemergence application experiments and eleven sequential postemergence application experiments. The experimental design was a randomized complete block with 4 replications. The plot size was approximately 6 ft. by 20 ft long. The targeted weed stage of growth for the initial application was 2 to 4 inches and approximately 14 days between sequential postemergence applications in the sequential application experiments. Treatments were applied with either CO_2 or compressed air small plot application equipment calibrated to deliver 15 GPA.

The data from these experiments indicate that 2,4-D provides good to excellent control of many troublesome weeds found in cotton with either single or multiple applications. The addition of 2,4-D to glyphosate or glufosinate based herbicide systems improved both the level of control and consistency of control demonstrating the power and reliability of 2,4-D based systems.

BROADHEAD™ HERBICIDE, A NEW GRASS AND BROADLEAF HERBICIDE FOR RICE. J.S. Wilson, H.R. Mitchell, and J.P. Reed, FMC, Philadelphia, PA

ABSTRACT

Broadhead™ (F7275) is a new herbicide in developed by FMC Corporation for weed control in both conventional and Clearfield© rice production systems. Excellent rice tolerance was observed with Broadhead. Rice injury in the form of stand reduction or stunting was not observed. At 7 days after treatment (DAT) for conventional rice, Broadhead treated rice resulted in less than 2% discoloration / necrosis and recovered from the initial discoloration by 30 DAT. At 7 days after treatment (DAT) for Clearfield© rice production systems, Broadhead treated rice resulted in less than 8% discoloration / necrosis and recovered from the initial discoloration by 30 DAT.

Broadhead provided excellent control (> 85% at 14-21 DAT) of entireleaf and ivyleaf (*Ipomoea hederacea*), palmleaf (*Ipomoea wrightii*) and pitted (*Ipomoea lacunosa*) morningglory, hemp sesbania (*Sesbania exaltata*), Pennsylvania smartweed (*Polygonum pensylvanicum*), and spreading dayflower (*Commeline diffusa*) at a rate of 0.175 to 0.53 lb ai/A. Excellent grass control was also observed against barnyardgrass (*Echinochloa crus-galli*) and broadleaf signalgrass (*Bracharia platyphylla*).

These data support acceptable rice tolerance to Broadhead when applied at rates of 0.175 to 0.53 lb ai/A (4 to 12.1 oz/A formulated, respectively). At these rates and application methods, Broadhead should prove to be a valuable new weed control tool in rice through its multiple modes of action, rapid activity and excellent broadleaf and grass weed efficacy. In a Clearfield© production system, Broadhead provides control of key weed species that escape NewPath® with its two unique non-ALS modes of action. Broadhead provides both contact and residual grass control with excellent control of hemp sesbania, morningglories, jointvetch species, smartweed and other broadleaves. In a conventional or hybrid production system, Broadhead provides an economical base herbicide program with proven active ingredients providing effective control of a wide variety of yield robbing grass and broadleaf weeds. . Results presented herein are a compilation of experiments conducted in 2009 by private and university personnel with Broadhead 70 DF applied early-post (EPOST) at a rates ranging from 0.175 to 0.53 lb ai/A for crop tolerance, weed efficacy and subsequent effects on yield.

HERBICIDAL ACTIVITY OF RING-OPEN FORM OF 5-KETOCLOMAZONE. J.D. Mattice, J.K. Norsworthy, and M. McIntosh. Department of Crop, Soil, and Environmental Sciences and Department of chemistry, University of Arkansas, Fayetteville.

ABSTRACT

Continued use of clomazone for weed control in rice has lead to clomazone-resistant populations of barnyardgrass. It has been reported that the active compound is actually 5-ketoclomazone, a metabolite of clomazone. We have found that 5-ketoclomazone is easily hydrolyzed in water with a half life of one to two hours to give a ring opened 5-ketoclomazone acid. The 5-ketoclomazone acid in nutrient solution affects both clomazone resistant and susceptible populations of barnyardgrass similarly causing chlorosis. The response of both the resistant and susceptible populations is similar to that of the susceptible population to clomazone. The 5-ketoclomazone has post-emergence activity toward barnyardgrass as well as other weeds. Pre-emergence activity is minimal to nonexistent, especially at elevated temperatures. The 5-ketoclomazone appears to be rapidly metabolized in soil at 32 C.

PERFORMANCE OF GLYTOL™ + LIBERTYLINK® COTTON TECHNOLOGIES – A US COTTON BELT PERSPECTIVE. G. Henniger, M. Rinehardt, S. Baker, R. Humphries, J. Holloway, and L. Trolinder; Bayer CropScience, Lubbock, TX 79423.

ABSTRACT

Bayer CropScience has developed in-house glyphosate tolerant, GlyTol™ cotton, expressing the 2*mepsps* gene and stacks of GlyTol with LibertyLink® cotton. Contingent upon regulatory approvals, GlyTol + LibertyLink cotton is planned for commercial release in 2010, and will provide US cotton growers with new cotton varieties with season-long tolerance to commercial glyphosate herbicide formulations as well as tolerance to Ignite®280 (glufosinate ammonium) herbicide at levels producers are accustomed to in current commercial varieties.

Extensive field testing of GlyTol cotton was conducted internally and with private researchers and University scientists in 2006-2008 and with GlyTol + LibertyLink in 2008 and 2009 across the US cotton belt. These trials have recorded no adverse effects on GlyTol or GlyTol + LibertyLink cotton plant establishment, plant height, maturity, vigor, yield, or quality following multiple applications at full labeled rates of a number of commercial formulations of glyphosate. The GlyTol + LibertyLink cotton was also tested with multiple applications of Ignite 280 and glyphosate at full labeled rates alone, sequentially, or in combination with each other with no adverse agronomic effects.

Once commercially available in elite germplasm, GlyTol + LibertyLilnk technology will provide US cotton growers with the option of over the top applications from more than one non-selective herbicide mode of action, which can be an important tool in managing weed resistance.

SULFONYLUREA AND QUIZALOFOP TOLERANCE TRAITS IN SORGHUM – NEW WEED MANAGEMENT TOOLS FOR SORGHUM PRODUCTION. R.N. Rupp, D.J. Meadows, D.W. Saunders and W.J. Schumacher; DuPont Crop Protection, Denver, CO.

ABSTRACT

Kansas State University Researchers have developed non-GMO sulfonylurea and quizalofop herbicide tolerance traits in sorghum. DuPont Crop Protection has acquired exclusive commercial rights to both tolerance traits and to the use of chemistries enabled by those traits. DuPont Crop Protection will license these herbicide tolerance traits to interested sorghum seed companies. Herbicide active ingredients including nicosulfuron, rimsulfuron and metsulfuron methyl are being evaluated for the sulfonylurea tolerant sorghum and Assure® II for the quizalofop tolerant sorghum. New herbicide offerings enabled by the traits will allow sorghum producers to use new postemergence solutions for grass and broadleaf control in sorghum that have previously not been available. The sulfonylurea trait enables the use of herbicides that control grass and broadleaf weeds with both contact and residual activity. The quizalofop trait enables the use of Assure® II for postemergence control of grass species. A parallel launch of sorghum seed products with complimentary DuPont Crop Protection herbicides is planned, pending herbicide trait development and EPA registration of herbicides.

KIXOR® HERBICIDE TECHNOLOGY: 'THERE'S A BURNDOWN REVOLUTION COMING'.

G. Stapleton and C. Youmans; BASF Corporation, Dyersburg, TN.

ABSTRACT

Kixor herbicide technology (saflufenacil) was labelled for use in a wide range of crops in September 2009. It will be marketed in a family of products including two solo products, Sharpen™ herbicide for use in most major row crops and Treevix™ herbicide for use in tree fruit and tree nut, and two pre-mix products, Integrity™ herbicide (saflufenacil + dimethenamid-P) for use in corn and OpTill™ herbicide (saflufenacil + imazethapyr) for use in soybean and pulses. Kixor inhibits the protoporphyrinogen oxidase (PPO) enzyme, is a member of Herbicide Group 14 and is the only active ingredient in the pyrimidinedione class of chemistry in the North American market. Kixor provides fast and complete burndown and/or residual control of over 70 major broadleaf weeds including acetolactate synthase, triazine and glyphosate resistant biotypes. For optimum burndown performance, Kixor must be applied with an adjuvant system of methylated seed oil (MSO) at 1% v/v plus ammonium sulfate (AMS) or urea ammonium nitrate (UAN). A representative four-year summary of broadleaf weed control showed that Kixor plus glyphosate provided fast, effective control of horseweed, dandelion, giant ragweed, and common lambsquarters greater than 94% within one to two weeks after application, whereas 2,4-D plus glyphosate achieved only 72%, 64%, 83%, and 87% control of these weeds, respectively.

AN UPDATE ON THE INVASIVE PLANT ATLAS OF THE MIDSOUTH PROJECT. J.D. Madsen and G.N. Ervin; Geosystems Research Institute and Department of Biological Sciences, Mississippi State University, Mississippi State.

ABSTRACT

Invasive weedy plants are a widespread problem throughout the United States. Their growth is often widely dispersed, with little scientific ability to predict why they occur in a given location. In addition, historical human activities such as urbanization, agriculture, and forestry have a marked effect on the distribution and spread of invasive plants. This project will quantify relationships of weed distribution and spread with land use, then use that information directly in educating agriculture stakeholders, natural resources managers, and other interested parties on potential human-induced opportunities for invasive species spread. The Invasive Plant Atlas of the Mid-South (IPAMS) is an integrated research and extension project to develop an invasive plant program for the Mid-South states of Alabama, Arkansas, Louisiana, Mississippi, and Tennessee. Research activities include conducting systematic regional vegetation surveys to assess the distribution of key invasive plants, developing models for predicting the occurrence of target species based on land use and cover, and evaluating the relative effectiveness of professional versus volunteer surveys. For the research component of this project, we have surveyed over 470 points throughout the state of Mississippi, providing data on more than 800 plant species, including more than 70 not native to the region. Initial analyses of these data have demonstrated a strong correlation of land use/cover with the presence of exotic plant species, especially key invaders such as cogongrass. Outreach and extension activities include developing training programs for volunteers to identify and report invasive species using IPAMS, developing an efficient Early Detection and Rapid Response (EDRR) system for invasive plants, developing best management information, and developing an online mapping system. To date, we have trained numerous individuals in identification of our target forty species. We are in the process of developing management information for these species. Our webpage (www.gri.msstate.edu/ipams) is operational, with over 8400 records of 134 species from 29 states, entered and many more observations completed but not entered into the database.

SEED BANK DYNAMICS IN THE INVASION ECOLOGY OF *Scleria lacustris*, AN ANNUAL SEDGE IN SEASONAL WETLANDS. C.C. Jacono*, K.A. Langeland, and A.M. Fox; Center for Aquatic and Invasive Plants and Department of Agronomy, University of Florida, Gainesville, FL 32653

ABSTRACT

Seed banks and their function in seedling regeneration are crucial in the perseverance of annual species, regardless of their status as weedy or rare. In this study we investigated the significance of the seed bank in the invasion ecology of *Scleria lacustris* (Wrights nut rush), an annual species severely impacting seasonal wetlands of south central Florida.

The study objectives aimed to 1)characterize the expected seed bank, 2)detail the demographic patterns of seedling emergence, 3)determine the seed bank to seedling stage transition (proportion of seed bank contributing to regeneration), and 4)to gain information relative to the mechanisms driving the recurrence of *S. lacustris*.

Substrates of contrasting wetlands were sampled twice, before and after seedling emergence, during 2004 to characterize the seed bank. Through the pairing of techniques in seed extraction and tetrazolium assay, we were able to estimate the depth, density, depletion, and persistence of viable seeds according to the number of intact seeds isolated for this one particular species. Results demonstrated a dense seed bank (up to 2,331 seeds m^{-2}) occurring at a high viability (mean 88%) in the top 9cm of soil before springtime germination. Although seeds were concentrated with organic matter in the upper 3cm, depletion in the seed bank increased with depth following regeneration. Regardless of a significant depletion in the postemergence seed bank and a monoculture of *S. lacustris* seedlings produced, a substantial seed bank remained after regeneration had ceased. Analysis confirmed a seed bank strategy of persistence and subsequently an impending source for reinvasion and continued threat to community integrity.

Seedlings of *S. lacustris* and hydrologic variables were monitored once to twice monthly through the growing season to detail the demographic patterns in regeneration. The number of seedlings that emerged was independent and not representative of the seed bank density. Seedlings emerged in a series of temporal cohorts and strong evidence pointed to hydrologic conditions (flooding) as a mechanism for directly regulating seedling regeneration.

This study was part of a larger project founded on the prediction that seed banks and regeneration events have specific strategies that are selected for and driven by the fluctuating hydrologic cycles of the seasonal marsh habitat. By understanding these strategies, we are better equipped to make inferences on recurrence and distribution of an invasive species under the environmental conditions that govern the habitat.

CEMETERIES, GYPSIES, AND BLUE SEDGE (*Carex breviculmis*). Charles T. Bryson, USDA-ARS, Stoneville, MS and Lucas Majure, Department of Botany University of Florida, Gainesville.

ABSTRACT

Non-native weeds present a huge threat to natural communities and disturbed lands throughout the U.S. An unknown sedge was discovered in Meridian, Mississippi during routine field surveys in 2007. After comparing the plants to herbarium material and texts, it was determined to be blue sedge (*Carex breviculmis* R. Br.). This sedge is native of Asia, Australia, and the Indian Subcontinent where it is a weed of sandy coasts, exposed grassy slopes, water courses, open grasslands, forest margins, and disturbed areas. Blue sedge is highly variable with plants4 to 30 cm tall and usually densely tufted from short rhizomes and fibrous roots. The stems are triangular in cross section, like most other weedy sedges. Leaves are usually shorter than the fruiting stems. There are one male spike and two to three female spikes on the same fruiting stem. The perigynia (sacks surrounding the achene) are green turning tan at maturity and each perigynia is subtended by a scale with a long awn. The achenes are unique from native Carex species because they possess a swollen area at the apex which is visible with a hand lens or under a microscope. Unlike many sedge species, blue sedge plants remain green during winter months, but only produce flowers and seed from March to June in Mississippi. Without flowers or fruit, blue sedge plants are difficult to distinguish from other sedge species.

Surveys determined that populations of blue sedge are established from eight sites in two Mississippi counties, Lauderdale and Newton. Population levels vary from several hundred to several hundred thousand plants in flowerbeds, lawns, roadsides, turf, and a natural area. Five of the eight sites are in or near cemeteries or churches and three are near railroads. Air travel, interstate highways, railroads, and a Gypsy connection seem to be the most probable possibilities of introduction. Surveys on Key Field and the Naval Air Station and along the highways in 2009 yielded no occurrences of blue sedge. The largest two populations of blue sedge are in the Rose Hill (Gypsy) and Magnolia cemeteries in Meridian and populations near railroads are in areas frequented by transient humans and/or near cemeteries. The Gypsy connection may be the most plausible vector for introduction. The most probable means of initial introduction seems to be from human visits to the Rose Hill Cemetery in Meridian, where Gypsy (Roma) royalty was buried as early as 1915. Since 1915, visitors to the cemetery have left tokens of respect on grave markers of Gypsy royalty. Secondarily, blue sedge was spread to other cemeteries, church lawns, construction sites, and along railroads from contaminated soil and mowing, weed-eating, and grave digging equipment. Blue sedge does not seem to present the threat of the nutsedge species; however, its population sizes and ability to spread seem to indicate that it can become a weed problem in lawns, turf, and fruit and nut crops and displace native flora in additional areas of the U.S. Additional research is needed to develop management strategies for blue sedge.

PRESENCE-ONLY METHODS FOR PREDICATION OF EURASIAN WATERMILFOIL HABITAT. J. M. Prince, J. D. Madsen, D. R. Shaw, and C. P. Brooks; Mississippi State University, Mississippi State, MS

ABSTRACT

A number of modeling techniques have been developed that predict habitat suitability based on species presence (e.g., Mahalanobis distance, Maxent, etc.). While presence-only models have limitations, presence data is often the only data available for regional to large-scale research. Additionally, sampling methods can often force the use of presence-only methods because a lack of data in specific areas cannot be treated as absence of a species.

In this study, Mahalanobis distance and Maximum Entropy were used to characterize and predict habitat for the invasive aquatic macrophyte, Eurasian watermilfoil (*Myriophyllum spicatum*). Both methods were applied within a GIS framework. The state of Minnesota was divided into a 500m grid using ArcGIS and Hawth's Tools. Non-water areas were removed from the sample. Data for analysis were obtained from the Minnesota Department of Natural Resources and several units at the University of Minnesota. These included: Secchi depth, total alkalinity, Carlson's Trophic State Index, lake size, distance from lake access (i.e., boat launch), distance from road, distance from reported bass habitat, *M. spicatum* presence, and where available, absence. Data were weighted for analysis using flow accumulation rates obtained from the National Hydrography Dataset Plus.

Mahalanobis distances were calculated for each grid cell and converted to χ^2 p-values with n-1 degrees of freedom (where n = the number of predictor variables). Re-classed output was compared to known values of presence and absence for validation. Validation included calculating Cohen's kappa, specificity, and sensitivity. Low kappa (0.1) along with sensitivity of 0.55 and specificity of 0.75 suggest that the Mahalanobis distance model is a poor predictor of *M. spicatum* habitat.

In contrast, the Maxent approach resulted in a highly predictive model. The area under the receiver operating curve for the model, which indicates the quality of the fit, is 0.968. Bass habitat (45%) followed by Carlson's TSI (28%) explained the greatest variation in the model. Lake access contributed the least (0.6%) to the model, confirming the conclusions of previous authors with regard to anthropogenic contributions to *M. spicatum* presence. Results of this analysis indicate that while current *M. spicatum* habitat is correctly characterized by the model, the weed may not have reached all potential habitats due to some limiting factor, probably time.

DEFINING INVASIVE PLANTS: THE CHARACTERIZATION OF NON-NATIVE PLANTS SOLD IN TENNESSEE. R.M. Koepke-Hill, G.A. Armel, W.E. Klingeman, and J.J. Vargas, Department of Plant Sciences, University of Tennessee, Knoxville.

