Proceedings of the

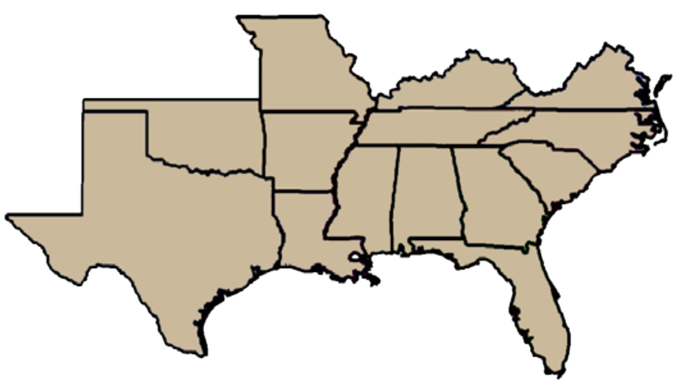
Southern Weed Science Society

66th Annual Meeting

Royal Sonesta Hotel

Houston, TX

28-30 January 2013



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Preface

These PROCEEDINGS of the 66th Annual Meeting of the Southern Weed Science Society contain papers and abstracts of presentations in Houston, TX at the Royal Sonesta Hotel. A list is also included giving the common/trade/code names and manufacturers of 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 Student Awards; the Annual Weed Survey; lists of officers and committee chairpersons; minutes of all business meetings; and lists of registrants attending the annual meeting and sustaining members.

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). The use of commercial names in the PROCEEDINGS neither constitutes an endorsement, nor does the non-use of similar products constitute a criticism by the Southern Weed Science Society.

This document is available as a PDF at the SWSS web site (www.swss.ws).

Theodore M. Webster
Proceedings Editor,
Southern Weed Science Society

Regulations and Instructions for Papers and Abstracts

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 crop death.

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.

Typing Instructions-Format

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

2. Content:

Abstracts - Title, Author(s), Organization(s) Location, the heading ABSTRACT, text of the

Abstract, and Acknowledgments. Use double spacingbefore and after the heading, ABSTRACT.

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

Each section of an abstract or paper should be clearly defined. The heading of each section should be typed in the center of the page in capital letters with double spacing before and after. Pertinent comments regarding some of these sections are listed below:

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

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

Example: **WEED CONTROL SYSTEMS IN SPRINKLER-IRRIGATED RICE.** K.H. Akkari,

R.F. Talbot, J.A. Ferguson and J.T. Gilmour; Department of Agronomy, University of Arkansas, Fayetteville, AR 72701.

ABSTRACT

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

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

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

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

SWSS Presidential Address
Thomas C Mueller

January 28, 2013

On behalf of the Southern Weed Science Society executive Board of Directors I officially welcome you to our annual meeting in Houston Texas. Steve Kelly our program chair and Gary Schwarzlose our local arrangements chair have done an excellent job to prepare for our meeting.

A few months ago I was forwarded an e-mail by a gentleman named Doug Worsham. Doug Worsham is a retired professor from North Carolina State University, and he was very active in the Southern years ago. His e-mail questioned why there were no recent presidential addresses in the proceedings. I told him that recent presidents had declined from having presidential addresses, mainly for the sake of brevity. I informed Dr. Worsham that I had planned to make a presidential address and I decided to write this speech and add it to the proceedings. I hold no one in higher regard with respect to the Southern than Dr. Doug Worsham.

I have three topics to cover in my presentation today: the state of the Southern Weed Science Society, my views on the discipline of weed science, and a few closing comments.

The Southern Weed Science Society is in fantastic shape. Our attendance declined for several years from a high in the late 80s to a low in 2007 of about 250. We have increased attendance and now we are stabilized at about the 350 level. From a financial standpoint we have erased several years of deficit spending and now are showing a budget surplus each year the last several years. We also hired a new business manager, Phil Banks, who has updated and streamlined many of our procedures. The interaction of members via the website is more efficient and up-to-date. Past president Barry Brecke and Constitution and Operating Procedures chair John Byrd, with the concerted efforts of the entire executive board have produced a largely renovated and updated manual of operating procedures, which is called the MOP. If you would like to know how something works in the Southern, please go to the website and check the MOP. What you'd like to know is probably right there. I could list the many people who devote substantial time to our organization, but I'm not going to do that because invariably I would forget somebody. Our organization is in great shape financially with sound governance and purpose.

I guess when I went to my first Southern Meetings in 1986 and 1987 I had no way of realizing that I was joining an organization that was at the zenith or maximum for attendance. I sometimes reminisce about the "good old days" of attendance of about 1000, and multiple hospitality suites on various levels of the hotel. We all know how the discipline of weed science changed in the following years. The 80s and 90s were times of new molecules, each of which was celebrated with a launch meeting. The companies were actively filling largely unmet biological needs of farmers and other producers.

The Roundup ready era began in the late 90s and expanded into the first decade of the next century. It was a time of great change for the discipline of weed science. Many herbicides lost market value and lost market share, more of the value proposition was transferred to the cost of the seed, and the expectations of end-users became perfect weed control with no crop injury. I remember an extension colleague who writes a weekly column that I read every week saying," it's pretty easy. You plant Roundup ready soybeans and you spray Roundup every week until there's nothing but soybeans left". As soybean and cotton yields increased, it was hard to argue with the success of the system. Lower-cost, completely effective, higher-yielding, more simple weed control was the norm. Companies responded by decreasing discovery activities for herbicides, universities did not replace many weed science faculty, and so it went.

The next chapter is different from this one. The massive selection pressure of using a single mode of action on millions of acres for multiple years searched the trillions of individual weedy plants for some that could tolerate post-emergent glyphosate. We first had glyphosate resistant horseweed. It was kind of a nuisance in no till systems, and we needed to manage that problem. The next weed the came along with glyphosate resistance was Palmer pigweed, first in Georgia and later in the Midsouth area. This is what the companies call a driver weed, which radically changed the weed control choices utilized by the farmer. We've also seen an increase in the number of glyphosate resistant weeds, including those in turf situations.

I remember a few years ago when there was this large outcry about the impending disaster that was Asian soybean rust. At the time I wanted to write an article and inform the United States that Asian soybean rust would never be as big a problem in United States as it is in South America. Viewing the disease triangle, we have a susceptible host in our US soybean crop, but we do not have a consistent source of inoculum nor do we have suitable environment to maximize infection. I didn't realize until I went to Brazil that they have frequent afternoon thundershowers to keep the soybean foliage wet and well suited for Asian soybean rust. There are two main ideas that I wish to draw from this Asian soybean rust story and contrast them to glyphosate resistant weeds. Firstly, Asian soybean rust is a tremendous possible threat but has yet to actually reduce yields in the United States. In contrast glyphosate resistant weeds, especially Palmer pigweed in the South, have greatly reduced crop yields. I remember my extension colleague Larry Steckel explaining to me the heart-ache of telling some farmers to harvest their fields with a Bush-hog, meaning they did not harvest that field and got zero yield. Glyphosate resistance is very real in the South, and I predict in the decade ahead our friends in the northern states will come to understand how "just a few waterhemp plants" this year can make for problems in the years ahead. The second contrast is that when the Asian soybean rust crisis was occurring the capacity of many universities to conduct meaningful field research was limited. Many schools in the South have robust plant pathology field research systems, while other universities have gone largely molecular in their research approach. I am hopeful that weed science as a discipline will maintain our ability to conduct a range of research from fundamental to applied.

In a recent popular press article, Dr. Bill Johnson said , "Control must be employed as soon as problem populations exist in a field, and that control can be much more than just application of another herbicide. Use of rotations, tillage, cover crops, and hand weeding of fields may be necessary. While there are herbicide programs that can provide control, they must be carefully managed and applied at early growth stages for such weeds." I find some aspects of this quote interesting. The overarching principle from the first sentence is that once you get resistant weeds you should start managing them. I have a few research colleagues who send me all of their published journal articles every year. I do not routinely do this type of distribution, but maybe we should consider more self-promotion in our work. I drafted a paper which I thought was interesting and has actually been cited fairly frequently. The Weed Technology paper was titled *Proactive Versus Reactive Management of Glyphosate-Resistant or -Tolerant Weeds*. The paper's take-home message is that the best course is to be proactive and thus not allow glyphosate resistant weeds to develop. In reality, I believe virtually 100% of farmers are entirely reactive in their weed management decisions. To quote an old phrase, "if it ain't broke; don't fix it". Perhaps glyphosate resistance, and future resistance to any other herbicides will cause a paradigm shift where farmers have a longer-term perspective on weed management.

I really do not like to use the term paradigm, since it has very different meanings to different people. To some people it's a worldview, others a philosophy, still others a "lens" through which we see the world. Yet the paradigm of intellectual property and weed science is a source of interest to people. When I started in this business in the early 90s, I would see early-stage experimental compounds in my fieldwork. It varied somewhat from company to company, but there was minimal legal paperwork associated with these studies. Contrast today's legalistic, bureaucratic environment in which we work. Many of the talks given at this meeting had to go through a company's legal department to be approved. Originally, I guess I saw this conflict as an academic versus industry interaction. Over the years I have come to appreciate this perspective is not correct. It is actually a researcher/extension/chemist group that interacts with a lawyer/ intellectual property/administration/patent office. The company guys I directly work with when they talk about their legal department say the exact same things I say about my legal department. They are not always words of glowing praise. Given the value of intellectual property I see no reason this should change in the future. However the need for objective, third-party evaluation of various weed control products and strategies is needed and even demanded by some stakeholders. It is in the best interest of all parties to allow for honest, open discussion of research results. I foresee a time in the not too distant future where a scientist will decline a given protocol not because of insufficient funding or lack of plot space, but because of overly restrictive publication limitations.

A good friend of mine, John Wilcut, was a professor at North Carolina State University. He was an avid reader, among other things, and he told me about this book entitled " The Seasons of a Man's Life." This book was a psychological study of four populations of people, with one group examined being college professors. I read the book with interest and it provided insights into my life. The book talks about the stages of a professor's professional life, the early years of excitement and passion and drive to earn tenure. As the group of professors aged and went through their lives a certain point was reached, and they had the realization that they would not win the Nobel prize. Each responded differently. Some devoted their efforts to enhance teaching, others went into administration, others played a more active role in mentoring junior faculty and students, some went into a slow decline of several years, and some others pressed onward and tried to win the prize. As a weed scientist I do not anticipate winning the Nobel Prize. If I am lucky the highest official award I will ever win will be a fellow of the Weed Science Society of America. I hope to win that award someday. To be honest, the greatest reward in my life is of a personal nature. I could make the case that the woman I married, my beautiful wife from Kentucky, and the three wonderful children that we have had and all their associated blessings and challenges are the greatest reward. On a professional level, being president of a regional society may not always be considered a positive. However, I shall always treasure my time as president of the Southern. I consider it my highest professional honor to have served you.

Thank you for electing me and allowing me to serve as your president. I appreciate this very much.

Respectfully submitted,
Thomas C. Mueller
President, SWSS January 2013

2013 Weed Scientist of the Year
Barry Brecke

Barry Brecke was born in Milwaukee, Wisconsin. He is married to Gayle and has two grown children, Darren and Suzanne. He earned his B.S. degree from the University of Wisconsin-River Falls and his M.S. and Ph.D. in Agronomy-Weed Science from Cornell University. He is currently Professor Emeritus - Weed Science and Interim Center Director at the University of Florida, West Florida Research and Education Center, Jay, FL. He joined the University of Florida in 1975 with a research focus on developing weed management systems for corn, soybeans, cotton and peanuts. In 1996 he accepted additional responsibilities in teaching as part of a satellite-teaching program at the University of Florida and expanded his research program to include weed management in turfgrass. Even though he is located at an off-campus facility, Dr. Brecke was major advisor for 8 M.S. and 5 Ph.D. students and served on the advisory committees of 24 other graduate students. Dr. Brecke has been an active member of SWSS since 1976. He served on numerous SWSS committees and chaired the following: Graduate Student, Weed Scientist of the Year Award, Distinguished Service Award, Outstanding Graduate Student Award and Outstanding Young Weed Scientist Award. Dr. Brecke was a member of the SWSS Board of Directors and was elected SWSS President for the 2012 annual meeting. He received the SWSS Distinguished Service Award in 2007. Dr. Brecke is also active in the Weed Science Society of America having served on and chaired many committees, was a member of the Board of Directors as SWSS Representative and was selected as a WSSA Fellow in 2004. In addition he is a past president of the Florida Weed Science and served on the FWSS Board of Directors. Dr. Brecke is listed as an author or co-author of 6 book chapters, 80 refereed publications, 248 abstracts and 240 extension publications. He is a frequent reviewer for *Weed Technology*, *Weed Science* and *Peanut Science* and has served as Associate Editor for *Weed Technology*.

Previous Winners of Weed Scientist of the Year

Year	Name	University
1984	Chester L. Foy	VPI & SU
1985	Jerome B. Weber	North Carolina State University
1986	no nominations	--
1987	Robert E. Frans	University of Arkansas
1988	Donald E. Moreland	USDA, ARS, North Carolina
1989	Roy J. Smith, Jr.	USDA, ARS, North Arkansas
1990	Chester McWhorter	USDA, ARS, Mississippi
1991	Ronald E. Talbert	University of Arkansas
1992	Thomas J. Monaco	North Carolina State University
1993	A. Douglas Worsham	North Carolina State University
1994	Stephen O. Duke	USDA, ARS, Mississippi
1995	Lawrence R. Oliver	University of Arkansas
1996	William L. Barrentine	Mississippi State University
1997	Kriton K. Hatzios	VPI & SU
1998	G. Euel Coats	Mississippi State University
1998	Robert E. Hoagland	USDA, ARS, Mississippi
1999	James H. Miller	U.S. Forest Service
2000	David R. Shaw	Mississippi State University
2001	Harold D. Coble	North Carolina State University
2002	no nominations	--
2003	John W. Wilcut	North Carolina State University
2004	Gene D. Wills	Mississippi State University
2005	R. M. Hayes	University of Tennessee
2006	James L. Griffin	Louisiana State University

2007	Alan C. York	North Carolina State University
2008	Wayne Keeling	Texas A&M University
2009	W. Carroll Johnson, III	USDA, ARS, Tifton
2010	Don S. Murray	Oklahoma State University
2011	Krishna Reddy	USDA, ARS, Mississippi
2012	Daniel Reynolds	Mississippi State University

2013 Outstanding Young Weed Scientist-Academia

Shawn Askew

Shawn Askew was born on May 22, 1973 and raised in Mt. Olive, MS. He completed his B.S. in Agriculture Pest Management from Mississippi State University in 1995. He obtained his M.S. degree in Weed Science with a minor in Botany under the direction of Dr. David Shaw at Mississippi State University in 1997 and his Ph.D. degree under the direction of the late Dr. John Wilcut in Crop Science at North Carolina State University in 2001. His M.S. research dealt with red rice control in soybean/rice rotations and his Ph.D. work concentrated on competition between *Polygonum* weeds and cotton. Barely 10 days after defending his dissertation, Shawn started his career as Assistant Professor and Extension Specialist in turfgrass weed science at Virginia Polytechnic Institute and State University in Blacksburg. He is responsible for the state's weed management recommendations in turfgrass and coordinates the Phytochemistry and Radiological Materials Laboratory in the Department of Plant Pathology, Physiology, and Weed Science where he now serves as Associate Professor. His research has focused on turfgrass weed management, lateral movement of turfgrass herbicides, and managing transition of overseeded turfgrasses. Shawn's research in turfgrass weed science over the past 10 years has generated $2.25 million and he has mentored 26 undergraduate and hourly employees and 14 graduate students. Shawn has authored or coauthored 60 peer-reviewed journal articles, 295 abstracts, and 164 trade journals and extension publications. He has extended weed science research through 437 invited or volunteered publications since 1996. In addition to his extension endeavors, Shawn currently mentors four Ph.D. students and one M.S. student, teaches two courses and guest lectures in 7 different courses at Virginia Tech.

Shawn and his students are very active in SWSS, NEWSS, and WSSA and have presented data at every meeting for these societies since he started at Virginia Tech in 2001. Shawn's students have been honored by the societies; one student received the Outstanding Graduate Student Award at the MS level and several students have placed in student poster, talk, and weed contest competitions. He actively promotes student involvement in the societies by coaching weed team participants for Virginia Tech in addition he and his students hosted the 2007 Northeast Weed Contest. He has been a member of the SWSS since 1995 and has not missed an annual meeting since then. He has served on several committees for SWSS and other societies and as Webmaster for NEWSS. He is currently chair of the computer science committee and serves on several other committees for SWSS. He completed two terms as Associate Editor for Weed Technology. Shawn has received numerous honors from the societies including being the first recipient of the SWSS Outstanding Graduate Student Award at the MS level in 1998 and the WSSA Outstanding Graduate Student Award in 2002. He was awarded the Outstanding Researcher Award by NEWSS in 2008 and the Allen H. Kates Extension Employee of the Year by Virginia Tech in 2010, and the WSSA Outstanding Early Career Award in 2012.

2013 Outstanding Young Weed Scientist- Industry
Greg Armel

Greg Armel was born and raised in Winchester, VA and received all three of degrees from Virginia Tech. Greg received his B.S. degree in Forestry and Wildlife Management in 1997 and his M.S. in Vocational and Technical Education the following year. In 1998, Greg started his Ph.D. project under the guidance of Dr. Henry Wilson at Virginia Tech's Eastern Shore Agricultural Research and Extension Center. His dissertation project centered on evaluations of the herbicide mesotrione and these efforts led to his invitation as a guest biokinetic researcher at Syngenta's Jealott's Hill International Research Centre in Berkshire, UK. Upon completion of his graduate studies in 2002, Greg went to work for DuPont Crop Protection in their Herbicide Discovery Group where he discovered new chemistries like the auxin herbicide aminocyclopyrachlor and helped characterize novel herbicides with new modes of action like the azolecarboxamides. Following his stint in Herbicide Discovery, Greg then worked in DuPont's U.S. Field Development organization as their Corn and Soybean Product Development Specialist helping bring to market several products including Enive®, Enlite®, Require® Q, and Resolve® Q. Greg then returned to academia in 2007, accepting a Weed Science faculty position at the University of Tennessee in Knoxville. In this joint extension and research position, he developed a program to address weed management issues in vegetables, small fruit, tree fruit, ornamental plants, and invasive weeds as they related to non-crop environments, roadsides, and forested areas. In addition to several applied research projects, Greg's basic research projects revolved around radiolabeled herbicide biokinetic studies, herbicide discovery, the impacts of pesticides on the nutrient quality and stress management in crops, and characterization of proprietary genes that conferred tolerance to auxin mimic herbicides. Also while at the University of Tennessee, Greg co-hosted the first ever WeedOlympics that brought nearly 150 students from all 4 regional weed science societies together for competition in an educational event. In June of 2012, Greg accepted an offer in Research Triangle Park, NC from BASF to be their Technical Market Manager for Zidua®, Facet L®, Raptor®, Cadre®, Newpath®, Clearpath®, and Beyond® herbicides. During his career Greg has authored or co-authored 35 refereed journal articles, 29 world and individual country patent applications, 20 extension publications, 83 professional meeting abstracts, and 6 popular press articles. In addition to the SWSS, Greg has also participated in other professional societies including ACS, ASHS, IWSS, WSSA, NCWSS, WSWS, and the NEWSS where he currently serves as Vice-President. Greg and his wife Julie have two sons, Carson who is 4 and Brenton who is 19 months old.

Previous Winners of Outstanding Young Weed Scientist

Year	Name	University / Company
1980	John R. Abernathy	Texas A & M University
1981	Harold D. Coble	North Carolina State University
1982	Lawrence R. Oliver	University of Arkansas
1983	Ford L. Baldwin	University of Arkansas
1984	Don S. Murray	Oklahoma State University
1985	William W. Witt	University of Kentucky
1986	Philip A. Banks	University of Georgia
1987	Kriton K. Hatzios	VPI & SU
1988	Joe E. Street	Mississippi State University
1989	C. Michael French	University of Georgia
1990	Ted Whitwell	Clemson University
1991	Alan C. York	North Carolina State University
1992	E. Scott Hagood, Jr.	VPI & SU
1993	James L. Griffin	Louisiana State University
1994	David R. Shaw	Mississippi State University
1995	John C. Wilcut	North Carolina State University
1996	David C. Bridges	University of Georgia
1997	L.B. McCarty	Clemson University
1998	Thomas C. Mueller	University of Tennessee
1999	Daniel B. Reynolds	Mississippi State University
2000	Fred Yelverton	North Carolina State University
2001	John D. Byrd, Jr.	Mississippi State University
2002	Peter a Dotray	Texas Tech. University
2003	Scott A. Senseman	Texas A & M University

2004	David L. Jordan	North Carolina State University
2004	James C. Holloway	Syngenta
2005	Eric Prostko	University of Georgia
2005	no nomination	
2006	Todd A. Baughman	Texas A & M University
2006	John V. Altom	Valent USA Corporation
2007	Clifford "Trey" Koger	Mississippi State University
2007	no nomination	
2008	Stanley Culpepper	University of Georgia
2008	no nomination	
2009	Jason K. Norsworthy	University of Arkansas
2009	no nomination	
2010	Bob Scott	University of Arkansas
2010	no nomination	
2011	J. Scott McElroy	Auburn University
2011	Eric Palmer	Syngenta Crop Protection
2012	Jason Bond	Mississippi State University
2012	Cody Gray	United Phosphorus Inc.

2013 Outstanding Educator Award

Tim Grey

Dr. Timothy Grey is an Associate Professor of Research and Teaching in Weed Science with a program focused on herbicide use and dissipation, herbicide resistant weeds, agronomic and alternative crop production, and weed control in vegetable and tree crop production systems. His research and teaching has been conducted in laboratory, greenhouse, and field environments. Dr. Grey grew up on a farm focused on production of burley tobacco, row crops, oil seeds, hay and livestock, and he maintains close ties to his families' 2500 acre farm in Central Kentucky. He obtained his BS from the University of Kentucky and MS and PhD. from Auburn University. Dr. Grey has been with the University of Georgia since 1999 and in Tifton since 2002. Dr. Grey is involved with teaching multiple classes at the University of Georgia along with several other colleagues. These classes include Weed Science and laboratory, Pesticides and Transgenic Crops, and Agroecology. He is very active in graduate education in the Department of Crop and Soil Sciences as a member of the University of Georgia Graduate School Faculty. Dr. Grey has served as the major professor for 6 graduate students, served on over 20 graduate student committees, and help direct post-doctoral personnel and visiting scientist. Dr. Grey serves as a member on the Graduate Admissions Committee for the Crop and Soil Sciences Department and for the Colleges Masters of Plant Protection and Pest Management degree program. Along with his graduate students, Dr. Grey has presented research and invited talks at regional, national, and international meetings. Dr. Grey is a co-author on over 80 referred articles with graduate student and fellow scientist in various agronomic and weed science related publications. He also serves on several committees for the Weed Science Society of America, Southern Weed Science Society, and American Peanut Research and Education Society, and an associate editor for *Weed Science* and editor of *Peanut Science*.

Previous Winners of the Outstanding Educator Award

Year	Name	University
1998	David R. Shaw	Mississippi State University
1999	Ronald E. Talbert	University of Arkansas
2000	Lawrence R. Oliver	University of Arkansas
2001	James L. Griffin	Louisiana State University
2002	Thomas F. Peeper	Oklahoma State University
2003	Daniel B. Reynolds	Mississippi State University
2004	William Vencill	University of Georgia
2005	John W. Wilcutt	North Carolina State University
2006	Don S. Murray	Oklahoma State University
2007	Thomas C. Mueller	University of Tennessee
2008	James M. Chandler	Texas A&M University
2009	William W. Witt	University of Kentucky
2010	Peter Dotray	Texas Tech. University
2011	Eric Prostko	University of Georgia
2012	Gregory Mac Donald	University of Florida

2013 Outstanding Graduate Student Award (MS)

Bob Cross

Robert B. (Bob) Cross is a MS student at Clemson University studying Weed Science under the direction of Drs. Bert McCarty, Ted Whitwell, and Nishanth Tharayil. His innovative thesis had dealt with Sulfonylurea-resistant weeds (*Poa annua*) in turf. He has identified the mechanism of this resistance and has conducted numerous trials to identify alternative means of control. Mr. Cross has a BS in Turfgrass Management from Clemson University with a minor in Business Management, graduating Magna Cum Laude. While an undergraduate, he served as President and Vice President for the Clemson University Turf Club, won the Outstanding Senior Award within the College, and was a recipient of SC Golf Association Scholarship and SC Educational Life Scholarship. As a graduate student, Mr. Cross has been a teaching assistant for two horticultural classes: Weed Science and Advanced Turfgrass Management. In addition, he has worked full and part time at very prestigious golf courses such as The Players Championship, Ponte Vedra, FL; Sage Valley Golf Club, Graniteville, SC; The Reserve Club at Woodside Plantation, Aiken, SC; and, The Walker Golf Course at Clemson University, Clemson, SC. He won First Place in the 2012 SWSS Graduate Student Paper Contest. He and his wife Meredith, are expected their first child in March, 2013.

Previous Winners of the Outstanding Graduate Student Award (M.S.)

Year	Name	University
1998	Shawn Askew	Mississippi State University
1999	Patrick A Clay	Louisiana State University
2000	Wendy A. Pline	University of Kentucky
2001	George H. Scott	North Carolina State University
2002	Scott B. Clewis	North Carolina State University
2003	Shawn C. Troxler	North Carolina State University
2004	Walter E. Thomas	North Carolina State University
2005	Witnee Barker	North Carolina State University
2006	Christopher L. Main	University of Florida
2007	no nomination	
2008	no nomination	
2009	Ryan Pekarek	North Carolina State University
2010	Robin Bond	Mississippi State University
2011	George S. (Trey) Cutts, III	University of Georgia
2012	Edinalvo (Edge) Camargo	Texas A&M University

2013 Outstanding Graduate Student Award (PhD)

Kelly Barnett

Kelly Barnett grew up on corn and soybean farm in Amity, Indiana. From an early age, she was very involved in the daily tasks of running their third generation family farm. After high school, Kelly attended Saint Mary's College, Notre Dame to pursue her Bachelor's of Science in Biology. She completed a senior comprehensive research project that evaluated the allelopathic effects of goldenrod on common teasel. She received several awards for this research including honors for her Senior Comprehensive Research Project, the George & Juanda Bick Nature Award for work in Environmental Biology, and the University of Notre Dame Chapter of Sigma Xi Outstanding Research Award. However, it wasn't until a couple of internships with Dow AgroSciences that Kelly realized she wanted to pursue a career in agriculture (and specifically weed science). In 2008, Kelly started her MS degree in weed science with Dr. Christy Sprague at Michigan State University. Her research focused on the potential effect of glyphosate on Rhizoctonia crown and root rot in glyphosate-resistant sugarbeets. She was also involved in projects that evaluated winter annual weeds as hosts for soybean cyst nematode in Michigan. In May of 2010, Kelly began her PhD in weed science with Dr. Larry Steckel at the University of Tennessee. She received the University of Tennessee J. Wallace and Katie Dean Multi-Year Fellowship for her accomplishments to date. Her dissertation research focused on glyphosate resistant giant ragweed biology and competition in cotton and also evaluated potential control options. Kelly was responsible for several other research projects that evaluated the effect of glufosinate applications to WideStrike cotton, confirmation of glyphosate-resistant goosegrass in Tennessee, and 2,4-D drift in cotton. Since 2008, Kelly has four published peer reviewed journal publications, with several more expected to come from her dissertation research. She also has been an author on 18 non-referred publications, 18 abstracts, and has spoken at dozens of field days and extension meetings. Kelly has presented at numerous professional meetings including Beltwide Cotton Conference, Michigan State CSS/Horticulture Symposium, WSSA, NCWSS, and SWSS where she has won eight awards for poster and paper presentations. She also has won several awards at the NCWSS and SWSS weed contests, including 1st place overall individual at the 2012 SWSS weeds contest. Kelly completed her PhD in 2012 and started a job with DuPont Crop Protection as the field development representative for Indiana and Kentucky.