ABSTRACT

Popular landscape plants tend to share common characteristics such as prolific reproductive capabilities, adaptability to stressful environments, resistance to common diseases and pests, allelopathic properties, and rapid establishment. The traits that allow these plants to thrive in new environments may also provide them opportunities to invade natural areas and compete with native flora. Tree of heaven (*Ailanthus altissima*), mimosa (*Albizia julibrissin*), butterfly bush (*Buddleja davidia*), burning bush (*Euonymus alata*), wintercreeper (*Euonymus fortunei*), English ivy (*Hedera helix*), Japanese bloodgrass (*Imperata cylindrica*),Chinese privet (*Ligustrum sinense*), bush honeysuckle (*Lonicera* spp.), Chinese silvergrass (*Miscanthus sinensis*), princesstree (*Paulownia tomentosa*), golden bamboo (*Phyllostachys aurea*), Callery pear (*Pyrus calleryana*), and Chinese wisteria (*Wisteria sinensis*), and periwinkle (*Vinca minor*) are popular ornamental plants that are not native to North America, but can be purchased in Tennessee, or are readily available at online nursery venues for direct shipment into Tennessee. Of the aforementioned species, Chinese privet, tree of heaven, mimosa, callery pear, princesstree, bush honeysuckle, Chinese wisteria, English ivy, golden bamboo, and wintercreeper have been identified as non-cultivated invaders along Tennessee roadsides during a recent vegetation management survey. This presentation will discuss the political, social, and environmental issues related to non-native species that propagate in areas outside of their original introduction.

MEASUREMENT OF DICAMBA VOLATILITY IN THE FIELD. T.C. Mueller, University of Tennessee, Knoxville; D.M. Haile and D.R. Wright, Monsanto Company, St. Louis, MO.

ABSTRACT

Off-target movement and injury to non-target plants can be a concern with certain agricultural pesticides. Off-target movement can occur through spray particle drift or volatilization and subsequent movement of vapors from the sprayed area. Dicamba is a product where volatility has been shown to have the potential to injure off-target plants. Part of the difficulty in determining if volatility is an issue is that it can easily be confounded with spray particle drift. An objective of this research was to determine if an air sampling method could quantify the amount of volatile dicamba present from commercial dicamba applications in the field. Under laboratory conditions, 12.4 to 21 micrograms of dicamba per cubic meter of air over 96 hours were measured to volatilize from soil treated with the equivalent of 0.5 lb/A ai Dicamba. Our research examined dicamba volatility under field conditions in three separate experiments. Field plots were 50 ft by 50 ft, with a 400 ft linear buffer between each main plot. NoTill RoundupReady® Soybeans had previously been planted in 30 inch rows at 45 lb seed per acre into plots with heavy plant residue, the soybeans were at the V2 to V3 growth stage at the time of dicamba application. Three treatments were examined; an untreated control plot, dimethylamine (DMA) salt of dicamba (Banvel®), and the diglycolamine (DGA) salt of dicamba (Clarity®). Each dicamba formulation was applied at 1.0 pound acid equivalent per acre. Treatments were applied in 20 gallons per acre of water carrier using a 6 nozzle hand-held backpack sprayer equipped with 8002 flat fan nozzles operated at 40 psi. All applications were made in the early morning from 6:00 AM to 6:25 AM and applied to plants with heavy dew present. There was essentially no wind (< 1 mph). After waiting approximately 10 minutes for all spray particles to settle, samplers were placed inside the plot area to collect air samples and determine an accumulative concentration of dicamba over time Samples were collected at intervals over 72 hours after treatment by capturing volatile compounds in polyurethane foam (PUF). The samples were kept frozen until later analysis. Our methods successfully quantified dicamba, and had sensitivity to the parts per trillion levels. The sampling collectors maintained uniform air flow ($10ft^3$/min) under field conditions, and were successfully operated for multiple days. The amount of dicamba volatility detected in these field trials was 0.12 – 0.24 $\mu g/m^3$ for Clarity® and 0.35 – 0.42 $\mu g/m^3$ for Banvel® over 60 – 72 hours. These values are substantially lower than the laboratory values previously reported. The majority of volatiles were collected in afternoon of the first day, which was coincident with the highest temperatures. There was minimal dicamba detected at night or during later sampling intervals. We detected more volatile dicamba from DMA dicamba than DGA dicamba in this test system. Rainfall did not completely eliminate volatility detection. These data indicate that total environmental loadings from volatilization of dicamba from a NoTill field may not be as high as indicated by previous laboratory findings from soil.

GLUFOSINATE EFFECTS ON NITROGEN FIXATION AND GROWTH OF GLUFOSINATE-RESISTANT AND GLUFOSINATE-SENSITIVE SOYBEAN. R.M. Zablotowicz, K.N. Reddy, W. Ding, N. Bellaloui, and R.E. Gordon. Crop Production Systems Research Unit, USDA-ARS, Stoneville, MS

ABSTRACT

The availability of new soybean cultivars genetically modified with resistance to glufosinate is providing a needed tool in management of glyphosate-resistant weeds. The mechanism of herbicidal activity by glufosinate is the inhibition of glutamine synthetase and subsequent interference with ammonium assimilation. Glutamine synthetase is also a pivotal enzyme in the regulation of the nitrogen fixation process. As it is possible that nitrogen assimilation/nitrogen fixation may be inhibited by exposure to glufosinate, field studies to assess the effects of glufosinate on nitrogen fixation, nitrogen assimilation and yield in glufosinate-sensitive and glufosinate-resistant soybean were initiated.

A field study was conducted in 2009 at the USDA-ARS, Crop Production Systems Research Farm, Stoneville MS on a Dundee silt loam soil. Glufosinate-resistant soybean (Liberty-Link S080120), and glufosinate-sensitive soybean (Roundup-Ready AG4605RR/S and Conventional Williams 82) were planted on May 18, 2009 in four rows spaced 102-cm apart and 13.7 m long with six replications of glufosinate treated or untreated plots. Glufosinate at $1/10^{th}$ rate of 45 g/ha was applied once at the 2-3 trifoliate stage to glufosinate-sensitive soybean and 45 g/ha to Liberty-Link soybean twice at the 2-3 trifoliolate stage followed by the same rate at the 6-7 trifoliolate stage. No additional herbicide was applied to the no- glufosinate controls and all plots were hand weeded as required. Plants were harvested from treated and non-treated plots at 3 and 12 DAT and roots were assayed for nitrogenase activity using the acetylene reduction assay, root respiration, and nodulation, and shoots were assayed for biomass, chlorophyll content, and leaf nitrogen content. Leaf nitrogen content was also determined at the R2 growth stage. Seed yield was determined at maturity and nitrogen content was likewise determined from the harvested grain.

Application of glufosinate to sensitive soybean resulted in a transient speckling of treated leaves and a reduction of chlorophyll 3 DAT; however, no effect on chlorophyll content was observed in Liberty-Link soybean or new leaves formed 12 DAT in any cultivar. No effect of glufosinate on shoot, or nodule biomass was observed regardless of cultivar although a significant reduction of nitrogenase activity was found in Roundup-Ready soybean at 12 DAT and in Liberty-Link soybean 12 d after second POST glufosinate application. Glufosinate significantly increased leaf nitrogen content at 3 and 12 DAT in conventional soybean, 3 DAT in Roundup-Ready soybean and at 3 and 24 d after second POST application in Liberty-Link soybean. No effect of glufosinate drift rate on seed yield of glufosinate sensitive soybean or label rate on Liberty-Link soybean was observed, however seed nitrogen content of Liberty-Link and Roundup-Ready soybean was increased by glufosinate compared to untreated, while untreated Williams 82 soybean had higher seed nitrogen content compared to treated soybean. These results suggest that glufosinate sensitive soybean can adequately compensate to exposure of a moderate drift rate, and that yield was not compromised. The alterations in nitrogen content observed may indicate some metabolic disturbances in nitrogen fixation/assimilation and this will be further explored in tissue analysis using isotopic nitrogen analysis and analysis of amino acid/ammonium pools.

THE EFFECT OF WHEAT HERBICIDE CARRYOVER ON DOUBLE-CROP COTTON AND SOYBEAN.
T.L. Grey[1] and L.B. Braxton[2]. [1]Department of Crop and Soil Science, University of Georgia, Tifton. [2]Dow AgroScience, Travelers Rest, SC.

ABSTRACT

Pyroxsulam is wheat residual herbicide available for use under the trade name Powerflex®. It will be an important component for herbicide resistant weed control management in Georgia wheat. Many farmers double crop wheat with soybean or cotton. However, little information about pyroxsulam residual activity to these rotational crops is available. Therefore, studies were conducted from 2007 to 2008 and 2008 to 2009 in soft red winter treated wheat to evaluate rotational crops of soybean and cotton after spring applications. Pyroxsulam, mesosulfuron, and sulfosulfuron at 1x and 2x rates were applied approximately 90 days before planting rotational crops. Pyroxsulam was applied at 18.5 or 37 g ai/ha, mesosulfuron at 150 and 300 g ai/ha, and sulfosulfuron at 35 and 70 g ai/ha. Studies were conducted in Georgia at Tifton on a Tift loamy sand soil and Plains on a Greenville sandy loam soil in order to evaluate two different soil types. After wheat harvest, soybean (Pioneer 97M50) and cotton (DP 0949 B2RF) were evaluated for injury, stand, and height and yields. For both locations herbicide, wheat tolerance to proxysulam was excellent with little to no visual injury 7 to 90 days after application (DAP). Sulfosulfuron and mesosulfuron injury was similar to proxysulam. Wheat injury was transient and no affect on yield. Soybean for both locations had no differences in stand establishment for any herbicide treatments. There were no height differences between herbicides in both locations and herbicide timings. With the exception of sulfosulfuron at the Plains location with the 90 day treatment, there was little to no herbicide damage. There was no effect of herbicide treatment on cotton stand. At the 90 day treatment there was noticeable herbicide damage by sulfosulfuron to the cotton. For the two studies evaluated, there was little to no difference in residual activity on rotational crops between pyroxsulam and other wheat herbicides when the label rate was used in wheat.

BIOLOGICAL RESPONSES TO GLYPHOSATE DRIFT FROM AERIAL APPLICATION IN NON-GLYPHOSATE-RESISTANT CORN. W. Ding, K.N. Reddy, R.M. Zablotowicz, S.J. Thomson, Y. Huang, and L.J. Krutz; Crop Production Systems Research Unit, USDA-ARS, Stoneville, MS.

ABSTRACT

The widespread adoption of glyphosate-resistant (GR) crops in the United States has led to an unprecedented increase in glyphosate usage in recent years. Glyphosate is applied multiple times in a year using either ground or aerial equipment. Numerous studies have shown that in virtually all pesticide applications, a small fraction of the pesticide drifts downwind and can be deposited on off-target surfaces. Glyphosate drift, however, is particularly important because it is a non-selective herbicide and highly active on sensitive plant species at low rates. GR crops are frequently planted adjacent to non-GR crops. Corn is usually planted in March-April and soybean and cotton are planted in April-May in Mississippi. Thus, corn has greater potential for exposure to glyphosate drift from pre-plant applications than soybean and cotton. In 2008, 56 cases of herbicide drift onto non-target crops were reported in Mississippi, of which 58% were due to glyphosate ground and aerial applications (John Campbell, Mississippi Department of Agriculture and Commerce, personal communication). Glyphosate drift from aerial application onto susceptible crops is inevitable, yet the biological responses to glyphosate drift in crops are not well characterized. This study examines the biological responses to glyphosate drift from aerial application in non-GR corn. The objectives of this research were to determine the effect of glyphosate drift from a single aerial application on visual injury, chlorophyll content, shikimate level, plant height and shoot dry weight in non-glyphosate resistant corn.

An aerial application study was conducted in 2009 at the USDA-ARS, Crop Production Systems Research Farm, Stoneville, MS. Non-GR corn (Pioneer 31P41) was planted on July 23, 2009 in eight rows spaced 102-cm apart and 80-m long with four replications. Aerial application of glyphosate was made over the corn (4-leaf stage) on August 12, 2009. Glyphosate (Roundup Weathermax®) at a rate of 866 g ae/ha and 2.6 g Rubidium Chloride tracer was applied with an Air Tractor 402B spray airplane equipped with fifty-four CP-09 spray nozzles delivering 46.8 L/ha at a release height of 3.7 m with an operating speed of 225 km/h over an 18.3-m-wide swath. One spray run west to east direction in the center of the field perpendicular to corn rows was flown over a marked swath line. On site weather conditions were recorded during the 4 s flight run: wind speed was 11.2 km/h from the northeast direction; average air temperature was 28.5°C; and relative humidity was 72%. The downwind drift sample locations were marked at 0, 3, 6, 11, 15.8, 25.6, and 35.4 m as measured from the downwind edge of 18.3 m wide swath. One upwind sample location at 35.4 m as measured from the upwind edge of the 18.3 m wide swath was included as a control (corn not exposed to glyphosate) for comparison of biological responses to drift. The biological data were collected from all eight rows in a 0.5-m-wide band centered over the sampling location except at 0 m. For the 0 m sampling location, data were collected from the 18.3 m spray swath. Sampling location at 0 m represented highest exposure to glyphosate and at 35.4 m upwind sampling location represented no exposure to glyphosate.

One week after application (WAA), corn was killed at 3 m from edge of the spray swath with injury decreasing to 18% at 35.4 m downwind. Chlorophyll content decreased from 78% at 6 m to 22% at 15.8 m and chlorophyll content was unaffected beyond 25.6 m at 1 WAA. Shikimate level in corn was 349% higher at 0 m compared to shikimate level in corn at 35.4 m upwind. Shikimate level decreased from 333% at 3 m to 93% at 15.8 m and shikimate levels were unaffected beyond 25.6 m downwind. Plant height and shoot dry weight decreased gradually with increased distance. At a distance of 35.4 m, corn height was reduced by 14% and shoot dry weight by 10% at 3 WAA. Visual injury and other biological (chlorophyll, shikimate, and plant height and shoot dry weight) responses point to same conclusion, that is, injury from glyphosate aerial drift is highest at edge of the spray swath and decreases gradually with distance. The LD_{50} (the lethal distance that drift must travel to cause a 50% reduction in biological response) ranged from 12 to 26 m among the biological parameters when wind speed (stable in direction) was 11.2 km h^{-1} and using a complement of CP-09 spray nozzles on Air Tractor 402B agricultural aircraft.

THE TRANSPORT OF GLYPHOSATE AND ITS DEGRADATE AMPA IN THE SURFACE WATERS OF AGRICULTURAL WATERSHEDS. R.H. Coupe, S.J. Kalkhoff, and P.D. Capel; U.S. Geological Survey, Jackson, MS 39208.

ABSTRACT

Glyphosate is the most widely used herbicide in the world, and its use has increased substantially in the last few decades. Glyphosate is used in the production of many crops and is heavily used on genetically modified (GM) soybean. Most (greater than 90 %) of the soybean grown in the United States is GM soybean, with some states producing an even higher percentage: South Dakota, 97%, and Mississippi, 96%, in 2007. Glyphosate use, particularly on crops genetically modified to be glyphosate-tolerant, has replaced the use of many other herbicides. Glyphosate is purported to be more environmentally friendly than many other herbicides because of stronger adsorption, decreased mobility, a generally shorter half-life, a smaller number of herbicide applications, and lower fossil fuel use due to the increase in conservation tillage and lower toxicity. However, there are indications that, under some circumstances, glyphosate will move offsite and degrade surface-water quality. In 2007 the U.S. Geological Survey, as part of the National Water Quality Assessment Program, began an intensive study to examine the transport of glyphosate and AMPA in two agricultural basins: the Bogue Phalia basin in northwestern Mississippi and the South Fork Iowa River (SFIR) basin in Iowa. Each of these basins has one or two smaller basins that are concatenated within the larger basin.

One hundred percent of the water samples from the Bogue Phalia and its two subbasins had detectable levels of glyphosate and AMPA; whereas only 59 percent of the water samples from the South Fork Iowa River and 72 percent of water samples from its subbasin had detectable levels of glyphosate. The median concentration of glyphosate for the Bogue Phalia and the SFIR was 0.96 and 0.07 ug/L, respectively. The flux of glyphosate as a percent of use was higher in the Bogue Phalia than in the SFIR, 0.33 and 0.12 percent, respectively. These results are unexpected as the overall application rate for the SFIR basin was higher than for the Bogue Phalia basin, although the application period in the Bogue Phalia basin was longer.

Although other factors are important, the major influence on the fate and transport of glyphosate in the Bogue Phalia and the SFIR is related to the amount of rainfall runoff that reaches the stream as overland flow or percolated through the soil. The SFIR basin is heavily tile drained, and there is little overland runoff. Most of the water reaches the streams through the tile drainage system after percolating through about 1 meter of soil. Because of glyphosate’s high affinity for soils, this process filters much of the glyphosate before it reaches the tile drain. The heavy clay soils in the Bogue Phalia basin allow little infiltration of rainfall, and most water reaches the stream by overland runoff. This lack of soil infiltration, coupled with the longer application period, accounts for the large and ever present concentrations of glyphosate in the surface waters of the Bogue Phalia.

AGRONOMIC AND ENVIRONMENTAL IMPLICATIONS OF ENHANCED S-TRIAZINE DEGRADATION. L.J. Krutz[1], D.L. Shaner[2], M.A. Weaver[3], R.M.T. Webb[4], R.M. Zablotowicz[1] and K.N. Reddy[1]. [1]United States Department of Agriculture, Agriculture Research Service, Crop Production Systems Research Unit, Stoneville, MS 38776, USA; [2]United States Department of Agriculture, Agricultural Research Service, Water Management Research Unit, Fort Collins, CO 80526, USA; [3]United States Department of Agriculture, Agricultural Research Service, Biological Control of Pests Research Unit, Stoneville, MS 38776; [4]United States Department of the Interior, United States Geological Survey, Lakewood, Colorado 80225.

ABSTRACT

Novel genes enabling rapid detoxification of *s*-triazine herbicides occur in at least four bacterial phyla and are implicated in the development of enhanced degradation on all continents except Antarctica. Moreover, enhanced degradation occurs in at least nine crops and six crop rotations that rely on *s*-triazine herbicides for residual weed control. With the exception of acidic soil conditions and *s*-triazine application frequency, adaptation of the microbial community is independent of soil physiochemical properties and cultural management practices. Reduced residual weed control with atrazine has been confirmed under growth chamber, greenhouse, and field conditions. By accounting for the altered metabolic pathway and reduced persistence estimates, leaching potential in adapted soil was reduced 12.3-fold for atrazine, 18.5-fold for desethylatrazine, 16.8-fold for deisopropylatrazine, 2.4-fold for hydroxyatrazine, and 13.7-fold for total *s*-triazine residues compared to non-adapted soils. LEACHM simulations demonstrate that if historic dissipation pathways and rate constants are used for *s*-triazine adapted soils, then herbicide fate, transport, and risk assessment errors will be considerable.

CONVERSION OF BERMUDAGRASS FAIRWAYS TO ZOYSIAGRASS UTILIZING GLYPHOSATE, DAZOMET, AND EPTC. M.C. Doroh, J.S. McElroy, R.H. Walker, and E.A. Guertal; Auburn University, Auburn, AL.

ABSTRACT

Renovating bermudagrass fairways to zoysiagrass, a more desirable species, is increasingly popular among golf course superintendents. However, this is a difficult task since the same attributes that make bermudagrass a popular turfgrass also make it a difficult-to-control perennial weed during turfgrass renovation. A successful turfgrass renovation requires that the existing grass species be effectively controlled to permit the establishment of a monoculture. Traditionally, nonselective herbicides have been utilized to kill the existing turf and subsequently replant the desired species; however, successful control is not always achieved. EPTC is a thiocarbamate herbicide once widely used in corn (*Zea mays* L.) infested with perennial grasses. Dazomet is a granular soil fumigant currently being used in a variety of agricultural sectors to control fungi, nematodes, bacteria, and weed seeds. Previous field research using dazomet has yielded variable control of coastal bermudagrass. At present, no research results have been published on the efficacy of EPTC and dazomet for the control of hybrid bermudagrasses prior to turfgrass renovation. Therefore, the objective of this research was to evaluate integrated practices for the fairway conversion of 'Tifway' bermudagrass (*Cynodon dactylon* (L.) Pers. × *C. transvaalensis* Burtt-Davy) to 'Zorro' zoysiagrass [*Zoysia matrella* (L.) Merr.].

Field studies were initiated on May 9, 2008 and May 8, 2009. Soil was a Marvyn sandy loam (fine-loamy, kaolinitic, thermic Typic Kanhapludult), pH 6.0. The experimental design was a randomized complete block (r = 4) with a plot size of 1.5 by 3.0 meters. Herbicide treatments were applied in 280 L H_2O ha^{-1} with a CO_2 pressurized boom sprayer. Dazomet treatments were applied with a 0.9 m drop spreader. Treatments included glyphosate (4.48 kg ha^{-1}); EPTC (7.84 kg ha^{-1}); dazomet (388 kg ha^{-1}); siduron (13.4 kg ha^{-1}); glyphosate plus ETPC (4.48 + 7.84 kg ha^{-1}); glyphosate plus dazomet (4.48 + 338 kg ha^{-1}); EPTC plus siduron (7.84 + 13.4 kg ha^{-1}); dazomet plus siduron (388 + 13.4 kg ha^{-1}); and a nontreated control. Glyphosate applications were made 5 weeks prior to establishment (WPE); dazomet and EPTC were made 3 WPE; and siduron was applied at establishment. 'Zorro' zoysiagrass was established in June 2008 and 2009 using a mixture of rhizomes and stolons at a rate of 10 bushels 1000 ft^{-2}. Percentage ground cover via line transect counts were taken at 5, 10, and 15 weeks after establishment (WAE). Percentage ground cover was determined in each plot by placing a dowel rod (122 cm) randomly across the plot twice. The dowel rod had twenty-five evenly spaced marks. The presence of any part of a zoysiagrass or bermudagrass plant under an intersection of an increment was recorded as a *hit*. The number of hits for each count was converted to percentage ground cover on a plot mean basis. Percentage ground cover data were analyzed using mixed models methodology as implemented in SAS® PROC GLIMMIX (SAS Statistical Software. v. 9.1. Cary, NC). The arcsine squareroot transformation resulted in homogenous variances among treatment groups. Least square treatment means were separated utilizing 95% confidence intervals. Pairwise contrasts were utilized when making preplanned comparisons

Bermudagrass and zoysiagrass cover data discussed herein were taken 15 WAE. Results from field studies were consistent between 2008 and 2009. Glyphosate + dazomet, glyphosate + EPTC, dazomet + siduron, and EPTC + siduron treatments controlled 'Tifway' bermudagrass effectively, resulting in ≤12% groundcover. While the four combination treatments controlled bermudagrass effectively, none of the individual treatments provided acceptable bermudagrass control. EPTC and dazomet controlled bermudagrass more effectively when integrated with glyphosate or siduron. There were no significant differences in bermudagrass cover between the EPTC combinations with glyphosate or siduron and dazomet applied with glyphosate or siduron. Comparing EPTC- and dazomet-alone, EPTC yielded significantly less bermudagrass cover (32%) than dazomet (71%). Zoysiagrass cover was greater in treatments that yielded lower bermudagrass cover. EPTC and dazomet integrated with glyphosate or siduron yielded similar zoysiagrass cover (>87%). In the individual dazomet, glyphosate, and siduron treatments, a continual decrease in zoysiagrass cover was observed over the duration of the study. Data from these studies indicate that EPTC and dazomet integrated with glyphosate or siduron effectively control hybrid bermudagrass during turfgrass renovation.

CONTROL OF PARAGRASS IN FLORIDA WETLANDS. S. Chaudhari, B.A. Sellers, G. MacDonald and S. Rockwood; University of Florida, Gainesville, FL.

ABSTRACT

Para grass (*Brachiaria mutica*) is an exotic invasive, perennial grass that is native to tropical Africa and South America. It is believed that paragrass was knowingly introduced as a fodder to the United States in the 1870s. In 1910, the Florida Agriculture Experiment Station recommended it as forage. Currently, paragrass is not recommended as a forage due to the development of superior forage grasses, however, it has persisted in Florida and has become a major problem in wetland ecosystems. The overall objective of this study is to develop a best management strategy via an integrated approach using both cultural and herbicide inputs to reduce the potential for paragrass invasion. Two field experiments consisted of evaluating the effect glyphosate and imazapyr at various rates for paragrass control. The experiments were established near Fellesmere, FL at the T.M. Goodwin Waterfowl Management Area, which consists of twenty 60 ha impoundments for water storage. Both experiments were conducted using a split-block design with water level (saturated vs. 40 cm water) at the time of application representing the block and herbicide treatments representing the individual plots; each treatment was replicated four times. The first experiment examined the effects of imazapyr at 0.28, 0.36, 1.12, and 1.68 kg ai/ha, and the second experiment examined the effects of glyphosate at 1.12, 2.24 and 3.36 kg ae/ha as well as imazapyr at 0.84 and 1.68 kg ai/ha. Control of paragrass was visually assessed at 4 week after treatment, followed by burning and immediate flooding of one of the blocks. The other block was flooded approximately 7 days later due to water pumping constraints. Each plot was monitored every month for establishment of native species and visual paragrass control. At least 1.12 kg/ha imazapyr was needed to overcome the effect of the initial water levels in the flooded (40 cm water) 4 weeks after treatment (WAT). There were no differences among imazapyr rates or initial water level 6 and 12 months after treatment (MAT), which was 2 and 8 months after burning (MAB), respectively. Glyphosate provided the highest level of control (>90%) 4 WAT and was significantly greater than that of imazapyr. Similar to the first experiment, neither herbicide treatment nor initial water level had any effect on paragrass re-growth following burning at 6 and 12 MAT (2 and 8 MAB). Additionally, it was observed that flooding the impoundments immediately after burning appeared to have an impact on paragrass re-growth in the untreated checks for both experiments. Therefore, a set of greenhouse experiments were conducted to examine the effect of flooding following burning or cutting. The experimental design was a 2 (burn vs. cut) x 3 (greenhouse vs. saturated vs. submerged). Twelve plants were cut at 1 cm above the soil surface and an additional 12 plants were burned with a propane burner; all plants were potted and placed in the greenhouse, or were subjected to water treatments so that the water level was even with the soil surface (saturated) or were inundated with 20 cm water. At 5 WAT stolon lengths was reduced by at least 68% when burned plants were subjected to either water treatment compared with greenhouse grown and all cut plants. Similarly, the number of stolons was at least 90% lower when burned plants were subjected to either water treatment compared with greenhouse grown and all cut plants regardless. These data provide evidence that glyphosate and imazapyr are viable options for paragrass control and that burning followed by immediate flooding may also impact paragrass re-growth.

FALL AND SPRING OPTIONS FOR HORSEWEED (*Conyza canadensis*) CONTROL IN WHEAT (*Triticum aestivum*). B.M. Davis, R.C. Scott, T.W. Dillon, and J.W. Dickson. University of Arkansas Cooperative Extension, Lonoke, AR

ABSTRACT

Severe infestations of horseweed can cause significant reduction in yield of soybean. With the increase of occurrence of glyphosate-resistant horseweed in the south, it is becoming increasingly difficult to control with in season soybean herbicides. Uncontrolled glyphosate-resistant horseweed populations in wheat can be difficult to control in double crop soybean. Field studies were conducted in 2008 and 2009 to evaluate the effectiveness of in season wheat herbicides. Studies were conducted in Clarkdale, AR on a known glyphosate-resistant horseweed population. Treatments were applied preemergent and in early spring on small horseweed. Treatments consisted of 2,4-D amine, 2,4-D ester, Harmony Extra, Peak, Express, Clarity, Sencor, Finesse, Osprey, Powerflex, Glean + Everest, Axiom, Atlantis, and an experimental compound (A15438 B) at the appropriate field rate and as tank mix partners. 2,4-D ester, amine, Peak, Sencor, Harmony Extra + Clarity and 2,4-D, and Finesse provided adequate control of glyphosate-resistant horseweed through harvest in 2008. In 2009, 2,4-D amine, ester, Clarity, Harmony Extra, Finesse, Harmony Extra + Dicamba, Glean + Everest, Atlantis, and Atlantis + Axiom provided above 70% control. In 2008 a new premix consisting of Fluroxypyr + Dicamba controlled horseweed alone and in tank mixes above 70%. Horseweed control in winter wheat is obtainable with in season herbicides prior to double cropping soybean. Controlling this weed in wheat may save time and money compared to control measures available prior to or after planting double crop soybean.

COMBINATIONS OF HALOSULFURON AND DIAZINON FOR YELLOW NUTSEDGE CONTROL IN TOMATOES. M.C. Lollar, W.G. Foshee, III, G.R. Wehtje, and C.H. Gilliam; Department of Horticulture, Auburn University, Auburn, AL

ABSTRACT

Greenhouse studies were conducted in 2008 and 2009 at Auburn University's Plant Science Research Center in Auburn, Alabama. Studies were all arranged in a completely randomized design (CRD) with a total of 25 treatments consisting of five levels of halosulfuron (0, 14, 21, 28, and 35 g a.i./ha) and five levels of diazinon (0, 140, 280, 420, and 560 g a.i./ha) applied preemergence. Approximately 30 days after applications (DAA), when nutsedge emergence was abundant, weed biomass was collected for each cup. Compared to the highest level of halosulfuron (35 g/ha) alone, no differences were observed when the highest level of diazinon (560 g/ha) was combined with either of the two lower levels of halosulfuron (14 g/ha or 21 g/ha). The lower levels of halosulfuron (14 g/ha or 21 g/ha) combined with the highest level of diazinon (560 g/ha) reduced nutsedge emergence 84 and 96 percent respectably. Field trials were conducted in 2009 at Auburn University's Wiregrass Research and Extension Center (WREC) in Headland, Alabama. Tomatoes were planted bareground in the spring/early summer of 2009 and a subsequent study was conducted on polyethylene plastic mulch in summer/early fall of the same year. There were eight treatments and a non-treated control in these studies. The treatments were factorially arranged in a complete randomized block design (CRBD) and replicated six times each. Treatments were applied preemergence (PRE) as follows: 35 g/ha halosulfuron plus 560 g/ha diazinon, 35 g/ha halosulfuron plus 420 g/ha diazinon, 35 g/ha halosulfuron plus 280 g/ha diazinon, 35 g/ha halosulfuron plus 140 g/ha diazinon, 28 g/ha halosulfuron plus 140 g/ha diazinon, 21 g/ha halosulfuron plus 560 g/ha diazinon, 21 g/ha halosulfuron plus 280 g/ha diazinon, 14 g/ha halosulfuron and 280 g/ha diazinon. Weed biomass was collected from each plot 30 days after application (DAA). In both studies, the mid level of halosulfuron (21 g/ha) combined with the highest level of diazinon (560 g/ha) was similar to the highest level of halosulfuron. This treatment reduced nutsedge emergence by 81 percent in the plastic mulch study. As expected, the bareground study yielded considerably higher nutsedge emergence compared to the plastic mulch study. A combined effect was observed in both the greenhouse and field studies, however ensuing research is required to contend with plastic mulch desiccation and allow for a multiple cropping system on a single installation of plastic mulch. Alternative combinations of sulfonylurea herbicides and organophosphate insecticides are promising.

MANAGEMENT STRATEGIES FOR NATALGRASS (*Melinis repens*) IN FLORIDA. C.A. Stokes, G.E. MacDonald, C. Reinhardt Adams and K.A. Langeland. University of Florida, Gainesville, FL.

ABSTRACT

Natalgrass (*Melinis repens*) is an exotic invasive grass introduced to Florida from southeastern Africa in the 1800s. Natalgrass was originally utilized as a forage, but cultivation ceased with the introduction of more suitable forage species in the early 1900s. However, natalgrass has persisted and has become an increasing problem in Florida, particularly in areas of active native plant restoration. A more comprehensive management plan for natalgrass would greatly aid land managers in combating this problem, but little is known about the biology and control of natalgrass. To address the need for more information, several studies have been conducted.

Natalgrass colonization appears to be seed-vectored. Therefore, a better understanding of seed germination characteristics will be useful to land managers. Natalgrass seed were collected from an infestation in central Florida. Studies on light, temperature and germination over time were conducted. All seed studies were conducted in growth chambers, with seed placed in Petri dishes lined with filter paper and moistened with deionized water. Percent germination was determined at two weeks and all ungerminated seed were tested for viability using 0.5% tetrazolium solution. Seed do not appear to require light for germination, and were found to germinate between 20 and 35 C. Optimum germination occurred at 30 C. Therefore, preemergence herbicide applied before temperatures reach 30 C may be successful in controlling natalgrass reinfestations from seed. When seed were collected directly from mature plants, an overall increase in germination from approximately 55% to 80% was observed over a two-month period, compared to an approximate germination rate of 90% for seed collected from deposits on the ground. This increase in germination over time indicates the possible presence of an afterripening mechanism.

An ecological study to determine the longevity of seeds on the soil surface was also initiated. Exclusion frames were placed over seed deposits on the ground, and the number of germinated seeds was counted monthly. Seedling densities decreased from a mean of 520 per square meter after one month to 0 per square meter after three months. This data indicates that if a land manager is able to control growth of seedlings for several months, the surface seed bank will be depleted.

Studies were also initiated to determine the potential of several herbicides for natalgrass control. Treatments consisted of two rates of glyphosate (1 and 3 lb-ai/acre), imazapyr (0.125 and 0.25 lb-ai/acre), imazapic (0.25 and 0.5 lb-ai/acre) and hexazinone (0.5 and 1 lb-ai/acre); and single rates of metsulfuron (0.25 lb-ai/acre) and fluazifop (0.25 lb-ai/acre). All treatments were applied in a carrier volume of 15 gallons per acre and included a non-ionic surfactant at 0.25% v/v. Plots were arranged in a randomized complete block design with four replications. Natalgrass control was evaluated visually and species composition data was collected by noting the species present at five-foot intervals along two transects stretched the length of each plot. Greater than 98% control of natalgrass was observed with both the low and high rates of hexazinone and the high rate of glyphosate three months after treatment. The lower rate of glyphosate provided only 80% control, while all other treatments showed less than or equal to 70% control. Metsulfuron and fluazifop provided very little control. When determining percent decrease in natalgrass from species composition data, glyphosate showed a 13 and 40% decrease in natalgrass, respectively. This discrepancy with the visual evaluation can be explained by the fact that, while glyphosate provided very good control of existing plants, the lack of soil residual activity from this herbicide allowed natalgrass to reestablish from seed. In evaluating *Eragrostis* spp., glyphosate, hexazinone and fluazifop showed a 100% decrease in density at three months after treatment. Imazapyr, imazapic and metsulfuron showed an increase in *Eragrostis* density; plots treated with the low rate of imazapic demonstrated an *Eragrostis* density six times higher than initial levels. This provides evidence that, although natalgrass control was not as high as that observed with some of the other herbicides, imazapic may have provided enough stunting of natalgrass to allow for the increase in *Eragrostis*. In addition, a number of native species have been shown to tolerate imazapic. This indicates that imazapic may be the best option for land managers attempting to control natalgrass in natural areas in Florida.

PHOTOSYNTHETIC CHARACTERISTICS OF NATIVE AND NON-NATIVE INVASIVE PLANTS IN NORTH-CENTRAL FLORIDA. K. Vollmer, G. MacDonald, and J. Erickson; Agronomy Department, University of Florida, Gainesville, FL.

ABSTRACT

Many non-native plants are alien plants that spread naturally in natural and semi-natural habitats and produce significant changes in terms of community, structure, or ecosystem processes (Cronk and Fuller 1995). These plants are commonly characterized as having rapid growth, short life cycles, prolific flower/seed production, and the ability to grow in a variety of habitats. Certain invasive plants (*Lonicera japonica*, *Hydrilla vericillata*) are able to optimize photosynthesis by having lower light compensation points than surrounding native species (Gordon 1998). This allows them to make more efficient use of low light levels for photosynthetic activity. To determine if this is the case with other invasive species, photosynthetic measurements, including light compensation points, were conducted on several invasive and co-occurring native plants. All measurements were taken on plants in naturally occurring infestations in Gainesville, FL between July and September 2009. Plants were divided into invasive trees and vines and native trees and vines. Invasive trees included Chinaberry (*Melia azederach*), Chinese tallow (*Sapium sebiferum*), and camphor (*Cinnamomum camphora*), while native trees included holly (*Ilex* spp.) and oak (*Quercus* spp.). Invasive vine species included cat's claw (*Macfadyena unguis-cati*) and air potato (*Dioscorea bulbifera*), while native vines included wild grape (*Vitis* spp.), Virginia creeper (*Parthenocissus quinquefolia*), trumpet creeper (*Campsis radicans*), and *Smilax* spp. Light curves were generated using a Li-Cor 6400 Portable Photosynthesis System on expanded, fully mature sun and shade leaves during peak sunlight hours. Light compensation point (LCP), the rate of light saturated photosynthesis (A_{max}), and respiration rates were determined based on the light curves generated for each individual species. Invasive vines had lower LCPs, lower A_{max}, and higher respiration rates compared to comparable native species. Invasive trees had higher LCPs, higher A_{max}, and lower respiration rates than surrounding native species. This suggests invasive vines are able to take advantage of low light levels for growth and establishment compared to native vines while invasive trees have a comparative photosynthetic advantage at higher light levels compared to native trees.