Previous Winners of the Outstanding Graduate Student Award (Ph.D)

Year	**Name**	**University**
1998	Nilda Roma Burgos	University of Arkansas
1999	A. Stanley Culpepper	North Carolina State University
2000	Jason K. Norsworthy	University of Arkansas
2001	Matthew J. Fagerness	North Carolina State University
2002	William A. Bailey	North Carolina State University
2003	Shea W. Murdock	Oklahoma State University
2004	Eric Scherder	University of Arkansas
2005	Ian Burke	North Carolina State University
2006	Marcos J. Oliveria	Clemson University
2007	Wesley Everman	North Carolina State University
2008	Darrin Dodds	Mississippi State University
2009	Sarah Lancaster	Texas A & M University
2010	Tom Eubank	Mississippi State University
2011	Sanjeev Bangarwa	University of Arkansas
2012	Josh Wilson	University of Arkansas

2013 Distinguished Service Award from Industry

Renee Keese

Renee received a B.S. degree in Horticulture from Clemson University, a Master's degree in Agronomy and Ph.D. in Plant Physiology, also from Clemson. She began working in the ornamentals business at the age of 10 in a family greenhouse operation. Upon graduation, and after a 12 year stint at Clemson running research labs, she worked for Dow AgroSciences and then Syngenta Crop Protection as a discovery or field R&D Scientist. Currently Renee is Biology Project Leader – Turf & Ornamentals, for BASF Corporation in Research Triangle Park, NC. In her current position she helps develop herbicides and fungicides for the turfgrass and ornamentals markets.

Dr. Keese first attended SWSS in 1992. She is a past student paper competition winner and is a frequent presenter. Over the years she has served the society as section chair on several occasions, has served on the Young Weed Scientist Award Committee and frequently judges the student paper contest. At the 2011 Puerto Rico meeting Renee organized the industry-sponsored Southern Hospitality and Tradeshow, and has organized coffee breaks and other hospitality events for SWSS. Currently she is serving on the SWSS Endowment Board. Renee is also a member of the Northeastern Weed Science Society (served as president), the Weed Science Society of America, the American Phytopathological Society, the Crop Science Society of America and NAADA (National Agriculture Alumni and Development Association).

Renee resides in Cary, NC and has been married to her husband Larry for 30 years. They have a son in Ft. Lauderdale, FL who is a landscape architect and alum of Purdue University.

2013 Distinguished Service Award from Academia

Donn Shilling

Donn G. Shilling received his B.S. degree in Agronomy from Virginia Polytechnic Institute and State University and his M.S. in Plant Physiology from the same university. He received his Ph.D. in Crop Science from North Carolina State University in 1983. From 1983 to 1986, Dr. Shilling worked as a Senior Research Biologist for Monsanto Co. In this position he was responsible for the development of methods used to evaluate natural products as herbicides. He also managed herbicide evaluation and development. He accepted the position of assistant professor at the University of Florida in 1986 with research and teaching responsibility. He was promoted to full Professor in 1994.

Dr. Shilling's research involves studying fundamental and applied aspects of chemical and physiological factors affecting herbicides and weedy plant species. He has also focused on the management of invasive and perennial plants and land restoration. Dr. Shilling had an active graduate and undergraduate education program. He was responsible for teaching both undergraduate and graduate courses. As a consultant, he has worked with several organizations on various issues related to Weed Science, pesticides, the environment.

From 1998 to 2004, Dr. Shilling was the Director for the University of Florida's West Florida Research and Education Center and the Mid-Florida Research and Education Center. These centers support research, teaching and extension programs relevant to the state. In January, 2004 Dr. Shilling became the Department Head of Crop and Soil Science at the University of Georgia. This department has teaching, research and extension programs at three locations in agronomic crop and turf grass management and improvement; soil, environment and water sciences; and genetics and molecular biology.

Previous Winners of the Distinguished Service Award

Year	Name	University/Company
1976	Don E. Davis	Auburn University
1976	V. Shorty Searcy	Ciba-Geigy
1977	Allen F. Wiese	Texas Agric. Expt. Station
1977	Russel F. Richards	Ciba-Geigy
1978	Robert E. Frans	University of Arkansas
1978	George H. Sistrunck	Valley Chemical Company
1979	Ellis W. Hauser	USDA, ARS Georgia
1979	John E. Gallagher	Union Carbide
1980	Gale A. Buchanan	Auburn University
1980	W. G. Westmoreland	Ciba-Geigy
1981	Paul W. Santelmann	Oklahoma State University
1981	Turney Hernandez	E.I. DuPont
1982	Morris G. Merkle	Texas A & M University
1982	Cleston G. Parris	Tennessee Farmers COOP
1983	A Doug Worsham	North Carolina State University
1983	Charles E. Moore	Elanco
1984	John B. Baker	Louisiana State University
1984	Homer LeBaron	Ciba-Geigy
1985	James F. Miller	University of Georgia
1985	Arlyn W. Evans	E.I. DuPont
1986	Chester G. McWhorter	USDA, ARS Stoneville
1986	Bryan Truelove	Auburn University
1987	W. Sheron McIntire	Uniroyal Chemical Company
1987	no nomination	

1988	Howard A.L. Greer	Oklahoma State University
1988	Raymond B. Cooper	Elanco
1989	Gene D. Wills	Mississippi State University
1989	Claude W. Derting	Monsanto
1990	Ronald E. Talbert	University of Arkansas
1990	Thomas R. Dill	Ciba-Geigy
1991	Jerome B. Weber	North Carolina State University
1991	Larry B. Gillham	E.I. DuPont
1992	R. Larry Rogers	Louisiana State University
1992	Henry A. Collins	Ciba-Geigy
1993	C. Dennis Elmore	USDA, ARS Stoneville
1993	James R. Bone	Griffin Corporation
1994	Lawrence R. Oliver	University of Arkansas
1994	no nomination	
1995	James M. Chandler	Texas A & M University
1995	James L. Barrentine	DowElance
1996	Roy J. Smith, Jr.	USDA, ARS Stuttgart
1996	David J. Prochaska	R & D Sprayers
1997	Harold D. Coble	North Carolina State University
1997	Aithel McMahon	McMahon Bioconsulting, Inc.
1998	Stephen O. Duke	USDA, ARS Stonville
1998	Phillip A. Banks	Marathon-Agri/Consulting
1999	Thomas J. Monaco	North Carolina State University
1999	Laura L. Whatley	American Cyanamid Company
2000	William W. Witt	University of Kentucky
2000	Tom N. Hunt	American Cyanamid Company
2001	Robert M. Hayes	University of Tennessee

2001	Randall L. Ratliff	Syngenta Crop Protection
2002	Alan C. York	North Carolina State University
2002	Bobby Watkins	BASF Corporation
2003	James L. Griffin	Louisiana State University
2003	Susan K. Rick	E.I. DuPont
2004	Don S. Murray	Oklahoma State University
2004	Michael S. DeFelice	Pioneer Hi-Bred
2005	Joe E. Street	Mississippi State University
2005	Harold Ray Smith	Biological Research Service
2006	Charles T. Bryson	USDA, ARS, Stoneville
2006	no nomination	--
2007	Barry J. Brecke	University of Florida
2007	David Black	Syngenta Crop Protection
2008	Thomas C. Mueller	University of Tennessee
2008	Gregory Stapleton	BASF Corporation
2009	Tim R. Murphy	University of Georgia
2009	Bradford W. Minton	Syngenta Crop Protection
2010	no nomination	--
2010	Jacquelyn "Jackie" Driver	Syngenta Crop Protection
2011	no nomination	--
2011	no nomination	--
2012	Robert Nichols	Cotton Incorporated
2012	David Shaw	Mississippi State University

Past Presidents of the Southern Weed Science Society

1948-49 C.A. Brown
1949-50 E.C. Tullis
1950-51 O.E. Sell
1951-52 G.M. Shear
1952-53 D.A. Hinkle
1953-54 W.B. Ennis, Jr.
1954-55 W.C. Shaw
1955-56 G.C. Klingman
1956-57 W.B. Albert
1957-58 E.G. Rogers
1958-59 R. Behrens
1959-60 V.S. Searcy
1960-61 R.A. Darrow
1961-62 W.K. Porter, Jr.
1962-63 J.T. Holstun, Jr.
1963-64 R.F. Richards
1964-65 R.E. Frans
1965-66 D.E. Wolf
1966-67 D.E. Davis
1967-68 R.A. Mann
1968-69 W.L. Lett, Jr.
1969-70 J.B. Baker
1970-71 D.D. Boatright
1971-72 J.R. Orsenigo
1972-73 T.J. Hernandez
1973-74 A.F. Wiese
1974-75 W.G. Westmoreland
1975-76 P.W. Santlemann
1976-77 A.J. Becon
1977-78 G.A. Buchanan
1978-79 C.G. Parris
1979-80 M.G. Merkle
1980-81 C.E. Moore
1981-82 J.B. Weber
1982-83 J.E. Gallagher
1983-84 C.G. McWhorter
1984-85 W.S. McIntire
1985-86 R.E. Talbert
1986-87 H.M. LeBaron
1987-88 R.L. Rogers
1988-89 L.B. Gillham
1989-90 L.R. Oliver
1990-91 J.R. Bone
1991-92 J.M. Chandler
1992-93 J.L. Barrentine
1993-94 A.D. Worsham
1994-95 P.A. Banks
1995-96 S.O. Duke
1996-97 B.D. Sims
1997-98 R.M. Hayes
1998-99 R.L. Ratliff
1999-00 D.S. Murray
2000-01 L.L. Whatley
2001-02 J.E. Street
2002-03 J.W. Wells
2003-04 W.W. Witt
2004-05 J.S. Harden
2005-06 D.R. Shaw
2006-07 J.A. Driver
2007-08 D.W. Monks
2008-09 A.M. Thurston
2009-10 D.B. Reynolds
2009-10 D.B. Reynolds
2010-11 T.J. Holt
2011-12 B.J. Brecke

List of Committee Members for 2013

100. **SOUTHERN WEED SCIENCE SOCIETY OFFICERS AND EXECUTIVE BOARD**

100a. OFFICERS

President	Tom Mueller- 2013
President Elect	Steve Kelly- 2014
Vice-President	Scott Senseman- 2015
Secretary-Treasurer	Greg MacDonald
Editor	Ted Webster
Immediate Past Presiden	Barry Brecke - 2013

100b. ADDITIONAL EXECUTIVE BOARD MEMBERS

Member-at-Large - Academia - Larry Steckel - 2013
Member-at-Large - Academia - Peter Dotray - 2014
Member-at-Large - Industry - Eric Palmer - 2013
Member-at-Large- Industry - Drew Ellis - 2014
Representative to WSSA - Darrin Dodds -

100c. EX-OFFICIO BOARD MEMBERS

Constitution and Operating Procedures - John Byrd 2013
Business Manager - Phil Banks
Student Representative - Kelly Barnett- 2013
Web Master - Tony White
Newsletter Editor - Bob Scott

101. **SWSS ENDOWMENT FOUNDATION**

101a. BOARD OF TRUSTEES - ELECTED

Stanley Culpepper - President - 2013
David Jordan - Vice President - 2014
Nilda Burgos - Secretary - 2015
Renee Keese - 2016
James Holloway - 2017
John Byrd - Past President - 2012

101b. BOARD OF TRUSTEES - EX-OFFICIO

Greg MacDonald (SWSS Secretary-Treasurer)
Scott Senseman (SWSS Finance Committee Chair)
Phil Banks (SWSS Business Manager)
John Byrd (SWSS Constitution & Operating Proc. Committee Chair)
Kelly Barnett (SWSS Student Representative)

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

Brad Minton - 2014
Jason Bond - 2014
Don Murray – 2014
Daniel Stephenson - 2014
Jay Ferrell - 2014
Barry Brecke* - 2013
Tom Mueller** 2014

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

102a. Distinguished Service Award Subcommittee

B. Minton*	2014	F. Carey	2015	Brent Sellers	2016
J. Richburg	2014	E. Prostko	2015	Bob Scott	2016

102b. Outstanding Young Weed Scientist Award Subcommittee

Jason Bond*	2014	David Shaw	2015	David Gealy	2016
S. McElroy	2014	G. Stapleton	2015	Nilda Burgos	2016

102c. Weed Scientist of the Year Award Subcommittee

Randall Ratliff*	2014	D. Jordan	2015	John Byrd	2016
Barry Brecke	2014	W. Keeling	2015	Bob Hayes	2016

102d. Outstanding Educator Award Subcommittee

Jay Ferrell*	2014	Stephen Enloe	2015	S. Culpepper	2016
Eric Webster	2014	Shea Murdock	2015	Peter Dittmar	2016

102e. Outstanding Graduate Student Award Subcommittee

Daniel Stephenson*	2014	Vern Langston	2015	Neil Rhodes	2016
Eric Palmer	2014	Mike Barrett	2015	Stephen Enloe	2016

102f. Life Time Achievement Award Subcommittee

Barry Brecke* 2013

103. COMPUTER APPLICATION COMMITTEE (STANDING)

Shawn Askew* 2013 Angela Post 2013 Michael Cox 2013

104. CONSTITUTION AND OPERATING PROCEDURES COMMITTEE (STANDING)

John Byrd* 2013 Wiley C. Johnson** 2016 (chair at summer board meeting of 2013)

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

Scott Senseman* 2013
Stanley Culpepper 2013
Steve Kelly 2013
Ted Webster (ex-officio)
Greg MacDonald 2013

106. GRADUATE STUDENT ORGANIZATION

President – Kelly Barnett (Tenn)
Vice President – Trevor Israel (Tenn)
Secretary – Brit Gaban (Tenn)
Herbicide Resistant Committee rep – Blake Edwards (Miss. State)

Student Program Committee Rep – James McCurdy (Auburn)
Endowment Committee rep – Michael Flessner (Auburn)

107. **HERBICIDE RESISTANT WEEDS COMMITTEE (STANDING)**
Ramon Leon 2016

108. **HISTORICAL COMMITTEE (STANDING)**
William Witt* 2016

109. **LEGISLATIVE AND REGULATORY COMMITTEE (STANDING)**
Don Shilling* 2013 Lee Van Wychen
Angela Post 2013 Bob Nichols**2016

110. **LOCAL ARRANGEMENTS COMMITTEE - 2013 MEETING (STANDING)**
G. Schwarzlose* 2013
Scott McElroy* 2014 Joyce Ducar 2014

111. **LONG-RANGE PLANNING COMMITTEE (STANDING)** - *Shall consist of the previous five presidents with the most recent past-president serving as Chair.*

Barry Brecke* 2017 Tom Holt 2016 Dan Reynolds 2015
Ann Thurston 2014 David Monks 2013

112. **MEETING SITE SELECTION COMMITTEE (STANDING)** - *Shall consist of six members and the SWSS Business Manager. The members will be appointed by the President on a rotating basis with one member appointed each year and members shall serve six-year terms. The Chairmanship will rotate to the senior committee member from the geographical area where the meeting will be held.*

C. Yeomans* 2014 G. Schwarzlose2019 T. Grey 2015
J. Norsworthy 2016 M. Edwards 2017 G. Oliver 2018
P. Banks - Business Mgr. Ex-officio

113. **NOMINATING COMMITTEE (STANDING)** - *Shall be composed fo the Past President as Chair in addition to nine individuals each chosen to represent one of the three geographical regions and disciplines of the Society. The members will serve staggered three-year terms with three new members each year.*

Barry Brecke* 2013 Tom Mueller** 2014

114. **PROGRAM COMMITTEE - 2013 MEETING (STANDING)**
Steve Kelly* - 2013

115. **PROGRAM COMMITTEE - 2014 MEETING (STANDING)**
Scott Senseman* - 2014

116. **RESEARCH COMMITTEE (STANDING)** – under revision

117. **RESOLUTIONS AND NECROLOGY COMMITTEE (STANDING)**

David Black*	2016	Peter Dittmar	2016	Larry Walton	2016

118. **SOUTHERN WEED CONTEST COMMITTEE (STANDING)**

T. Eubank*	S. Askew	N. Burgos
P Dotray	J. Griffin	G. MacDonald
T. Mueller	D. Reynolds	S. Senseman
W. Vencill	E. Webster	W. Everman
S. McElroy	open to all SWSS members	

119. **STUDENT PROGRAM COMMITTEE (STANDING)**

Matt Goddard*2013	Hunter Perry** 2014	James McCurdy 2013

120. **WEED IDENTIFICATION COMMITTEE (STANDING)**

Angela Post	2013	Katelyn Venner 2013

121. **SUSTAINING MEMBERSHIP COMMITTEE (STANDING)**

John Richburg	2013	Bruce Kirksey*	2015	Cheryl Dunne	2015
David Black	2014	Daniel Stephenson	2015	Hunter Perry	2015

122. **CONTINUING EDUCATION UNITS COMMITTEE (SPECIAL)**

Bobby Walls*	2016	Travis Gannon	2016	Alan Estes	2016
Ken Muzyk	2016	Scott McElroy	2016	Mike Harrell	2016
Pat McCullough	2016	Tim Adcock	2016	Shawn Askew	2016
Jim Taylor	2016	Matt Mathocha	2016	Louisiana rep?	
Oklahoma rep?		Bob Scott	2016		

123. **MEMBERSHIP COMMITTEE (SPECIAL)**

Chad Brommer*	2013	Cecil Yancy	2015

Minutes of the SWSS Board of Directors Meeting
January 22 to January 23, 2010
Francis Marion Hotel, Charleston, SC

Attending: Barry Brecke, Tom Mueller, Steve Kelly, Bert McCarty, Tony White, Greg MacDonald, John Byrd, Darrin Dodds, Dustin Lewis, Tom Holt, Larry Newsom, Larry Steckel, Eric Palmer, Phil Banks, Ted Webster, Chad Brommer, Shawn Askew, Scott Senseman, Lee Van Wychen, Donn Shilling and Rodney Lym.

Meeting was called to motion by President Brecke at 6:30pm on 22 January 2012. The agenda (see last page) as presented by the president was reviewed and a motion to approve was put forth by Larry Steckel, seconded by Tom Mueller. MOTION PASSED -UNANIMOUSLY.

Rodney Lym, incoming president for WSSA gave brief update on the activities of WSSA. He said the annual meeting this year in Hawaii will have 440 papers/posters and has over 500 persons registered. He also reported that the week of 27th February through 2 March will be Invasive Species Awareness week. Rodney would like to highlight success stories, one being Team Leafy Spurge with a $5.5 million grant. He also mentioned that congress is not high on weeds and weed research; they see weeds as a recurring problem with no end. On 12 May there will be a herbicide resistance workshop/meeting and David Shaw is spearheading this effort through the Special Ad Hoc S71 committee through WSSA. The contract with Allen Press, both publication and meeting services, is up this year, so if SWSS has any concerns please let WSSA know. WSSA will also be renegotiating Lee VanWychen's position. Rodney also mentioned that Jason Norsworthy will be the new editor of Weed Technology, replacing Neil Harker. Future meetings of the WSSA include Baltimore in 2013 – joint meeting with the NEWSS and Vancouver in 2014 – joint meeting with CWSS. WSSA will be coming to the southern region in 2015, possibly in conjunction with SWSS. Sean Askew asked that WSSA consider moving the annual meeting time, since it often conflicts with the Golf Course Industry Show, change dates?

John Byrd made a comment that congress should look at biofuel invasive species work, since there is major emphasis in this area. Ted Webster also commented that it seems of late that there are too many WSSA meetings in the West. Due to decreased budgets for many federal employees this poses major travel concerns, limiting the travel of him and several others.

MacDonald provided copies of the minutes from the mid-summer board of directors meeting held June 30 – July 1, 2011 and the conference call held on November 9, 2011.

MacDonald provided the Treasurers report, highlighting the following:
Assets $313,233.54 minus $9,446.31 for Weed Contest Fund = **Total Net Worth $303,787.23**
Cash Flow from Feb 28, 2011 to Jan 11, 2012 = Total Inflows $103,474.04; Total Outflows $57,260.74 = Overall Total $46,213.30
Cash Flow from June 1, 2010 to May 31, 2011 = Total Inflows $185,290.20; Total Outflows $166,870.43 = Overall Total $18,419.77
Previous Assets May 31, 2008 = $242,242.37; 2009 = $239,102.58; 2010 = $247,056.17

Both reports were motioned for approval by Larry Steckel, seconded by Steve Kelly. MOTION PASSED – UNANIMOUSLY.

Business Managers report – see below the report discussed by Phil Banks, Business Manager:
Business Manager's Report for the 2012 SWSS Meeting: Charleston, SC January 23, 2012

"All tax forms and bills were paid on time during the past year. The attached financial statements show that SWSS is in good financial order and posted a slight increase in net worth ($7953.59) during the last fiscal year (ended May

31, 2011). Most income for SWSS comes from annual meeting registration, annual meeting support from Industry, Sustaining Member dues, and sale of books or DVDs, in order of greatest to least (see the Cash Flow Statements). Mike DeFelice and his committee completed the revision of the Interactive Encyclopedia of North American Weeds and sales began in the late fall of 2011. Sale of the revised DVD is expected to contribute significantly to income during 2012. Interest income from our investments and excess funds was minimal during 2011 and is not expected to improve during 2012. Expenses for the 2012 meeting in Charleston are expected to be much less than the Puerto Rico meeting and it is hopeful we will post an increase in net worth for fiscal year 2012.

Preregistration for the Charleston meeting has run smoothly. As of January 11, 2012, we had 232 regular members, 82 students, and 13 spouses/friends registered. Based on non-registered speakers and those that have made hotel registrations, I expect another 30 to 35 walk-in registrations. I also handled the registration of the SWSS Golf Tournament (15 golfers plus those Tom Holt registered). I have worked closely with Bert McCarty, local arrangements committee, the hotel (Stephen Parker) as well as Tom Mueller, Program Chair. The posting and printing of the program went smoothly and was done in a timely manner. Award plaques and the Awards Program were printed well ahead of the meeting.

I worked closely with Cletus Yomans, Chair of the Site Selection Committee, and we completed negotiations with the Wynfrey Hotel in Birmingham, AL to host our 2014 annual meeting. The process went smoothly and the current chair of the committee, Tim Gray, has started the search for a 2015 site.

There are a couple of items to be considered by the Board.

1. The updated Operating Guide has not been completed and this continues to cause confusion for committee chairs and officers as to their duties. I will be presenting a New Officer Orientation at the Charleston meeting but until the completed guide has been posted, problems will persist.
2. The Committee List is still out-of-date. Getting a complete, accurate list of committee chairs and members should be a priority for the Board."

Submitted by Phil Banks, Business Manager

Phil said meeting attendance looks to be good and expects 350 total registrations.
Phil has sent out advertisements for the DVD "Encyclopedia of Weeds" on the website and has sold 150 so far. He has also brought several copies to the meeting for sale. SWSS makes $40.00 from $49.95 selling price.
Phil Banks also discussed site selection. The 2014 location will be the Wynfrey Hotel in Birmingham, AL with a $139.00 room rate, no student rates, and a $6 kickback on rooms. Phil mentioned the problem with student rates on rooms at the current hotel – Francis Marion. We did not fill 10 student rooms, even though the hotel was full. He asked do we need to continue this practice.
Phil said we need to get the operating guide up and going as soon as possible, with a current list of committees. Phil will hold officer training - open to all SWSS members and future officers during the meeting.

Bert McCarty discussed local arrangements. He said all is good to go; specific rooms – Legislative committee meeting Monday morning from 10-11am in Drake; dessert social 9-10:30 pm Gold ballroom on the 3rd floor, the Christian fellowship breakfast will be held in the Swamp Head restaurant in the hotel, the Colonial Ballroom will hold posters and breaks, and the lobby and lobby bar for socializing.

Tom Mueller provided program updates. There were several corrections - 6 posters are not in the student contest, poster #29 cancelled, talk #147 not in contest, talk #153 cancelled, talk #168 talk – the author Jeff Smith is with Valent, not Dupont, talk #192 cancelled, talk #262. Steve Powles was added to grad symposium discussion panel. The Quiz Bowl will be held Tuesday evening at 5:30pm. Tom Eubank will discuss the dedication of the proceedings to Jackie Driver at business meeting necrology report.

Larry Newsome discussed the spouses program. There are 20 spouses pre-registered with 10 expected walkins for a total of 30. BASF has sponsored driving tour for Tuesday, and there is a cooking class on Wednesday from 11-1pm with 15 slots for persons interested.

Editor Ted Webster provided a handout of his report – see below:

Summary of Progress: The 2011 Proceedings of the Southern Weed Science Society contained 515 pages, including 342 abstracts. By comparison, the 2010 Proceedings had 245 abstracts and 365 pages, the 2009 WSSA/SWSS joint meeting, contained 588 pages , 2008 Proceedings contained 315 pages, 2006 Proceedings contained 325, 2005 Proceedings contained 363 pages, and 2004 Proceedings contained 521pages.

The 2011 Proceedings was dedicated to the late Dr. William Lewis "Bill" Barrentine. The proceedings contained executive board minutes from the quarterly meetings, committee reports (including reports from: Editor, Business Manager, Legislative/Regulatory, WSSA Representative, Continuing Education, SWSS Summer Contest, Weed Identification, Historical, Necrology, Constitution and By-Laws, and Sustaining Membership), award winners, and research reports, as well as abstracts in sections detailed below. The Proceedings were complete by the summer board meeting. Once posted to the SWSS homepage (www.swss.ws), there were some issues with missing abstracts, but those problems were fixed and the updated Proceedings re-posted to the website.

Section	Number of Pages
Minutes of Executive Board, Committee Reports, etc	88
Posters	114
Weed Management in Agronomic Crops	71
Weed Management in Turf	30
Weed Management in Ornamental Crops	4
Weed Management – Pastures and Rangelands	21
Weed Management – Horticultural Crops	11
Weed Management in Forestry	5
Weed Management in Organic Production	11
Management of Invasive Weeds	8
Vegetation Management In Utilities, Railroads & Highway Rights-Of-Way, and Industrial Sites	8
Physiological and Biological Aspects of Weed Control	14
Educational Aspects of Weed Management	4
New Technologies in Weed Science: Updates from Industry	9
Aquatics	4
Soil and Environmental Aspects of Weed Science	9
Symposium: Monitoring and Managing Invasive Aquatic Plants in Tropical Freshwater Systems	9
Symposium: 2,4-D: Past, Present, and Future	7
Symposium: Management of Herbicide-Resistant Weeds	4
Weed Survey (Most Common & Most Troublesome)	15
State Weed Control Publications – 2011	26
Herbicide Names (common, chemical, and trade)	9
Registrants of 2011 Annual Meeting	15

Objectives for Next Year: Complete the 2012 Proceedings prior to the summer board meeting. Also, progress has been made to adding recent proceedings to the SWSS website. Proceedings from 1999, 2000, 2001, 2009, 2010, and 2011 can be found on SWSS web site. The goal is to add the Proceedings from 2002 through 2008 to the website in the coming year. The Annual SWSS Weed Surveys beginning in 2000 will be posted on the website.
Finances (in any) Requested: None.