USE OF SAFLUFENACIL IN PEANUT. S. Morichetti, J.A. Ferrell, G.E. MacDonald, and B.J. Brecke; University of Florida, Gainesville, FL.

ABSTRACT

Saflufenacil is a new herbicide currently registered for application prior to crop emergence or as a harvest aid in several crops. Saflufenacil is a protoporphyrinogen oxidase (PPO) inhibitor which causes rapid desiccation and necrosis of leaves in susceptible plants. The onset of foliar symptoms is rapid and residual activity is observed for many broadleaf weeds. ALS-resistant Palmer amaranth (*Amaranthus palmeri*) has become widely distributed across the southeast, hence there is currently no herbicide registered for use in peanut that possesses effective postemergence control with residual activity. Since saflufenacil has foliar and residual activity, the objective of this research was to assess this new herbicide in peanut to determine if one application of saflufenacil could prove more effective than the standard treatment of flumioxazin followed by lactofen. Field experiments were conducted in Levy County and at the Plant Science Research and Education Unit at Citra, FL to determine Palmer amaranth control, peanut injury and yield. For Palmer amaranth control, treatments included three rates of saflufenacil (0.0125, 0.025, and 0.05 kg ai/ha) plus the standard treatments of flumioxaxim (PRE) and lactofen (POST) and four application timings (preemergence, 5-10cm, 10-15cm, and 15-20 cm Palmer amaranth). For peanut injury and yield, saflufenacil was applied at three rates (0.0125, 0.025, and 0.05 kg ai/ha) and 5 timings (Preemergence, 15, 30, 45, and 60 days after peanut emergence)The Palmer amaranth experiment was used solely for weed management data (no yield data collected) while the yield trial was conducted under weed-free conditions. For the Palmer amaranth trial, preemergence applications of flumioxazin (0.11 kg ai/ha) provided >90% control 28 DAT without any peanut injury. Safulfenacil effectively controlled 5 to 10 cm Palmer amaranth at all rates (>90%). As plants reached 10 to 15 cm, 0.025 kg ai/ha was required to provide greater than 90% control. All rates failed to achieve >55% control as Palmer amaranth reached 15 to 20 cm. Across 10 to 20 cm Palmer amaranth heights, saflufenacil at 0.0125 and 0.025 kg ai/ha was found to be comparable to the control provided by 0.2 kg ai/ha lactofen. Saflufenacil applications resulted in peanut injury that ranged from 30 to 40% at 2 DAT, while at 28 DAT injury was ≤ 5%. Peanut stunting at 28 DAT ranged between 5 to 40% and was rate dependant. Saflufenacil at 0.0125 kg ai/ha resulted in the least amount of peanut stunting and was similar to lactofen applications. Regardless of injury and stunting, peanut yield was not reduced by saflufenacil at any application timing or rate.

SOYBEAN PRODUCTION SYSTEMS AND DEEP TILLAGE AFFECT PALMER AMARANTH SEED BURIAL AND EMERGENCE. J.D. DeVore, J.K. Norsworthy, G.M. Griffith, M.J. Wilson, and E.K. McCallister; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

ABSTRACT

Glyphosate-resistant Palmer amaranth has become a major problem for Arkansas crop producers. With Arkansas soybean producers relying heavily on glyphosate-resistant soybean, an alternative solution to controlling resistant Palmer amaranth is needed. A field experiment was conducted at Marianna, AR, in which various soybean production systems were tested in combination with deep tillage and no tillage to determine the impact on Palmer amaranth emergence and soil seedbank numbers. This experiment was organized in a split plot design replicated four times. The main factor was the four production systems: early-season soybean planted in April, full-season soybean following spring tillage and full-season soybean following rye planted in May, and soybean double-cropped with wheat planted in June. The subplot factor was deep tillage using a mouldboard plow or no deep tillage. A 1-m^2 area was marked in the center of each plot (4.6m by 30.5m) by GPS. Once marked, 250,000 glyphosate-resistant Palmer amaranth seed were placed within the m^2, and then the plot was disked twice. Half of the plots were deep tilled and half were not (subplot factor – tillage). During the growing season, five counts were taken to determine the number of Palmer amaranth that emerged within the center of the plot. Soil cores were taken at 0 to 15 centimeters and 15 to 30 centimeters in the fall of 2008 immediately after deep tillage and again in the fall of 2009. Evaluation of the seed content in these cores is on-going in the greenhouse. Deep tillage alone caused an 87% reduction in emergence. A rye cover crop, without deep tillage, in full-season soybean caused a 61% reduction in emergence. The greatest reduction in emergence was in plots that received deep tillage in combination with a rye cover crop, with up to a 98% reduction in emergence. This research clearly shows that deep tillage in combination with soybean production systems that have high amounts of residue on the soil surface without spring tillage is an alternative means for providing a high level of control of glyphosate-resistant Palmer amaranth. In the future, integration of these best management practices with other non-glyphosate herbicides should be investigated as a means to further improve Palmer amaranth control.

HERBICIDE COMBINATIONS WITH HALOSULFURON FOR HEMP SESBANIA CONTROL IN RICE.
E.K. McCallister, J.K. Norsworthy, J.D. Devore, M.J. Wilson, S.K. Bangarwa, and G.M. Griffith, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

ABSTRACT

Permit 75DF herbicide is halosulfuron, which can be used for broadleaf and sedge control in a rice production system. Halosulfuron is not intended to be used as a stand-alone herbicide in rice; therefore, there is a need to determine optimal herbicide combinations with halosulfuron to minimize antagonism and maximize weed control. Three field experiments were conducted at Stuttgart, AR, to optimize herbicide combinations with halosulfuron for hemp sesbania control in rice. Herbicides used in these experiments included: propanil (Stam), carfentrazone (Aim), and pyraflufen-ethyl (Vida) alone and in combination with halosulfuron. Plot layout was a four by five factorial design with different rates of each herbicide alone and in combination with halosulfuron. Propanil was applied at rates of 0, 1, 2, 3, and 4 lb ai/A, carfentrazone at 0, 0.125, 0.25, and 0.5 oz ai/A, and pyraflufen-ethyl at 0, 0.013, 0.026, and 0.052 oz ai/A. In each experiment, halosulfuron was applied at rates of 0, 0.25, 0.5, 0.75, and 1 oz ai/A. All treatments were applied to 12- to 15-inch hemp sesbania (*Sesbania herbacea*) and rated for control 7, 14, and 28 days after treatment. The herbicide combination that resulted in the best season-long weed control was propanil plus halosulfuron. This combination provided >90% hemp sesbania control across all rates and resulted in the least amount of early-season rice injury (<7%). Pyraflufen-ethyl plus halosulfuron and carfentrazone plus halosulfuron both provided good hemp sesbania control (>90%) at early-season ratings but control declined later in the season (<90%) unless applied at highest evaluated rates of the combinations. These same combinations caused the greatest early-season rice injury (up to 20%) of the herbicide combinations evaluated in these field experiments. Based on this research, halosulfuron can be applied with propanil to improve hemp sesbania control without causing antagonism. Additional research should be conducted to evaluate halosulfuron/propanil combinations on a broader spectrum of weeds.

VALUE OF CLEARFIELD RICE: AN AGRONOMIC AND ECONOMIC APPROACH. T.P. Carlson, E.P. Webster, M.E. Salassi, S.L. Bottoms, J.B. Hensley, and J.A. Bond; Louisiana State University AgCenter, Baton Rouge, LA and Mississippi State University, Stoneville, MS.

ABSTRACT

Imidazolinone-resistant (IR) rice, was developed in 1993, allows for the control of red rice with no effect on the crop. The target herbicide for use in IR rice is imazethapyr which is in the imidazolinone herbicide family. Several studies have evaluated the efficacy of imazethapyr on red rice resulting in 93% red rice control with a single postemergence (POST) application and up to 99% control with sequential applications. However, due to costs and total weed control concerns surrounding the most effective imazethapyr timing, the objective of this research is to evaluate the weed control, crop response, cost, yield and economical return of imazethapyr at various application rates and timings throughout the growing season.

This study was conducted in 2009 at the LSU AgCenter Rice Research Station and the Mississippi State University Delta Research and Extension Center using Clearfield ‘CL 131’ rice drilled-seeded at 75 lb/A. This study was arranged in a randomized complete block design on a Crowley silt loam soil. Plot size was 5 by 20 feet and each treatment was replicated four times. The initial application of imazethapyr was applied at emergence, 1 week after emergence (WAE), 2 WAE, 3 WAE, or 4 WAE followed by a sequential application of imazethapyr 14 days after the initial application on a given treatment. A nontreated was added for comparison purposes. Imazethapyr was applied at 0.0625 lb ai/A for both applications, 0.094 lb/A for both applications, or a combination of the two. A crop oil concentrate (COC) was added in each application at 1% v/v. Economic applications were based on average prices for 2009. Base rice price was $13.00/cwt with price deductions based on rice grade. Newpath was priced at $525/gallon and crop oil at $15/gallon.

A timing interaction occurred for red rice control and yield; therefore, data were averaged over rate. Newpath applied at emergence controlled red rice 89%; however, delaying the initial application to 1 WAE or later resulted in 48 to 59% red rice control. Since all herbicide rates were averaged over timing, yields and quality will play the biggest role in maximizing profit. Newpath applied at emergence resulted in a rice yield of 4280 lb/A and a rice grade of 3, resulting in a gross market revenue of $546/A. However, when the initial application was delayed to 1, 2, or 3 WAE, yields and gross market revenue were reduced approximately 30% to 40%. When delaying the initial application of Newpath to 4 WAE yield and gross market revenue were reduced approximately 50% compared with treatments that received a Newpath application at emergence. Furthermore, milling and rice grade were also reduced when delaying the initial treatment to 1 WAE or later.

The data evaluated in this study suggest that delaying the initial herbicide application can be detrimental to rice production. To maximize profit initial applications should be applied within the first week of rice emergence. Delaying this initial application could result in reduced profit due to yield, milling, and grade reductions.

SEASONAL VEGETABLE TOLERANCE TO EPTC UNDER LOW-DENSITY POLYETHYLENE AND HIGH-BARRIER MULCHES. R.D. Wallace, A.S. Culpepper; University of Georgia, Crop and Soil Sciences Department, Tifton, GA; A.W. MacRae; University of Florida, Wimauma, FL; L.M. Sosnoskie, and T.L. Grey; University of Georgia, Crop and Soil Sciences Department, Tifton, GA.

ABSTRACT

The continued phase out of methyl bromide challenges a vegetable grower's ability to control weeds in plasticulture production systems. Herbicides will be needed as part of a methyl bromide (MBr) alternative system. An experiment was conducted during the spring of 2008 and 2009 in Ty Ty, GA to determine tomato (*Lycopersicon esculentum* L.), pepper (*Capsicum annuum* L.), eggplant (*Solanum melongena* L.), and watermelon (*Citrullus lanatus* L.) tolerance to EPTC applied under mulch. Treatments consisted of a factorial arrangement with four rates of EPTC including 0, 2, 3, or 4 kg ai/ha and two plastic mulch types including a low density polyethylene (LDPE) mulch or a high barrier mulch (HBM). Each crop was planted 28 days after applying herbicides and laying mulch.

EPTC, regardless of rate, applied under LDPE mulch did not impact plant development or yields of any crop. In contrast to LDPE mulch, pepper, tomato, and eggplant heights were reduced 65 to 72%, 30 to 75%, and 9 to 32%, respectively, by EPTC at 2 to 4 kg/ha when applied under HBM. Yields followed similar trends with fruit number or weights harvested being reduced for pepper (71 to 84%), tomato (36 to 76%), and eggplant (7 to 15%) by EPTC at 2 to 4 kg/ha when compared to the no EPTC HBM control. Watermelon noted 12% or less early season stunting, and no impact of EPTC rate on runner lengths or yield was noted. It appears plausible that high barrier mulches reduce the loss of EPTC through volatilization thereby increasing the dose present at time of planting. EPTC could be included as part of a MBr alternative system for tomato, pepper, eggplant and watermelon when applied under LDPE mulch but only for watermelon when applied under high barrier mulches.

BROADLEAF WEED CONTROL WITH DPX-KJM44 IN RICE. M.J. Wilson, J.K. Norsworthy, G.M. Griffith, S.K. Bangarwa, J.D. DeVore, and R.M. Edmund (Dupont); Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

ABSTRACT

DPX-KJM44, aminocyclopyraclor, is an experimental auxin-type herbicide that is being considered for development in rice by DuPont Crop Protection. A broad-spectrum, residual broadleaf herbicide is needed in rice due to the extensive use of clomazone and imazethapyr, both of which provide minimal control of the most problematic broadleaf weeds of rice. Experiments were conducted in 2008 and 2009 in Stuttgart, AR, to determine the effectiveness of aminocyclopyraclor on weeds common to Arkansas rice culture, and the overall rice tolerance to the herbicide over a range of rates and application timings. Aminocyclopyraclor was applied at 0.5, 0.75, 1.0, and 1.5 oz ai/A at 20 gal/A after planting (PRE), at the 2- to 3-lf stage of rice, 1-d prior to flooding, and 2 weeks after flooding. Triclopyr (Grandstand) at 0.25 lb ai/A was applied at the same timings as aminocyclopyraclor. All postemergence (POST) applications contained 0.25% v/v nonionic surfactant. Visual weed control ratings were assessed throughout the growing season. Fenoxaprop (Ricestar HT) at 1.2 oz ai/A was applied at the 4-lf stage of rice to remove barnyardgrass, the most problematic rice weed, due to poor control with aminocyclopyraclor. Averaged over years, aminocyclopyraclor provided 61 to 94% control of hemp sesbania throughout the growing season, which was superior to triclopyr at all application timings. Aminocyclopyraclor provided greater than 80% control of hemp sesbania, eclipta, ducksalad, and pitted morningglory at rates of 0.75 to 1.5 oz ai/A throughout the growing season based on assessments taken at least 2 weeks after application. Rice showed a high degree of tolerance to aminocyclopyraclor, with no more than 3% injury observed. Rice yields ranged from 110 to 150 bu/A for all aminocyclopyraclor treatments; therefore, the effect of herbicide treatment on rice yields was non-significant. Additional research will be need to further define the spectrum of weeds effectively controlled, sensitivity of adjacent crops, potential carryover to rotational crops, influence of adjuvant selection on efficacy, and rice tolerance in the absence of weed interference.

EVALUATIONS OF AMINOCYCLOPYRACHLOR FORMULATIONS FOR BROADLEAF WEED CONTROL IN PUMPKIN. J. Vargas, and G.R. Armel; University of Tennessee, Knoxville, TN.

ABSTRACT

Four field studies were conducted in 2009 at the University of Tennessee Plateau Research and Education Center in Crossville, TN to investigate crop safety and efficacy of aminocyclopyrachlor and aminocyclopyrachlor-methyl alone and in mixtures with other herbicides for weed control in various cucurbit crops. The first study evaluated preemergence (PRE) applications of aminocyclopyrachlor-methyl at 9, 18, 35, and 70 g ai/ha in comparison to halosulfuron at 39 g ai/ha and fomesafen at 280 g ai/ha for safety to pumpkin (*Curcurbita pepo*), cucumber (*Cucumis sativa*), watermelon (*Citrullus lanatus*), and cantaloupe (*Cucumis melo*). A second study was developed to evaluate PRE weed control in pumpkin with aminocyclopyrachlor-methyl at 18 and 35 g ai/ha alone and in two and three way herbicide mixtures with ethalfluralin at 1680 g ai/ha, clomazone at 420 g ai/ha, halosulfuron at 39 g ai/ha, and naptalam at 1120 g ai/ha. A third study, evaluated broadleaf weed control and pumpkin response from postemergence (POST)-directed applications of aminocyclopyrachlor-methyl at 18 and 35 g ai/ha alone and in mixtures with naptalam at 560 and 1120 g ai/ha and halosulfuron at 26 and 53 g ai/ha. The fourth study, evaluated pumpkin safety and weed control from POST over-the-top applications of aminocyclopyrachlor and aminocyclopyrachlor-methyl both applied at 18 and 35 g ai/ha. In general, pumpkin or cantaloupe injury never exceeded 17% when treated with PRE applications of aminocyclopyrachlor-methyl at 9 to 70 g ai/ha. Watermelons and cucumbers were injured up to 32% with PRE aminocyclopyrachlor-methyl treatments, however yield of all cucurbits treated with aminocyclopyrachlor-methyl PRE were similar to those cucurbits treated with halosulfuron at 39 g ai/ha or fomesafen at 280 g ai/ha or those harvested in a hand-weeded check. POST or POST-directed treatments of aminocyclopyrachlor-methyl or POST applications of aminocyclopyrachlor caused 15 to 25% pumpkin injury by 14 and 28 DAT and this response did not differ from pumpkin treated with halosulfuron or naptalam applied alone. In general weed control, evaluations in all studies were variable due to excessive rainfall that accumulated throughout the growing season and halosulfuron, naptalam, and aminocyclopyrachlor (-methyl) provided the most consistent activity on broadleaf weeds in these studies. Common ragweed (*Ambrosia artemisiifolia*), smooth groundcherry (*Physalis subglabrata*), and ivyleaf morningglory (*Ipomoea hederacea*) were controlled better POST-directed with aminocyclopyrachlor-methyl at 35 g ai/ha alone or in mixtures with halosulfuron or naptalam when compared to halosulfuron or naptalam applied alone. Halosulfuron alone or in mixtures with aminocyclopyrachlor-methyl provided the best POST-directed control of yellow nutsedge (*Cyperus esculentus*). No POST-directed treatments provided adequate control of annual grasses. PRE control of annual grasses was most consistent with herbicide mixtures containing clomazone and/or ethalfluralin. No PRE herbicide treatments provided acceptable control of common ragweed, ivyleaf morningglory, or smooth groundcherry

MORPHOLOGICAL AND ANATOMICAL RESPONSE OF ST. AUGUSTINEGRASS TO AMINOCYCLOPYRACHLOR. M.L. Flessner, J.S. McElroy, R.R. Dute, and G.R. Wehtje; Auburn University, Auburn, AL.

ABSTRACT

Aminocyclopyrachlor (AMCP) is a synthetic auxin herbicide that effectively controls a wide spectrum of broadleaf weeds. Previous research indicates St. Augustinegrass (*Stenotaphrum secondatum* (Walter) Kuntze) is readily injured by AMCP. In light of the fact that synthetic auxin herbicides are usually safe when applied to monocots, the mechanism for this injury is not fully understood. St. Augustinegrass-morphological and -anatomical response was investigated using light microscopy with the hypothesis that AMCP stimulates deleterious growth.

Field and greenhouse tissue samples were collected two and four weeks after treatment (WAT). Fresh tissue samples were used for dissecting microscope observations. For light microscopy, samples were placed in formalin acetic acid for kill and preservation then prepared according to a paraffin wax technique and sectioned at 10 µm. Sections were stained with Toluidine Blue O, a non-specific, metachromatic stain. Treatments included AMCP (DPX-KJM44; DuPont Company, Wilmington, Delaware) at 0.005 and 0.112 kg ai ha^{-1}. These rates were chosen because symptoms at the cellular level were clear and death of root or shoot tissue occurred. Treatments were applied with a CO_2 powered sprayer calibrated at 280 L ha^{-1} at 4.8 km hr^{-1}. Responses were consistent among samples.

Two WAT, apical meristem node tissue responded with callus tissue proliferation, abnormal location and development of the apical meristem, necrosis surrounding the developing vascular tissue, vascular parenchyma proliferation, and xylem gum blockages. These developments most likely stress the plant by placing a higher demand for water and nutrients through the stimulation of growth, while at the same time inhibiting the plants ability to deliver water and nutrients through vascular inhibition. Four WAT, symptoms of AMCP treatment noted at two WAT were still present, with the additional stimulation of adventitious root formation and release of lateral meristems from apical dominance. Node tissues away from the apical meristem responded with xylem gum blockages and the stimulation of lateral meristems and adventitious root formation. These developments further stress the plant through increased water and nutrient requirements and additional vascular inhibition. Root tip response to AMCP treatment was similar at two and four WAT and was characterized by a loss of organization. Apical root tip meristem and vascular tissue maturation was disorganized. Additionally, lateral root generation occurred abnormally close to the root tip itself. These developments may impair the ability of the plant to uptake water. Mature tissue was unaffected by AMCP treatment. All of these responses are characteristic of synthetic auxin herbicide treatment to other susceptible species. St. Augustinegrass is susceptible to other auxinic herbicides including 2,4-D, MCPP, dicamba and triclopyr. St. Augustinegrass whole-plant response to these herbicides is similar to the response induced from AMCP treatment. This research indicates that AMCP treatment results in St. Augustinegrass injury and subsequent death through deleterious growth stimulation and concomitant vascular inhibition.

WEED AND DISEASE CONTROL IN PEANUT AS INFLUENCED BY CO-APPLICATION OF AGRICHEMICALS. G.B.S. Chahal, D. L. Jordan, B.B. Shew, R. L. Brandenburg, J. Burton, D. Danehower and P. Eure; North Carolina State University, Raleigh, NC.

ABSTRACT

In peanut (*Arachis hypogaea* L.), the purpose of co-applying herbicides, fungicides, insecticides, micronutrients, and adjuvants is primarily to increase efficiency of crop management operations. However, a wide range of interactions can occur when agrichemicals are applied together. While interactions of two components applied simultaneously are understood relatively well, data are limited with respect to interactions of three or more components in the same mixture. The objective of this research was to define interactions of up to five agrichemicals co-applied with respect to weed and disease control in peanut.

Research was conducted during 2008 and 2009 at various locations in North Carolina to evaluate efficiency of clethodim, imazapic, imazethapyr, lactofen, sethoxydim and 2,4-DB applied alone or with three fungicides (none, chlorothalonil plus tebuconazole, or pyraclostrobin), two insecticides (none or lambda-cyhalothrin), three micronutrients (none, boron, or manganese), and two adjuvants (nonionic surfactant or Class Act® for imazapic and imazethapyr, none or Class Act® for 2,4-DB, crop oil concentrate or Class Act® for clethodim, sethoxydim, and lactofen). Each herbicide was evaluated in separate experiments. In canopy defoliation experiments, canopy defoliation caused by incidence of early leaf spot (*Cercospora arachidicola*) and late leaf spot (*Cercosporidium personatum*) was determined at harvest following application of chlorothalonil plus tebuconazole and pyraclostrobin (two trials in 2008) or chlorothalonil and prothioconazole plus tebuconazole (two trials in 2009). These fungicide treatments were applied alone or with three herbicides (no herbicide, clethodim, or 2,4-DB), two insecticides (none or lambda-cyhalothrin), and three micronutrients (none, boron, or manganese). Each of these treatment combinations was followed by no additional fungicide or two additional applications of fungicides. The experimental design in weed control experiments was a randomized block with treatments replicated four times. The experimental design in canopy defoliation test was a split plot with fungicide program (1 or 3 sprays) serving as the whole plot unit and combinations of fungicide, herbicide, insecticide and micronutrient serving as subplot units. Visual estimates of percent weed control 3 weeks after treatment or percent canopy defoliation at peanut harvest were determined using a scale of 0 to 100% where 0 = no weed control or no defoliation of the peanut canopy and 100 = complete weed control or complete defoliation of the peanut canopy. Data were subjected to ANOVA appropriate for the factorial arrangement of treatments. Means of significant main effects and interactions were separated using Fisher's Protected LSD test at $p \leq 0.05$.

A wide range of interactions were observed for weed control, and no clear conclusion could be drawn for specific interactions across herbicides or within herbicides for different weed species. In most instances when interactions occurred differences in control were relatively minor (10-20%). In general, fungicides affected herbicide efficacy more than lambda-cyhalothrin, while micronutrients and adjuvants varied in their effect on weed control. Canopy defoliation, an indicator of the effect of co-applied agrichemicals, was affected less by co-application of agrichemicals compared with effects of co-application on weed control.

INVESTIGATIONS INTO THE EFFECTS OF TANK MIX PARTNERS ON THE EFFICACY AND BEHAVIOR OF SAFLUFENACIL IN GLYPHOSATE RESISTANT HORSEWEED (*Conyza canadensis*). B. Waggoner, L. Steckel, C. Main, and T. Mueller; University of Tennessee, Knoxville, TN.

ABSTRACT

With glyphosate resistant (GR) marestail (*Conyza Canadensis)* continuing to pose problems for growers in the state of Tennessee, growers are always looking for new tools to be available in their herbicide arsenal to combat this troublesome weed. With Sharpen (a.i. saflufenacil) being available for 2010 growing season investigations during the 2009 growing season were conducted on cotton, in a burndown situation, to determine how this product works with other common burndown a.i. such as Glyphosate, Glufosinate, and Paraquat. This investigation was conducted to determine synergistic or antagonistic effects at labeled 1X use rate of the burndown herbicides when mixed at 0.25 oz/a, 0.5 oz/a. 1.0 oz/a, 2.0 oz/a rates of Sharpen. Crop injury, stand counts, and lint yield were taken to more accurately evaluate crop safety with yield data to further identify possible injury not seen by visual means. Treatments were put out at 7 DBP with Round-up Weathermax mixed with Clarity as the industry standard used for comparison. Results were that Sharpen at the 1 oz/a rate by itself did not provide acceptable control on marestail, though when tank mixed with each of the other common burn down herbicides at 1X use rates and Sharpen at 1 oz/a, greater that 95% control was achieved with no visual crop injury past the second true leaf.

ENVIRONMENTAL FATE OF AMINOPYRALID. B.J. Fast, J.A. Ferrell, G.E. MacDonald, and L.J. Krutz; Agronomy Department, University of Florida, Gainesville and USDA Southern Weed Science Research Unit, Stoneville, MS.

ABSTRACT

Aminopyralid is a synthetic auxin herbicide that provides foliar and soil residual control of numerous annual broadleaf weed species and is widely used in bahiagrass pastures throughout Florida. The fact that vegetable crops are often planted in a long rotation with bahiagrass pastures in Florida and aminopyralid's soil residual activity suggest that aminopyralid carryover can potentially injure vegetable crops. The objectives of this research were to quantify the sensitivity of bell pepper, eggplant, muskmelon, tomato, and watermelon to aminopyralid carryover and to determine if aminopyralid is sequestered in bahiagrass. Aminopyralid was applied at six rates (0.00125–0.04 lb ae/acre) and vegetables were planted in the treated areas. Soil samples were collected at planting to a depth of 6 inches, and the aminopyralid concentration in the soil was quantified. Crop visual injury and yield data were collected and regressed as a function of aminopyralid soil concentration at planting. In a separate experiment, ^{14}C-aminopyralid was applied to bahiagrass plants and herbicide uptake, translocation, and metabolism were quantified 1 and 4 days after treatment (DAT). At an aminopyralid soil concentration of 1 ppb, visual injury ratings were 77 (bell pepper), 84 (eggplant), 85 (tomato), 14 (muskmelon), and 12% (watermelon). Additionally, yield losses caused by 1 ppb aminopyralid were 91 (bell pepper), 86 (eggplant), 98 (tomato), 27 (muskmelon), and 40% (watermelon). Regression models for each species were used to determine the aminopyralid soil concentration that would result in 10% visual injury (the maximum acceptable level of injury) for each crop. Those concentrations were 0.022 (bell pepper), 0.009 (eggplant), 0.007 (tomato), 0.675 (muskmelon), and 0.811 ppb (watermelon). In bahiagrass, 82% of ^{14}C-aminopyralid remained in the treated leaf 1 DAT and 89% at 4 DAT. No statistical difference was observed between 1 and 4 DAT, and these data indicate that aminopyralid is not readily translocated in bahiagrass. Additionally, 94 (1 DAT) and 96% (4 DAT) of recovered ^{14}C was in the form of parent aminopyralid. The results of this research indicate that bell pepper, eggplant, and tomato are extremely sensitive to aminopyralid carryover. Muskmelon and watermelon are also sensitive to aminopyralid carryover, although they are less sensitive than the other three crops included in this research. It was also concluded that aminopyralid is not readily translocated or metabolized in bahiagrass, which indicates that it can be released into the soil in a biologically active form as treated bahiagrass plants decompose. The lack of aminopyralid metabolism in bahiagrass suggests that knowing the aminopyralid application rate and dissipation rate may not be useful for accurately predicting the aminopyralid soil concentration at a given point in time after application.

CORN AND SOYBEAN RESPONSE TO LOW RATES OF IMAZOSULFURON. J.K. Norsworthy, S.K. Bangarwa, J.D. DeVore, E.K. McCallister, and M.J. Wilson; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

ABSTRACT

Imazosulfuron is an acetolactate synthase-inhibiting (ALS) herbicide that is being developed by Valent for use in rice. Soybean and corn are often grown in close proximity to rice, and therefore, the tolerance of soybean and corn to low rates of imazosulfuron is needed. Research was conducted to determine the response of corn and soybean to low rates of imazosulfuron applied at various growth stages. Imazosulfuron was applied to the two center rows of four-row corn and soybean plots, both planted on 38-inch wide rows. The corn experiment was conducted at Keiser, AR, on a clay soil and the soybean experiment at Marianna, AR, on a silt loam soil. For corn, imazosulfuron was applied at the VE, V4, and VT stages. For soybean, imazosulfuron was applied at the VC, V3, V6, and R2 stages. Imazosulfuron rates evaluated for both crops were 0.0047, 0.0094, 0.0188, 0.0375, 0.075, and 0.15 lb ai/A. These rates correspond to 1/64, 1/32, 1/16, 1/8, 1/4, and 1/2 of the anticipated postemergence rate that will be labeled for rice. All treatments were applied at 15 gal/A, and a nonionic surfactant was included at 0.25% v/v. Both experiments contained a nontreated control. Injury to both crops was evaluated weekly throughout the growing season. At maturity, the height of three soybean plants/plot was determined, and corn and soybean plots were machine harvested to determine grain yield. Corn showed a high level of tolerance to imazosulfuron with little or no visible injury, regardless of rate or application timing. Furthermore, all imazosulfuron treatments yielded similar to the nontreated control. Conversely, soybean was highly sensitive to imazosulfuron, with injury resulting at all rates and application timings. The highest rate of imazosulfuron often caused more than 80% injury to soybean. Soybean did recover from the injury caused by the two lowest rates of imazosulfuron applied at the VE and V3 stages by the end of the growing season based on visual injury ratings and the absence of yield reductions relative to the nontreated control. Injury was generally in the form of purple veins and stunted plants, characteristic symptoms of ALS-inhibiting herbicides. In the most severely injured treatments, soybean failed to produce grain. Based on these findings, application of imazosulfuron to rice adjacent to soybean fields will require extreme caution if injury to soybean is to be prevented.

RESPONSE OF GRAFTED WATERMELON TO FOUR HERBICIDES. J.I. Adkins, S.M. Olson, W.M. Stall, A.W. MacRae, B.M. Santos, and G.E. MacDonald, University of Florida, Gainesville, FL; R.H. Hassell, Clemson University, Clemson, SC; J.R. Schultheis, K.M. Jennings, and P.J. Dittmar, North Carolina State University, Raleigh, NC.

ABSTRACT

Potential use of grafted watermelon as an alternative to soil fumigation by methyl bromide has been a topic of recent interest in the United States. Although various herbicides are labeled for use in watermelon production and in the production of other cucurbits (such as those utilized as rootstock for grafted watermelon), there is a lack of information on the effects of various herbicides when applied to a grafted watermelon crop. Herbicide trials were conducted in 2009 to examine the effects of four herbicides on grafted seedless watermelon. Field trials were located in Quincy, FL, Charleston, SC, and Kinston, NC. Watermelon plants utilized in the study include non-grafted Tri-X-313 watermelon and Tri-X-313 watermelon grafted onto gourd, inter-specific hybrid squash, wild watermelon, and seedless watermelon ("self-grafted" to Tri-X-313) rootstocks. Two rates of terbacil (0.11 and 0.22 kg ai/ha), halosulfuron (0.35 and 0.53 kg ai/ha), clomazone (0.28 and 0.42 kg ai/ha), and S-metolachlor (1.07 and 1.42 kg ai/ha) were applied prior to transplanting. Additional treatments included two rates of halosulfuron (0.35 and 0.53 kg ai/ha) applied over-the-top and an untreated control. Phytotoxicity ratings were conducted at 19 days after transplanting and at one week after the halosulfuron over-the-top application (27 days after transplanting). Yield was recorded at each of four harvests.

Establishment of watermelons grafted to certain rootstocks was difficult at two locations. Due to low stand count, only data from Tri-X-313/gourd, Tri-X-313/inter-specific hybrid squash, and non-grafted Tri-X-313 was included from Quincy. Likewise, only data from Tri-X-313/gourd and non-grafted Tri-X-313 was included from Kinston. All data from the four grafting combinations and non-grafted Tri-X-313 was included from Charleston.

Each location was analyzed separately. None of the herbicide treatments resulted in a significantly lower total marketable yield when comparing the same scion/rootstock combination from treated and untreated plots. Phytotoxicity was somewhat variable based on location. At Quincy, all plant types (grafted and non-grafted) exhibited bleaching when clomazone was applied prior to transplanting. Watermelons grafted onto gourd and inter-specific hybrid squash rootstocks appeared to be more tolerant of clomazone compared to non-grafted plants. All plant types also exhibited bleaching due to clomazone at Charleston. However, at this location, plants grafted onto gourd and inter-specific hybrid squash appeared to be less tolerant of clomazone compared to non-grafted plants. Considerable injury due to pre-transplant applications of S-metolachlor and halosulfuron was only observed at Kinston. No terbacil injury was reported at any location for any plant types. A consistent level of injury was observed on all plant types at Quincy subjected to over-the-top applications of halosulfuron. Symptoms of injury included stem splitting, shorter vines, and an increase in the number of nodes at the distal end of the vines. This is not a surprise since halosulfuron is known to injure watermelon when applied over-the-top. At Quincy, it did not appear that any of the rootstocks examined imparted tolerance to this type of application.

Plants appeared to recover fairly well form herbicide injury in terms of the total marketable yield produced. A second year of field trials is planned for 2010. With additional data, we should have a better idea as to what products may be safe for growers to use on a grafted watermelon crop.

EFFECTS OF SEEDING RATE AND APICAL DOMINANCE ON FLOWERING AND WEED SUPPRESSION IN SUNN HEMP. A.H. Cho, C.A. Chase, D.D. Treadwell and R.L. Koenig; University of Florida, Gainesville, FL.

ABSTRACT

Sunn hemp (*Crotalaria juncea*), a tropical leguminous fiber crop, can also be used as a cover crop and green manure because of its rapid canopy closure, weed and pest suppression, soil stabilization, and nitrogen fixation. The limited use of sunn hemp as a cover crop in the US is primarily due to the reliance on overseas seed sources, which often results in limited and uncertain availability and high seed cost. Growers are unable to save seed because the commonly available short day varieties such as 'Tropic Sun' fail to set seed or produce low seed yields even when grown in the Southeastern US. Previous research shows that cutting sunn hemp to break apical dominance leads to more branching and thereby more flowering, suggesting a potential for increased seed yield. The objective of our study was to evaluate how cutting the main stem to break apical dominance and seeding rates affect weed suppression and seed yield. The experimental design was a randomized complete block with a factorial arrangement of the treatments. The study was conducted at a seed production seeding rate of 11 kg/ha, a cover crop seeding rate of 45 kg/ha, and an intermediate seeding rate of 28 kg/ha. Seeds were sown in rows spaced 49 cm apart on May 15, 2008 and May 18, 2009. Main stems were either left uncut or were cut at 3, 4, and 5 weeks after planting (WAP). In 2009, an untreated control plot was added. Weeds within a 91cm x 46cm quadrat were identified and counted, and weed biomass was collected. Leaf area index (LAI) and photosynthetically active radiation (PAR) were measured using an AccuPAR model LP-80 Ceptometer to evaluate canopy closure. In 2008, cutting sunn hemp to break apical dominance had no significant effect on weed biomass, but in 2009 cut plots had significantly less weed biomass than those left uncut. In 2008, the lowest seeding rate of 11 kg/ha had significantly higher weed biomass than the other seeding rates. In 2009, with the added weedy fallow, all seeding rates had significantly less weed biomass than the weedy fallow. By 12 WAP, the highest seeding rate of 45 kg/ha had the lowest weed biomass. Cutting did not significantly impact PAR. Lower seeding rates had higher percentages of PAR penetrating the canopy at 3 and 6 WAP, but by 8 WAP all plots were well-established and there were no significant differences among the treatments. In both 2008 and 2009 cutting induced branching. In 2009 removing the apical meristem at the later dates increased the number of branches per plant. Plants in the lower seeding densities in both years had significantly more branches than plants in the cover crop seeding rate treatment (45 kg/ha). In 2008 and 2009 cutting had no significant effect on flower production. In both years, the lowest seed rate (11 kg/ha) had significantly more flowers than the other two seeding rates. Although flowering was profuse, seed set was minimal which may be due to the lack of an effective naturally-occurring pollinator and limitations of the commercially available cultivar of sunn hemp.