Respectively submitted,
Theodore M. Webster, Editor

Membership survey summary – Chad Brommer performed on online survey of the membership in the Fall of 2011 with 134 respondents. He provided a handout of the survey results and discussed some relevant points:

1) Aging society – 42% of members ages 50-62
2) Science major reason to come to meeting, but networking a major reason as well
3) Majority of attending members are university affiliated
4) Mixed response as to whether location of meeting is a factor in attendance
5) Private funding changes may affect attendance?
6) Fluctuations in meeting attendance could be attributed to graduate student attendance

Summary and suggestions:

1) Increase turnover of management
2) Push relevant and timely topics
3) Strive for an economic meeting site – travel, food, hotel
4) Bridge with common interest groups
5) Utilize local talent, local issues
6) Global advertisement and inclusion

Tom Holt stressed the value of the science and the society and asked why do folks come to the meeting and where do we need to improve. Larry Newsome suggested we glean past registrations and find out where are the grad students going? Who are we losing? Shawn Askew suggested a one day registration for workshops and said we need a local champion to advertise the meeting. Continuing Education Units were suggested as a way to bring in local folks. John Byrd said we are missing the NRCS folks. Chad was asked to find out why meetings fluctuate in attendance and put in the history of past attendance.

Director of Science Policy – Lee VanWychen provided a handout – please see a summary of what was discussed below:

1) USDA formula funds and grants for weed science was a 0% loss
2) USDA-ARS closed 10 labs this year, but nobody from Stoneville as of yet.
3) Jim Parochetti of USDA retired this past year but word as to whether his position will be filled and in what capacity. Rob Hedberg and Bowers have currently picked up some of his responsibilities
4) The NPDES permanent bill fix did not pass; there was a strong coalition though, and efforts will continue to push for a change in this ruling.
5) The US Army Corps of Engineers Aquatic Plant Research Division was zeroed out in their budget cycle - $4 million slated to be lost completely. However there was a restoration of $3 million.
6) National Invasive Species Council and Invasive Species Awareness Week will stress the value of federally funded research, and the impact of invasive species on endangered species.
7) There is a complete loss of pesticide safety training funds, working with a group of educators on how to proceed at the federal and state levels.
8) There is more research claiming atrazine is sterilizing frogs but the data doesn’t support the claim and cannot repeat the study. We are watching this issue closely.
9) APHIS has issued papers on the status of the science and position of the science, and strategies for weed management
10) WSSA wrote in support of the Roundup Ready sugar beet issue and also supported MSMA retention and NASS.
11) IPM is being redefined that is stressing that herbicides are to be used only as a last resort; do we need take a position on this?

Meeting adjourned at 8:30pm by President Brecke

<u>Meeting was called to motion by President Brecke at 7:30am January 23, 2012</u>.

The purpose of meeting was to finalize the Manual of Operating Procedures for the SWSS. This has been an on-going process for several meetings.
It was suggested that several committees be deleted from the MOPs. These included placement, public relations, weed ID, herbicide resistance (is this a standing committee or ad hoc?) Shawn Askew asked about archival of old MOP's, John Byrd said each MOP would be changed with a date for each change – this would be in a separate, non-accessible file only by Business manager, webmaster, and constitution persons.

Tom Mueller made a motion, MacDonald 2nd to delete the ***placement committee***. MOTION PASSED - UNANIMOUSLY.

Tom Mueller made a motion, Larry Steckel 2nd to delete the ***public relations committee***. MOTION PASSED - UNANIMOUSLY.

The ***Weed ID committee*** was discussed as being mainly publication driven and Ted Webster mentioned they are an active committee. It was decided to leave in the MOP's.

The herbicide resistance was found to be an ad hoc committee. It was suggested to fold into ***research committee***, possibly as a subset? John Byrd suggested this could be tailored similar to the common/troublesome weeds table – weed, crop, herb, state. Larry Steckel made a motion, Tom Mueller 2nd to have this be made a standing committee. MOTION PASSED –UNANIMOUSLY. John Byrd said he would develop an MOP for this committee.

Tom Mueller made a motion, Tom Holt 2nd to delete the ***display committee***. MOTION PASSED – UNANIMOUSLY.

Tom Mueller made a motion, Shawn Askew 2nd to delete the ***terminology committee***. MOTION PASSED – UNANIMOUSLY.

There was some discussion to eliminate the ***nominating committee***, since the BOD has had major oversite, but the group decided to leave in place. Tom Mueller stated as currently written needs to be complete revised.

The ***long-range planning committee***, consisting of past president as chairs, needs to be discussed –Tom Holt is the most current member on this committee. (see later section)

In the wording of the ***Awards Committee*** – 2nd page in the section for Outstanding Graduate Student Award – there is statement that a previous Masters degree winner is not eligible for PhD. There was discussion as to whether this should be changed to be allowed for compete for both? There was some discussion and it was suggested that a student can only win once per degree program, and they are only eligible within a calendar year of graduation and the next SWSS meeting. There was also discussion concerning the Weed Scientist of the year award. Why it was needed and can this be incorporated into the Distinguished Service Award. Tom Mueller motioned to eliminate the award, MacDonald 2nd, however after some discussion the motion was withdrawn by Mueller and there was suggestion that this could be considered a fellow? However, there was no further discussion on the matter.

Computer Applications Committee – this committee has only done presentation loading only for several years past, and it was suggested that we need to remove web responsibilities from this committee. Shawn Askew was asked to provide a write-up of the procedures of uploading presentation and he will provide guidance as to how many persons should be on the committee

Constitution and Operating Procedures – no changes.

Finance Committee – delete #6, #4 remove budget responsibilities from this section. It was suggested by Phil Banks that a budget was not helpful and really not needed for the business operations of the society.

Historical Committee – no changes

Legislative and Regulatory Committee– no changes

Local Arrangements – Bert McCarty was asked to look over; he suggested better liaison with business manager, but the details still need to be revised

Long Range Planning – consists primarily of past presidents, but not restricted to only past presidents. This is covered in the language in section 1b.

Meeting Site Selection Committee – Tom Holt questioned whether we need to continually rotate, or stick with popular sites to maximize attendance. It was suggested the language is appropriate for the committee – John Byrd suggested the business manager would be more influential in site selection. Strike 4B, reword to reflect that property selection will provide, not that they arrange for these criteria.

Nominating Committee – Tom Holt made a motion that long range and nominating be put together, Tom Mueller 2nd. There was a friendly amendment that the name of the ***Long Range Planning Committee*** to be the ***Long Range Planning and Nominating Committee***. MOTION PASSED –UNANIMOUSLY.

There was some discussion as to whether editor was appointed or elected – no resolution on this????

Program Committee – the MOPS and Operating Procedures contradict on the rules – this is being worked thru with Drew Ellis in conjunction with the ***Student Program Committee***. It was suggested that section 5B be eliminated and incorporated into the ***Student Program Committee***. It was also suggested to eliminate the sentence on page charges in section 5A and also remove from a similar section in the editor OP's.
Public Relations Committee – deleted.

Research Committee – provide a report for proceedings, several items – see mops, eliminate #2 from section 1. The role of the Extension Publication committee is to provide information on the weed survey.

Resolutions and Necrology Committee – suggested to eliminate items 7, reword #6 to prompt president and be appropriate for writing a letter.

Sales Coordination Committee – Shawn Askew made a motion, Tom Mueller 2nd to delete this committee. MOTION PASSED –UNANIMOUSLY.

SWSS Contest Committee – here in mop and in appendix, amend item #3 to read that funding be worked thru the local host and the BOD – suggest this be a function of the BOD, relieving this responsibility from the chair of the contest committee. Drop items 8 and 9. Add "the chair of the committee be appointed by the president of SWSS for a 3-year term and a vice chair is also appointed that will become chair at the end of the chairs 3 year term." Add "The committee shall consist of up to one voting member per academic institution." There was a resolution prepared by President Brecke to address concerns of the scoring of the contest and commend the organizers and all involved in the contest.

SWSS Executive Board Resolution – 2011 WeedOlympics

"Whereas the first ever national WeedOlympics contest was successfully held on July 27, 2011 at Knoxville, TN and over 140 undergraduate and graduate students from the North Central Weed Science Society, Northeastern Weed Science Society, Southern Weed Science Society, the Western Society of Weed Science and Canadian Weed Science Society competed in several events and whereas the events were very well organized and were conducted in a fair and efficient manner and the events were scored fairly and expeditiously in accordance with Rules and Procedures set forth prior to the contest and whereas awards, both for the WeedOlympics overall and for SWSS participants, were determined based in the scoring systems approved by all organizations participating in the WeedOlympics, therefore be it resolved that the Southern Weed Science Society Executive Board commends the organizers and all involved in the WeedOlympics for a job well done."

Tom Mueller moved and Shawn Askew 2nd that the resolution be accepted as prepared and read at the business meeting. MOTION PASSED –UNANIMOUSLY.

Student Program Committee **–** President Brecke will work with Drew Ellis to consolidate and unify the rules from this area and the appendix, suggested to delete the section in appendix. Move the section that addresses the student paper/poster contest from the appendix to the student program OP's. This would then result in this section being eliminated from the appendix. A motion to approve these changes was made by Tom Mueller, Dustin Lewis 2nd. MOTION PASSED –UNANIMOUSLY.

Sustaining Membership Committee – no changes, add "if space and accommodations are available" to the end of item #1

Weed Identification Committee – President Brecke will contact Mike DeFelice and Charles Bryson as to potential changes/modifications.

Byrd and Brecke will develop an OP for herb resistance.

Tom Holt – joint meeting 2015 report. David Langston with the Southern Branch of Plant Pathology and Norm Leppla with the Southern Entomologists are both meeting with their executive committees, and both feel the time of year is good for a joint meeting. They will then report back to us once they have the information from their respective boards. WSSA also wants to meet together potentially in 2015. This will be further discussed at the BOD meeting on Thursday.

Darrin Dodds motioned to adjourn, Steve Kelly 2nd adjourned at 10:04am.

Appendix to Minutes

SWSS Executive Board Meeting
Sunday, January 22, 2012
Francis Marion Hotel, Pinckney Room
6:30 pm to 8:00 pm
AGENDA

1. Approval of Agenda
2. Rod Lym - WSSA President-Elect
3. Minutes of Summer Board Meeting and Fall Conference Call - Greg MacDonald
4. Treasures Report - Greg MacDonald
5. Editors Report - Ted Webster
6. Membership Survey Summary - Chad Brommer
7. Director of Science Policy Report - Lee VanWychen
8. Business Managers Report - Phil Banks.
9. Program Chair Report - Tom Mueller
10. Local Arrangements Report - Bert McCarty
11. 2015 Joint-Meeting Update - Tom Holt
12. MOP Revision - John Byrd
13. Weed Olympics/Southern Weed Contest

Minutes – January 26, 2012
SWSS Board of Directors Annual Meeting
Francis Marion Hotel, Charleston, SC

Attending: Tom Mueller, Scott Sensman, Phil Banks, Eric Palmer, Peter Dotray, John Byrd, Steve Kelly, Drew Ellis, Darrin Dodds, Tony White, Kelly Barnet (student rep), Greg MacDonald, Ted Webster

Phil Banks provided a post-meeting update. He stated that Bert McCarty did a great job with local arrangements and there was only one complaint – lack of CEU's (from 2 people). There were 43 walkin registrations, 365 total registrations that excluded 23 spouses, and there was a total income of $86,000 from the meeting. There were endowment contributions of $7,000 ($5000 from golf tournament). For DVD's there 13 DVD's sold and 46 DVD's given to students. The banquet has 280 attending, which Phil said was fairly typical attendance. With respect to the spouses program, BASF currently pays for Lisa Newsom's travel and some of the spouses program.

Several dates were suggested for the summer BOD meeting – June 11th-12; July 2, 3, June 14th 15th; Mueller will followup with an email polling to nail down specific dates.

There were several names suggested as nominees for officer positions including: Brad Minton, Larry Newsom, Renee Keese, Gary Schwarzlose, Eric Prostko, Hunter Perry, David Black, Glenn Oliver, Wes Everman, Brent Sellers, Jay Ferrell, to name a few.

2015 chair of meeting site selection committee is Tim Grey, heavy interest in Entomology joint meeting – Tom Mueller and possibly Cletus Yomans will be meeting with their BOD in March. This meeting would be in Puerto Rico regardless, and SWSS would be the lead group in the meeting. Dodds will communicate to WSSA that SWSS is not interested in a joint meeting in 2015.

Bert McCarty – local arrangements report, nothing major, once again concerns on locations of meetings,

A question was asked about the student organization and how does it operate and what does it operate from? Kelly Barnet will get in touch with Cody Gray to provide a constitution, MOP, and SOP and make sure this is on the web.

Other MOP revisions………

Business manager – eliminate item 36, providing books to students is a responsibility of the endowment committee

Changes in ***Operating Procedures*** – nothing

Science Policy – adding in paying for travel to annual meeting only

Discretionary fund - $5,000 for expenditures during the year – no changes

Editor – delete language about charges for extra pages beyond 1, delete language about "web sites of state Extension weed control publications" number 5 delete '(in an electronic form-compact disc') delete entire #6

Executive board – no changes

Operating procedures – change, currently incorporated in AL, to endowment incorporated in Illinois

Newsletter Editor – lots of detail, but for the new editors, arrange for photos to be taken of awardees for use in the newsletter, delete item M, also delete item 8 about attending the BOD meeting, item 6 – 50% reduction in rate structure for advertisement to $100, 250, 500 from $250, 500 and 1,000.

Immediate Past President - #4 serve as chair of Long Range Planning Committee (shouldn't this now be Long Range Planning and Nominating Committee?

President - #23 change language to "Can' give a presidential address; Mueller said he would not be giving an address – (John Byrd shared verbal excitement at the meeting), delete items 25 and 26.

President Elect - # f add in "contest' after Student, delete #3, 'Schedule topics of greater interest on Wednesday afternoon to increase the attendance of the Awards Banquet on Wednesday night'. Delete #6

Registration Fees – no changes

WSSA Representative – no changes

Website Editor – should there be language on elections? John Byrd said this was handled in other areas, but the website editor would be responsible for making elections possible via the web/electronically in accordance with MOPS for SWSS elections.

John Byrd will revise the MOPs and OPs, and then send to Phil Banks by Feb 4th. Phil will collate into 2 sections (committee, officers) then send to Tom Mueller who will send to BOD by Feb 13th. BOD has one week to look over – Feb 21st deadline for edits to Tom Mueller, then March 1 for voting.

Conference call in spring – President Tom Mueller will decide if one is needed.

Weed contest for 2012 - $$ for contest, Norsworthy may be asking for $$ for food functions, this would to need be a formal request at the summer board meeting. The contest is scheduled for Fayetteville, Arkansas on Aug 1, 2012.

Mueller will send a list of officers and committees (work with Brecke) to webmaster, copy in Phil Banks – ideally by March 1. Tom Mueller will also send out email requesting committee members to the membership.

SWSS website login is completely separate from the abstract submission site login. Tony and Phil will send out an email to change SWSS to be the same as the abstract login.

Tom Mueller expressed concern on how the Weed Tech editor was chosen by WSSA, there appeared to be no transparency of the process. Is there a process for choosing editors and was this processed followed? Darrin Dodds will bring up at WSSA meeting.

New business – Phil Banks will send Cody Gray the contact information of kbarnet7@utk.edu Kelly Barnet – student representative so she can begin developing/revising constitution, MOP's and OP's for the SWSS Student Organization.

Eric Palmer moved to adjourn, Kelly Barnet seconded. MOTION PASSED UNANIMOUSLY.

Minutes – January 23, 2012
SWSS Annual Business Meeting
Francis Marion Hotel, Charleston, SC

The annual business meeting was called to order by President Brecke. Secretary Treasurer MacDonald was asked to read the minutes and provide a treasurer's report. Minutes were posted on the website and no changes were noted. The treasurer's report reflected those numbers included in the SWSS BOD January 23, 2012 meeting. Below is a highlight of what was covered:

Cash Flow Fiscal year 2010-2011
$185,290.20 income
$166,870.43 outflow
$18,419.77 net

Cash Flow – since 2011 Meeting
$103,474.04 income
$57,260.74 outflow
$46,213.30 net

Total Assets
$247,056.17 – 2010
$303,787.23 – 2011

Endowment (*$12,015 from golf tournament)
$16,050.38 – 2010/2011
$3,354.36 – cash flow
$12,696.02 – net

Total Society Assets as of September 30, 2011
$362,342.46 - Total Assets
$259,017.81 – Donations
$103,324.65 – available

President Brecke then read the following resolution concerning the 2011 WeedOlympics.

"Whereas the first ever national WeedOlympics contest was successfully held on July 27, 2011 at Knoxville, TN and over 140 undergraduate and graduate students from the North Central Weed Science Society, Northeastern Weed Science Society, Southern Weed Science Society, the Western Society of Weed Science and Canadian Weed Science Society competed in several events and whereas the events were very well organized and were conducted in a fair and efficient manner and the events were scored fairly and expeditiously in accordance with Rules and Procedures set forth prior to the contest and whereas awards, both for the WeedOlympics overall and for SWSS participants, were determined based in the scoring systems approved by all organizations participating in the WeedOlympics, therefore be it resolved that the Southern Weed Science Society Executive Board commends the organizers and all involved in the WeedOlympics for a job well done."

This resolution was moved to be accepted by Tom Eubanks, seconded by Tom Holt. PASSED UNANIMOUSLY.

Stephen Powles made an announcement concerning an international conference on herbicide resistance, to be held on February 18-23, 2013. See flyer below. He encouraged all to attend.

Chad Brommer provided a brief summary of the membership survey, highlighting the major points he discussed during the BOD meeting on January 22, 2012.

Lee Van Wychen also addressed the membership about various activities concerning the SWSS and WSSA at the federal level. These included a 0% reduction in funding for NIFA, USDA, and AFRI grants, and an increase in IPM grants. He also mentioned that Jim Parochetti has retired, and the weed science societies need to have considerable input in re-filling this position. Lee went on to explain the various campaigns to have the NPDES permitting for aquatic herbicide applications (under the Clean Water Act) removed, but nothing to report to date. Lee finished by stating that the US Army Corps of Engineers – Aquatic Plant Research Division had its funding restored for one year, albeit a reduction from $4 million to $3 million. This was spearheaded by Senator Charles Shummer of New York. However, this division is zeroed out in the next budget cycle, so efforts in this area will need to continue.

The meeting was moved to adjourn by Tom Mueller, seconded by Eric Webster.

Summary of Email Activities of the SWSS Board of Directors
February to June 2012

2/21/12 – President Mueller was asked to provide a nomination from the SWSS to the International Weed Science Congress in China this June. The deadline was February 28, 2012. Megh Singh from the University of Florida was nominated by President Mueller. No additional emails or feedback were made.

2/29/12 – President Mueller sent an email requesting that BOD members review and provide comments on various sections of the SWSS MOP revisions. In this email he also detailed the process of compiling the edits from each person and collating into the final document.

3/9/12 – President Mueller resent the 2/29/12 email, reminding folks to get their edits back to him in a timely fashion. The deadline was 3/15/12.

3/22/12 – President Mueller provided an update on SWSS matters. Jason Norsworthy requested $6,000 for the SWSS contest; this request was granted and handled by Phil Banks. The discussion concerning a joint meeting with the Entomology Society of America Southern Branch is still on-going. Their membership is weighing the option of moving their meeting time to January to accommodate our timeframe. President Mueller is assembling the edits for the MOPS.

4/5/12 – Final MOP revisions for BOD approval sent by President Mueller, with a 14 day review turnaround.

6/14/12 – President Mueller, upon majority approval by the SWSS BOD, attached the final version of the MOP as a pdf document, which webmaster Tony White will place on the SWSS website under the 'Society' section.

SWSS Executive Board Meeting
Monday, July 2 and Tuesday July 3, 2012
Intercontinental Hotel, Chairmans Room
1:00 pm to 5:30 pm (Monday) to 7:00 am to 10:00 am (Tuesday)

Monday, July 2, 2012. Tom Mueller called meeting to order at 12:30pm, then made introductions. We made then made arrangements for dinner.

Attending: Tom Mueller-President, Eric Palmer - Member at Large Industry, Darrin Dodds – WSSA Rep, John Byrd – Constitution and By Laws, Steve Kelly – Program Chair, Kelly Barnett – Student Rep, Larry Steckel - Member at Large Academia, Drew Ellis - Member at Large Industry, Barry Brecke – Past President, Scott Sensman – Vice President, Tony White - WebMaster, Gary Schwarlose – Local Arrangements, Peter Dotray - Member at Large Academia, Phil Banks – Business Manager

Tom Mueller asked about the agenda (see last page); no changes – passed by acclamation.

Greg MacDonald asked if there were any comments on the minutes sent out via email. These included minutes from the 2012 annual meeting, the 2012 business meeting and summary of email business since the annual meeting. Peter Dotray made motion to accept the minutes (including the corrections of President Mueller), this seconded by Barry Brecke. MOTION PASSED -UNANIMOUSLY. Phil Banks asked that the final version be sent to Ted Webster for the Proceedings and copy in Phil Banks.

The proceedings report was read by Phil Banks via Ted Webster. Currently the 2012 Proceedings is 387 pages long and almost completed; a few problems with getting committee reports and a minor number of missing abstracts. The missing abstracts are primarily due to minor glitches in new abstract system - which has been fixed. Ted has set a deadline of July 10th and will post on the website. The 2012 proceedings is rather comprehensive but reflects all the SWSS activities for the annual year. Ted Webster has agreed to stay on as editor for another year or two. The position is actually an elected position, but he was actually appointed by President Holt and then President Brecke. John Byrd asked if Ted had the OmniPress proceedings, Phil said he did have. Dan Reynolds is still working on scanning old proceedings. According to Phil Banks, Dan has all copies of the proceedings. It will be a searchable document (s).

Tim Grey, chair of the site selection committee, provided an update on the 2015 meeting location; this report via Phil Banks. Phil Banks and the site selection committee looked at Puerto Rico, Savannah, and Florida (Tampa, St. Petersburg, Clearwater, and Jacksonville). The committee decided on the Hyatt Regency in Savannah, GA. Tom Mueller performed a site selection visit in June and thought the Hyatt property had a better location with respect to other places to eat, shop, etc. Phil mentioned that the Hyatt provided a very good deal with respect to complimentary rooms, and other amenities. Mueller asked for a motion to accept the report of the site selection committee. Steve Kelly made the motion, Brecke seconded to accept the recommendation of the property selected by the committee. MOTION PASSED -UNANIMOUSLY.

Tom Mueller reflected the joint meeting issues, and discussed the inability to coordinate a joint meeting with the Entomology Society of America – Southern Branch (ESB-SB) for 2015. Tom Holt contacted Norm Leppla, President of ESA and Leppla would poll their membership to ascertain the interest in a joint meeting during the standard SWSS January timeframe for 2015. There was no further contact and SWSS decided to go ahead without the joint for 2015 and try again for 2016. Darrin Dodds asked about why – not sure, but there appears to be a lack of communication with the ESA group.

Brecke asked who was in charge of the 2016 possible joint meeting with this same group. David Buntin with the University of Georgia – Griffin Campus, is the current ESA-SB President. Phil Banks said he would contact him to get the ball rolling on this issue (this was accomplished – see item #8 below.)

Comments on the Joint Meeting Issue:

1) Mueller asked about the issues involved with a joint meeting, specifically how does it flow?; how is it managed – jointly or one society takes the lead; completely together with one registration, joint registrations, proceedings together or separate?
2) Phil Banks said there needs to be a clear delineation of who does what prior to setting up a joint meeting.
3) The joint meeting may allow us to capture more industry support by having more than one discipline together.
4) John Byrd said the Mississippi Weed Science, Plant Pathology and Entomology groups starting meeting together several years ago, but currently there is a major loss in numbers from the weed group.
5) Discussion on the previous (2009) joint meeting with WSSA included: some folks not happy with the lack of a SWSS specific proceedings, lack of control of the meeting and the lack of complimentary rooms for the society.
6) Location possibly with the 2016 joint meeting centered on Puerto Rico. Darrin Dodds mentioned that WSSA was considering Puerto Rico in 2016 as well. It was mentioned that would be a major problem for the SWSS meeting in reduced attendance, etc. If Puerto Rico was the destination selected, Tom Mueller mentioned that the meeting registration fees would have to be increased to cover costs. A figure of a $100 increase was mentioned.
7) The reason ESA-SB was chosen was similar size to SWSS, similar registration costs and also over-laps with industry persons that currently attend both meetings.
8) Phil called David Buntin of the ESA about the joint meeting in 2016 during the break; in 2016 their national society is holding an international meeting in Orlando during their annual meeting in March. The makeup of their board is mostly urban and he is doubtful they would agree to a joint meeting.

Phil Banks and the site selection committee would contact the appropriate persons in ESA-SB on a joint meeting. It was decided that a go/no-go decision was needed by October 15, 2012 to have a joint meeting during the SWSS regularly scheduled meeting time in January 2016. Jason Norsworthy is the slated site selection committee chair for that year.

Business Manager's Report for the Summer Board Meeting:
Intercontinental Hotel, Houston, TX, July 2 and 3, 2012.

The attached financial forms detail our current situation. We had a net operating profit of approximately $ 19,000 for the 2011-2012 fiscal year. This information was given to our tax accountant and we will be submitting all needed tax forms within the next few weeks. Total attendance at the Charleston meeting was 369 (272 regular members, 96 students, and 1 one day registration). There were an additional 24 spouse/friend registrations. This is about the average over the past 10 meetings (see attached attendance and membership data sheet). The golf tournament generated approximately $5,400 for the Endowment Fund. The Francis Marion Hotel was very popular with the members and the hotel was accommodating to our needs. Some members had to find hotel rooms nearby due to a full house on several nights during the meeting. I recommend the same fee schedule as used for the Charleston meeting: $ 275.00 for regular members, $100 for students, and $ 100 for walk-in one day registration. Walk-in full registration would be $325.00 for regular members and $ 125.00 for students. We need to discuss the possibility of an increase for the spouse registration depending on what options are offered for the Houston meeting. Lisa Smith again did a fantastic job with the spouse program.

In mid-April, I sent requests for proposals to host our 2015 annual meeting to hotels in Florida, Puerto Rico, and Savannah, GA. A total of twelve proposals were received, summarized and sent to the Site Selection Committee. The process went smoothly and the current chair of the committee, Tim Gray, and his committee have made a recommendation (see his report) and with the approval of President Tom Mueller (following his inspection of two properties in Savannah), I have negotiated a contract with the Hyatt Regency Savannah for the Board's approval. I was informed that the name of the host hotel for our 2013 meeting will be changed from the Houston InterContinental Hotel to the Royal Sonesta Hotel on July 16, 2012. This change will have no effect on our meeting according to the hotel management. We will need to use the new name in all of our registration and advertising pertaining to the meeting. The three year service agreement between SWSS and Marathon-Agric. & Environmental Consulting, Inc. will expire following the 2013 Houston meeting. If asked by the Board, I will prepare a new agreement for consideration.

Submitted by Phil Banks, Business Manager

Summary of Financial Status
The society has total assets of $287,154.45, all earning very low interest but not showing any loss. The liabilities consist solely of the SWSS contest fund, which is $3,446.31 and will be depleted this year. Overall total net worth is therefore $283,708.14. This is a substantial increase from previous years, as reflected below:

Yearly Net Change – 2008 to current

Total Assets on May 31, 2008	242,242.37	-10,079.63
Total Assets on May 31, 2009	239,102.58	-3,139.79
Total Assets on May 31, 2010	247,056.17	7,953.59
Total Assets on May 31, 2011	264,386.91	17,330.74
Total Assets on May 31, 2012	283,708.14	19,321.23

The society showed cash inflows last year of $134,927.62, primarily from annual meeting registration, meeting support from donations and member dues. The society also showed income from sales of books (~$7,000), but the DVD sales show a loss at this point in time. Cash outflows during the same time period were $112,160.08, primarily from annual meeting expenses, managerial fees, and director of science policy. Other significant outflows include a transfer of funds to the endowment foundation. Overall the society showed a net gain of $22,767.54 for last year. The endowment fund is currently $367,977.51 of that approximately $110,000 in accrued interest.