EFFECT OF HERBICIDE PROGRAM ON SEED RAIN IN LIBERTY LINK® AND ROUNDUP READY FLEX® COTTON. G.M. Griffith, J.K. Norsworthy, J.A. Still, J.D. Devore, and M.J. Wilson; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR

ABSTRACT

A shift to conservation tillage systems in the Midsouth in the mid 1990's was facilitated by the introduction of glyphosate-resistant crops and the ability to use a total postemergence (POST) herbicide program consisting of glyphosate only. Reduced tillage practices and use of a single mode of action (MOA) can lead to weed species shifts. Species shifts can be due to lack of control in the absence of tillage or it may be natural tolerance to a herbicide. With the evolution of glyphosate-resistant weed species worldwide, weed science is now focussing on developing effective weed control programs that alleviate the intense selection pressures associated with using a single MOA. Weed control programs need to be flexible and provide acceptable control of glyphosate-resistant species. Technologies such as the Liberty Link® (LL) cotton system are being used along with different herbicide rotations to help manage glyphosate-resistant species and further sustainable agriculture. Incorporating a residual herbicide in a cotton weed control program applied either preemergence (PRE), POST, or post-directed (PD), may broaden the weed spectrum and provide extended weed control. However, research incorporating this technology and resistance management strategies is limited and needs to be addressed. We hypothesize that over time there will be a species shift resulting from a total POST herbicide program in both LL and Roundup Ready Flex® (RRF) cotton systems. Research was conducted at the Northeast Research and Extension Center in Keiser, AR, in 2007, 2008, and 2009 to evaluate the effect of herbicide programs in LL and RRF 3-year cotton rotations. A 15-A cotton field was used with 8-row (38-in) plots that were 600 feet in length, with three replications. The experimental design was a split-plot with cotton rotation as the main plot and herbicide program as the sub-plot. There were four 3-year cotton rotations: (1) LL-LL-LL, (2) LL-RRF-LL, (3) RRF-RRF-RRF, and (4) RRF-LL-RRF. Each year, either ST 4554 B2/RRF or Fibermax 955 B2/LL was planted. The three herbicide programs were: (1) a total POST (P-P-P) consisting of either glufosinate at 0.53 lb ai/A or glyphosate at 0.78 lb ae/A (1X rate) applied to 1- to 3-lf cotton, followed by (fb) 5- to 6-lf cotton, fb ≥10-lf cotton at LAYBY, (2) a residual PRE (R-P-P) of *S*-metolachlor at 1.25 lb ai/A + fluometuron at 2.0 lb ai/A, fb either glufosinate or glyphosate at the 1X rate at 5- to 6-lf cotton, fb ≥10-lf cotton at LAYBY, (3) a residual PRE + LAYBY (R-P-R) consisting of *S*-metolachlor + fluometuron PRE, fb either glufosinate or glyphosate at the 1X rate at 5- to 6-lf cotton, fb flumioxazin at 0.063 lb ai/A + MSMA at 2.0 lb ai/A at ≥10-lf cotton at LAYBY. To estimate the soil seedbank before initiating the experiment, soil cores were taken to a depth of 4 inches in April 2007 using a 4-inch-diameter cup cutter. Eight subsamples, consisting of five soil cores taken from between rows 3 and 4, and rows 5 and 6, at distances of 100, 200, 300, and 400 feet (40 cores/plot). Soil cores were returned to Fayetteville and placed in flats where they were allowed to germinate throughout the summer for species identification and counting. Seed traps were made using 6-in X 9-in flats containing 580 μm mesh screen small enough to catch all seeds, yet porous enough for water penetration. Traps were placed in the exact locations of original soil cores in early August each year and allowed to sit through harvest in order to catch any seed rain resulting from experimental treatments. Traps were brought back to Fayetteville for identification and counting. Seedcotton yields were taken each year. Data from each year were analyzed separately. Square-root transformation was performed on seed trap data, and the initial soil core counts were used as a covariate in data analysis. Data were subjected to ANOVA, and means were separated using Fisher's protected LSD (α=0.05). Seed from a total of 16 weed species were detected. Palmer amaranth [*Amaranthus palmeri* (S.) Wats], barnyardgrass [*Echinochloa crus-galli* (L.) Beauv], large crabgrass [*Digitaria sanguinalis* (L.) Scop], and prickly sida (*Sida spinosa* L.) were the dominant weed species, accounting for over 92% of the total seed counted. In 2007, the main effect of cotton rotation was significant, showing higher Palmer amaranth seed production in the LL rotations (58 and 134 seed/ft^2) when compared to the RRF rotations (5 seed/ft^2). In 2008 and 2009, there was an interaction between cotton rotation and herbicide program for Palmer amaranth seed production, with the lowest Palmer amaranth seed production in RRF rotations where a residual herbicide was applied PRE. Barnyardgrass and prickly sida seed production was highest each year in the LL systems. In 2009, the highest barnyardgrass seed production was in a total POST herbicide program, regardless of cotton rotation. After only 3 years of continuous RRF cotton the total POST glyphosate program had higher Palmer amaranth seed production (55 seed/ft^2) than a total POST glufosinate program (27 seed/ft^2). In 2009, when averaged over cotton rotations, a total POST program resulted in higher barnyardgrass seed production (124 seed/ft^2) than either herbicide program that contained a residual herbicide (25 and 12 seed/ ft^2). Regardless of cotton system, a PRE herbicide fb two POST herbicide applications is needed for long-term Palmer amaranth control and seed suppression. For long-term barnyardgrass control and seed reduction in a LL system, a PRE herbicide is needed fb either two POST glufosinate applications or fb a POST glufosinate application at midseason fb a residual herbicide at LAYBY.

HUSKIE HERBICIDE WEED CONTROL AND CROP INJURY IN GRAIN SORGHUM. R.E. Brandon, B.W. Bean, and J. Robinson; Texas AgriLife Research, Amarillo, TX

ABSTRACT

Huskie is a combination of bromoxynil octanoate; 13.4%, bromoxynil heptanoate; 12.9%, pyrasulfatole; 3.3% and is labeled for post emergence control of broadleaf weeds in wheat, barley, oats, rye, and triticale. Three studies were initiated to determine the potential of Huskie for weed control in grain sorghum (*sorghum bicolor L*.) In the first study, Huskie rates of 1.87, 2.68, 3.48, and 4.3 oz ai/a with and without atrazine (0.5 and 1 lb ai/a) and dicamba (2 oz ai/a), were applied to four inch Palmer amaranth. A second study was initiated to determine the effect of weed height (3, 9, 16 and 18 in) control. A third study examined crop injury in weed free plots by applying Huskie at rates of 2.68, 3.48 and 4.3 oz ai/a with and without 2 oz ai/a dicamba, to grain sorghum growth stages of V-4, V-8 and boot. All applications were applied with Ammonium Sulfate at 8.5 lb/100 gal. Weed control ratings were made 1, 2, 4, and 8 weeks after each application. Yield was obtained at crop physiological maturity.

When Huskie was applied to four inch Palmer amaranth at 2.68 oz ai/a or higher, control was 90% throughout the growing season with or without 0.5 lb ai/a of atrazine. When 1.87 oz ai/a of Huskie was applied without atrazine, control dropped to 80% after four weeks. Palmer amaranth control was 80% or greater at Huskie rates of 2.68, 3.48, and 4.3 oz ai/a, with 0.5 lb ai/a atrazine, when applied to 9, 16, or 18 in. weeds one week after treatment.

When treatments were applied to V-4 sorghum, only the 4.3 oz ai/a Huskie application applied with dicamba (1 oz ai/a) and atrazine (0.25 lb ai/a) significantly reduced plant height (18% reduction) seven days after application. Sorghum had recovered when evaluated 14 days after application with no effect on grain yield. No significant crop injury was observed with any treatments applied at V-8. When applied at the boot stage, those treatments with 2 oz ai/a dicamba reduced yield by as much as 40%. Leaf burn less than 3% was observed in all Huskie treatments shortly after application, but did not affect grain yield.

ASSESSING THE ECONOMICS OF IMPLEMENTING A WEED RESISTANCE MANAGEMENT STRATEGY AS A FOUNDATION PRODUCTION PRACTICE FOR SOUTHERN CROPPING SYSTEMS.

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ABSTRACT

When a producer is selecting a weed control program, major deciding factors are the economic costs and benefits of the program. 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 2006-2008. 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). Each on-farm site was split into two production systems ranging from 8-20 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, 2007 and 2008 were analyzed with herbicide cost, yield and net return. Across all four production systems the herbicide cost was slightly higher for the resistance weed management program than for the farmer's normal glyphosate program. Herbicide costs for grower vs. university systems were $24.51 and $33.90, respectively. There were no differences in yield and net returns for any of the production systems. Even though the university-recommended weed resistance management program required more intensive inputs and management, yields and net returns were similar. Thus, growers can implement these resistance management strategies with the confidence that their net returns will be equivalent, and long-term resistance management will delay or prevent the development of glyphosate resistant weeds in their fields, creating substantial savings when this is considered.

EPTAM IN SUGARCANE: INCORPORATION METHODS, WEED CONTROL, AND CROP TOLERANCE. J. Mite, J.L. Griffin, and J.M. Boudreaux; School of Plant, Environmental, and Soil Sciences, Louisiana State University Agricultural Center, Baton Rouge, LA 70803.

ABSTRACT

In 2008 Eptam (EPTC) was labeled for use in fallow ground and research was initiated to investigate potential use of Eptam during the fallow period in a sugarcane production system. In sugarcane because row tops are not disturbed over the multi-year crop cycle, perennial weeds including johnsongrass, bermudagrass, and nutsedges can become problematic. During the fallow year, fields are prepared for replanting and weed control programs are implemented to reduce infestations of perennial weeds. Glyphosate is used extensively in fallowed sugarcane fields, but is not highly effective on bermudagrass and nutsedges. Research was conducted over three years during the fallow period to evaluate Eptam at 2, 3, 4, and 5 pints/A incorporated on pre-formed sugarcane beds using a Lilliston® rolling cultivator or a hipper/bedder. The rolling cultivator was equipped with six gangs per bed and was set to incorporate herbicide 2 to 3 inches deep. The hipper/bedder was equipped with a sweep centered on the row top that opened the bed followed by 3-disk gangs that re-hipped in a single operation. All Eptam treatments were followed by a glyphosate application and weed control was compared to that of glyphosate applied in sequential applications.

Experiments were conducted over three years in fields with moderate to heavy infestations of bermudagrass, johnsongrass, and purple nutsedge. For all weeds, differences in control among Eptam rates and between incorporation methods were not observed and responses were consistent across years. For bermudagrass at 30 days after treatment (DAT), ground cover was 7 to 18% where Eptam was applied and was less than for the nontreated (29%). Two weeks later, bermudagrass ground cover for the Eptam treatments was 13 to 28% compared with 6% ground cover where glyphosate was applied 14 d earlier. By 55 DAT bermudagrass ground cover was equal (no more than 6%) where Eptam was followed by a single glyphosate application and where glyphosate was applied twice. Johnsongrass was controlled 57 to 69% 30 DAT regardless of Eptam rate or application method. By 50 DAT, johnsongrass control was equal (89 to 97%) where Eptam was followed by glyphosate and where glyphosate was applied twice. Purple nutsedge was controlled 29 to 50% 30 DAT regardless of Eptam rate or application method. By 50 DAT, nutsedge control was equal (39 to 51%) where Eptam was followed by glyphosate and where glyphosate was applied twice.

In another study, crop response was evaluated when Eptam was applied at 3, 5, and 7 pints/A and incorporated with a rolling cultivator immediately after sugarcane was planted in September. Sugarcane shoot population in late October and in February of the following year was not negatively affected by Eptam when compared to the Prowl plus Sencor standard applied to the soil surface at planting. Eptam at 7 pt/A controlled sowthistle, white clover, Italian ryegrass, and winter annual bluegrass 0, 58, 65, and 61%, respectively, compared with 75, 100, 97, and 100%, respectively, for Prowl plus Sencor.

Although Eptam can be used safely in sugarcane, bermudagrass, johnsongrass, and purple nutsedge were not effectively controlled with Eptam applied during the fallow period. Perennial weed control was no greater when glyphosate was applied following Eptam than when glyphosate was applied alone. Using a price of $45.10/gallon for Eptam, cost of 2 pt/A would be $11.28. The cost for one application of Roundup Original Max at 23 oz/A ($36.00 per gallon) and of generic glyphosate at 32 oz/A ($11.00 per gallon) would be $6.47 and $2.75/A, respectively. This would bring the total weed control cost where Eptam is followed by glyphosate to $17.75 and $14.03/A, depending on formulation. This compares with $12.94 and $5.50/A where the glyphosate products are applied twice. The value of Eptam as a component of fallow weed control programs would be directly dependent on economics and grower preferences.

HERBICIDE TREATMENTS TARGETING COGONGRASS ERADICATION. J. S. Aulakh[1]; S. F. Enloe[1]; N. J. Loewenstein[1] and J. H. Miller[2]; [1]Auburn University, Auburn, AL, [2]USDA-Forest Service, Auburn, AL

ABSTRACT

Cogongrass eradication entails the complete elimination of all living propagules including rhizomes and seeds within a defined boundary. While previous studies have achieved as high as 96% control of regrowth, no published studies have determined the optimal treatment series for cogongrass eradication. With this in mind, a field experiment targeting complete cogongrass eradication was initiated in April 2008 on natural cogongrass infestations at two locations near Tilman's Corner and Bayou La Batre in southwestern Alabama. Treatments consisted of glyphosate alone (4 lb/acre), imazapyr alone (0.75 lb/acre) and a combination of both at three different application timings (May, August and October). Plot size was thirty by thirty feet and the experiment was a randomized complete block design with four replications. Treatments were applied with an ATV mounted boom sprayer at 20 gallons per acre. The measurements were made 12 MAT on shoot biomass, rhizome biomass, and rhizome total non structural carbohydrate (TNC) content. Statistical analysis was done using Proc glimmix in SAS. The results revealed a significant effect of location and herbicide treatment on rhizome dry weight. Imazapyr alone was as effective as the combination with glyphosate regardless of the application timing and was better than glyphosate alone. A single application of glyphosate alone did not result in reduction in rhizome biomass compared to the contol. However, two applications of glyphosate (May and October) were as effective as Imazapyr alone and the combination of both. Total non structural carbohydrate content was significantly affected by herbicide, timing and their interaction. In general, TNC content from plots in the May and October timings were significantly higher than plots treated in August. Imazapyr alone resulted in significantly lower rhizome TNC content than glyphosate alone and the tank mix of glyphosate and imazapyr. August application of imazapyr reduced TNC reserves more than the May application. Similarly, the August glyphosate treatment reduced TNC content more than the October glyphosate treatment but was similar to the May glyphosate treatment. To date, imazapyr alone has resulted in the greatest reduction in rhizome biomass and TNC reserves. On the basis of rhizome biomass reduction compared to the control; 81, 48 and 70 per cent control of cogongrass has been achieved with imazapyr alone, glyphosate alone and combination of both, respectively. In 2009, all the treatments were reapplied as a second step towards eradication.

EVALUATION OF SEEDED CUCURBIT AND MELON TOLERANCE TO FOMESAFEN APPLIED UNDER PLASTIC MULCH. Tyler P. Jacoby*, Andrew W. MacRae, and Richard O. Kelly, Univ. of Florida/IFAS/GCREC, Wimauma, FL

ABSTRACT

With the reduction in availability of methyl bromide for mulch production systems, weeds are becoming increasing problems in Southeastern vegetable fields. The growers need more herbicides to become registered to combat the wide range of weeds that are becoming problems in plastic mulch systems. We are observing an increase in both annual broadleaf and grass weeds emerging from the planting holes, an area where there are very competitive with the crop, potentially reducing crop yields.

Four experiments were conducted in the spring of 2009 to determine the tolerance of seeded cantaloupe, cucumber, summer squash, and watermelon to preemergence applications of fomesafen applied under plastic mulch. A single crop was the focus of each experiment. Treatments included fomesafen applied at 0.25, 0.31, 0.375, 0.5, and 0.75 lbs ai/A plus a non-treated control. The test site was prepared with conventional tillage and then fumigated with methyl bromide:chloropicrin (67:33 formulation) at 175 lbs/A. Application of the fomesafen was made using a CO_2 powered backpack sprayer calibrated to deliver 20 gallons/A at 23 psi using TeeJet 11003XR tips. The application was made to the top of the finished bed and a black on black VIF mulch (Filmtec 1.2 mil) was laid immediately after application of the herbicide treatments. The plots were drip irrigated and grown using standard crop production methods. Data collected was visual crop injury, plant height or vine length, stand counts, and crop yield.

Cantaloupe – when rated at 2 weeks after planting (WAP) all treatments caused excessive visual injury to the cantaloupe plants, greater than 52%. Any treatment containing fomesafen greatly reduce the stand count of cantaloupe. Vine lengths for fomesafen at 0.25 and 0.31 lbs ai/A were found similar to the non-treated control, however plant stand was reduced. All other treatments had reduced vine lengths. All herbicide treatments greatly reduced fruit number (61% or greater) and total weight (58% or greater). The level of injury and plant death from the fomesafen treatments is unacceptable for a grower and thus should not be registered for seeded cantaloupe in Florida.

Cucumber - when rated 2 WAP, all treatments caused 50% or greater visual injury. Fomesafen applied at 0.5 and 0.75 lbs ai/A reduced plant stand compared to the non-treated control. Only the fomesafen at 0.375 lbs ai/A treatment was found to have vine lengths similar to the non-treated control. Fomesafen applied at 0.25 or 0.31 lbs ai/A had similar fruit number to the non-treated control, while all other treatments reduced yield. In combination with the stunting and yield loss, the amount of plant death would be unacceptable by a grower from fomesafen applied under plastic mulch.