Phil updated and said the DVD sales are almost a net neutral at this point in time. The North Central Weed Science Society is also selling and currently owes SWSS about $1000.00.

Phil Banks recommends similar registration fees as last year, but suggests increasing the registration for spouses – particularly if BASF ceases to contribute support for the spouses program.

The hotel is changing the name in 2 weeks (new management group) to the Royal Sonesta Hotel. No expected problems although the membership needs to be made aware of this name change frequently.

2013 Program update from Steve Kelly – He envisions the theme for the 2013 program would center on re-visiting Biotechnology – where have we come from since 1984. This would be a historical perspective through a symposium, maybe bring in persons to culminate the changes in the past. MacDonald suggested Harry Klee as a speaker; Steve was going talk with Eric Palmer with Syngenta and other companies. John Byrd will provide a symposium on the biofuel industry – how do we prevent the problems they make. He said the National Wildlife Federation has come out with a white paper on the risks associated with these plantings. Also there will be a graduate student symposium on career development. The SWSS will use the WSSA title and abstract submission website. There were some issues with conflict between SWSS and WSSA submissions – these are two separate platforms and have to be logged in separately. Peter Dotray suggested that the afternoon sessions start at 1:30pm to accommodate lunch.

Other changes/suggestions for the program include keeping the quiz bowl, and it was suggested to keep the ice cream social. Renee Keese put this together last year and Steve Kelly would contact her to see if she wanted to head this up again. Brad Minton was a local person suggested to help. Steve also mentioned he had section chairs for all sections with the exceptions of physiology and regulatory – although Larry Wells would likely continue in this role.

Approval of Candidates for Elections – Barry Brecke passed out a sheet of the slate of potential officers. These included for Vice President – Brad Minton with Syngenta or Larry Newsom with BASF; Member at Large for Academia – Jay Ferrell with University of Florida and another person to be determined; Member at Large for Industry – John Richburg with Dow AgroSciences or Mike Edwards with DuPont; Endowment Fund Board – Hunter Perry with Dow AgroSciences or Brent Sellers with University of Florida. This list was accepted by the BOD - MOTION PASSED -UNANIMOUSLY.

Phil Banks left the room and the BOD had discussion of the contract for the managerial services provided by Phil Banks. This contract is for 3 years. John Byrd inquired about the evaluation procedure and this contract also serves as an evaluation of his services. The contract is essentially the same as the prior three years. The current fee structure is $20,000 per year, he is asking for an increase to $26,000 per year. Scott Sensman moved to accept the contract as presented by Phil Banks – MARATHON Agricultural and Environmental Consulting, Inc.; seconded by Peter Dotray. MOTION PASSED -UNANIMOUSLY.

The BOD conducted a tour of the hotel property with our staff liaison, David Bennett. The meeting space is excellent and we have plenty of space.

The Director of Science Policy contract is currently $10,802 per year. This agreement was signed by Tom Holt for a 5 year term in 2010, with annual revisiting of the amount by the SWSS BOD at each summer board meeting. There was some question as to the direct support of this position to SWSS. Barry Brecke moved, Greg MacDonald seconded, that we continue the support of the DSP at the current rate of $10,802. Peter Dotray called the question. Vote was almost unanimous – 1 descending vote.

Tuesday, July 3, 2012. Tom Mueller opened the meeting at 7:27AM.

John Byrd provided an endowment report (Stanley Culpepper – Chair) that included the suggestion of an "Endowment Enrichment Scholarship" that would provide an opportunity for graduate and undergraduate students to have short term internships. This would be potentially 5 - one week internships to various venues, both industry and academia. There was a list of criteria for the application process and what the students would be required to present after the completed the internship. One suggestion would be that the student would provide a report (possibly an oral presentation or poster) to the SWSS at the annual meeting. The goal of the endowment foundation was to provide educational opportunities for students in SWSS. MacDonald mentioned the post-meeting student tour conducted by the Aquatic Plant Management Society. There was some concern that one week might not be long enough to provide a quality internship experience. The endowment committee would continue to work on possibilities.

This email was sent by Tom Eubanks to the SWSS Board of Directors,
It is of my opinion that given the reduced number of teams and individuals entering the SWSS Weed Contest annually that "winning" has become somewhat muted due to the current number of awards and/or plaques that have been given out in recent years. I would like to propose a few changes to the current award structure, this being implemented in 2013:

***Team awards** – Remove the monetary awards to teams. I believe the schools themselves do not need this money and the "Broken Hoe" will serve as their accomplishment. Keep in place the engraved plaque for first place team members and coaches. I am in a quandary as to whether we should continue to award the second and third place teams with plaques.*

***Individual awards –** Verbally recognize the top ten individuals but only award the top three individuals with plaques and monetary awards. I would propose rounding the monetary awards to $400, $200 and $100, respectively. I also would propose removing the monetary awards for undergraduates but keep the plaques awarded to three places. I would continue to award high overall individual within each respective event (weed id, etc.) with a plaque as well.*

Implementing these changes would save the SWSS $1,525 in award monies and the costs of 7 to 17 additional plaques. As a side note, my goal, while in this capacity as Weed Contest chair, is to see the contest become less of a "competitive" atmosphere and more of a learning environment while at the same time building friendships between these graduate students. The best way I know how to make this event less competitive, while still maintaining the importance and integrity of the contest, is to remove as much of the financial reward structure as possible but I am open to suggestions. I also plan on having future host sites include events/socials that promote building of relationships as well as knowledge. As we all know many of our current colleagues are also some of our closest friends. I would like to see these young people get an early start on building those relationships we all value so much.

John Byrd suggested the endowment fund be used to help fund the weed contest, both to the host and also for awards. The feeling of the board was to have the Weed Contest committee look this over and provide a proposal to the board during the BOD meeting in January. Currently the contest chair is required to obtain funds to support the contest, this was questioned. There was a motion by Drew Ellis to remove the requirement of the chair and the contest in the MOP's to solicit funds for the weed contest. This was seconded Darrin Dodds. MOTION PASSED - UNANIMOUSLY.

Tom Mueller then went through the list of chair persons for the various SWSS committees. A summary of these are as follows:

Constitution and Operating - John Byrd has served for several years. He will provide names to Tom Mueller for replace.

Nominating – set by By-Laws
Finance – set by By-Laws

Local Arrangements – for the 2014 meeting in Birmingham - someone from Auburn University needs to be the chair; for the 2015 meeting in Savannah - Mark Czarnata, Sandy Newell, Tim Gray were all suggested as possibilities.

Program – set by By-Laws

Awards – set by By-Laws, but several folks want to be involved as members

Student Program – Mack Goodard is upcoming chair, Hunter Perry is vice chair

Computer Applications – Shawn Askew - considerable discussion pertaining to the presentation loading process but the decision was deferred to the to the program chair

Resolutions and Necrology – David Black is current chair. John Byrd suggested that a person from each state, preferably an older individual be members of this committee.

Meeting Site Selection – set by By-Laws

Long Range Planning - set by By-Laws

Weed Contest –each state has a representative

Legislative and Regulatory – Donn Shilling is Chair, suggested members were Ginger Light, Fred Fishel

Historical – Bill Witt would like to serve

Research – no suggestions

Weed ID – Victor Maddox was suggested

Sustaining Member – James Holloway was suggested

OLD BUSINESS – John Byrd is developing an herbicide resistance MOP and asked several guidance questions such as how many folks, should there be a rep from every state, how long should be the term? Larry Steckel was Chair of this committee when it was an ad hoc committee and he utilized the WSSA model. It was suggested that every state provide a report for the proceeding on the status of herbicide resistance in their state. John would continue to work on this MOP.

NEW BUSINESS – none

There was a motion to adjourn made by Larry Steckel, seconded by Drew Ellis at 9:05AM.

AGENDA

Monday Afternoon - Lunch provided by SWSS from noon to 1:00pm

1:00 pm Introductions and approval of agenda – Mueller
Secretary's Report – MacDonald

1:15 pm Proceedings update - Webster, via phone call
Approval of 2015 meeting location - Banks
Discussion of 2016 joint meeting, ESA-SEB - Mueller/Banks
Financial overview and report – Banks

2:00 pm Break

2:15 pm 2013 Program update – Kelly
Approval of candidates for elections – Brecke

3:00 pm Hotel walk-through - Gary Schwarzlose, hotel staff

4:00 pm Old Business – BOD
New Business – Mueller
Approval of business manager contract
Approval of Director of Science Policy contract

Monday Evening – TBD dinner as a group - Schwarzlose/Mueller

Tuesday Morning – Breakfast provided by SWSS from 7:00am to 7:30am

7:30 am Recap and review from Monday – Mueller
SWSS field contest – Mueller, from Eubank

8:00 am Suggestions - committee chairs, members, term of service? – Mueller

8:30 am Old Business and New Business – Mueller

10:00 am Adjourn meeting – Mueller

Editor's Report

Summary of Progress: The 2012 Proceedings of the Southern Weed Science Society contained 277 abstracts and 375 pages. By comparison, the 2011 Proceedings had 342 abstracts and 515 pages; there were 245 abstracts and 365 pages in 2010, 588 pages from the 2009 WSSA/SWSS joint meeting, 315 pages in 2008, 325 pages in 2006, 363 pages in 2005, and 512 pages in 2004.

The 2012 Proceedings was dedicated to the late Dr. Jacquelyn Driver. The proceedings contained executive board minutes from the quarterly meetings, committee reports (including reports from: Editor, Business Manager, Legislative/Regulatory, WSSA Representative, Continuing Education, SWSS Summer Contest, Necrology, Constitution and By-Laws, and Site Selection), award winners, and research reports, as well as abstracts in sections detailed below. The Proceedings were complete by the summer board meeting. Once posted to the SWSS homepage (www.swss.ws), there were some issues with missing abstracts, but those problems were fixed and the updated Proceedings re-posted to the website. The Annual SWSS Weed Surveys beginning in 2000 have been posted on the website.

Section	**Number of Pages**
Minutes of Executive Board, Committee Reports, etc	28
Posters	101
Weed Management in Agronomic Crops	51
Weed Management in Turf	16
Weed Management – Pastures and Rangelands	12
Weed Management – Horticultural Crops	11
Weed Management in Forestry	6
Management of Invasive Weeds	8
Vegetation Management In Utilities, Railroads & Highway Rights-Of-Way, and Industrial Sites	7
Physiological and Biological Aspects of Weed Control	8
Regulatory Aspects of Weed Science	10
Graduate Student Contest	42
Symposium: Herbicide Stewardship	4
Symposium: Dicamba	8
Weed Survey (Most Common & Most Troublesome)	22
Registrants of 2011 Annual Meeting	15

Objectives for Next Year: Complete the 2013 Proceedings prior to the summer board meeting. Also, progress has been made to adding recent proceedings to the SWSS website. Proceedings from 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2009, 2010, and 2011 can be found on SWSS web site. The goal is to add the Proceedings from 2007 and 2008 to the website in the coming year.

Finances (if any) Requested: None.

Respectively submitted,
Theodore M. Webster, Editor

Business Manager's Report
for the 2013 SWSS Meeting
Houston, TX, January 27, 2013

All tax forms and bills were paid on time during the past year. The attached financial statements show that SWSS is in good financial order and posted an increase in net worth ($19,321.23) during the last fiscal year (ended May 31, 2012). Most income for SWSS comes from annual meeting registration, annual meeting support from Industry, Sustaining Member dues, and sale of books or DVDs, in order of greatest to least (see the Cash Flow Statements). Interest income from our investments and excess funds was minimal during 2012 and is not expected to improve during 2013. The Finance Committee should look at current investment policy and determine if changes should be made.

Preregistration for the Houston meeting has run smoothly with the only exception being that members have had difficulty getting room reservations at the Royal Sonesta (the meeting hotel). This is mainly due to the hotel not increasing our room block above contract. The hotel is sold out for every night of our meeting. As of January 21, 2013, we have 210 regular members, 91 students, and 10 spouses/friends registered. I also handled the registration of the SWSS Golf Tournament (10 golfers). While the tournament does raise money for the Endowment Fund, participation has declined since the Puerto Rico meeting in 2011. I have worked closely with Gary Schwarzlose and his local arrangements committee, the hotel (David Bennett) as well as Steve Kelly, Program Chair. The posting and printing of the program went smoothly and was done in a timely manner. Award plaques and the Awards Program were printed well ahead of the meeting (thanks to the timeliness of Barry Brecke).

I worked closely with Tim Grey, Chair of the Site Selection Committee, and after a site visit by President Tom Mueller we chose the Hyatt Regency Savannah for the 2015 meeting. The rotation of the site for 2016 would be in the western (Oklahoma, Texas, Arkansas, and Louisiana). I will poll the committee and start the process in time to have a recommendation to the Board by the summer meeting.

Submitted by

Phil Banks,

Business Manager

Net Worth: Southern Weed Science Society		
	5/31/2012	
Account	Balance	
ASSETS		
Cash and Bank Accounts		
Merrill Lynch	111,610.98	All fixed. Very low return.
Money Market	130,497.05	Currently pays 0.4%
SWSS Checking	11,995.57	
Wells Fargo Savings	33,050.85	Conservative Bond fund. Earned $723.70 for year (2.2%).
TOTAL Cash and Bank Accounts	287,154.45	
TOTAL ASSETS	287,154.45	
LIABILITIES		
Other Liabilities		
Liability	3,446.31	Weed Contest Fund. Will be depleted after 2012 contest.
TOTAL Other Liabilities	3,446.31	
TOTAL LIABILITIES	3,446.31	
OVERALL TOTAL	283,708.14	
		Net Change for the year.
Total Assets on May 31, 2008	242,242.37	-10,079.63
Total Assets on May 31, 2009	239,102.58	-3,139.79
Total Assets on May 31, 2010	247,056.17	7,953.59
Total Assets on May 31, 2011	264,386.91	17,330.74
Total Assets on May 31, 2012	283,708.14	19,321.23

SWSS Cash Flow Report for Fiscal year 2011-12	
	6/1/11-5/31/2012
Category Description	
INFLOWS	
Annual Meeting Registration	88,812.91
Annual Meeting Support	21,347.83
Endowment Funds Received (not transferred)	225
Forest Plants Of The SE	1,932.99
Interest Inc	1,819.22
Renewal	3,069.43
Sustaining Member Dues	15,737.10
Weed DVD	-2,081.10
Weeds Of Midwestern US & Candada	1,060.63
Weeds Of The South	3,003.61
TOTAL INFLOWS	134,927.62
OUTFLOWS	
Account Fee	125
Annual Meeting Expense	37,779.21
Awards	4,000.00
Director Of Science Policy	10,802.00
Endowment Funds Transferred	18,092.00
Insurance	489.44
Management Fee	20,000.00
Merchant Acct.	1,710.70
Newsletter	200
Power Pay	201.56
Site Selection	527.25
Supplies	49.92
Tax Preparation	699.16
Travel To Annual Meeting	4,079.40
Travel To Summer Meeting	666.9
Value Change from Wells Fargo Account	342.29
Website Editor	2,500.00
Website Host	1,240.00
Weed Contest	8,655.25
TOTAL OUTFLOWS	112,160.08
OVERALL TOTAL	22,767.54

Director of Science Policy Report

Summary of Activities

1. Generated support for USDA research funding through competitive grants (AFRI) and formula funds (Hatch, Smith-Lever) as well as integrated programs (Regional IPM): met with House and Senate committee staff and wrote coalition letters on behalf of the National and Regional Weed Science Societies. FY 2013 budget is in limbo and a continuing resolution based on FY 2012 may fund the entire FY 2013. The current funding for FY 2013 is funded through March of 2013.

    a. President's Council of Advisors for Science and Technology (PCAST) recommended that the U.S. increase its investment in agricultural research by a total of $700 million per year:
        i. $180 million for new graduate and post-doctoral fellowships;
        ii. $235 million for new competitively funded research at USDA AFRI;
        iii. $130 million for basic research at NSF; and
        iv. $150 million for new public-private institutes.
    b. Top challenges they listed for 21st century agriculture:
        i. Managing new pests, pathogens, and invasive plants.
        ii. Increasing the efficiency of water use.
        iii. Reducing the environmental footprint of agriculture.
        iv. Growing food in a changing climate.
        v. Managing the production of bioenergy.
        vi. Producing safe and nutritious food.
        vii. Assisting with global food security and maintaining abundant yields.

2. Worked to prevent EPA from finalizing a rule which would allow fuel made from two known noxious weeds, *Arundo donax* (giant reed) and *Pennisetum purpureum* (napier grass or elephant grass), to count toward federally-mandated renewable fuels targets. We need more research on *Arundo* and *Pennisetum* before incentivizing their production. If OMB signs off on EPA releasing the rule, we requested to see a complete assessment of the costs and benefits, as outlined in Executive Order 13112. Additionally, if EPA approves Arundo donax and similarly high risk feedstocks, we believe that the rule must include – at the very minimum— guidelines on stringent best management practices to reduce the risk of escape.

3. Worked with interested coalitions to get support in both the House and Senate for the NPDES legislative fix bill, H.R. 872 and S. 3605. However, legislation remains blocked by Sen. Boxer (CA). Submitted letters of support on behalf of the National and Regional Weed Science Societies. New legislation will have to be reintroduced in the 11^{3th} Congress.
4. Generated support for the Pesticide Safety Education Program (PSEP) through a technical paper, and a joint press release with entomology and plant pathology. Currently participating in a national stakeholder group to find more permanent funding mechanisms at the federal and state level for PSEP.
5. Generated support for Army Corps of Engineers Aquatic Plant Control Research Program (APCRP) and sent letters to House and Senate Energy and Water appropriations committee members. FY 2013 funding in limbo again for APCRP. Senate has proposed $4 million, but House and President proposed $0. Senate support from Schumer (NY), Leahy (VT) and Cochran (MS) will be key again. I will need to send another letter to House and Senate appropriators before the end of March.
6. Coordinated and co-organized support for National Invasive Species Awareness Week activities which occurred Feb. 26 to March 3, 2012. Planning for NISAW 2013 is in the final stages. WSSA is hosting a presentation on Capitol Hill on Mar. 4, 2013 regarding invasive plants and biofuels. We are also working with other NGO's to introduce a Congressional resolution in the House and Senate supporting NISAW.
7. Supported Public Awareness Committee activities and responded to press inquiries. Recent headlines include six news releases on pesticide stewardship as well as the following:
    a. Three Leading Scientific Societies take an Objective Look at the Issues Associated with "Least Toxic Pesticides" Applied as a "Last Resort".
    b. Annual Meetings of Weed Science Societies to Highlight Latest Developments in Research and Management of Weeds and Invasive Plants.

    c. Decades Old Weed Seeds Trigger New Outbreak of Devastating Plant Parasite.

8. Continued educating Federal agency and NGO stakeholders on herbicide resistance management. Watched and listened for any legislation that would attempt to regulate herbicide resistance or restrict the interstate movement of herbicides due to resistance issues.
9. Helped plan and coordinate 2012 EPA Herbicide Resistance Education Tour on the Delmarva Peninsula in August. The tour report is on the WSSA website.
10. Participated in Farm Bill stakeholder meetings and advocated for the following provisions where differences existed between the House and Senate:
    a. Support the Senate provision that establishes the Foundation for Food and Agricultural Research (FFAR), a new nonprofit corporation designed to supplement USDA's basic and applied research activities, and provides total mandatory funding of up to $100 million of matching funds. The foundation will solicit and accept private donations to award grants or enter into agreements for collaborative public/private partnerships with scientists at USDA and in academia, non-profits, and the private sector.
    b. Strongly oppose the House provision that require matching funds for applied research and extension that is commodity or state specific.
    c. Support the Pesticide Registration Improvement Act (PRIA III) in the House bill. PRIA was set to expire on Oct. 1, 2012, but separate legislation was introduced and passed in Sept 2012.
    d. Support reauthorization of the Specialty Crops Competitiveness Act through FY2017 in the Senate bill. Increases mandatory funding to $70 million annually (FY2013 - FY2017), which would also raise the minimum grant amount received by each state/territory.
    e. WSSA supports conservation compliance, but only if exemptions are granted for herbicide resistance management.

The DSP and Science Policy Committee were active with many other issues on a continuous basis in 2012. Notable issues that arose during the past year that required support through letters, phone calls, and meetings included:

a) asked USDA NIFA to rethink their "Crop Protection Program" funding line item and explore options on how to maintain equal funding for the six programs involved, especially IR-4, the Regional IPM Centers, and Extension IPM.
b) Supported a letter to Congress asking them to avoid legislation that would place severe restrictions on government employees' abilities to attend meetings and conferences.
c) asked EPA OPP to support the use of MSMA in turf weed control

<u>2013 Plan for Committee Activities</u>

- Discuss weed science priorities with NIFA Director, Sonny Ramaswamy and generate support for USDA to fund a $10 million CAP grant for weed resistance management.
- Investigate the "fine print" of provisions that get incorporated in the 2013 Farm Bill.
- Investigate FY 2014 federal budget proposal for programs affecting weeds and invasive plants
- Support funding for the Aquatic Plant Control Research Program
- Monitor any new Renewable Fuel Standard proposals that try to add invasive plants as biofuels.
- Continue support for an NPDES Fix bill in the 113th Congress.
- Advertize and hire a new EPA Subject Matter Expert (SME) to replace Jill Schroeder.
- Explore the possibility of establishing a similar SME position within USDA
- Engage in formal discussions with USDA-ARS leadership on the importance of refilling John Lydon's position of National Program Leader for Weed Science.
- Work with new APHIS PPQ leadership to reestablish federal funding for noxious weed control and eradication. The witchweed eradication program is the only funding that has survived.
- Hold a successful National Invasive Species Awareness Week (NISAW)

2012 Endowment Board Meeting
Monday January 23, 2012
Francis Marion Hotel, Rutledge Room, Charleston, SC

Present: Stanley Culpepper, David Jordan, Nilda Burgos, Renee Keese and James Holloway.

Absent: John Byrd

Meeting called to order by Stanley Culpepper at 8:14 am.

Whistle blower policy – we have a policy on record with Phil Banks and have met the objective.

Investments – proposal to move to 1-yr CD's since the rates are so low, then we are prime to move to another fund with greater projected earnings. Move from Merrill Lynch to a current bank SWSS is using and avoid fees. Easier for Phil Banks as well. 2CD's, checking account and a money market account. Stanley will tell Phil we support the change.

The Board has been requested to evaluate what activities should be supported and formally change the operating guide. Stanley will get a copy of the operating guide and circulate to members for input. Will compare to other committees and to the WSSA so we format appropriately and match other documents. Endowment Committee is to support the scientific and educational commitments of the society.

Contributions: 4 donations so far this year, plus $5000 from golf tournament yesterday. Need to have more impact to increase donations, then have greater visibility during the year.

Currently give the students a book, and fund the graduate student awards. Need a 'wow factor' to promote the Endowment. Have $103,000 in income for the year. Spent on books and awards. Should be spending $10,000 a year, could do this for 10 years and then we'd be out of money – therefore need to increase visibility to sustain this and increase contributions.

Use of funds: New ideas to assist students 1) travel support for students to visit Industry site, or 2) potential for 6-mo assistantship to study with Industry. 3) Give 7-8 scholarships to visit industry or another institution for a week. Would like to give the students a project to conduct while they are there. Students attend and then present a brief talk at the student session during SWSS. Could present a menu of options – several companies, USDA, Steve Dukes lab, etc. Students sign up for what they want to do. Students could also use the funds to visit another university program to see another program. Funds would cover travel, company/sponsor would have to cover the hotel and meals for the students. Students could submit their receipts for reimbursement and the SWSS funds after they complete the trip – greater tax advantage for SWSS. Students know they have a $1000 stipend (7 students for $1000, or 4 students for $1500?). Endowment Board would select the students based on their proposals. Could have students present at Quiz Bowl type event. Will need to decide – 2 Master and 3 PhD students? Something like this – start with 4-5 students first year, want to grow to 7 or more (then will need more funding). Stanley to draft the letter and go to the SWSS Board for approval.

Companies – Monsanto, Syngenta, BASF, Bayer, DuPont, Pioneer, Delta Pine, etc. Steve Duke lab, Pat Donald at Tenn, Scott Senseman for Pesticide Fate, Pete Dotray, David Jordan, hope people will volunteer and want to participate. Companies would have to offer up a program and the students would select what they are interested in.

Paperwork will state $X amount of money to be spent for the student to travel to a site, hopefully the sponsor will cover the hotel and meals for the students. Some locations may cost more than others – committee needs to be prepared for this.

Need a catchy name for this. ‘SWSS Endowment Student Enrichment Program’. ‘SWSS Endowment Experience’.

Meeting adjourned at 9:35am.

Respectfully submitted,

Renee Keese, Secretary

2013 Endowment Board Meeting
Monday January 28, 2013
Royal Sonesta Hotel, Founders Ballroom III, Houston, TX

Present: Stanley Culpepper, David Jordan, Michael Flessner, Kelly Barnett, Brent Sellers, James Holloway and Renee Keese.

Absent: Nilda Burgos

Meeting called to order by Stanley Culpepper at 8:02 am.

2012 Minutes were reviewed and approved. 2012 and 2013 minutes need to be sent to Ted Webster and Greg MacDonald.

Financial Review: The SWSS endowment is currently stable with funds available to spend on students. The SWSS board made an official request of $5000 from the Endowment board to support the student weed competition held every other year when being hosted at a University setting. The Endowment board agreed to donate $2500 each year thereby fulfilling the SWSS board request of $5000 every other year.

Merrill Lynch Money Market Account: The account is earning very little, Phil Banks would like to move the funds to a more staggered CD time commitment or mutal funds that are moderately aggressive. Since the SWSS finance committee is currently in discussions with an investment counselor the SWSS Endowment board decided to wait and make this decision after learning the actions taken by the SWSS finance committee led by Scott Sensemen

Donations: Member donations are behind that of last year; therefore, we need to solicit funds. Miminal support is expected from the golf tournament yesterday since attendance was very low.

Print for Auction: Charles Bryson donated a print that will be up for silent auction.

Nominations for the Endowment Board this year: Need a nominee name to give to Tom Mueller for the vote.

SWSS Endowment Enrichment Scholarship: SWSS Board and the SWSS Endowment are in favor of sponsoring both the Weed Contest and the development of this scholarship. The details for the scholarship are still in development but current information is provided below.

2013 SWSS Endowment Enrichment Scholarship

Purpose: Provide an opportunity for SWSS graduate and undergraduate students to participate in a week long educational experience with Industry or Academia.

Student Application Deadline: David Jordan must receive applications by April 5, 2013.

Description of Scholarship: Scholarship winners will have a week long educational experience of their choosing as described in Table 1 on page two. Opportunities include learning among many areas of weed science including experiences from the field to the lab, in research or extension, and with industry or academia. Winners will be provided $1500 from the SWSS Endowment to pay for expenses incurred during their experience.

Eligibility Requirements: Applicants must meet the following criteria:

The applicant must be an undergraduate or graduate student in good academic standing enrolled in a degree program (B.S., M.S., or Ph.D.) at an accredited college or university in the southern region.

Graduate students must be actively conducting, or have recently finished, research in the area of weed science. Undergraduates must document their interest in the area of weed science.

The applicant must be a member of the SWSS at the time of application.

The applicant must present a 10 minute paper and submit an abstract about their experience at the SWSS annual meeting following their experience. Specifics will be provided directly to winners.

Application Procedure:

Complete application form (*example provided on page 3*).

Cover letter describing applicants interest in weed science and the scholarship (< 1 page).

Brief resume or CV summary highlighting recent relevant experiences (< 1 page).

Two letters of support, one of which must be from the student's graduate or major advisor.

Academic transcripts (unofficial copy is acceptable).

Email application information to David Jordan (david_jordan@ncsu.edu) by April 5, 2013.

Selection Criteria and Process: Applicants will be evaluated based on contribution of research to the discipline of weed science and to the SWSS objectives, academic record and scholarly achievements, and potential contributions to the future of weed science. Submitted applications will be distributed to the Endowment Committee members where each member of the committee evaluates and ranks the applicants as shown on the Application Evaluation Form on page 4. Judging will not be done by individuals with a personal or advisory affiliation with an applicant.

Timeline: Students must submit applications by April 5, 2013. The scholarship selection process will be completed by May 1, 2013. Scholarship winners and their host will determine the date in which the experience is to occur during 2013. The Endowment Committee will function as a liaison between the scholarship winners and their hosts throughout the process.

Revising Guidelines or Procedures: The Endowment Committee will likely make changes or revisions to the scholarship guidelines and operating procedures as more experience is obtained. The Endowment welcomes suggestions from the membership on methods to improve this experience for students.

Table 1. Host opportunities provided for the SWSS Endowment Enrichment Scholarship; students will select three potential opportunities and list them on their application form.

Academic Hosts	Location	Experience
Askew, Shawn	Blacksburg, VA	Turf weed management
Brosnan, James	Knoxville, TN	Turf weed management
Burgos, Nilda	Fayetteville, AR	Basic molecular biology techniques, enzyme assay, 14C experiment procedure, GLP trial implementation protocols and practices, vegetable weed management options
Duke, Steve	Oxford, MS	Herbicide resistance, weed resistance, MOA
Griffin, Jim	Baton Rouge, LA	Soybean and sugarbeet weed management
Jordan, David	Raleigh, NC	Peanut weed management
MacDonald, Greg; Dittmar, Petter; Ferrell, Jay	Gainsville, FL	Weed management in agronomic crops and pastures; managing invasive weeds
Miller, Donnie; Stephenson, Daniel	St. Joseph, LA	Weed mgmt in sweet potato and agronomic crops
Prostko, Eric; Culpepper, Stanley	Tifton, GA	Peanut, corn, soybean, cotton, and vegetable weed mgmt. from extension specialists point of view.
Reynolds, Dan	Starkville, MS	Weed management in agronomic crops and GIS/Remote Sensing Technology
Webster, Ted	Tifton, GA	Weed biology in field crops
Industry Hosts	**Location**	**Experience**
BASF - Steve Bowe	RTP, NC	BASF Opportunities: Field R&D, GH & Lab Research, Tech Service, etc
Bayer CropScience -		
Diligence Technologies - Tim Adcock	Jackson, TN	Ins and outs of contract research
Dow AgroScience -		
Monsanto -		
Syngenta – David Black – Plant Pathologist	Searcy, AR	Pest management (insect, disease, and weeds) in cotton, soybean, corn, and rice.
Syngenta – Scott Moore - Nematologist	Monroe, LA	Nematodes and pest management (insect, disease, and weeds) in cotton, soybean, corn, and rice.
Syngenta – James Holloway – Weed Scientist	Jackson, TN	Pest management (insect, disease, and weeds) in cotton, soybean, corn, and rice.
Syngenta – Cheryl Dunne – Weed Control Lead	Vero Beach, FL	Work with weed scientist in glass houses and field environments, screen for resistance in weeds.
Syngenta - Jerry Wells – Herbicide regulatory	Greensboro, NC	Get an in depth look at the regulatory world
Valent –		

Scholarship Application Form

1. Applicant Name:

2. Selection of Host Institution for the SWSS Endowment Experience:
   First Choice: ___________________
   Second Choice: _________________
   Third Choice: ___________________

3. Cover Letter (max 1 page):

4. Resume or CV Summary (max 1 page):

5. Academic Transcript (official form NOT required):

5. Include two letters of support with one from your academic advisor:

Applicant Evaluation

Cover Letter. Evaluate the student's statements summarizing their research, career goals, and their contribution to the field of weed science. Keep in mind that academic and research progress will vary greatly between applicant's (undergraduate to Ph.D.), so do your best to evaluate each student relative to their level.

Resume/CV: Evaluate how the student's CV summary illustrates their interest in weed science.

Transcript. Evaluate how the student's academic record (courses and final grades) reflect their interest and commitment to weed science.

Letters of support. Evaluate how the student's letters of support reflect the success of the student's research skills, likelihood of continuing to work on weed science issues, and professionalism.

Scoring & overall ranking

Name of Candidate: ____
Rank the following categories of the candidate's application from 1 (poor) to 5 (outstanding),

____ 1. Quality of research

____ 2. Applicability of research to weed science in general

____ 3. Potential for this student to contribute to weed science in the future

____ 4. Student involvement in weed science issues and activities

____ 5. Quality of student's academic record

Total Points:____________________________

Name of Reviewer: ____

Meeting adjourned at 9:35am.

Respectfully submitted,

Renee Keese, filling in as Secretary

Necrologies

Four necrology reports were submitted, Dr. Ray Cooper, Mark Boyles, Craig Collins, and Karen DeFelice.

Dr. Ray Cooper, 72, died February 13th, 2012. He was born on July 21st, 1939 in Thomas County, Georgia.

Ray graduated from the University of Georgia in 1962 with a BS and MS in Agro Sciences and continued to Virginia Polytechnic Institute where he earned a PhD in Biochemistry. He worked in agricultural chemical research for 35 years and retired from Dow Chemical Company in 2001.

Ray was an influential mentor to young professionals, his children and his grandchildren. He used his knowledge to teach his grandchildren about all of nature's wonders and he exemplified how faith in God plays a critical role in the connection between these two entities. Ray is survived by his wife of 48 years, Rose Wood Cooper, his sons Marc and Brad Cooper and their spouses, his daughter Cita Cooper Streiff and her spouse. In addition, he is survived by six grandchildren, his sister Martha Taylor and her spouse, and his niece Lei Taylor and nephew Billy Taylor and his wife

WHEREAS Dr. Cooper served with distinction at Dow Chemical Company and,

WHEREAS Dr. Cooper provided numerous contributions to weed science and the Southern Weed Science Society,

THERFORE BE IT RESOLVED that the officers and membership of the Southern Weed Science Society do hereby take special note of the loss of our coworker, Ray Cooper, and by copy of this resolution, we express to his family our sincere sympathy and appreciation for his contributions.

Mark C. Boyles, 58, died January 23rd, 2013. He was born August 8th, 1954 in Guam, Mariana Islands. In 1976 he married Maria Brandana in Stillwater, OK.

Mark graduated from Stillwater High school in 1972 before going on to attend Oklahoma State University. Mark received his Bachelor's degree from OSU in 1977 followed by his Master's degree in Agronomy from OSU in 1979.

Mark started his carrier with Sandoz in 1979, then with BASF where he worked until 2002 as a Field Biologist and then in Field Management. Mark had many patents and awards during this 23 year period. In 2004 Mark went back to Oklahoma State University as a faculty member and worked in the Research and Extension for the Plant and Soil Science Department. The major focus of his research was on winter canola as a rotation crop for winter wheat. From 1987 until 2005, Mark owned the Ghost Hollow Christmas Tree Farm in Ripley, OK and he donated the proceeds to the American Diabetes Association for kid camps.

Mark was member of many professional societies and a long standing active member of SWSS, serving as a committee member and Chairman on a variety of different committees from 1984 through 1999.

WHEREAS Mr. Boyles served with distinction at BASF and Oklahoma State University and,

WHEREAS Mr. Boyles provided numerous contributions to weed science and the Southern Weed Science Society,

THERFORE BE IT RESOLVED that the officers and membership of the Southern Weed Science Society do hereby take special note of the loss of our coworker, Mark Boyles, and by copy of this resolution, we express to his family our sincere sympathy and appreciation for his contributions.

Craig Collin Evans, 53 died August 8th, 2012. He was born on January 24th, 1959 in Ethiopia in the Horn of Africa. On December 31st, 1997 he married Mary Catherine Koelsch in Oklahoma City, OK.

Craig graduated from high school in Dennison, TX and went on to earn his Master's of Science degree from Oklahoma State University. Craig worked as a horticulturist for Oklahoma State University as an Extension Associate. Craig was a member of several professional organizations including the Southern Weed Science Society. He liked gardening and was known as the neighborhood turf expert.

He is survived by his mother, Joy Evans; wife, Cathy Evans; daughter, Sarah E. Evans; his two brothers Brian, Kent, and Shuan Evans and their spouses.

WHEREAS Mr. Evans served with distinction at Oklahoma State University and,

WHEREAS Mr. Evans provided numerous contributions to weed science and the Southern Weed Science Society,

THERFORE BE IT RESOLVED that the officers and membership of the Southern Weed Science Society do hereby take special note of the loss of our coworker, Craig Evans, and by copy of this resolution, we express to his family our sincere sympathy and appreciation for his contributions.

Karen Leigh DeFelice, 51, died December 1, 2012. She was born in Louisville, KY on April 8th, 1961.

Karen earned Bachelor of Science and Master of Science degrees in agriculture at the University of Kentucky. Karen served a tour in Ecuador in the Peace Corps between degrees. She worked in the areas of education and the sciences over 25 years, writing numerous education publications, technical documents, and interactive software titles. Karen was the author of Enzymes for Autism and other Neurological Conditions: The Practical Guide to Digestive Enzymes and Better Behavior, and Enzymes: Go With Your Gut. She was an internationally recognized expert and speaker on digestive enzymes and digestive health, supplements and diets. Karen's enjoyable down-to-earth writing and speaking style came from personal experience with chronic health issues in herself and her family. Her non-profit educational work on the use of digestive enzymes has been used by tens of thousands of people suffering from conditions ranging from Autism to food intolerances to sensory integration disorder. Karen's first book is considered by many to contain the best practical guide to dealing with encopresis in children. She also ran an interactive software training business for over 20 years and created numerous award winning interactive training programs for industry and government clients.

Although Karen was not a member of SWSS, Karen did a lot of work with her husband Michael in helping the SWSS in getting our Weed Identification books available with on-line vendors.

Karen is survived by her husband, Michael S. DeFelice, sons Matthew M. DeFelice, and Jordan L. DeFelice; her mother, Ellen Sprepski, and her sister Beth Corbett.

WHEREAS Mrs. DeFelice served with distinction as an author,

WHEREAS Mrs. DeFelice provided numerous contributions to weed science and the Southern Weed Science Society,

THERFORE BE IT RESOLVED that the officers and membership of the Southern Weed Science Society do hereby take special note of the loss of our coworker, Karen DeFelice, and by copy of this resolution, we express to his family our sincere sympathy and appreciation for his contributions.

EFFECT OF ORGANIC MATTER ON HYBRID BERMUDAGRASS INJURY WITH PREEMERGENCE HERBICIDES IN SAND-BASED ROOTZONES. P. A. Jones*, J. Brosnan, D. A. Kopsell, G. K. Breeden; University of Tennessee, Knoxville, TN (1)

ABSTRACT

Preemergence (PRE) herbicide applications in sand-based rootzones have been reported to result in root and shoot hybrid bermudagrass (*C. dactylon* x. *C. transvaalensis* Burtt-Davey, cv. Tifway) injury. Research was conducted in 2012 to determine the impact of organic matter content on hybrid bermudagrass injury with PRE herbicide applications was established from washed sod in mini-rhizotrons containing four sand rootzones uniformly blended with organic matter: 1) a 95:5 mix containing 0.003 kg kg^{-1} organic matter; 2) an 80:20 mix containing 0.007 kg kg^{-1} organic matter; and 3) a 60:40 mix containing 0.012 kg kg^{-1} organic matter; and 4) a 100:0 mix containing 0.000 kg kg^{-1} organic matter. In all rootzones the organic matter source was sphagnum peat moss. Herbicide treatments included indaziflam (35 and 52.5 g ha^{-1}) and prodiamine (840 g ha^{-1}). Plants were allowed to acclimate for two weeks prior to herbicide application. Bermudagrass injury was visually evaluated weekly after application using a 0 (no injury) to 100 (complete kill) scale. At 6 weeks after treatment (WAT) roots were washed free of debris and excised as close to the crown as possible. WinRhizo software was used to characterize root length (cm), root length density (cm cm^{-3}), and root surface area (cm^2). Significant hybrid bermudagrass foliar injury was observed with indaziflam at 52.5 g ha^{-1} in the sand rootzone with no organic matter. Injury ranged from 4 to 61% from 1 to 6 WAT. Increasing organic matter from 0.003 to 0.007 kg kg^{-1} reduced hybrid bermudagrass injury on every evaluation date, regardless of herbicide. Increasing levels of organic matter decreased foliar injury symptoms; however, no significant reductions were seen when organic matter increased from 0.007 to 0.012 kg kg^{-1}. Root length, root length density, and root surface area values were lowest in sand rootzones with ≤ 0.003 kg kg^{-1} organic matter. Consequently, these values were greatest in sand rootoznes with ≥ 0.007 kg kg^{-1} organic matter. When averaged over all four rootzones, prodiamine and indaziflam at 52.5 g ha^{-1} reduced all three parameters by 50 to 65%. Results of this study suggest that soil organic matter content affects hybrid bermudagrass injury potential with PRE herbicide applications on sand based-rootzones.

MOWING HEIGHT EFFECTS ON PREEMERGENCE HERBICIDE EFFICACY FOR SMOOTH CRABGRASS CONTROL. S. M. Breeden*, D. Farnsworth, J. Brosnan, G. K. Breeden; University of Tennessee, Knoxville, TN (2)

ABSTRACT

Smooth crabgrass (*Digitaria ischaemum*) is a problematic weed of warm- and cool-season turfgrass across the United States. While several preemergence (PRE) herbicides can effectively control smooth crabgrass, data describing the effects of mowing height on PRE herbicide efficacy are limited. Research was conducted in 2012 at the East Tennessee Research and Education Center (Knoxville, TN) investigating the effects of mowing height on PRE herbicide efficacy for smooth crabgrass control in common bermudagrass (*Cynodon dactylon*) turf.

Treatments included the factorial combination of two mowing heights (15 and 50 mm), six PRE herbicides (indaziflam, dithiopyr, oxadiazon, pendimethalin, prodiamine, and prodiamine + sulfentrazone), and two application regimes (single, sequential). Both regimes delivered the same rate of active ingredient for each herbicide; however, sequential regimes split this rate across two applications spaced eight weeks apart. Total application rates were as follows: indaziflam (35 and 52.5 g ha^{-1}), dithiopyr (560 g ha^{-1}), oxadiazon (4500 g ha^{-1}), pendimethalin (3360 g ha^{-1}), prodiamine (1680 g ha^{-1}), and prodiamine + sulfentrazone (1260 g ha^{-1}). All treatments except oxadiazon were applied with a CO_2 powered boom sprayer calibrated to deliver 281 L ha^{-1} utilizing four, flat-fan, 8002 nozzles at 124 kPa, configured to provide a 1.5-m spray swath. A granular formulation of oxadiazon was applied by hand with a shaker jar. All treatments were applied on 6 March 2012 with sequential applications made 30 April 2012. Irrigation was applied after treatment application. Plot size measured 1.5 x 3 m and treatments were arranged in a 2 x 6 x 2 factorial randomized complete block design with three replications. Weed control and turf injury were visually evaluated using a 0 (i.e., no weed control or turf injury) to 100 % (i.e., complete weed control or turf injury) scale at 2, 3, 4, 5, and 6 months after initial treatment (MAIT).

Mowing height-by-application regime interactions were detected in smooth crabgrass control data 5 MAIT. Mowing height-by-herbicide interactions were also detected in smooth crabgrass control data collected 3, 4, and 5 MAIT as well. At the 15 mm mowing height, split application regimes provided greater smooth crabgrass control than single applications at 5 MAIT; however, no significant differences were detected between single and split application regimes at the 50 mm mowing height. By 5 MAIT, all herbicides except prodiamine provided greater smooth crabgrass control when applied to turf maintained at 50 mm compared to 15 mm. Data illustrate that mowing height can affect efficacy of PRE herbicides for smooth crabgrass control.

TOPRAMEZONE FOR CRABGRASS AND GOOSEGRASS CONTROL IN COOL SEASON TURF. A. Smith*[1], M. Cox[2], S. D. Askew[1], K. Miller[3]; [1]Virginia Tech, Blacksburg, VA, [2]Virginia Tech, Blaksburg, VA, [3]BASF, Richmond, VA (3)

ABSTRACT

Topramezone is a HPPD- inhibiting post-emergence herbicide, currently labeled in corn and is expected to be labeled in cool-season turfgrass. It controls many broadleaf and grass weed species and exhibits safety to several cool-season turfgrasses. The objective of this research was to determine the efficacy of topramezone alone or in combination with triclopyr or quinclorac for goosegrass (*Eleusine indica* (L.) Gaertn.) and smooth crabgrass (*Digitaria ischaemum* Schreb. Ex Muhl.) control in cool-season turfgrass. Trials were initiated in July 2012 in perennial ryegrass and Kentucky bluegrass. Treatments were topramezone alone applied twice at 33.6 g ai/ha, topramezone + triclopyr (1.12 kg ai/ha) applied twice, topramezone + quinclorac (0.426 kg ai/ha) applied twice, and mesotrione (0.213 kg ai/ha) applied twice. All second applications were made at a 3-week interval. All topramezone treatments included a methylated seed oil surfactant (0.5% v/v), and the mesotrione treatment included a nonionic surfactant (0.25% v/v). A non-treated check was included for comparison. Percent cover of desired turfgrass, percent cover of goosegrass or crabgrass, percent control of goosegrass or crabgrass, and percent cover of white tissue was estimated and recorded. At trial initiation, smooth crabgrass cover ranged from 63-73%. At 1 week after initial treatment (WAIT), topramezone plus quinclorac controlled smooth crabgrass 82%, while all other treatments controlled smooth crabgrass 50%. White tissue cover, an undesirable result of using an HPPD- inhibiting herbicide that decreases turf aesthetics, was 80 and 83% in plots treated with topramezone and mesotrione applied alone, respectively and 0% from combinations of topramezone with quinclorac or triclopyr. At 2 WAIT, all treatments with topramezone controlled smooth crabgrass 97-100%, while mesotrione alone controlled crabgrass 50%. White tissue cover was 0% from combinations with triclopyr or quinclorac, 1.3% from topramezone alone, and 12% from mesotrione alone. At 3 WAIT, the second treatment was applied, resulting in similar trends. Plots receiving topramezone or topramezone in combination with triclopyr or quinclorac maintained excellent control of smooth crabgrass. In plots infested with goosegrass, topramezone alone or in combination with triclopyr controlled goosegrass 97-98%, significantly better than topramezone plus quinclorac (92%) or mesotrione alone (13%) at 3 WAIT. Topramezone plus quinclorac and topramezone plus triclopyr resulted in significantly less white tissue cover than all other treatments. At 8 WAIT, all plots receiving topramezone or a combination of topramezone and triclopyr or quinclorac had 99-100% turf cover with no white tissue cover. Mesotrione was the least effective treatment for controlling goosegrass, resulting in 43% control. These data suggest that topramezone may be an effective postemergence herbicide treatment for goosegrass and smooth crabgrass, and when combined with triclopyr or quinclorac, will cause minimal white tissue injury. Turfgrass managers needing to maintain turf aesthetics have the option of using topramezone as a selective herbicide in cool-season turfgrass.

APPLICATION TIMING OF AMICARBAZONE AND METHIOZOLIN INFLUENCES EFFICACY FOR ANNUAL BLUEGRASS CONTROL IN CREEPING BENTGRASS GOLF GREENS. P. McCullough*[1], D. Gomez de Barreda[2], J. Yu[1]; [1]University of Georgia, Griffin, GA, [2]Polytechnic Univ. of Valencia, Valencia, Spain (4)

ABSTRACT

Methiozolin controls annual bluegrass in creeping bentgrass but application timing and temperature could influence efficacy in turf. In field experiments, sequential methiozolin applications totaling 3.36 kg ai ha^{-1} provided excellent (>90%) annual bluegrass control at 8 weeks after initial treatment when treatments were initiated in Feb./March or May but programs totaling 0.84 and 1.68 kg ha^{-1} provided poor control (<70%) at both timings. Methiozolin at all rates caused minimal turf injury (<8%) but creeping bentgrass was only injured from Feb./March applications. In growth chamber experiments, creeping bentgrass injury from methiozolin at 10 C was 2 and 4x greater than at 20 C and 30 C, respectively, while annual bluegrass injury was similar across temperatures. In laboratory experiments, annual bluegrass had more foliar absorption of ^{14}C-methiozolin than creeping bentgrass at 30/25 C (day/night), compared to 15/10 C, but translocation was similar at both temperatures as >90% of absorbed ^{14}C remained in the treated leaf after 72 hours. Annual bluegrass distributed and recovered more radioactivity to shoots from root-applied ^{14}C-methiozolin than creeping bentgrass while both species had about 2x more distribution to shoots at 30/25 C than 15/10 C. Metabolites were not detected in annual bluegrass or creeping bentgrass at 1, 3, or 7 days after treatment when grown at 15/10 C or 30/25 C suggesting uptake and translocation contributes to methiozolin selectivity in turfgrass.

GERMINATION AND HERBICIDE RESPONSE OF CARPETGRASSÂ . G. S. F Souza*[1], J. S. McElroy[2], D. Martins[1], M. L. Flessner[3], J. N. Toombs[2]; [1]Universidade Estadual Paulista - UNESP, Botucatu, Brazil, [2]Auburn University, Auburn, AL, [3]Auburn University, Auburn University, AL (5)

ABSTRACT

Common carpetgrass (*Axonopus affinis* Chase) is a warm-season grass species prevalent throughout the Coastal Plain region of the southeastern United States. Carpetgrass is used on roadsides, lawns, parks, pastures and other low-maintenance turfgrass areas, which may remain too wet for other warm season turfgrasses to thrive (McCarty and Colvin, 1991). Seed germination is influenced by many environmental factors (Bush et al. 2000). Carpetgrass is slow to establish via seed, allowing weeds to germinate and develop, making selective postemergence herbicides a necessity when a establishing a weed free carpetgrass area.

The objectives of this study were (i) to determine the effects of pH, osmotic stress, and salinity on germination of common carpetgrass and (ii) to evaluate the response of two *A. affinis* populations to widely used postemergence herbicides for turfgrass management. Two populations of carpetgrass seeds were obtained from Outsidepride.com (named OTSP) and Athens Seed Co. (named ATSC) in April 2012. These studies were conducted in greenhouse and growth chamber in the Agronomy and Soils department of Auburn University, Alabama, during April-August 2012. Experiments were repeated in time and data were collected 2 and 4 weeks after treatment (WAT). For growth chamber experiments were evaluated the effect of pH, osmotic stress and, salinity on carpetgrass seed germination. For growth chamber experiments Germination Percentage (GP), Germination Rate (GR), Germination Index (GI) and, Coefficient of Velocity of Germination (CVG) were determined. For the greenhouse experiments herbicides treatments were applied in postemergence with a enclosed research cabinet delivering 280 L ha^{-1} by a single TP8002EVS nozzle[4] at 193 kPa and the herbicides utilized was: fluazifop-P-butyl, sethoxydim, foramsulfuron, sulfosulfuron, trifloxysulfuron, atrazine, metribuzin, siduron, simazine, carfentrazone-ethyl, oxadiazon, sulfentrazone, mesotrione, glufosinate, pronamide, triclopyr, ethofumesate, dicamba and, quinclorac. The study was conducted as completely randomized design with three replications and one pot per experimental unit. Data included Percent Visual Necrosis (PVN) and Plant Height at 2 and 4 WAT and Fresh Mass at 4 WAT. Reductions of plant Height and Fresh Mass were calculated relative to the nontreated.

GP, GR and GI decreased with increase in water stress on both carpetgrasses populations. However, the CVG remained constant in the OTSP population until -0.4MPa of water stress unlike ATSC population, which showed decreases in CVG with increase in water stress. Plant height of both carpetgrasses was constant until -0.2 MPa of water stress; after this point height decreased, but OTSP were taller than ATSC plants until -0.6 MPa of water stress. The salinity experiment resulted in reduction on GP, GR and Height with increase in NaCl concentration. The OTSP plants results in increases on GI from 0.00 to 1.25 g of N L^{-1} of distil water and greater. Conversely, ATSC plants resulted in decreased GI with increased salinity. The CVG remained constant from 0.00 to 2.50 g of N L^{-1} of distil water in the ATSC population while OTSP population was reduced with increase in salinity. In the greenhouse experiment, differences among cultivars were not observed and the greatest tolerance for both populations was observed with atrazine, carfentrazone, diglycolamine, ethofumesate, foramsulfuron, mesotrione, pronamide, siduron, simazine, sulfentrazone, sulfosulfuron, and trifloxysulfuron. The metribuzin application was selective just for the ATSC population. Plant Height was influenced by the herbicide application while all tolerant herbicides do not influenced expressively. Carfentrazone was the only treatment similar to the nontreated in Fresh Mass 90% of nontreated fresh mass. Others treatments resulted in less Fresh Mass than carfentrazone and the nontreated.

The authors express their thanks to CAPES (Coordination for the Improvement of Higher Education Personnel) from Brazil for the scholarship and support.

GOOSEGRASS AND SMOOTH CRABGRASS CONTROL WITH INDAZIFLAM AND OXIDIAZON PROGRAMS. K. Venner*[1], M. Cox[2], S. D. Askew[1], J. Hope[3]; [1]Virginia Tech, Blacksburg, VA, [2]Virginia Tech, Blaksburg, VA, [3]BayerCropScience, Raleigh, NC (6)

ABSTRACT

Goosegrass (*Eleusine indica*) and smooth crabgrass (*Digitaria ischaemum*) are problematic grasses in both warm and cool season turfgrass swards. Oxadiazon (Ronstar® G) is typically used in established turfgrass to control both goosegrass and crabgrass when applied preemergence in late winter or early spring. Indaziflam (Specticle Flo™) is a new chemistry, released in 2012 by Bayer CropScience for annual grass control in warm season turfgrass. The objective of this trial is to evaluate preemergence (PRE) goosegrass and smooth crabgrass control with programs comparing oxadiazon and indaziflam in bermudagrass turf.

This study was conducted at two locations in Virginia. The first, at the Independence Club in Richmond, VA, was initiated on March 26, 2012 on a bermudagrass driving range maintained at a fairway height of between 1.3 and 2.0 cm. The second location, initiated on March 28, 2012, was at the Turfgrass Research Center in Blacksburg, VA on a bermudagrass fairway maintained at a cutting height of 1.3 cm. Experimental design is a randomized complete block with 3 replications. Treatments included: Oxadiazon PRE at 3363 g ai/ha, indaziflam PRE at 49 g ai/ha, indaziflam PRE fb 60 days after initial treatment (DAIT) at 24 g ai/ha, and oxadiazon PRE at 3363 g ai/ha fb indaziflam at 60 DAIT at 24 g ai/ha.

At the Richmond location, only goosegrass was evaluated. Overall goosegrass pressure was sporadic, and percent cover never exceeded 1% across all treatments, including the untreated check, and will therefore not be discussed. There was no delay in greenup or injury to the bermudagrass at this location.