Squash - when rated 2 WAP, all treatments caused greater than 10% injury and were different from the non-treated control. Fomesafen at 0.75 lbs ai/A caused the greatest stunting. For the stand counts, there was a lot of variability in the death of plants, thus all treatments were found similar to the non-treated control. The squash plants that died were killed by girdling of the stem from the fomesafen treatments. For the first three harvests, fomesafen applied at 0.75 lbs ai/A and all other treatments were found to be similar. For total harvest, all treatments were found to be similar to the non-treated control. While the data seems to indicate that squash will recover from the initial injury caused by fomesafen, it is unlikely a grower would be happy with the level of stunting and plant death associated with the treatments. Plant death was variable with some plots showing no plant death while others having up to half of the plants die from the application of fomesafen. This variability clouds the true results of the trial which is that fomesafen should not be registered for use in seeded summer squash in Florida.

Watermelon - when rated 2 WAP all fomesafen treatments had injury ranging from 21 to 37.5%. For vine length, there was a lot of variability, even in the non-treated control. The watermelon vines that survived the fomesafen treatments recovered and were not found different from the non-treated control at the end of the season. A single harvest was collected from the watermelons due to an increase in disease. No differences were found for total yield. While the data seems to indicate that watermelon will recover from the initial injury caused by Reflex, it is unlikely a grower would be happy with the level of stunting and plant death associated with the treatments. This variability clouds the true results of the trial which is that fomesafen should not be registered for use in seeded watermelon in Florida.

BELL PEPPER TOLERANCE AND WEED CONTROL OF IMAZOSULFURON AND THIFENSULFURON. P.J. Dittmar, K.M. Jennings, and D.W. Monks; Department of Horticultural Science, North Carolina State University, Raleigh.

ABSTRACT

Field experiments were conducted in 2008 and 2009 to examine bell pepper tolerance and weed response to imazosulfuron and thifensulfuron alone and tank mixed. Treatments were weed-free (hand weeded when weeds were less than 2 in tall), weedy (nontreated), imazosulfuron at 0.1 and 0.2 lb ai/A, thifensulfuron at 0.1 and 0.4 oz ai/A, and imazosulfuron (0.1, 0.2 lb ai/A) plus thifensulfuron (0.1, 0.4 oz ai/A) tank mixed. Herbicide treatments were applied postemergence-directed to the bottom three to four inches of the pepper plant using a CO2 backpack sprayer calibrated to deliver 20 GPA. No crop injury was observed at 14 and 21 days after treatment (DAT) by imazosulfuron alone at 0.1 and 0.2 lb ai/A. Tanking mixing imazosulfuron with thifensulfuron increased pepper injury to 15% in 2008 and 5% in 2009. Thifensulfuron at 0.1 and 0.4 oz ai/A alone or tank mixed had injury up to 15% at 14 and 21DAT in 2008. However, in 2009, pepper injury from thifensulfuron alone was 5% or less. For plant height at 21 DAT, imazosulfuron at 0.1 lbs ai/A tank mixed (12.7 and 11.6 in) and thifensulfuron at 0.4 oz ai/A tank mixed (11.6 and 12.6 in) caused the plant heights to be lower than pepper in the weed-free (13.9 in). Imazosulfuron alone (3 to 19%) provided less control of common purslane (Portulaca oleracea) than imazosulfuron tank mixed with thifensulfuron (up to 88%). Thifensulfuron alone (74 to 79%) had the same control as thifensulfuron tank mixed with imazosulfuron (up to 88%). Bell pepper plants treated with imazosulfuron alone or in tank mixed treatments (22118 to 27617 lb/A) had less marketable (fancy plus number 1 grade fruit) yield than the weed-free (32801 lb/A). Bell pepper plants treated with thifensulfuron tank mixed with imazosulfuron (24873 to 27617 lb/A) had less marketable yield than plants in the weed-free treatment (32801 lb/A). Bell pepper receiving herbicide treatment produced similar yield as the weedy treatment. Yield was reduced in the imazosulfuron and thifensulfuron treatments; however, common purslane at high densities and/or in fields with mixed weed populations can greatly reduce pepper yield and quality.

MANAGEMENT OF ALS-RESISTANT COMMON RAGWEED IN CORN, COTTON, PEANUT, AND SOYBEAN. A. Chandi, D.L. Jordan, A.C. York, J.D. Burton, and B.R. Lassiter; North Carolina State University, Raleigh.

ABSTRACT

Development of herbicide resistant weed biotypes has increased considerably over the past decade in many regions of the United States. Herbicides that inhibit this enzyme are used in most agronomic crops including corn, cotton, peanut, and soybean in the southern region of the United States. Popularity and effectiveness of this mode of action in these crops has lead to tremendous selection pressure in many field and the subsequent development of cross resistance. Common ragweed is an important weed in agronomic crop production in the southern region of the United States, and in many production systems, especially those for peanut, use of ALS-inhibiting herbicides such as diclosulam have been important in managing this weed and minimizing interference with yield. However, in recent years biotypes of common ragweed resistant to ALS inhibiting herbicides have been reported in the southern region of the United States. Resistance to ALS-inhibiting herbicides combined with documentation of common ragweed resistance to glyphosate has increased concern over ability of practitioners to effectively manage these and other weed species in southern row crops. Defining herbicide programs that control susceptible and ALS-resistant common ragweed is important in developing a comprehensive weed management strategy in southern row crops. Therefore, research was conducted in North Carolina to develop herbicide programs to control a mixture of ALS resistant and susceptible populations in corn, cotton, peanut, and soybean.

Management of ALS resistant common ragweed was compared in North Carolina from 2007-2009 in the field where ALS-resistant common ragweed was conformed. Herbicide programs included PRE (peanut) or early postemergence (EPOST) (corn, cotton, soybean) applications of ALS-inhibiting herbicides with activity against ALS-susceptible common ragweed versus PRE (cotton, peanut, soybean) or EPOST (corn) applications of non-ALS-inhibiting herbicides with activity on common ragweed. Within each of these PRE or EPOST herbicide programs, either no additional herbicides were applied or tank mix or sequential applications of non-ALS-inhibiting herbicides were included. These respective groups of herbicides will be referred to as base and complement herbicide programs. Metolachlor at 1.7 kg ai/ha was applied PRE on the entire test area for cotton, peanut, and soybean, including the non-treated control. Nicosulfuron was applied EPOST over the entire test area for corn. Metolachlor and nicosulfuron are routinely applied to control annual grasses and small-seeded broadleaf weeds in these crops. ALS-inhibiting herbicides with efficacy against ALS-susceptible common ragweed included thifensulfuron in corn, trifloxysulfuron in cotton, diclosulam and imazapic in peanut, and clorsulfuron in soybean. Alternative herbicides to ALS-inhibiting herbicides in cotton included fomesafen, glyphosate, MSMA, and prometryn. In corn, alternative herbicides included atrazine, dicamba, and glyphosate. Alternative herbicides in peanut were acifluorfen, bentazon, flumioxazin, lactofen, and paraquat. Lactofen and glyphosate were alternative herbicides in soybean. Visual estimates of percent common ragweed control and the number of common ragweed plants in the center two rows of each plot was also recorded 8 WAP. Population of common ragweed was converted to the number of plants/m^2. Yield of each crop was determined. The experimental design for each crop was a randomized complete block with treatments replicated four times (2007) or five times (2008 and 2009). Data for visual estimates of percent common ragweed control, common ragweed density, and pod yield were subjected to analysis of variance appropriate for the factorial arrangement of treatments for a two (base herbicide) by three (complement herbicide) treatment arrangement excluding the non-treated control. Data for visual estimates of percent common ragweed control were converted to arc sin square root to ensure proper statistical assumptions. Means of significant main effects and interactions were separated using Fisher's Protected LSD test at $p \leq 0.05$.

Results from field trials demonstrate the value of using herbicides that control common ragweed with a mode of action different from ALS inhibition in minimizing interference of common ragweed with corn, cotton, peanut, and soybean. However, these data also indicate that herbicide alternatives to ALS-inhibiting herbicides may be less effective in controlling the entire population of resistant and susceptible common ragweed in a particular field. For example, while diclosulam did not control ALS-resistant common ragweed, control of the overall common ragweed population was greater than the non-ALS-inhibiting alternative flumioxazin. However, extended selection pressure with diclosulam only most likely would render diclosulam less effective than flumioxazin in controlling common ragweed.

BIOFUELS: PIPELINE OR PIPE DREAM? G.N. Rhodes, Jr.; Plant Sciences Department, University of Tennessee, Knoxville.

ABSTRACT

In the Midsouth, numerous alternative or nontraditional crops have appeared, disappeared, and in some cases disappeared yet to reappear in a few years. Some examples include kenaf, hyacinth bean, giant knotweed, sumac, rapeseed/canola and others. As is the case with traditional southern crops, weed competition is problematic, leading to requests, which are sometimes quite vocal, from crop promoters, growers, university administrators, politicians and other stakeholders for weed management recommendations and solutions. Weed scientists in the southern region have always answered the challenge to provide research-based production recommendations. Sometimes these requests are accompanied by substantial funding; oftentimes they are not. Interest in biofuels and in particular, cellulosic ethanol, has dramatically increased over the past 5 years due to volatile petroleum prices, political instability in the Middle East, and the "green" movement. One of the leading candidates for sustainable cellulosic ethanol production is switchgrass. Once established, this warm-season native grass grows aggressively and out-competes most summer annual and perennial weeds. However, successful stand establishment is jeopardized by weed competition during the year of establishment. Previous research has shown that weed competition is the most frequent cause of stand establishment failure. Summer annual and warm season perennial grasses are much more problematic than broadleaves; most current research is focused accordingly. Particularly troublesome grasses in the Midsouth include large crabgrass (*Digitaria sanguinalis* (L.) Scop.) , broadleaf signalgrass (*Urochloa platyphylla* (Nash) R.D. Webster), goosegrass (*Eleusine indica* (L.) Gaertn.), johnsongrass (*Sorghum halepense* (L.) Pers.) and bermudagrass (*Cynodon dactylon* (L.) Pers.). This symposium, titled "Biofuels – Opportunities for Weed Scientists", examines some of the current switchgrass weed management research, the development of, and rationale for, switchgrass as a biofuel crop, one state's unique pilot research and development program for the production cellulosic ethanol, and what the future may hold for the commercial production of cellulosic ethanol in the southern region.

DEVELOPING SWITCHGRASS FOR BIOFUELS. R. Mitchell and K.P Vogel; USDA-ARS, Grain, Forage, and Bioenergy Research Unit, Lincoln, NE

ABSTRACT

Switchgrass (*Panicum virgatum* L.) is a native warm-season grass that is a leading biomass crop in the US, but is not a new or novel crop. The USDA location in Lincoln, NE has conducted switchgrass research continuously since 1936. Plot-scale research has been conducted on switchgrass establishment, fertility requirements, and response to harvest date in numerous environments in the Great Plains and Midwest. Currently available plant materials and production practices can reliably-produce 5 tons per acre in the central Great Plains and Midwest, and 10 tons per acre in much of the Southeast. Weed control is essential during establishment, but with good management is typically not required again. Although stands can be maintained indefinitely, stands are expected to last at least 10 years, after which time the stand will be renovated and new, higher-yielding material will be seeded on the site. Fertility requirements are well understood in most regions, with about 12 to 14 pounds of N per acre required for each ton of expected yield if the crop is allowed to completely senesce before the annual harvest. Switchgrass production parameters such as economics, net energy, carbon sequestration, temporal and spatial biomass variation, and harvest and storage management have been evaluated at the field-scale on marginal land in the central and Northern Great Plains. Studies conducted on 10 farms over 5-years concluded that switchgrass biomass could be produced for an average farm gate cost of $60 per US ton. Switchgrass on these 10 farms produced 13 times more energy as ethanol than would be required as energy from petroleum and produced 5.4 times more renewable than non-renewable energy consumed when properly managed. After five production years, soil organic carbon was sequestered at a rate of 2,590 pounds of C $acre^{-1}$ yr^{-1} in the top 48 inches of soil. The information from these studies on economic feasibility, net energy, C-sequestration, sustainability, and best agronomic production practices forms the basis on which large scale switchgrass production for bioenergy can be based. Nearly 75-years of research and field experience with switchgrass as a hay and forage crop suggests switchgrass will be productive and sustainable on rain-fed marginal land east of the 100th Meridian. Long-term plot trials and farm-scale studies in the Great Plains and plot trials in the Great Plains, Midwest, South, and Southeast indicate switchgrass is productive, protective of the environment, and profitable for the farmer. New cultivars and management practices will significantly increase yields similar to the corn yield increases achieved in the last 30 years. The availability of adequate acres of agricultural land and the profit potential provided to farmers for growing switchgrass in a region will determine the success of growing switchgrass for biomass energy. Production practices and plant materials are available to achieve sustainable and profitable biomass production, for both farmers and bio-refineries, to help meet the energy requirements of the nation and reduce our dependence on foreign oil.

THE COMMERCIAL PATHWAY FOR CELLULOSIC ETHANOL. K. Althoff; DuPont Danisco Cellulosic Ethanol, LLC, Itasca, IL.

ABSTRACT

Dupont Danisco Cellulosic Ethanol LLC (DDCE) is developing an integrated technology solution to convert renewable biomass feedstocks including agricultural residues and dedicated energy crops into cellulosic ethanol. The technology is based on a biochemical platform that utilizes groundbreaking pretreatment, enzymatic hydrolysis and fermentation steps which are the result of coordinated research between DDCE's parent companies, Dupont and Danisco (Genencor). In December 2009, DDCE started up a 250,000 gallon demonstration plant in Vonore, TN that will convert feedstocks including corn cob and dedicated energy crops such as switchgrass and sorghum into cellulosic ethanol. This plant will serve as the precursor for scaling up DDCE's technology to a commercial scale of 25 million gallons per year by 2012.

The market for cellulosic ethanol may evolve to a structure similar to that of other commodities whereby the lowest cost, most reliable, and sustainable technologies will become the dominating conversion methods. To reach that stage and be competitive with petroleum based fuels, DDCE is forming strong partnerships with private and public entities to advance the development of its first cellulosic ethanol plants. The presentation will highlight how these partnerships have accelerated the timeline for commercial deployment at DDCE.

New feedstocks for ethanol such as switchgrass and energy crops provide significant opportunities to expand agricultural production in the southern US. Integration within the supply chain will be a key component of the success for both the biorefinery as well as farmers that are growing the crops. While these crops have been grown for years in smaller production plots, there are still significant achievements to come regarding the potential yields, soil carbon sequestration, pests, weeds, production and harvesting practices. Furthermore, new supply chains will be required that maximize the value of the feedstock for farmers while ensuring that it meets the specifications for conversion at the biorefinery. The presentation will focus on how those potential advances can impact the future development of the bio-renewable industry.

WEED SURVEY – SOUTHERN STATES

2010

Vegetable, Fruit and Nut Crops Subsection

(Cucurbits, Fruiting Vegetables, Cole Crops and Greens, Other Vegetables,
Peaches, Apples, Fruits and Nuts, Citrus Crops)

Theodore M. Webster
Chairman

Information in this report is provided by the following individuals:

Alabama	Mike Patterson	
Georgia	A. Stanley Culpepper	Wayne Mitchem
Florida	Andrew MacRae	
North Carolina	Katie Jennings	Wayne Mitchem
South Carolina	Wayne Mitchem	
Virginia	Jeff Derr	

Table 1. The Southern States 10 Most Common and Troublesome Weeds in Apples.

	States		
Ranking	Alabama	Georgia, North Carolina, and South Carolina	Virginia
Ten Most Common Weeds			
1	crabgrass spp.	large crabgrass	large crabgrass
2	pigweed spp.	common lambsquarters	common lambsquarters
3	cutleaf eveningprimrose	smooth pigweed	pigweed spp.
4	bermudagrass spp.	white clover	giant foxtail
5	prickly sida	buckhorn plantain	dandelion
6	ragweed spp.	morningglory spp.	buckhorn plantain
7	common lambsquarters	Carolina geranium	fall panicum
8	yellow nutsedge	dandelion	common ragweed
9	purple nutsedge	common chickweed	common chickweed
10	morningglory (*ipomoea*) spp.	fall panicum	white clover
Ten Most Troublesome Weeds			
1	blackberry spp.	mugwort	poison ivy
2	southern dewberry	yellow nutsedge	virginia creeper
3	yellow nutsedge	poison ivy	bramble spp.
4	purple nutsedge	Virginia creeper	bindweed spp.
5	prickly sida	bermudagrass	horsenettle
6	ragweed spp.	bramble spp.	morningglory spp.
7	common lambsquarters	morningglory spp.	dandelion
8	cutleaf eveningprimrose	horsenettle	quackgrass
9	bermudagrass spp.	white clover	tall fescue
10	bahiagrass	dallisgrass	johnsongrass

Table 2. The Southern States 10 Most Common and Troublesome Weeds in Citrus.

No states reporting

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Cole Crops and Greens.

	States	
Ranking	Alabama	Georgia
Ten Most Common Weeds		
1	annual ryegrass	henbit
2	Virginia pepperweed	cutleaf eveningprimrose
3	cutleaf eveningprimrose	chickweed spp.
4	Carolina geranium	wild radish
5	henbit	pink purslane
6	common lambsquarters	pigweed spp.
7	vetch spp.	annual grasses
8	chickweed spp.	swinecress
9	wild radish	yellow nutsedge
10	purslane spp.	purple nutsedge
Ten Most Troublesome Weeds		
1	wild radish	wild radish
2	cutleaf eveningprimrose	yellow nutsedge
3	carolina geranium	purple nutsedge
4	henbit	pink purslane
5	vetch spp.	cutleaf eveningprimrose
6	chickweed spp.	pigweed spp.
7	common lambsquarters	morningglory (*ipomoea*) spp.
8	virginia pepperweed	annual grasses
9	annual ryegrass	swinecress
10	purslane spp.	chickweed spp.

Table 4. The Southern States 10 Most Common and Troublesome Weeds in Cucurbit Crops.

	States		
Ranking	Alabama	Georgia	Florida
Ten Most Common Weeds			
1	sicklepod	Texas millet	purple nutsedge
2	crabgrass spp.	pigweed spp.	yellow nutsedge
3	pigweed spp.	crabgrass spp.	common purslane
4	Florida pusley	pink purslane	goosegrass
5	yellow nutsedge	Florida pusley	Florida pusley
6	morningglory (*ipomoea*) spp.	yellow nutsedge	spanish needles
7	purple nutsedge	purple nutsedge	American black nightshade
8	Florida beggarweed	smallflower morningglory	pigweed sp.
9	smallflower morningglory	morningglory (*ipomoea*) spp.	Carolina geranium
10	arrowleaf sida	goosegrass	crabgrass
Ten Most Troublesome Weeds			
1	yellow nutsedge	purple nutsedge	purple nutsedge
2	sicklepod	yellow nutsedge	yellow nutsedge
3	purple nutsedge	pigweed spp.	common purslane
4	morningglory (*ipomoea*) spp.	pink purslane	goosegrass
5	tropic croton	morningglory (*ipomoea*) spp.	crabgrass
6	smallflower morningglory	smallflower morningglory	Florida pusley
7	wild radish	Florida pusley	American black nightshade
8	arrowleaf sida	Texas millet	pigweed sp.
9	Florida pusley	Florida beggarweed	black medic
10	pigweed spp.	goosegrass	dog fennel

Table 4. The Southern States 10 Most Common and Troublesome Weeds in Cucurbit Crops (continued).