At the Blacksburg location, smooth crabgrass was evaluated. At 8 weeks after the initial treatment (WAIT), percent smooth crabgrass cover was 8% in the untreated check, and all treatments reduce smooth crabgrass cover 80%. At 16 WAIT, percent cover in the untreated check was 57%, and all treatments reduced smooth crabgrass cover 91%. At 22 WAIT, percent smooth crabgrass cover in the untreated check increased to 80%, and all treatments reduced smooth crabgrass cover 92%. At the conclusion of the study, smooth crabgrass populations were reduced by frost in late September and early October, but all treatments still reduced smooth crabgrass cover 89%.

At both locations and all timings, no delay in greenup or injury to bermudagrass was observed. These results demonstrate the ability of oxadiazon alone, indaziflam alone, or combinations of the two compounds to provide season long smooth crabgrass control in Virginia.

EVALUATION OF WEED CONTROL SPECTRUM OF CANADIAN BIOHERBICIDE PHOMA MACROSTOMA. J. M. Smith*1, B. Wherley1, P. A. Baumann2, S. Falk3; 1Texas A&M University, College Station, TX, 2Texas AgriLife Extension, College Station, TX, 3The Scotts Company, Marysville, OH (7)

ABSTRACT

Effective natural options for weed control in turfgrass systems have been limited. Canadian Bioherbicide is a granular biopesticide being developed for selective broadleaf weed control. This product is produced from the solid fermentation of the fungus *Phoma macrostoma* on grain, and is applied as a dry granular product. Herbicidal activity from this product causes foliar bleaching and necrosis of susceptible broadleaf weeds. Much of the product development has been conducted in northern climates. This research is evaluating spectrum of weed control with emphasis on southern weeds. A greenhouse study was conducted in College Station, TX to evaluate different application rates of *Phoma macrostoma* for weed control on common dandelion (*Taraxacum officinale*), slender aster (*Symphyotrichum ligulatum)*, yellow woodsorrel (*Oxalis stricta*), shepherd's purse (*Capsella bursa-pastoris*), common mallow (*Malva neglecta*), common purslane (*Portulaca oleracea*), California burclover (*Medicago polymorpha*), and annual sowthistle (*Sonchus oleraceus*). Dandelion proved to be the most susceptible weed with all *Phoma macrostoma* rates causing significant reductions in weed biomass dry weights, and significantly greater chlorosis. The higher rates also produced significantly higher weed mortality ($\geq$95%) and decreased weed cover (data not shown). Annual sowthistle showed significant levels of chlorosis at the high rates, but only the highest rate provided significant reductions in weed cover (data not shown), weed biomass dry weights, and weed mortality (80%). Significant levels of chlorosis were visible on California burclover, slender aster, and shepherd's purse, but the weeds were able to outgrow the injury. *Phoma macrostoma* had no activity on common purslane, common mallow, or yellow woodsorrel.

EFFICACY OF CELSIUS AND TRIBUTE TOTAL FOR ANNUAL BLUEGRASS CONTROL IN BERMUDAGRASS. J. Yu*, P. McCullough; University of Georgia, Griffin, GA (8)

ABSTRACT

Field experiments were conducted on a ‘Tifway’ bermudagrass fairway in Griffin, GA to evaluate efficacy of Celsius and Tribute Total for annual bluegrass control. Treatments included Celsius 68WG (thiencarbazone + dicamba + iodosulfuron) at 176 g ai/ha, Celsius plus Revolver (foramsulfuron) at 7.4 g ai/ha, Celsius at 0.85 g/L, Tribute Total 60.5WG (thiencarbazone + foramsulfuron + halosulfuron) at 127 g ai/ha, and foramsulfuron alone at 29 g ai/ha. Treatments were made on March 6, 2012 at 374 L/ha spray volume to 0.9 x 3-m plots in a randomized complete block with four replications. At 3 weeks after treatment (WAT), Celsius treatments controlled annual bluegrass 72% and were similar to Tribute Total and foramsulfuron alone. However, annual bluegrass control from Celsius alone was 40% or less at 6 WAT but tank-mixtures with foramsulfuron provided 71% control. Tribute Total and foramsulfuron alone provided similar annual bluegrass control, averaging 81% at 8 WAT. Overall, Celsius alone does not appear to effectively control annual bluegrass but tank-mixtures with foramsulfuron, Tribute Total, and foramsulfuron alone were effective treatments in spring.

ALTERNATIVES TO METSULFURON FOR THE POSTEMERGENCE CONTROL OF BAHIAGRASS. C. M. Straw*, J. A. Hoyle, G. M. Henry; University of Georgia, Athens, GA (9)

ABSTRACT

The occurrence of bahiagrass hybridization in nature may lead to an increase in tolerance to postemergence applications of metsulfuron. Therefore, field experiments were conducted at the University of Georgia Plant Sciences Research Farm (Watkinsville, GA) to examine alternatives to metsulfuron for the postemergence control of bahiagrass (*Paspalum notatum*) in bermudagrass. Research was conducted on a mature common bermudagrass [*Cynodon dactylon* (L.) Pers.] roadside maintained at a 5 cm height. Herbicide treatments were applied on July 16, 2012 and consisted of a non-treated check, metsulfuron at 0.021 or 0.042 kg ai ha^{-1}, thiencarbazone + iodosulfuron + dicamba at 0.176 kg ai ha^{-1}, metsulfuron + aminopyralid at 0.042 kg ai ha^{-1} + 0.088 kg ae ha^{-1}, metsulfuron + nicosulfuron at 0.042 + 0.035 kg ai ha^{-1}, and trifloxysulfuron at 0.028 kg ai ha^{-1}. Each treatment included a nonionic surfactant at 0.25% v/v. Treatments were applied to 1.5 x 1.5 m plots arranged in a randomized complete block with four replications. Applications were made with a CO_2 powered boom sprayer equipped with XR8004VS nozzle tips calibrated to deliver 375 L ha^{-1} at 221 kPa. Percent bahiagrass cover was recorded visually at 4 and 10 weeks after treatment (WAT) on a scale of 0 to 100%. Percent bahiagrass control for each treatment was calculated by comparing each plot back to initial bahiagrass cover recorded prior to herbicide applications. No bermudagrass phytotoxicity was observed throughout the length of the trial, regardless of treatment. Bahiagrass control was 41% to 63% 4 WAT, regardless of treatment. Bahiagrass control with thiencarbazone + iodosulfuron + dicamba and trifloxysulfuron was reduced to 14% and 37% 10 WAT, respectively. Applications of metsulfuron + aminopyralid and metsulfuron at 0.021 kg ai ha^{-1} resulted in 73% and 80% bahiagrass control, respectively. The greatest level of bahiagrass control 10 WAT was observed in response to metsulfuron + nicosulfuron (93%) and metsulfuron at 0.042 kg ai ha^{-1} (95%).

ANNUAL BLUEGRASSÂ CONTROL IN BENTGRASS GOLF GREEN WITH METHIOZOLIN. K. Koh*, J. Moss; Oklahoma State University, Stillwater, OK (10)

ABSTRACT

Creeping bentgrass (*Agrostis stolonifera L.*) is widely used for golf putting greens because it tolerates frequent mowing at low mowing height and endures traffic and wear. Despite the technical improvement in turfgrass cultural practices and chemical weed control products, turfgrass managers are being challenged to maintain quality golf greens throughout the year. Annual bluegrass (*Poa annua L.*)is the most problematic weed in creeping bentgrass golf green. Annual bluegrass reduces not only visual quality, but also playability for the golfers. Currently, there is no selective post-emergence herbicide available for controlling annual bluegrass in creeping bentgrass golf greens. In addition, there are few pre-emergence herbicides labeled for annual bluegrass control in creeping bentgrass golf greens. Plant growth regulators (PGRs) such as flurprimidol and paclobutrazol have been used as alternative options for turf managers to suppress annual bluegrass, but complete annual bluegrass control is difficult to achieve. The objectives of this study were to evaluate methiozolin as a pre and post-emergence herbicide for annual bluegrass control and to evaluate the safety of methiozolin on creeping bentgrass putting greens in spring and fall. This study was conducted in Stillwater, OK at the Oklahoma State University Turfgrass Research Center. Plots (91cm x 151cm) were arranged on a ‘Penncross’ creeping bentgrass putting green with four replications. Methiozolin at different rates (0.25, 0.50, 0.75 and 1.0g ai ha^{-1}) and application intervals (7, 14, or 28 days) was treated to compare with bensulide, siduron, bensulide + oxadiazon, and dithiopyr at labeled rates. Percent weed control and percent weed cover were assessed visually and phytotoxicity was evaluated by the Greenseeker handheld sensor as well as visual assessment. Spring only post-emergence methiozolin treatments provided inconsistent annual bluegrass control. None of the treatments controlled the weed effectively. However, pre-emergent methiozolin treatments in fall 2012 significantly decreased percent weed cover when compared to the other tested herbicides as well as untreated control. NDVI data revealed that there was no unacceptable herbicide injury from the treatments in spring 2012. However, significant visual injury was observed in bensulide + oxadiazon treated plots in fall 2012. The herbicide injury increased in methiozolin treated plots as temperature decreased towards the end of the fall season.

EVALUATION OF APPLICATION TIMING OF QUINCLORAC PLUS CARFENTRAZONE DURING TALL FESCUE ESTABLISHMENT. S. Sidhu*, P. McCullough; University of Georgia, Griffin, GA (11)

ABSTRACT

Field experiments were conducted to evaluate application timing of quinclorac + carfentrazone (Square One 70WG) on smooth crabgrass and broadleaf weed control during tall fescue establishment in spring. Tall fescue was seeded at 8 lbs per 1000 sq ft on April 12, 2011 and Square One was applied on the day of seeding, one week after seeding, or one week after emergence at 0, 0.5, or 0.79 lb ai/acre. Other treatments evaluated at these timings included mesotrione at 0.25 lb ai/acre. The most effective timing for Square One treatments was 7 days after emergence as both rates provided excellent smooth crabgrass control (>90%) and had >80% tall fescue cover at 6 weeks after seeding. Square One applied the day of seeding tall fescue provided poor (<70%) crabgrass control and had 65% or less tall fescue cover after 6 weeks. Square One applied one week after seeding provided excellent crabgrass control but had less turf cover than treatments applied one week after emergence. Mesotrione provided excellent control of smooth crabgrass when applied at one week after seeding or one week after emergence but was less effective when applied the day of seeding tall fescue. Overall, practitioners should delay applications of Square One until one week after turf emergence to maximize efficacy for smooth crabgrass control during spring establishment.

ADVANCES IN IDENTIFYING AN EFFECTIVE ALTERNATIVE TO METHYL BROMIDE IN TURFGRASS SYSTEMS. J. Unruh*, B. J. Brecke; University of Florida, Jay, FL (12)

ABSTRACT

Methyl bromide (MB) is an odorless, colorless gas that has been used nearly seventy-five years as a preplant soil-fumigant in agriculture throughout the world. MB was designated an ozone depleting substance resulting in a phase out of use for most agricultural commodities. MB label changes will eliminate all golf course related uses at the end of 2013 leaving that segment of the turf industry in a quandary. Our research has sought to identify effective and affordable alternatives to MB for use on warm-season golf courses and sod production farms. Iodomethane (IM) (98:2) applied at 100 lbs ac^{-1} under a virtually impermeable film provided control of *Commelina benghalensis* and *Panicum ramosum* equal to that of MB. Addtionally, IM applied at rates ≥ 125 lbs ac^{-1} under totally impermeable film could effectively control troublesome *Cynodon* and *Cyperus* species initially but control waned over time. IM proved to be an effective MB alternative but the manufacturer discontinued its use in 2012. MB rate reduction studies demonstrated that control of *Commelina benghalensis* and *Panicum ramosum* with MB under TIF was comparable at all rates (100 – 400 lbs ac_{-1}). However, in another study, reduced rates (< 400 lbs ac^{-1} of tractor-applied MB reduced the number of *Cynodon dactylon* plants (56 DAA) and reduced the % *Cynodon* ground cover (110 DAA), but only the standard 400 lbs ac^{-1} rate provided the level of bermudagrass control necessary to avoid further contamination. Reduced rates of MB applied using "hot gas" type methods were less effective in controlling bermudagrass and nutsedge – regardless of plastic type. The use of steam for soil disinfestation provided acceptable control of several troublesome weeds. However, the costs associated with steam disinfestation (~ two-times MB) are prohibitive and this method is not currently a commercially available option in the turf industry.

COMMON CARPETGRASS (*AXONOPUS FISSIFOLIUS*) CONTROL IN A BERMUDAGRASS ROUGH. C. M. Straw*, J. A. Hoyle, G. M. Henry; University of Georgia, Athens, GA (13)

ABSTRACT

Field experiments were conducted at Pine Hills Golf Club in Winder, GA and the University of Georgia Golf Club in Athens, GA to examine the control of carpetgrass in a common bermudagrass rough maintained at 5 cm. Carpetgrass cover (70 to 95%) within each plot was determined at the time of initial herbicide application. Treatments were applied to plots (1m x 1m) arranged in a randomized complete block design with four replications. Treatments included a non-treated check, MSMA at 2.29 kg ai ha^{-1}, foramsulfuron (Revolver) at 0.058 kg ai ha^{-1}, thiencarbazone + iodosulfuron + dicamba (Celsius) at 0.171 kg ai ha^{-1}, thiencarbazone + foramsulfuron + halosulfuron (Tribute Total) at 0.127 kg ai ha^{-1}, nicosulfuron (Accent) at 0.035 kg ai ha^{-1}, and trifloxysulfuron (Monument) at 0.028 kg ai ha^{-1}. Initial applications were conducted on 5 July 2012 and sequential applications were made 4 weeks later (8 August 2012) using the same rates. Treatments were applied using a CO_2 pressurized backpack sprayer equipped with XR8004VS nozzle tips calibrated to deliver 375 L ha^{-1} at 221 kPa. Greenhouse experiments were conducted at the Crop and Soil Science greenhouse complex in Athens, GA to mimic previous field experiments. Carpetgrass was harvested from a rough at the University of Georgia Golf Club in Athens, GA with a standard USGA cup cutter. Specimens were planted into 15.2 cm round nursery pots and placed within the greenhouse with temperatures maintained at 32/26 C (day/night). Specimens were acclimated to the greenhouse environment for 2 weeks and contained 100% carpetgrass cover prior to trial initiation. Treatments and experimental design were identical to the field experiments. Treatments were applied to individual carpetgrass specimens. The trial was repeated in time and contained four replications. Initial applications were conducted on 14 November 2012 and sequential applications were made 4 weeks later (5 December 2012) using the same rates. Percent bermudagrass phytotoxicity and carpetgrass cover were visually evaluated 2, 4, and 8 weeks after initial treatment (WAIT) for field experiments. Percent carpetgrass control for each treatment was calculated relative to the initial carpetgrass cover. Percent carpetgrass control was visually evaluated weekly throughout greenhouse experiment trials. Plants were destructively harvested 8 WAIT and above ground dry biomass (g) was recorded. Analysis of variance was performed in SAS and means were separated according to Fisher's protected LSD at the 0.05 significance level. No bermudagrass phytotoxicity was observed throughout the length of the experiment regardless of treatment. MSMA, Tribute Total, and Celsius exhibited moderate (44 to 55%) carpetgrass control 4 WAIT. All other treatments resulted in $\leq$ 20% carpetgrass control 4 WAIT. MSMA and Celsius exhibited the greatest control (94 and 92%, respectively) 8 WAIT. These results coincide with minimal dry weight biomass (2.0 g and 1.9 g, respectively) collected from the greenhouse trial. Tribute Total provided 77% carpetgrass control 8 WAIT, while all other treatments resulted in $\leq$ 30% carpetgrass control. Research concludes that viable options are available for long-term carpetgrass control in a bermudagrass rough with MSMA and Celsius.

GLYPHOSATE TOLERANT PERENNIAL RYEGRASS CULTIVARS: TOLERANCE DETERMINATION. M. L. Flessner*[1], J. S. McElroy[2], G. R. Wehtje[2]; [1]Auburn University, Auburn University, AL, [2]Auburn University, Auburn, AL (14)

ABSTRACT

'Replay' and 'JS501' perennial ryegrass (*Lolium perenne*) cultivars have been conventionally bred for tolerance to glyphosate, potentially allowing the herbicide to be used as a selective weed control agent in these cultivars. Previous field research indicates minimal discoloration of these cultivars from glyphosate applied at approximately 0.5 kg ae ha^{-1} and that 20% leaf firing occurs at 0.81 kg ae ha^{-1}. However, the glyphosate tolerance of these cultivars has not been directly compared to unenhanced cultivars. Greenhouse experiments were conducted to compare glyphosate tolerance of Replay and JS501 to cultivars with unenhanced tolerance- 'Caddy Shack' and 'Top Gun II.'

Plants were established from seed in potting mix and treated at approximately 3 to 4 tillers. Plant height was maintained at 7.5 cm via mowing prior to treatment application and 2, 4, and 6 weeks after treatment (WAT). Glyphosate was applied at 0 (nontreated) to 6.3 kg ae ha^{-1} across 13 treatments in a 280 L ha^{-1} carrier volume via a single TeeJet 8002VS nozzle in an enclosed research spray cabinet. Each treatment was replicated 4 times, and the experiment was repeated-in-time. Visible injury was assessed relative to the nontreated 2, 4, and 6 WAT on a 0 to 100 scale where 0 corresponds to no injury and 100 corresponds to plant death. Clipping weight data (biomass above 7.5 cm) were collected 6 WAT and transformed to a percent reduction relative to the nontreated. Cultivars were compared using I_{50} (50% population inhibition) values using GraphPad Prism software for both data types.

I_{50} values 6 WAT obtained from visible injury data were 2.56, 2.64, 0.81, and 0.84 kg glyphosate ha^{-1} for Replay, JS501, Caddy Shack, and Top Gun II, respectively. Similarly, I_{50} values 6 WAT obtained from clipping weight data were 2.13, 1.90, 0.67, and 0.56 kg glyphosate ha^{-1} for Replay, JS501, Caddy Shack, and Top Gun II, respectively. Analysis revealed two tolerance groups; Replay and JS501 were similar in tolerance to glyphosate and were up to 4 times more tolerant than Caddy Shack and Top Gun II, across rating dates and data types. Results are similar to previous research that indicate minimal discoloration and leaf firing at rates < 0.5 kg glyphosate ha^{-1}. Previous research indicates the recommended rate for annual bluegrass (*Poa annua*) control in mature stands of Replay and JS501 is 0.29 kg glyphosate ha^{-1}. Therefore this research indicates Replay and JS501 are tolerant to glyphosate rates that are adequate for weed control in a single application.

EFFICACY OF TOPRAMEZONE FOR BERMUDAGRASS CONTROL IN CENTIPEDEGRASS. C. Johnston*[1], P. McCullough[2]; [1]University of Georgia, Athens, GA, [2]University of Georgia, Griffin, GA (15)

ABSTRACT

Field experiments were conducted in centipedegrass (Eremochloa ophiuroides (Munro) Hack.) to evaluate efficacy of topramezone for bermudagrass (Cynodon dactylon L.) control. Treatments included two applications of topramezone 3.65SC at 1 fl oz/acre + MSO, three applications of topramezone 2.8SC at 1.33 fl oz/acre + MSO, and sethoxydim 1EC applied twice at 2.25 pt/acre. Initial treatments were applied on June 26, 2012 and sequential applications were made on a three-week interval. Applications were made with CO2 pressured sprayers calibrated to deliver 25 gallons per acre. All treatments provided excellent (>90%) control of smooth crabgrass and injured bermudagrass. However, topramezone treatments provided <25% control of bermudagrass at 12 weeks after initial treatments while sethoxydim provided 50% control. Results suggest topramezone has potential to suppress bermudagrass in centipedegrass but long-term control could be inconsistent from exclusive treatments.

LATE SEASON COMMON LESPEDEZA (*LESPEDEZA STRIATA*) MANAGEMENT IN CENTIPEDEGRASS.
R. E. Strahan*, J. Beasley; LSU AgCenter, Baton Rouge, LA (16)

ABSTRACT

It is not unusual for lawn care operators (LCOs) to obtain new properties in late summer that are heavily infested with weeds.Â These lawns are often centipedegrass (most popular lawn grown by homeowners in Louisiana) infested with common lespedeza (*Kummerowia striata*). Common lespedeza is a dark green, mat-forming summer annual legume with small trifoliate leaves. Â The weed grows close to the ground and is not easily cut by mower blades, especially as the plants mature. Â Mature common lespedeza stems become rigid as plants begin flowering in September southern Louisiana.Â LCOs are reporting difficulty managing late season common lespedeza with several broadleaf herbicides that are commonly used in the lawn care industry.

In order to provide effective control options for LCOs, a field experiment was conducted at the Burden Research Center in Baton Rouge, LA in 2012 to evaluate late season common lespedeza management options. Â Herbicides evaluated included:Â atrazine (32 oz/A), Speed Zone Southern (60 oz/A), Trimec Southern (24 oz/A), metsulfuron (0.50 oz/A), 2,4-D (32 oz/A), and Celsius (5 oz/A).Â Celsius applications included an MSO at 0.50% v/v.Â Metsulfuron applications included non-ionic surfactant at 0.25% v/v.Â Herbicides were applied on September 12, 2012 with a CO_2 pressurized backpack sprayer equipped with 11003 XR flat fan nozzles that delivered 30 GPA at 26 psi.Â Ambient temperature at the time of the application was 92 F and RH was 46%.Â

The experiment was conducted on irrigated common centipedegrass with a heavy natural infestation of common lespedeza (at least 65% coverage).Â Plots were mowed as needed to maintain 2 inch height.Â Plot size was 6 ft x 10 ft.Â Visual ratings of percent common lespedeza control and centipedegrass injury were conducted weekly.Â The experiment was conducted as a randomized complete block with 4 replications.Â Data were subjected to analysis of variance (P=0.05) and means were separated using Fisherâ€™s LSD.

No herbicide tested provided >40% control 2 WAT.Â Centipedegrass injury was unacceptable for 2,4-D (>40%) at 2 WAT.Â Â By 4 WAT, Celsius and metsulfuron provided >75% control.Â Atrazine controlled 60% of the lespedeza.Â Trimec Southern and Speed Zone Southern provided no better than 40% control.Â 2,4-D only controlled 20% of the lespedeza and caused 25% centipedegrass injury.Â By 6 WAT, Celsius and metsulfuron controlled 85% of the lespedeza compared with atrazine with 70% control, respectively.Â Centipedegrass injury was acceptable at all rating periods for both Celsius and metsulfuron.Â Common lespedeza control never exceeded 40% for Trimec Southern, Speed Zone Southern, and 2,4-D in the trial.

SEQUENTIAL APPLICATIONS FOR THE POSTEMERGENCE CONTROL OF VIRGINIA BUTTONWEED. J. A. Hoyle*, C. M. Straw, G. M. Henry; University of Georgia, Athens, GA (17)

ABSTRACT

Virginia buttonweed (*Diodia virginiana*) is a difficult to control broadleaf perennial weed. Field experiments were conducted at Pine Hills Golf Club in Winder, GA to examine the control of Virginia buttonweed in a common bermudagrass rough. The soil was an Appling sandy loam (Fine, kaolinitic, thermic Typic Kanhapludult). Research was conducted on a mature common bermudagrass rough maintained at a 4 cm height. Virginia buttonweed cover (60 to 95%) within each plot was determined at the time of initial herbicide application. Treatments were applied to plots (1.2 m x 1.5 m) arranged in a randomized complete block design with four replications. Treatments included a non-treated check, thiencarbazone + iodosulfuron + dicamba [Celsius] (0.17 kg ai ha^{-1}), thiencarbazone + foramsulfuron + halosulfuron [Tribute Total] (0.13 kg ai ha^{-1}), penoxsulam + dicamba [Lockup with Dicamba] (0.23 kg ai ha^{-1}), metsulfuron [Blade] (42 g ai ha^{-1}) + aminopyralid [Milestone] (88 g ae ha^{-1}), 2,4-D + triclopyr + dicamba + pyraflufen [4-Speed XT] (1.64 kg ai ha^{-1}), and thifensulfuron + tribenuron [TNT Broadleaf] (0.03 kg ai ha^{-1}). Celsius, Tribute Total and 4-Speed XT were applied with a methylated seed oil (MSO) at 0.5% v/v. Blade + Milestone and TNT Broadleaf applications included a non-ionic surfactant (NIS) at 0.25% v/v. Initial applications were conducted on 16 July 2012 and sequential applications were made 4 weeks later (14 August 2012) using the same rates. Treatments were applied using a CO_2 pressurized backpack sprayer equipped with XR8004VS nozzle tips calibrated to deliver 375 L ha^{-1} at 221 kPa. Virginia buttonweed cover was visually evaluated 1, 2, 3, 4, 5, 6, 8 and 10 weeks after initial treatment (WAIT). Percent Virginia buttonweed control for each treatment was calculated relative to initial Virginia buttonweed cover. Analysis of variance was performed in SAS and means were separated according to Fisher's protected LSD at the 0.05 significance level. Lockup with Dicamba, Blade + Milestone, and 4-Speed XT controlled Virginia buttonweed greater than 75% at 2 WAIT. At 4 WAIT, Blade + Milestone resulted in 100% Virginia buttonweed control. Similar Virginia buttonweed control was observed at 4 WAIT with Celsius and 4-Speed XT, 87% and 81%, respectively. After application of sequential treatments all herbicidal treatments resulted in excellent Virginia buttonweed control (≥ 92%) excluding TNT Broadleaf (< 48%) 10 WAIT.

MORPHOLOGICAL DIFFERENCES AMONG BAHIAGRASS HYBRIDS COLLECTEDÂ IN GEORGIA. J. A. Hoyle*, C. M. Straw, G. M. Henry; University of Georgia, Athens, GA (18)

ABSTRACT

Bahiagrass (*Paspalum notatum*) is a warm-season perennial grass that was introduced into the United States from South America. Bahiagrass has long been used in pastures, forages, and roadsides, but its ability to grow and reproduce in a wide range of environments has contributed to its success and spread as a weed. Differences have been observed in bahiagrass seedhead morphology over the past decade. Furthermore, hybridization has been observed between several *Paspalum* spp. The existence and spread of bahiagrass hybrids may reduce herbicidal control and enhance infestation in turfgrass environments. Therefore, the objective of this research was to identify possible bahiagrass hybrids, describe their distribution throughout the state, and determine their morphological differences.

Bahiagrass biotypes were collected from 12 counties throughout the state of Georgia between 3 July 2012 and 20 July 2012. Approximately, 12 to 15 bahiagrass biotypes were obtained from 3 to 4 locations within each county. Seedhead branch number was used to identify possible bahiagrass hybrid biotypes. Biotypes with seedhead branch numbers ranging from 2 to 8 were collected. Latitude and longitude were obtained along with elevation characteristics for each collection site. Each biotype was excavated from the site and transplanted into 1 liter pots containing native soil and placed in the Crop and Soil Sciences greenhouse complex in Athens, GA. Greenhouse temperatures are maintained at 32/26 C (day/night). Each bahiagrass biotype was destructively harvested and approximately 20-30 rhizome cuttings, 2.5 cm in length, were replanted into 1 liter pots containing a 1:1:1 (peat:native soil:sand) media. Transplanted bahiagrass biotypes were grown to maturity in the greenhouse. Morphological data were collected from regenerated bahiagrass biotypes (n = 1002) between 11 November 2012 and 9 December 2012. Collected data included leaf width at leaf base (mm), leaf width midway to leaf apex (mm), leaf length (cm), ligule description (membranous, hairy, or absent), ligule length (mm), seedhead branch number, seedhead length (cm), and flowering culm length (cm).

Bahiagrass biotypes ranging in seedhead branch number from 2 to 8 were collected throughout the state of Georgia. Biotypes with 2, 3, and 4 seedhead branches were collected from all 12 counties. Bahiagrass biotypes with 5 seedhead branches were collected in 9 of 12 counties, while biotypes with 6, 7, and 8 branches were collected from 6, 3, and 1 counties, respectively. The frequency of the presence of 3- to 8-branched seedhead bahiagrass biotypes were visually correlated with the close proximity of dallisgrass (*Paspalum dilatatum*) and/or vaseygrass (*Paspalum urvillei*). Both membranous- and hairy-ligules were observed on all bahiagrass biotypes regardless of location or original seedhead number. Differences were observed between original seedhead number and leaf width and leaf length. Identified *Paspalum* genetic markers will be used to determine genetic differences between collected biotypes.

TOLERANCE OF 'DURANA' CLOVER AND FESCUE TO HERBICIDES. M. L. Zaccaro*, J. D. Byrd, J. M. Taylor; Mississippi State University, Mississippi State, MS (19)

ABSTRACT

A mixture of grass and clover is more desirable for grazing than a monoculture of either one but herbicide options are limited especially when clover is desired in the forage component. Therefore, common herbicide treatments were evaluated for their potential for weed control in a mixed tall fescue and white clover grazing system. Tall fescue (*Festuca arundinacea* Schreb.) ‘PDF AR584’ and white clover (*Trifolium repens* L.) ‘Durana’ were planted November 6, 2011 and herbicide treatments applied March 26, 2012. The herbicide treatments were 3 or 6 fl oz/A Pursuit 2L, 0.5 oz/A Harmony 50 WG, 1 pt/A 2,4-D amine 3.8EC, 1 pt + 3 oz/A 2,4-D amine + Pursuit, 1 oz/A Telar 75WG, 0.25 or 0.5 oz/A Cimarron 60WG, 24 oz/A Roundup Pro 3L, 2 pt/A Basagran 4L, 2 pt/A Envoy Plus 0.97EC, 1.5 or 3 pt/A Segment 1EC, or 1.33 oz/A Python 80WG, and an untreated control. Non-ionic surfactant was added to each treatment at 0.25% V/V, except Roundup Pro or Segment which had no additive or Basagran which was applied with 2 pt/A crop oil concentrate. Pursuit or 2,4-D were the best treatments as far as tolerance to both forages, and Pursuit + 2,4-D was similar. Pursuit at 6 oz/A did injure tall fescue more than 3 oz at 37 DAT with 25% injury compared to 10%. The tank-mix of Pursuit + 2,4-D or 2,4-D alone caused no injury at 37 days after treatment (DAT). At 51 DAT, less than 10% tall fescue injury was observed with Pursuit, 2,4-D or the tank-mix of the two and no more than 8% injury was observed by the same treatments on white clover at 37 or 51 DAT. Python did not injure tall fescue and clover was marginally tolerant. Python initially resulted in 45 and 40% injury to white clover at 25 and 37 DAT, respectively, and injury was still 23% at 51 DAT. Telar and Cimarron did as expected with some tall fescue injury and an almost complete loss of the clover stand. At 37 DAT, injury to tall fescue from Cimarron or Telar was 23 to 33% and 10 to 23% at 51 DAT. White clover was injured 85 to 100% at 51 DAT with Cimarron or Telar. The opposite was true of Basagran and the graminicides Envoy and Segment. Basagran reduced the stand of tall fescue by approximately 53% while Envoy and Segment reduced it by 70 to 85%. Basagran, Envoy and Segment did little or no damage to the clover. Harmony did not cause any injury to tall fescue and clover was injured 65 and 60% at 37 and 51 DAT, respectively. At 51 DAT, tall fescue was injured 23% or less by Cimarron or Telar but these treatments provided 75 to 83% seedhead suppression of tall fescue. Pursuit at 3 oz/A suppressed tall fescue seedheads 68% while the higher rate of 6 oz/a provided 85% seedhead suppression. Harmony and Python did not provide any significant seedhead suppression. The other treatments because of the high injury had little tall fescue seedhead formation. The best control of wild garlic was with the sulfonylurea herbicides Harmony, Cimarron, and Telar which had 90 to 98% control at 37 DAT. Pursuit or Roundup had 40 to 65% control of wild garlic, Envoy or Segment had no control and Python had 23% control. The best control of field madder was with Pursuit, 2,4-D, Roundup or Python with 85 to 100%. Other treatments provided 60% or less control of field madder. Carolina geranium was controlled by almost all treatments with the exception of Envoy, Segment, or Basagran. At 37 DAT 83 to 100% control was observed with the exception of Envoy, Segment or Basagran. Overall, the best treatment appeared to be Pursuit tolerance of both ‘Durana’ white clover and tall fescue with some seedhead suppression of tall fescue is considered. While both tall fescue and white clover tolerated 2,4-D and Python there was no seedhead suppression and Python caused higher injury to clover in the early ratings. The sulfonylurea herbicides caused too much injury to clover and Envoy or Segment caused too much injury to tall fescue to be used for weed control in mixed tall fescue and white clover stands.

EFFICACY OF AMINOCYCLOPYRACHLOR HERBICIDE PRODUCTS ON PASTURE AND FORAGE WEEDS. N. Barksdale*, J. D. Byrd, J. M. Taylor; Mississippi State University, Mississippi State, MS (20)

ABSTRACT

Experiments in pasture weed control were conducted in 2012 at various sites in Mississippi to evaluate combinations of aminocyclopyrachlor (AMCP) with other herbicides. The herbicide treatments were the same in all experiments and were 1.5 or 2.5 oz/A DPX-RDQ98 WP (44.5% AMCP + 6.67% metsulfuron-methyl), 8 or 12 fl oz/A DPX-RRW96 SL (7.3% AMCP + 14.6% triclopyr), 2.5 oz/A Perspective WG (39.5% AMCP + 15.8% chlorsulfuron), 1 oz ai/A AMCP 2L + 7.6 oz ae/A 2,4-D amine 3.8EC, 1.5 oz/A Pastora (56.2% nicosulfuron + 15% metsulfuron methyl), or 2 pt/A GrazonNext 3L (0.41 lb/gal aminopyralid + 3.33 lb ae/gal 2,4-D). Treatments were applied to separate plots replicated four times with a CO_2 backpack sprayer and plot size averaged 10 by 20 ft. Dogfennel (*Eupatorium capillifolium*) which ranged from 12 to 36 inches was treated May 10. 2012, woolly croton (*Croton capitatus*) that averaged 6 inches were treated May 22, 2012, common ragweed (*Ambrosia artemisiifolia*) which was quite variable in size from 8 to 36 inches was treated July 5, 2012, spiny amaranth (*Amaranthus spinosus*) averaging 12 inches was treated July 5, 2012, and bitter sneezeweed (*Helenium amarum*) which averaged 8 inches was treated Aug 1, 2012. Woolly croton was susceptible to all treatments with 100% control by all treatments by 8 weeks after treatment (WAT). Any differences in control were mainly seen at 2 WAT. The lower rates of DPX-RDQ98 or DPX-RRW96 resulted in 65 to 70% control while the higher rates provided 85 to 88% control. Control with Pastora also had low control (38%) at 2 WAT. By 6 or 8 WAT, all treatments provided 90% or greater control. The best control of dogfennel at 4 WAT was the high rate of DPX-RRW96 at 63% control. The high rate of DPX-RDQ98, Perspective, and GrazonNext had similar control of 50 to 58%. By 8 WAT, the best treatment was still the high rate of DPX-RRW96 with 85% control. Other treatments with similar control were the high rate of DPX-RDQ98, Perspective, the lower rate of DPX-RRW96, and DPX-MAT28 + 2,4-D with 70 to 78% control. Other treatments provided 55 to 58% control of dogfennel. Common ragweed control was 100% by both rates of DPX-RRW96, GrazonNext, and DPX-MAT28 + 2,4-D 4 WAT. Both rates of DPX-RDQ98 and Perspective averaged 77 to 83% control. Pastora alone provided 27% control. At 8 WAT, results were similar with both rates of DPX-RRW96, GrazonNext, and DPX-MAT28 + 2,4-D having 93 to 100% control, both rates of DPX-RDQ98 and Perspective controlled common ragweed 73 to 83% and Pastora provided only 7% control. Bitter sneezeweed control indicated a good rate response for DPX-RDQ98 and DPX-RRW96 at 4 WAT with 43 to 58% control with the lower rates and 70% control with the higher rates and GrazonNext and DPX-MAT28 + 2,4-D provided similar control to the best treatments with 68 to 78% control. At 8 WAT, the best treatments were the high rate of DPX-RRW96, GrazonNext and DPX-MAT28 + 2,4-D with 98 to 100% control. Both rates of DPX-RDQ98, Perspective, the lower rate of DPX-RRW96, and Pastora controlled bitter sneezeweed 63 to 75%. At 4 WAT all treatments except both rates of DPX-RRW96 controlled spiny amaranth 93 to 100% while DPX-RRW96 treatments only provided 50 to 65% control. Results were similar at 8 WAT with DPX-RRW96 only providing 50 to 68% control of spiny amaranth and other treatments controlling spiny amaranth 93 to 100%. These data indicate that changing the herbicide packaged with aminocyclopyrachlor will give some flexibility according to the weed species present. However, the combination of aminocyclopyrachlor + 2,4-D was as good as the best treatment in any of the studies.

TOLERANCE OF SUB-TROPICAL AND TROPICAL FORAGES TO AMINOCYCLOPYRACHLOR. D. G. Abe*[1], B. A. Sellers[2], J. Ferrell[1]; [1]University of Florida, Gainesville, FL, [2]University of Florida, 33865, FL (21)

ABSTRACT

Traditionally, ranchers in Florida grow warm season grasses to feed beef cattle, either through grazing or hay production. Bahiagrass (*Paspalum notatum*) cultivars ('Argentine' and 'Pensacola') are widely used for grazing, in south Florida, with some cured for hay in north Florida. However, 'Jiggs' and 'Florakirk' bermudagrass (*Cynodon dactylon*) and 'Florona' and 'Florico' stargrass (*Cynodon nlemfuensis*) are used primarily for hay production in south Florida. Two experiments were conducted in south-central Florida (Ona) to evaluate tolerance of forage cultivars to aminocyclopyrachlor (ACP) in 2010 and 2012 and ACP premixes in 2012. Prior to initiating the experiments, each experimental area was clean-mowed, with all grass clippings removed. Herbicide treatments were applied to bermudagrass and stargrass within seven days after mowing, and applied to bahiagrass when regrowth measured 15 cm using a randomized complete block design. In the first study, ACP was applied at 35, 70, 140 and 280 g/ha. The second study evaluated the effect of ACP and ACP premixes: ACP at the rates above, ACP + chlorsulfuron at 69 + 27 and 138 + 54 g/ha; ACP + 2,4-D amine at 70 + 532 g/ha and 140 + 1,064 g/ha; ACP + triclopyr-amine at 70 + 140 g/ha and 140 + 280 g/ha; ACP + metsulfuron at 46 + 7, 78 + 12, and 168 + 26 g/ha; an untreated check was included. A non-ionic surfactant 0.25% v/v was included in all herbicide treatments. All treatments were applied with an air-pressurized ATV sprayer equipped with 11003 Turbo Teejet nozzles calibrated to deliver 281 L/ha. Plots were harvested 30 and 60 days after treatment (DAT) and dry weight measurements were recorded and converted to percent of the untreated check prior to analysis. Data were combined over cultivar for each forage species, except bahiagrass. Regression analysis revealed that ACP at 133.2 and 63.1 g/ha in bermudagrass and stargrass resulted in 10% yield loss. There were no differences among bahiagrass cultivars when ACP was applied alone. Aminocyclopyrachlor and premixes had a negative effect on bermudagrass and stargrass biomass 30 DAT. For bermudagrass, all treatments, except for ACP + 2,4-D at 70 + 532 g/ha and ACP + metsulfuron at 46 + 7 g/ha, resulted in at least 18% yield reduction. All treatments resulted in at least a 10% stargrass yield reduction. At 60 DAT, there were no differences in stargrass yields among treatments, and yield ranged from 92 to 115% of the untreated. There were significant differences among treatments in bermudagrass at 60 DAT, however, yields ranged from 95 to 132% of the untreated. The two highest rates of the ACP + metsulfuron premix resulted in 50% biomass reduction of 'Argentine' bahiagrass at 30 DAT, however, there were no differences among treatments at 60 DAT. 'Pensacola' bahiagrass was reduced by at least 27% by ACP premixes containing chlorsulfuron and metsulfuron 30 DAT. By 60 DAT, no yield reduction was recorded for the ACP + chlorsulfuron premixes, however, the metsulfuron premixes resulted in at least 72% reduction in biomass. These data indicate that 'Argentine' bahiagrass is among the most tolerant forage species, while Pensacola is tolerant to most all premixes except those containing metsulfuron, and is initially sensitive to the chlorsulfuron containing premix. Bermudagrass appears to be more tolerant to ACP premixes than stargrass as stargrass is less tolerant to ACP alone. However, both bermudagrass and stargrass yields will likely recover within 60 DAT.

ABSORPTION ANDÂ FATE OF AMINOCYCLOPYRACHLOR IN TALL FESCUE. E. T. Parker*[1], G. R. Wehtje[1], J. S. McElroy[1], A. J. Price[2], P. McCullough[3]; [1]Auburn University, Auburn, AL, [2]USDA-ARS, Auburn, AL, [3]University of Georgia, Griffin, GA (22)

ABSTRACT

Aminocyclopyrachlor (AMCP) is a hormone disrupting herbicide that exhibits selective broadleaf weed control in tolerant graminaceous species. Some questions have risen over the ability of AMCP applied at labeled rates to translocate to and escape from plant roots into the soil, therefore prolonging the life of the herbicide in the soil. Studies were performed to evaluate AMCP foliar absorption and translocation using radiolabeled AMCP in tall fescue. Bioassay studies were also performed to determine whether AMCP root exudation exists in tall fescue.

Tall fescue plants were established in cell-pack trays with Marvyn loamy sand soil and treated at the five-leaf growth stage. Experiments were conducted using a 0.052 kg ae ha^{-1} AMCP rate. Each plant was treated with a 10µ drop of ^{14}C-AMCP on the adaxial side of a fully mature leaf. Four individual plants were partitioned at each interval of 24, 48, 96, and 192 HAT into various parts. The treated area was washed with 1 mL of 50:50 methanol/water % v/v mix to remove non-absorbed herbicide then the plant was separated into target area, treated leaf above target area, treated leaf below target area, remainder of foliage, crown, and roots. Samples were then dried, oxidized, and radioactivity was determined through liquid scintillation spectrometry. Data were subjected to ANOVA and means were separated by LSD ($\alpha = 0.05$).

In a second study, tall fescue plants were established in 8 inch round pots containing either Marvyn loamy sand soil or USGA 90/10 sand-peat % vol/vol mix. The study was set up with two soil types and three herbicide treatments (non-treated, AMCP, dicamba) replicated four times. Two cucumbers approximately 4 cm in height were planted in each pot as a bioassay species. Herbicide treatments were applied only to the tall fescue foliage by placing small paper cup over each bioassay; the soil was then covered with 2 cm of perlite and finally the pots were treated with a standard field application rate of dicamba (2.24 kg ai ha^{-1}) or AMCP (0.0526 kg ae ha^{-1}) using an enclosed spray chamber. Pots were randomized and allowed to dry for 24 hours before a vacuum was used to remove the perlite. The paper cups were then removed; bioassay plants were visually rated from 0 to 100% control where 0 corresponds to no control and 100 corresponds to complete plant necrosis at 1, 2, and 3 weeks after treatment (WAT). Data were subject to ANOVA and means separation as above.

Absorption and translocation did not vary significantly from 24 HAT to 192 HAT. AMCP absorption was greatest at 192 HAT but did not exceed 8.9%. Translocation throughout the study was minimal and ranged from 0.9% of applied AMCP at 24 HAT to 5.3% moving out of the treated area at 192 HAT. Absorption and translocation data indicate that AMCP is minimally translocated upward toward the leaf tip when applied to the foliage, likely through the xylem. These results indicate that AMCP is only slightly absorbed into tall fescue foliage and translocation amounts were negligible. The root exudation study indicated that dicamba treatments resulted in significantly more damage to bioassay species than did AMCP treatments. Dicamba treated pots exhibited 56.0, 64.0, and 76.0% damage to bioassay species at 1, 2, and 3 WAT respectively. AMCP treatments resulted in 14.0% damage to bioassay species across all time intervals. Based on these data, AMCP does exude through tall fescue roots after foliar treatment into the surrounding environment but is minor and less than dicamba.

RESPONSE OF MOWING ON THE EFFICACY OF TANK-MIXTURES FOR THE CHEMICAL CONTROL OF KUDZU. G. M. Henry*, J. A. Hoyle, C. M. Straw; University of Georgia, Athens, GA (23)

ABSTRACT

Field experiments were conducted on two roadsides in Athens, GA during the summer of 2012 to investigate the chemical control of kudzu. The first trial was located on an embankment with a mature stand of kudzu (> 95% cover) ranging in height from 0.6 to 0.9 m. Herbicide treatments were applied to plots (1.5 x 1.5 m) arranged in a randomized complete block design with four replications. Applications were made on 3 August 2012 and consisted of 4-Speed XT (2,4-D + triclopyr + dicamba + pyraflufen) at 1.64 kg ae/ha + Overdrive (diflufenzopyr + dicamba) at 0.2 kg ae/ha, Turflon Ester (triclopyr) at 1.12 kg ae/ha + Overdrive at 0.2 kg ae/ha, Plateau (imazapic) at 0.14 kg ae/ha + Overdrive at 0.2 kg ae/ha, Blade (metsulfuron) at 0.04 kg ai/ha + Milestone (aminopyralid) at 0.09 kg ae/ha + Overdrive at 0.2 kg ae/ha, Blade at 0.04 kg ai/ha + Imprelis (aminocyclopyrachlor) at 0.08 kg ae/ha + Overdrive at 0.2 kg ae/ha, Blade at 0.04 kg ai/ha + Milestone at 0.09 kg ae/ha + Specticle (indaziflam) at 0.035 kg ai/ha + Overdrive at 0.2 kg ae/ha, and Turflon Ester at 1.12 kg ae/ha + Specticle at 0.035 kg ai/ha + Overdrive at 0.2 kg ae/ha. All treatments were applied with a methylated seed oil (MSO) at 0.5% v/v. Treatments were applied using a CO_2 pressurized backpack sprayer equipped with XR8008VS nozzle tips calibrated to deliver 750 L ha^{-1} at 235 kPa. The second trial was located on a highway on-ramp with a mature stand of kudzu (> 95% cover) that was mowed to a height of 15.2 cm 1 week prior to herbicide application (15 August 2012). The treatments and application techniques were similar to the non-mowed trial. Kudzu cover was visually evaluated 1, 2, 3, 4, 5, 6, 8 and 10 weeks after treatment (WAT). Percent kudzu control for each treatment was calculated relative to initial kudzu cover recorded prior to herbicide applications. Analysis of variance was performed in SAS and means were separated according to Fisher’s protected LSD at the 0.05 significance level. Herbicide applications following mowing resulted in increased kudzu control 4 WAT compared to herbicide applications alone. All treatments (herbicides alone) resulted in 80 to 84% kudzu control 4 WAT except 4-Speed XT + Overdrive (59%) and Plateau + Overdrive (14%). Following mowing, all treatments resulted in 100% kudzu control 4 WAT except Plateau + Overdrive (69%). Control increased 10 WAT regardless of mowing or herbicide treatment. Mowing increased the efficacy of 4-Speed XT + Overdrive, Plateau + Overdrive, and Blade + Milestone + Overdrive 10 WAT. The greatest kudzu control 10 WAT, regardless of mowing was observed in response to Turflon Ester + Overdrive (94 to 100%), Blade + Imprelis + Overdrive (91 to 100%), Blade + Milestone + Specticle + Overdrive (94 to 100%), and Turflon Ester + Specticle + Overdrive (94 to 100%).

EVALUATION OF GLYPHOSATE PLUS INDAZIFLAM FOR RESIDUAL WEED CONTROL IN NON-CROP AREAS. T. Reed*, P. McCullough; University of Georgia, Griffin, GA (24)

ABSTRACT

Experiments were conducted to evaluate efficacy of glyphosate + indaziflam + diquat treatments on weed control in gravel areas compared to other commercially available glyphosate containing products. Treatments were applied on April 11, 2012 to a gravel driveway in Griffin, GA with a CO_2 pressured backpack sprayer. Control of white clover, hop clover, and buckhorn plantain were variable across products tested from 5 to 16 days after applications but excellent control (>90%) was obtained at 30 days after treatment. Glyphosate + indaziflam + diquat applications provided comparable weed control to other glyphosate products that contained imazipac at labeled use rates. Residual effects of treatments provided excellent control of white clover and buckhorn plantain at 114 days after treatments but regrowth was noted with several glyphosate products without indaziflam or residual herbicides in the mix.

ITCHGRASS [*ROTTBOELLIA COCHINCHINENSIS* (LOUR.) W.D. CLAYTON] CONTROL ON A HIGHWAY RIGHT-OF-WAY IN MS. V. L. Maddox*[1], J. D. Byrd[1], D. Thompson[2]; [1]Mississippi State University, Mississippi State, MS, [2]Mississippi Department of Transportation, Jackson, MS (25)

ABSTRACT

Invasive weed species continue to be problematic for land managers, including departments of transportation. Transportation agencies manage approximately 12 million acres of right-of-way in the United States (NCHRP 2006). Thus, vegetation is a significant safety and management issue. Itchgrass [*Rottboellia cochinchinensis* (Lour.) W.D. Clayton] is regulated as a noxious weed in the United States and Mississippi (Maddox et al. 2012) and continues to spread. A study was conducted in Wayne County, MS to evaluated seven herbicide treatments for itchgrass control on Mississippi roadsides. Foliar herbicide applications were made on 27 June 2012 using a CO_2 backpack sprayer at 20 PSI with a delivery rate of 25 GPA. Replicated treatments (prod/A) were: Accord (3 lb ae/gal) at 32 oz, Fusilade II (2 lb ai/gal) at 9 oz, MSMA (6 lb ai/gal) at 32 oz, Oust (75% ai) at 0.25 oz, Oust (75% ai) at 1 oz, Oust (75% ai) at 0.25 oz plus Roundup Pro Concentrate (5.1 lb ae/gal) at 12.8 oz, Pastora (50% ai) at 1.25 oz, and an untreated check. A non-ionic surfactant was added at 0.25% v/v to each herbicide treatment that required surfactant. At 2 WAT, Oust plus Roundup Pro Concentrate, Accord, and MSMA showed significantly more control than other treatments. At 1 MAT, Oust plus Roundup Pro Concentrate, Fusilade, and Oust (1 oz ai/A) showed significantly more control compared to other treatments. This pattern was similar at 2 and 4 MAT. At 2 WAT, there were significant differences in bahiagrass (*Paspalum notatum* Fluegge) cover. MSMA showed significantly more damage compared to all other treatments at 2 WAT. At 1 MAT, Fusilade and MSMA treatments had significantly more bahiagrass cover with a similar pattern through 4 MAT. Although Fusilade was not as effective in controlling itchgrass at 4 MAT compared to Oust (1 oz ai/A) and Oust plus Roundup Pro Concentrate, the differences were not significant and Fusilade showed less bahiagrass damage. However, regrowth was observed in treatments receiving Oust by 2 MAT and as well as apparent itchgrass pre-emergence activity. This may be an important factor when attempting to control difficult annual grasses in perennial turf species such as bahiagrass.

POSTEMERGENCE CONTROL OPTIONS OF PALMER AMARANTH ON DITCHBANKS. Z. T. Hill*, J. K. Norsworthy, D. B. Johnson; University of Arkansas, Fayetteville, AR (26)

ABSTRACT

Weed infestations along ditchbanks have been a growing concern in the past several years, especially with the growing infestation of glyphosate-resistant Palmer amaranth (*Amaranthus palmeri*). The reasons for concern are the pernicious characteristics that glyphosate-resistant Palmer amaranth is capable of such as; the contamination of adjacent ditchbanks or crop fields, the addition of resistance seed to the soil seedbank, and a seed source for long-distance dispersal. Palmer amaranth is the most common weed infesting ditchbanks in Arkansas, with a majority of Palmer amaranth populations being resistant to glyphosate. Although there are several herbicides labeled for use on ditchbanks, no recommendations currently exist for controlling glyphosate-resistant Palmer amaranth on ditchbanks; which is why control options are urgently needed. An experiment was conducted in Keiser, AR in 2012 to evaluate postemergence applied herbicides for Palmer amaranth control on ditchbanks, but will allow sufficient grass groundcover to reduce soil erosion and further Palmer amaranth emergence. This experiment consisted of a nontreated check, triclopyr at 3.37 kg ae/ha, imazapyr at 0.42 kg ai/ha, 2,4-D amine at 1.06 kg ae/ha, aminopyralid at 0.123 kg ae/ha, dicamba at 0.56 kg ae/ha, diquat at 0.28 kg ai/ha, and two rates of diuron at 2.24 to 4.48 kg ai/ha. At 7 weeks after application (WAA), all treatments provided less than 80% Palmer amaranth control, except for dicamba at 0.56 kg/ha. By 18 WAA, the highest level of control was obtained with dicamba, aminopyralid, triclopyr, and both rates of diuron. Triclopyr and 2,4-D amine allowed for moderate grass groundcover at 3 WAA, which should reduce soil erosion and suppress Palmer amaranth emergence. By 18 WAA, there was 50% or more grass groundcover following the treatments triclopyr, 2,4-D amine, and dicamba. In conclusion, labeled postemergence treatments are available that provide a high level of Palmer amaranth control on ditchbanks when applied in a timely manner without negatively impacting grass groundcover.

RESPONSE OF SPROUTING MONOECIOUS HYDRILLA TURIONS TO VARIOUS STRESS REGIMES. R. J. Richardson*; North Carolina State University, Raleigh, NC (27)

ABSTRACT

The submersed aquatic monocotyledonous angiosperm Hydrilla verticillata (L.f.) Royle is an aggressive, opportunistic, nuisance species in the Hydrocharitaceae family that has spread from its native Asia to every continent except Antarctica. Two biotypes have invaded North America, a dioecious biotype typically found in the Southern U.S. and a monoecious biotype commonly found from North Carolina northward. Both biotypes produce axillary and subterranean turions as a large component of their reproductive strategy. Therefore, research was conducted to evaluate the effect of various stressors on the initial growth from monoecious hydrilla subterranean turions. In a clipping trial, turions were collected from Harris Lake and placed in distilled water at 25 C with 12 hr photoperiod. Once sprouts reached approximately 3 cm, shoots were clipped at base. Turions were allowed to resprout and number resprouting quantified. In this trial, 100% of clipped turions resprouted. In a salinity trial, sea water was collected from Wrightsville Beach, NC and diluted to concentration with distilled water; water was exchanged every 2 weeks. Treatments included 0, 12, 18, 24, 36 ppt salinity. Each salinity level had 2, 4, 6, and 8 week salinity exposure time followed by 2 to 8 weeks in fresh water for a total trial period of 10 weeks. Each treatment had 10 unsprouted turions per treatment with 3 treatment repetitions and 12 hr photoperiod. Turions had 100% sprouting at 0 ppt and 0% sprouting at 36 ppt. 100% sprouting was also observed with 2 wk exposure to 12 and 18 ppt, however, 40% sprouting was observed with 2 wk exposure to 24 ppt. All 12 ppt exposures had 77% or greater sprouting. In a trial evaluating turion sprouting at various planting depths and light conditions, turions were collected from Harris Lake at night with only exposure to green light. Turions placed in growth chamber in distilled water at 25 C with no light or 7 light exposures; each treatment had 4 repetitions. >96% of turions sprouted regardless of light exposure regime including complete darkness. Turions grown in complete darkness maintained shoot elongation for 56 days with no significant mortality. In a planting depth trial, turions were planted at 0, 3, 6, 15 or 30 cm in organic potting mix; each treatment had 4 repetitions. No significant differences in emergence were present between turions planted at 3, 6, 15, or 30 cm. Finally, a pH exposure trial was conducted with pH levels of 5.5, 6, 6.5, 7, 7.5, 8, 8.5 pH manipulated with aquarium pH buffers. Each treatment had 10 turions and 5 repetitions. Water was replaced after 1 week and the trial ended at 2 weeks. Percent sprouting, number of shoots and length of each shoot was measured. In this trial, all turions sprouted and shoots elongated. Fewer shoots were present at pH 5.5 than other treatments, but shoot length did not differ from shoots at pH 7.0. In conclusion, monoecious hydrilla turions were very tolerant of the stress regimes evaluated. This tolerance likely explains how monoecious hydrilla can establish rapidly on new sites and produce new turions to maintain long-term infestations even in high disturbance areas. Future research should evaluate the factors that trigger turion sprouting or dormancy in situ.