	States	
Ranking	North Carolina[a]	North Carolina[b]
Ten Most Common Weeds		
1	Palmer amaranth	Palmer amaranth
2	carpetweed	carpetweed
3	large crabgrass	large crabgrass
4	smooth pigweed	smooth pigweed
5	yellow nutsedge	yellow nutsedge
6	common purslane	common purslane
7	pink purslane	pink purslane
8	entireleaf morningglory	entireleaf morningglory
9	purple nutsedge	purple nutsedge
10	pitted morningglory	pitted morningglory
Ten Most Troublesome Weeds		
1	Palmer amaranth	Palmer amaranth
2	yellow nutsedge	yellow nutsedge
3	purple nutsedge	purple nutsedge
4	smooth pigweed	florida pusley
5	Florida pusley	smooth pigweed
6	wild radish	wild radish
7	entireleaf morningglory	entireleaf morningglory
8	goosegrass	goosegrass
9	sicklepod	sicklepod
10	common cocklebur	common cocklebur

[a] This survey refers to watermelon and squash for North Carolina.
[b] This survey refers to cucumber and cantaloupe for North Carolina.

Table 5. The Southern States 10 Most Common and Troublesome Weeds in Fruit and Nut Crops.

	States		
Ranking	Alabama[c]	Georgia, North Carolina, and South Carolina[d]	Florida[e]
Ten Most Common Weeds			
1	bahiagrass	large crabgrass	black medic
2	bermudagrass spp.	horsenettle	Carolina geranium
3	crabgrass spp.	Palmer amaranth	goatweed
4	pigweed spp.	common lambsquarters	goosegrass
5	morningglory (*ipomoea*) spp.	white clover	common purslane
6	Florida pusley	goosegrass	hairy galinsoga
7	nutsedge spp.	common chickweed	crabgrass
8	plantain spp.	dandelion	purple nutsedge
9	ragweed spp.	morningglory (*ipomoea*) spp.	yellow nutsedge
10	curly dock	spotted spurge	wild mustard
Ten Most Troublesome Weeds			
1	blackberry spp.	bermudagrass	black medic
2	southern dewberry	horsenettle	Carolina geranium
3	nutsedge spp.	white clover	goosegrass
4	arrowleaf sida	Virginia creeper	crabgrass
5	trumpetcreeper	johnsongrass	purple nutsedge
6	vetch spp.	smallflower morningglory	yellow nutsedge
7	spotted spurge	morningglory (*ipomoea*) spp.	wild mustard
8	morningglory (*ipomoea*) spp.	purslane spp.	goatweed
9	bahiagrass	yellow nutsedge	hairy galinsoga
10	bermudagrass spp.	henbit	common purslane

[c] This survey refers primarily to pecan for Alabama.
[d] This survey refers to grape for Georgia, North Carolina, and South Carolina.
[e] This survey refers to strawberries in Florida.

Table 5. The Southern States 10 Most Common and Troublesome Weeds in Fruit and Nut Crops (continued).

	States	
Ranking	North Carolina[f]	Virginia[g]
Ten Most Common Weeds		
1	needleleaf rosettegrass	large crabgrass
2	large crabgrass	common lambsquarters
3	annual sedge	pigweed spp.
4	common toadflax	dandelion
5	Maryland meadowbeauty	giant foxtail
6	greenbriar	buckhorn plantain
7	broomsedge	fall panicum
8	red maple	common ragweed
9	red sorrel	common chickweed
10	Carolina jasmine	white clover
Ten Most Troublesome Weeds		
1	greenbriar	yellow nutsedge
2	bramble spp.	bermudagrass spp.
3	large crabgrass	dandelion
4	needleleaf rosettegrass	bindweed spp.
5	yellow nutsedge	horsenettle
6	maryland meadowbeauty	quackgrass
7	Carolina jasmine	johnsongrass
8	red maple	tall fescue
9	holly spp.	morningglory (*ipomoea*) spp.
10	annual sedge	red sorrel

[f] This survey refers to blueberry for North Carolina.
[g] This survey refers to grape, blueberry, and raspberry in Virginia

Table 6. The Southern States 10 Most Common and Troublesome Weeds in Fruiting Vegetables.

	States		
Ranking	Alabama	Georgia	Florida
Ten Most Common Weeds			
1	crabgrass spp.	crabgrass spp.	purple nutsedge
2	sicklepod	pigweed spp.	yellow nutsedge
3	morningglory (*ipomoea*) spp.	Texas millet	goosegrass
4	yellow nutsedge	pink purslane	American black nightshade
5	purple nutsedge	Florida pusley	common purslane
6	pigweed spp.	yellow nutsedge	Florida pusley
7	Florida pusley	purple nutsedge	devil's beggarticks
8	Florida beggarweed	smallflower morningglory	crabgrass
9	bristly starbur	morningglory (*ipomoea*) spp.	pigweed sp.
10	arrowleaf sida	goosegrass	Carolina geranium
Ten Most Troublesome Weeds			
1	yellow nutsedge	purple nutsedge	purple nutsedge
2	purple nutsedge	yellow nutsedge	yellow nutsedge
3	morningglory (*ipomoea*) spp.	morningglory (*ipomoea*) spp.	American black nightshade
4	horsenettle	smallflower morningglory	common purslane
5	tropic croton	nightshade spp.	goosegrass
6	spotted spurge	pigweed spp.	Florida pusley
7	smartweed spp.	pink purslane	crabgrass
8	bristly starbur	Florida pusley	ragweed parthenium
9	Florida beggarweed	goosegrass	pigweed sp.
10	arrowleaf sida	Florida beggarweed	spanish needles

Table 6. The Southern States 10 Most Common and Troublesome Weeds in Fruiting Vegetables (continued).

	States	
Ranking	North Carolina[h]	North Carolina[i]
Ten Most Common Weeds		
1	carpetweed	carpetweed
2	common purslane	common purslane
3	large crabgrass	large crabgrass
4	goosegrass	goosegrass
5	common lambsquarters	common lambsquarters
6	Palmer amaranth	smooth pigweed
7	smooth pigweed	yellow nutsedge
8	yellow nutsedge	purple nutsedge
9	pink purslane	eastern black nightshade
10	eastern black nightshade	cutleaf groundcherry
Ten Most Troublesome Weeds		
1	yellow nutsedge	Palmer amaranth
2	purple nutsedge	common lambsquarters
3	Palmer amaranth	smooth pigweed
4	common lambsquarters	common purslane
5	smooth pigweed	entireleaf morningglory
6	common purslane	yellow nutsedge
7	pink purslane	purple nutsedge
8	entireleaf morningglory	pink purslane
9	sicklepod	wild radish
10	wild radish	sicklepod

[h] This survey refers to pepper for North Carolina.
[i] This survey refers to tomato for North Carolina.

Table 7. The Southern States 10 Most Common and Troublesome Weeds in Other Vegetable Crops.

	States	
Ranking	Georgia	North Carolina[j]
Ten Most Common Weeds		
1	crabgrass spp.	Palmer amaranth
2	pigweed spp.	carpetweed
3	Texas millet	yellow nutsedge
4	pink purslane	large crabgrass
5	wild radish	goosegrass
6	yellow nutsedge	smooth pigweed
7	purple nutsedge	common lambsquarters
8	cutleaf evening-primrose	common purslane
9	morningglory (*ipomoea*) spp.	Florida pusley
10	goosegrass	smooth groundcherry
Ten Most Troublesome Weeds		
1	yellow nutsedge	Palmer amaranth
2	purple nutsedge	yellow nutsedge
3	pigweed spp.	smooth pigweed
4	pink purslane	common lambsquarters
5	wild radish	common purslane
6	Florida pusley	pink purslane
7	morningglory (*ipomoea*) spp.	Florida pusley
8	smallflower morningglory	Pennsylvania smartweed
9	nightshade spp.	wild radish
10	Texas millet	entireleaf morningglory

[j] This survey refers to sweet potato in North Carolina.

Table 8. The Southern States 10 Most Common and Troublesome Weeds in Peaches.

	States		
Ranking	Alabama	Georgia, North Carolina, and South Carolina	Virginia
Ten Most Common Weeds			
1	crabgrass spp.	cutleaf eveningprimrose	large crabgrass
2	pigweed spp.	large crabgrass	common lambsquarters
3	morningglory (*ipomoea*) spp.	Palmer amaranth	pigweed spp.
4	horseweed	common chickweed	giant foxtail
5	prickly sida	henbit	dandelion
6	nutsedge spp.	common lambsquarters	buckhorn plantain
7	plantain spp.	goosegrass	fall panicum
8	Florida pusley	bermudagrass spp.	common ragweed
9	arrowleaf sida	morningglory (*ipomoea*) spp.	common chickweed
10	curly dock	Carolina geranium	white clover
Ten Most Troublesome Weeds			
1	blackberry spp.	purple nutsedge	poison ivy
2	bermudagrass spp.	yellow nutsedge	Virginia creeper
3	yellow nutsedge	Bahiagrass	bramble spp.
4	purple nutsedge	Horseweed	bindweed spp.
5	ragweed spp.	bermudagrass spp.	horsenettle
6	curly dock	Johnsongrass	morningglory spp.
7	morningglory (*ipomoea*) spp.	morningglory (*ipomoea*) spp.	dandelion
8	Florida pusley	Palmer amaranth	quackgrass
9	arrowleaf sida	Virginia creeper	tall fescue
10	bahiagrass	cutleaf evening-primrose	johnsongrass

STATE WEED PUBLICATIONS

State: ALABAMA

Prepared by: 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 Southern United States ($4.00)
ANR-1058	Brush Control
ANR-1128	Weed Identification for Horticulture 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	
FSA 2149	Ryegrass Identification Keys
FSA 2152	Prevention and Control of Glyphosate Resistant Pigweed in Roundup Ready Soybean and Cotton (color)
FSA 2155	Sod Farm Weed Control (color)
FSA 3054	Musk Thistle (color)
FSA 6123	Nursery Series: Weed Control in Container Nurseries
FSA 6124	Woody Plant Control in Landscapes
FSA 6127	Nursery Series: Weed Control in Field Nurseries
FSA 6137	Weed Control in Landscape Plantings
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
FSA-2080	Pasture Weed and Brush Control
FSA-2109	Home Lawn Weed Control

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, Gainsville, FL 32606

4 Dr. B. R. Unruh, 1523 Fifield Hall, Gainsville, FL 32611

5 University of Florida Publications, P.O. Box 110011, Gainesville, FL 32611-0011

Number	Title
SS-AGR-001	Weed Control in Tobacco
SS-AGR-002	Weed Control in Corn
SS-AGR-003	Weed Control in Peanuts
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SS-AGR-005	Weed Control in Soybeans
SS-AGR-006	Weed Control 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
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SS-AGR-50	Tropical Soda Apple in Florida
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SS-AGR-101	Applications 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	Labeled 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
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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
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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 Management in Blueberries
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HS-1881	Weed Management in Commercial Citrus
HS-1891	Weed Control in Cold or Brassica Leafy Vegetables
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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

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2805	Families, Mode of Action and Characteristics of Agronomic, Non-Crop and Turf Herbicides
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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.)
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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
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1118	Non-Commercial 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	2009 Georgia Peach Spray and Production Guide
Pub. 377	2009 Georgia Tobacco Growers Guide
Pub. 380	2009 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	Comprehensive Guide to Corn Management in Kentucky ($10.00)

State: LOUISIANA

Prepared by: Dearl Sanders

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RIS 105	Guidelines for Managing Winter Vegetation in Northeast Louisiana

State: MISSISSIPPI

Prepared by: John D. Byrd, Jr.

Internet URL: http://www.msucares.com/pubs/index.html

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963	Soybean Preemergence Weed Control
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TECHNICAL NOTES

MTN-SG3	Weed Control in Christmas Tree Plantations
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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: Joe Neal, David Ritchie, and Fred Yelverton

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http://www.turffiles.ncsu.edu/AllPublications.aspx

Order from: Dr. Fred Yelverton, Department, Box 7620, North Carolina State University, Raleigh, NC 27695-7620

Dr. J.C. Neal, Department of Horticulture, Box 7609, North Carolina State University, Raleigh, NC 27695-7609

Communication Services, N.C. State University, 3210 Faucette Dr., Box 7603, Raleigh, NC 27695-7603

Dr. David Ritchie, Department of Horticulture, Box 7609, North Carolina State University, Raleigh, NC 27695-7609

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State: OKLAHOMA

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F-7318	Integrated Control of Musk Thistle in Oklahoma
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FS-9998	Clearfield Wheat Production Systems in Oklahoma

State: SOUTH CAROLINA

Prepared by: Bert McCarty

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

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	2009 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: Neil Rhodes and Larry Steckel

Internet URL: http://www.utextension.utk.edu/weedcontrol/weedcontrol.html

Order from: Extension Mailing Room, P.O. 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	2009 Weed Control Manual for Tennessee Field Crops
1659	Weed Management in Annuals, Perennials and Herbaceous Ground Covers: Nursery Production and Professional Grounds Maintenance

State: TEXAS

Prepared by: Dr. Paul A. Baumann

Internet URL: http://tcebookstore.org/

Order from: Dr. Paul A. Baumann, Extension Weed Specialist, 349 Soil & Crop Sciences, Texas A&M University, College Station, TX 77843-2474

Number	Title
B-1466	Chemical Weed and Bush Control – Suggestions for Rangeland
B-5038	Suggestions for Weed Control in Pastures and Forage Crops
B-5039	Suggestions for Weed Control in Cotton
B-5042	Suggestions for Weed Control in Corn
B-5045	Suggestions for Weed Control in Sorghum
B-6010	Suggestions for Weed Control in Peanuts
B-6139	Weed Control Recommendations in Wheat
L-1708	Wild Oat Control in Texas
L-2254	Common Weeds in Corn and Grain Sorghum
L-2301	Common Weeds in Cotton
L-2302	Common Weeds in West Texas Cotton
L-2339	Field Bindweed Control in the Texas High Plains
L-2436	Silverleaf Nightshade Control in Cotton in West Texas
L-5102	Perennial Weed Control During Fallow Periods in the Texas High Plains
B-6081	Herbicides: How They Work and The Symptoms They Cause
B-6079S	Como identificar malezas: Las estruccturas de la planta son la clave
B-6079	Weed Identification: Using Plant Structures as a Key
L-5205	Reducing Herbicides in Surface Waters- Best Management Practices
L-5204	Some Facts About Atrazina
L-5324	Protecting the Environment- Using Integrated Weed Management in Lawns

State: VIRGINIA

Prepared by: Scott Hagood and Shawn Askew

Internet URL: gopher://ext.vt.edu:70/11/vce-data

Order from: Virginia Polytechnic Institute and State University, Extension Distribution Center, Landsdowne St., Blacksburg, VA 24061

Number	Title
PUBLICATIONS	
456-016	Pest Management Guide for Field Crops
456-017	Pest Management Guide for Horticultural and Forest Crops
456-018	Pest Management Guide for Home Grounds and Animals

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	Micro-Tech	Monsanto
ametryn	Evik	Syngenta
amicarbazone		Bayer
aminopyralid	Milestone	Dow AgroSciences
asulam	Asulox	Bayer
atrazine	AAtrex / others	Syngenta / others
Atrazine + s-metolachlor + glyphosate	Expert	Syngenta
azafenidin		DuPont Ag Products
B		
BAS 625H	Aura	BASF
BAS 654		BASF
BAY FOE5043	Axiom	Bayer
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	Dow AgroSciences
	Stinger	

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	Frontier	BASF
dimethenamid-P	Outlook	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,	Griffin
	Meturon	Griffin
Fluoroxypyr	Vista	Dow AgroSciences
Fluroxypyr + aminopyralid	Cleanweave	Dow AgroSciences
fluthiacet methyl	Action	Syngenta
	Appeal	KI USA
Fomesafen	Reflex	Syngenta
Fomesafen + metolachlor	Prefix	Syngenta
foramsulfuron + iodosulfuron	Equip	Bayer
fosamine	Krenite	DuPont Ag Products

G

glufosinate	Liberty	Bayer Crop Science
	Rely	Bayer Crop Science
	Ignite	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,	BASF
	Chopper,	BASF
	Stalker, Habitat	BASF
imazaquin	Scepter	BASF
	Image	BASF
imazethapyr	Pursuit	BASF
	NewPath	BASF
imazethapyr + imazapyr	Lightning	BASF
	Event	
isoxaben	Gallery	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, Tenacity	Syngenta
mesotrione + metolachlor	Camix	Syngenta
mesotrione + metolachlor + atrazine	Lumax	Syngenta
mesotrione + glyphosate	Halex GT	Syngenta
metham	Vapam	Amvac
methyl bromide	Bromo-gas	Great Lakes
metolachlor	Dual Magnum	Syngenta
	Pennant	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,	BASF
	Prowl H2O	BASF
	Pendulum	BASF
	Pentagon	Lesco
	Lesco PRE-M	The Scotts Company
	Corral	
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 One-Pass	FMC
sulfometuron	Oust	DuPont
sulfosulfuron	Monitor, Maverick, Outrider, Certainity	Monsanto

T-Z

tebuthiuron	Spike	Dow
tembotrione + safener	Laudis	Bayer
terbacil	Sinbar	DuPont
thiafluamide + V-1014270 + metribuzin	Axiom	Bayer
thiazopyr	Dimension	Dow
	Spindle, Visor	
thifensulfuron	Harmony GT	DuPont
thifensulfuron + tribenuron	Harmony Extra	DuPont
topremazone	Impact	AmVac
triasulfuron	Amber	Syngenta
triasulfuron + dicamba	Rave	Syngenta
tribenuron	Express	DuPont
triclopyr	Garlon	Dow
	Grandstand	
triclopyr +clopyralid	Redeem R&P	Dow
trifloxysulfuron	Envoke , Monument	Syngenta
trifluralin	Treflan	Dow
	Trifluralin	Dow /
trinexapac-ethyl	Primo	Syngenta
	Palisade	

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