PROPOSED DICAMBA APPLICATION REQUIREMENTS FOR ROUNDUP READY® XTEND CROP SYSTEMS. J. Sandbrink*[1], J. N. Travers[2], C. Kamienski[1], J. Willis[1]; [1]Monsanto, St. Louis, MO, [2]Monsanto Co., St. Louis, MO (28)

ABSTRACT

Pending regulatory approvals, the Roundup Ready® Xtend Crop System includes the simultaneous launch of a new soybean product with tolerance to both glyphosate and dicambaRoundup Ready® 2 Xtend and a low volatility premix formulation of dicamba and glyphosate. The system is designed to provide more consistent control of glyphosate-resistant and tough to control weeds. Monsanto also intends launch new low volatility formulations of dicamba for over-the-top use on Roundup Ready® 2 Xtend Soybeans. A premix of dicamba and glyphosate will be branded as Roundup® Xtend, and a stand-alone formulation of dicamba will be branded as XtendiMax™. To ensure the highest level of on-target application and herbicide performance, Monsanto will also announce Application Requirements for the Roundup Ready Xtend Crop System. Growers will continue to use residual herbicides in the Roundup Ready PLUS™ program to maintain a sound weed resistance management strategy. Dicamba product labels will increase application accuracy compared to older products and uses. Targeted weeds should be less than four inches tall. Spray nozzles must provide very coarse, extremely coarse or ultra coarse droplets. Spray gallonage must be at least 10 GPA, and spray ground speed must be less than 15 mph. Drift reduction agents should be used, and spray boom height should be 20-24 inches above the canopy. Roundup Xtend and XtendiMax should be applied when winds are 10 mph or less. Growers are encouraged to check local sensitive crop registries (e.g. DriftWatch, others) before making applications, and to pay special attention to both wind direction and speed. Growers will also be required to maintain the required label buffer to protect sensitive areas. It is very important that growers triple rinse their sprayers according to label directions after using Roundup Xtend or XtendiMax.

SEQUENTIAL APPLICATIONS VERSUS TANK MIXES OF GLYPHOSATE AND GLUFOSINATE IN COTTON. C. W. Cahoon*, A. C. York, D. L. Jordan, W. J. Everman; North Carolina State University, Raleigh, NC (29)

ABSTRACT

In 2012, Phytogen Widestrike and Bayer GlyTol/LibertyLink (LL) varieties accounted for a large portion of the cotton acreage in the southeast and mid-south. The basis for transition to Widestrike and GlyTol/LL varieties is due to increasing glyphosate-resistant (GR) Palmer amaranth (*Amaranthus palmeri*) throughout the cotton belt. Widestrike and GlyTol/LL varieties allow topical applications of glyphosate and glufosinate over-the-top, offering growers more options in their weed control strategy. Both glyphosate and glufosinate offer advantages and disadvantages in weed control. However, research in the literature on this topic is limited and needs to be addressed to determine if antagonism exists with mixtures of glyphosate and glufosinate.

The experiment was conducted at 6 locations in North Carolina during 2011 and 2012. Cotton cultivar PHY 375WRF was planted in 2011 whereas PHY 499WRF or FM 1944 GLB2 was planted in 2012. POST 1 herbicides were applied to 2-leaf cotton 18 to 22 days after planting. POST 2 applications were applied 7 days after POST 1 to 4-leaf cotton whereas POST 3 herbicides were applied to 6-leaf cotton 14 days after POST 1. The potassium salt of glyphosate was applied at 868 g ae ha-1 (1X rate) or 434 g ae ha-1 whereas glufosinate-ammonium was applied at 543 g ae ha-1 (1X rate) or 272 g ae ha-1. These herbicides were either applied sequentially or in combination. Sequential treatments included: glyphosate applied POST 1 followed by (fb) glyphosate POST 3, glufosinate POST 2, or glufosinate POST 3 all at the 1X rate; and glufosinate applied POST 1 fb glufosinate POST 3, glyphosate POST 2, or glyphosate POST 3 all at the 1X rate. Tank mix treatments comprised of the 1X rate of glyphosate + the 1X rate of glufosinate applied POST 1 and POST 3; the 1X rate of glyphosate + the 1/2X rate of glufosinate applied POST 1 and POST 3; and the 1/2X rate of glyphosate + the 1X rate of glufosinate applied POST 1 and POST 3. Additionally, a non-treated check was included. Excluding the non-treated check, all plots received a directed lay-by application of at 841 g ai ha-1 plus monosodium acid methanearsonate at 2240 g ai ha-1 plus non-ionic surfactant at 0.25% v/v when cotton was 38 to 61 cm tall. Herbicides were applied using CO2-pressurized backpack sprayers calibrated to deliver 140 L ha^{-1}. Visual estimates of weed control were recorded late season (mid-September) and at 7 and 14 days after POST 1, POST 2, POST 3, and layby applications. The experiment was set up in a randomized complete block design, with treatments replicated four times. Plots were machine-harvested to determine seed cotton yield. Data for weed control and yield were subjected to ANOVA using the PROC MIXED procedure of SAS. Data for checks were not included in analysis. Means were separated using Fisher's Protected LSD at $p < 0.05$. Differences in Palmer amaranth control at North CCRS in 2012, Mount Olive, and both locations in Clayton in 2011 were minor, except when glyphosate was applied alone. However, there were some differences in Palmer amaranth control at Rocky Mount and Micro at 7 days after POST 3. At Rocky Mount, glyphosate alone provided 87% control of Palmer amaranth. Tank mixing glufosinate (1/2X rate) + glyphosate only provided 80% control. At Micro, glyphosate alone controlled only 8% of Palmer amaranth present whereas glufosinate provide greater than 93% control. Utilizing the 1/2X rate of glufosinate also limited Palmer amaranth control by the herbicide at this location (76%). Goosegrass control was similar across all trials. Therefore, data were pooled together. 7 days after POST 3, glyphosate alone and all sequential application treatments controlled goosegrass 96 to 100%. Glufosinate alone controlled goosegrass only 88%. Glyphosate added to glufosinate did not improve control. At 14 days after POST 3, the same trend can be seen in goosegrass control. At this time, glufosinate (1/2X rate) + glyphosate (1X rate) was least effective, controlling goosegrass 86%. Therefore, it appears glufosinate can antagonize glyphosate when applying the tank mix to weeds glufosinate is typically weak against. In this situation, sequential applications of glufosinate and glyphosate may be more appropriate.

MANAGING PALMER AMARANTH WITH RESIDUAL HERBICIDES IN ROUNDUP READY FLEX COTTON. G. B. Montgomery*, H. M. Edwards, J. A. Bond, S. A. Shinkle, T. W. Eubank; Mississippi State University, Stoneville, MS (30)

ABSTRACT

Amaranthus spp. are among the most troublesome weeds in many cropping systems in the United States. Most herbicide programs are based on control of Palmer amaranth (*Amaranthus palmeri*) because of its rapid growth rate and competitive impacts on crops. Roundup Ready and Flex cotton production systems and the historical effectiveness of glyphosate led to decreased use in residual herbicides to control problem weeds. Widespread incidence of glyphosate-resistant (GR) Palmer amaranth has forced producers to shift back to older residual herbicides to control this weed. Most Mississippi producers are accustomed to using one or two residual herbicide applications during the growing season. However, additional research is needed to evaluate GR Palmer amaranth control with programs including multiple applications of residual herbicides. The objective of this research was to evaluate Palmer amaranth control with programs containing multiple applications of residual herbicides.

The study was conducted in 2012 at the Mississippi State University Delta Research and Extension Center in Stoneville, Mississippi, at a site known to be infested with GR Palmer amaranth. Palmer amaranth at the site contained approximately 25% GR individuals. The soil texture was a Dundee very fine sandy loam with a pH of 6.1 and 1.2% organic matter. Individual plots were four 40-inch rows measuring 30 feet in length. 'Fibermax 1944 GLB2' was seeded at 39,000 seed/A on May 1, 2012. Treatments were arranged as a three-factor factorial within a randomized complete block experimental design with four replications. Factor A was treatments applied prior to cotton emergence [early preplant (EPP) or preemergence (PRE)], factor B was treatments applied postemergence as a broadcast spray (POST-OT), and factor C was treatments applied postemergence as a directed spray (POST-DIR). Palmer amaranth control was visually estimated at weekly intervals from planting until 14 d following the last POST-DIR application. Data were subjected to ANOVA and means were separated using Fisher's protected LSD at p=0.05.

Cotoran PRE or Reflex EPP followed by Cotoran PRE controlled GR Palmer amaranth better than Reflex EPP at 19 d after planting. Pooled across POST-OT treatments, sequential applications of Reflex EPP followed by Cotoran PRE provided greater GR Palmer amaranth control 14 d after the last POST-OT applications than treatments that included only Reflex EPP or Cotoran PRE although the data is not presented. Pooled across treatments prior to emergence, two applications of Roundup PowerMax plus Dual Magnum controlled more GR Palmer amaranth than one application at 14 d after the last POST-OT application. When only Roundup PowerMax plus Direx plus MSMA was applied POST-DIR, GR Palmer amaranth control was greater 14 d after the last POST-DIR application in plots receiving two applications of Roundup PowerMax plus Dual Magnum compared with only one application. However, no differences in control were detected among POST-OT treatments when Roundup PowerMax plus Caparol plus MSMA and Roundup PowerMax plus Direx plus MSMA were utilized as POST-DIR treatments. For each residual herbicide treatment applied prior to cotton emergence, GR Palmer amaranth control was similar regardless of POST-DIR treatments when two applications of Roundup PowerMax plus Dual Magnum were applied POST-OT. However, GR Palmer amaranth control was reduced when only one POST-DIR treatment was applied following two applications of Roundup PowerMax plus Dual Magnum and Reflex EPP compared with Refex EPP followed by Cotoran PRE. Where only one application of Roundup PowerMax plus Dual Magnum was applied POST-OT, both POST-DIR treatments were required to optimize GR Palmer amaranth control. Sequential applications of Reflex EPP followed by Cotoran PRE provided greater GR Palmer amaranth control than either herbicide as single applications. This was likely due to the increased time that Reflex was in the field since it was applied EPP and the shorter length of residual control provided by Cotoran compared with Reflex. Two applications of Roundup PowerMax provided greater GR Palmer amaranth control compared with one application, regardless of residual herbicide applied prior to cotton emergence. A minimum of four applications of a residual herbicide were required to maximize GR Palmer amaranth control by 14 d after the last POST-DIR application.

ENVIRONMENTAL AND AGRONOMIC FACTORS AFFECTING INJURY TO COTTON FROM SOIL-APPLIED HERBICIDES. B. W. Schrage*, J. K. Norsworthy, D. B. Johnson; University of Arkansas, Fayetteville, AR (31)

ABSTRACT

With the evolution of glyphosate-resistant weeds throughout the Midsouth, especially Palmer amaranth, many cotton growers are reverting to using soil-applied herbicides as part of an integrated weed management approach to controlling these weeds. Preemergence (PRE) herbicides, although often effective, can cause considerable injury to cotton; hence some growers are reluctant to use these products. Agronomic and environmental factors that could potentially affect the tolerance of cotton to PRE-applied herbicides were evaluated to better understand the causes of injury and steps growers could take to minimize the risk of injury from soil-applied herbicides. Field experiments were conducted in 2012 to evaluate the influence of cotton seed size, planting depth, and seed vigor on cotton tolerance various rates of PRE-applied herbicides.

The first experiment in Fayetteville was designed as a randomized complete block with a factorial arrangement of five seed sizes by two rates (1X and 2X) of diuron with four replications. Cotton seed sizes ranged from 9.3 to 13.1 g/100 seed. The second experiment in Rohwer was organized as a split-split plot design with the main plot being planting depth (1.27 and 2.54 cm), the subplot being herbicide product (diuron, fomesafen, and fluometuron) at two application rates (1X and 2X), and seedling vigor (low and high) as the sub-sub plot factor, replicated four times. Both experiments were assessed for injury, plants per 2 m^{-1} of row, and biomass. Smaller seed, generally less than 11.6 g/100 ct, exhibited more injury and less biomass than that of the larger seed. Depth of seed had no significant effect on injury from fluometuron; however, injury increased in cotton when planted at 2.54 cm whereas, injury decreased in cotton planted at 2.54 cm from diuron. High seed vigor resulted in less injury from diuron, fomesofan and fluometuron.

ENLIST WEED MANAGEMENT SYSTEMS IN TEXAS HIGH PLAINS COTTON. J. D. Reed*[1], W. Keeling[1], P. A. Dotray[1], J. Lee[2]; [1]Texas AgriLife Research, Lubbock, TX, [2]Dow AgroSciences, Lubbock, TX (32)

ABSTRACT

Russian thistle (*Salsola iberica*) and Palmer amaranth (*Amaranthus palmeri*) are troublesome weeds in Texas High Plains cotton. Russian thistle emerges before planting and can be difficult to control with burndown treatments such as glyphosate. Palmer amaranth can be controlled with glyphosate but resistant escapes are a concern. Enlist technology utilizes crop tolerance to a new innovative 2,4-D Choline formulation + glyphosate to manage difficult to control weeds including Russian thistle and Palmer amaranth.

Field studies were conducted in 2012 near Lubbock and Halfway, TX to evaluate preplant burndown control of Russian thistle and in-season control of Palmer amaranth with 2,4-D Choline and Enlist Duo in Enlist Cotton. The objective of these studies was to 1) evaluate 2,4-D Choline alone, glyphosate alone, and 2,4-D Choline + glyphosate (Enlist Duo) for preplant burndown (PPBD) control of glyphosate-susceptible Russian thistle and 2) evaluate Enlist Duo alone and in combination with glufosinate and several soil-residual herbicides for postemergence control of glyphosate-susceptible Palmer amaranth in Enlist Cotton.

Preplant burndown treatments included Enlist Duo, Enlist Duo + glufosinate, 2,4-D Choline + glufosinate, glyphosate, 2,4-D Cholone, and glufosinate. All PPBD treatments were applied to 2 to 4 inch Russian thistle. Palmer amaranth plots all received a preemergence application of Cotoran. Postemergence treatments included glyphosate followed by (fb) glyphosate, Enlist Duo (1.46 lbs ae/A) fb Enlist Duo (1.46 lbs ae/A), Enlist Duo (1.96 lbs ae/A) fb Enlist Duo (1.96 lbs ae/A), Enlist Duo + glufosinate fb Enlist Duo, Enlist Duo + glufosinate fb glufosinate, Enlist Duo + glufosinate fb Enlist Duo + glufosinate, glufosinate fb glufosinate, Enlist Duo + Dual II Magnum fb Enlist Duo + glufosinate, Enlist Duo + Warrant fb Enlist Duo + glufosinate, Enlist Duo + Staple fb Enlist Duo + glufosinate, Enlist Duo + Warrant fb Enlist Duo + glufosinate, and 2,4-D Choline + glufosinate fb 2,4-D Choline + glufosinate. Postemergence treatments were applied to 2 to 4 inch Palmer amaranth. Treatments were made using a CO_2-presurized backpack sprayer calibrated to deliver 15 gallons per acre. Plots, 4 rows by 30 feet in length, were replicated four times. Weed control was visually estimated based on a standard scale of 0 to 100% where 0 = no weed control and 100 = complete weed control and verified by weed counts.

Enlist Duo (93-95%) improved Russian thistle control compared to glyphosate or 2,4-D Choline alone (68-79%). Enlist Duo alone (95%) controlled Russian thistle as well as Enlist Duo + glufosinate or 2,4-D Choline + glufosinate (91-93%). At Lubbock, similar Palmer amaranth control was achieved 14 and 28 days after treatment (DAT) with glyphosate, Enlist Duo, or Enlist Duo + glufosinate applied EPOST (93-99%). At Halfway, Enlist Duo control EPOST was improved with the addition of a soil-residual herbicide (83-94%) compared to Enlist Duo alone (68%). Enlist Duo followed by Enlist duo mid-postemergence achieved>94% Palmer amaranth control at both locations.

MANAGING PALMER AMARANTH IN COTTON WITH RESIDUAL HERBICIDES. J. W. Cave*[1], W. Keeling[2], P. A. Dotray[2], J. D. Reed[2]; [1]Texas A&M Agrilife Research, Lubbock, TX, [2]Texas AgriLife Research, Lubbock, TX (33)

ABSTRACT

Palmer amaranth (*Amaranthus palmeri*) is the most common and widespread weed problem on the Texas High Plains. Prior to the introduction of glyphosate-tolerant cotton varieties, producers used a combination of preplant and preemergence soil residual herbicides in combination with cultivation to control this weed. The use of residual herbicides has declined as producers relied more on glyphosate to control Palmer amaranth and other weeds. Concerns about emerging glyphosate-resistant Palmer amaranth has resulted in a renewed interest and need for residual herbicides.

A field study was conducted on a field with glyphosate susceptible Palmer amaranth near Halfway, TX in 2012 evaluating preplant incorporated (PPI), preemergence (PRE), postemergence (POST), and postemergence-directed (PDIR) herbicides in cotton. Plots were 4 rows by 30 feet with 4 replications arranged in a randomized complete block design. The soil type was a Pullman clay loam with 1.2% O.M. and pH 7.7. Herbicide applications were made at the recommended use rate for a clay loam soil using a carrier volume of 10 GPA. Preplant incorporated treatments were incorporated with a field cultivator and PRE treatments activated with 0.5 inches of overhead irrigation after application. Palmer amaranth were 2-4 inches tall at the POST application and PDIR treatments were applied to late-season weed flushes when Palmer amaranth were 2-4 inches tall.

Trifluralin and pendimethalin PPI controlled Palmer amaranth greater than 90% early-season, but late-season control declined to 70 and 50%, respectively. Late-season control with trifluralin improved with a PRE overlay of prometryn, fluometuron, or diuron. Preemergence treatments alone controlled Palmer amaranth 91 to 97% early-season, but declined to 35 to 80% mid-season. Combinations with s-metolachlor or pyrithiobac improved mid-season Palmer amaranth control when compared to PRE applications alone. Glyphosate POST alone or in combination with s-metolachlor, acetochlor, pyrithiobac, propazine, or trifloxysulfuron, controlled mid-season Palmer amaranth greater than 97% 14 days after treatment. All treatments applied PDIR controlled Palmer amaranth at least 94%. These results indicate that a PPI herbicide with a PRE overlay, combined with a residual herbicide tank-mixed with glyphosate can effectively control Palmer amaranth season-long in this region.

PREEMERGENCE HERBICIDE PLACEMENT AND WIDE VS. NARROW STRIP TILLAGE, IMPLICATIONS FOR PIGWEED CONTROL IN REDUCED-TILLAGE COTTON. J. N. Toombs*[1], A. J. Price[2], J. S. McElroy[1], C. D. Monks[1]; [1]Auburn University, Auburn, AL, [2]USDA-ARS, Auburn, AL (34)

ABSTRACT

The role of conservation tillage is well documented in reducing soil erosion, improving soil quality, and enhancing water availability. However, weed control in conservation tillage systems is problematic and has increased producers' reliance on herbicides. Cover crops are a vital component of weed management in conservation tillage systems due to their potential to inhibit weed germination and emergence. Soils in the southeastern U.S. Coastal Plains are susceptible to sub-surface compaction and producers often practice in-row sub-soiling using strip-tillage implements. However, the practice of strip-tillage may disrupt the cover crop layer reducing its effectiveness in weed suppression. Typically, strip-tillage implements disturb 30 to 45 cm wide zone. Narrow row subsoiler implements are available that disturbs < 5cm wide zone, while still successfully alleviating compaction. Currently, glyphosate-resistant Palmer amaranth (*Palmer amarantus*) (PA) has become a serious threat to conservation tillage cotton production. Research indicates that cotton yields were higher when weeds were controlled for the first eight weeks after emergence. With theses concerns in mind, studies were conducted to evaluate the role of preemergence (PRE) herbicide placement and wide vs. narrow strip tillage for pigweed control in reduced-tillage cotton. The objective of this study was to construct an integrated glyphosate-resistant PA management program for cotton producers practicing conservation tillage.

A two-year field study was conducted from 2011 through 2012 at the Wiregrass Research and Extension Center near Headland, AL. The experiment was a randomized complete block, with a split block restriction on randomization with three replications and twelve treatments. A cover crop of Wrens Abruzzi Rye (*Secale cereale*) was established using a no-till drill at 100 kg ha^{-1} on the entire test area. Low residue plots were achieved by applying 2.24 kg ha^{-1} of glyphosate before rye was completely mature. Prior to planting all plots received a burndown glyphosate treatment, were rolled with a 3-section spiral roller, and subsoiled with either a wide-slot (30 cm) four row 3m KMC strip-till rig with 4 wavy coulters and rolling baskets or a narrow-slot (< 5cm) four row 3m KMC subsoiler. PRE herbicides used were pendimethalin (Prowl 3.3 EC) at 0.84 kg ai ha^{-1} and fomesafen (Reflex 2 EC) at 0.28 kg ha^{-1} respectively. Herbicides were band or broadcast applied with a backpack sprayer directly after planting Phytogen 375 WRF. Data collected included visual PA control taken six weeks after planting on a 0-100 scale where 0 corresponds to no control and 100 corresponds to complete plant death. PA control was evaluated between row (BR) and within the row (WR). Seed cotton yield data were collected after harvest.

PA control was not influenced by tillage width either BR or WR in 2011 or 2012. Herbicide treatment resulted >89% control in 2011 and 2012 for both BR and WR except for 2011 BR PRE banded application. In 2011 an interaction between residue and weed control was observed BR. Low residue and banded herbicide along with non-treated controlled <23% PA. All other combinations controlled >94% PA. Yield was significantly affected by herbicide treatments in both 2011 and 2012. Where broadcast herbicide treated plots had higher yields than non-treated plots and non-treated plots had higher yields than those that were banded with herbicides. In 2011 residue amount influenced yield. Low residue produced greater yields than high. In 2012 the interaction of residue by weed control influenced yield. Yield was greatest with high residue and broadcast herbicide. Overall, broadcast PRE herbicide application generally resulted in the greatest weed control and the highest yield.

SELECTED HERBICIDE PROGRAMS FOR BROADLEAF WEED CONTROL IN DICAMBA-TOLERANT COTTON. C. H. Sanders*[1], D. D. Joseph[1], M. W. Marshall[2]; [1]Clemson University, Clemson, SC, [2]Clemson University, Blackville, SC (35)

ABSTRACT

Glyphosate- and ALS-resistant Palmer amaranth biotypes continue to spread throughout the coastal plain of South Carolina. Currently, Palmer amaranth biotypes resistant to glyphosate, ALS-inhibitors, or both have been confirmed in 20 counties. New technologies are needed to manage this pest. Herbicide tolerant crop technology provides the ability to apply herbicides over-the-top that would otherwise severely injure the crop. In the near future, dicamba tolerant crop technology will provide over-the-top crop tolerance to applications of dicamba. Therefore, research studies were initiated to determine the effectiveness of dicamba-based herbicide programs for control of Palmer amaranth and other important broadleaf weeds and yield response of dicamba tolerant cotton. Field experiments were conducted at the Clemson University Edisto Research and Education Center located near Blackville, SC in 2012. Experimental design consisted of a randomized complete block design with 4 replications with individual plot sizes of 12.7 by 40 ft. The middle two rows were treated leaving the outside two rows of the plots as untreated running checks. Dicamba-tolerant cotton was planted on June 19, 2012 using a 4-row Almaco cone planter with a final seed spacing of 3 seed per row ft. Fomesafen at 0.25 lb ai/A, dicamba at 0.5 lb ai/A were applied preemergence (PRE) shortly after planting alone and in combinations in water at a carrier volume of 15 GPA with a pressure of 34 PSI. Approximately 14 (early-post) and 33 (late-post) days after planting, various combinations of dicamba at 0.5 lb ai/A, glyphosate at 0.75 lb ae/A, glufosinate at 0.53 lb ai/A, and acetochlor at 1.125 lb ai/A were applied postemergence (POST) with the same application parameters discussed above. Palmer amaranth and pitted morningglory percent visual control were measured 19 days after early-post (EP) and 14 days after the late-post (LP) applications. Seed cotton yield and weed control data were analyzed using ANOVA and means separated at the P=0.05 level. Dicamba, fomesafen, and fomesafen plus dicamba PRE treatments provided excellent control of Palmer amaranth and pitted morningglory (93-100%). Glyphosate plus dicamba, glufosinate plus acetochlor, and glufosinate plus dicamba EP provided greater than 95% control of pitted morningglory and Palmer amaranth. More variation in Palmer amaranth and pitted morningglory control was observed with the NO PRE followed by POST treatments. Dicamba- and glufosinate-based PRE and EP herbicide programs provided excellent control of small Palmer amaranth and pitted morningglory. At the 14 days after late POST evaluation, all treatments provided 100% control of Palmer amaranth and pitted morningglory. No significant seed cotton yield differences were observed across the treatments. Based on these results, dicamba and glufosinate-based herbicide alone and in combination provide an alternative control for small (3-5 inch) glyphosate- and ALS-resistant Palmer amaranth biotypes and other important broadleaf weeds in cotton. Future work includes testing dicamba and glufosinate combinations on larger Palmer amaranth and other broadleaf weeds including sicklepod and small-flower morningglory

CONTROL OF PALMER AMARANTH WITH SEQUENTIAL HERBICIDE PROGRAMS.
D. Z. Reynolds*[1], D. M. Dodds[1], T. H. Dixon[1], C. A. Samples[1], A. Mills[2]; [1]Mississippi State University, Mississippi State, MS, [2]Monsanto, Collierville, TN (36)

ABSTRACT

Glyphosate-resistant(GR) Palmer amaranth was first reported in 2005 in Georgia. Since that time, occurrence of GR-Palmer amaranth has spread throughout the mid-south and southeastern U.S. Growers have been forced to dramatically alter weed control practices in areas where this weed is problematic. Crops that are tolerant to glyphosate, glufosinate, and dicamba are under development and will be commercially available as Roundup Ready Xtend® crops. Substantial data are available on the effect of postemergence applications of glufosinate on GR-Palmer amaranth; however, little previous research has been conducted evaluating GR-Palmer amaranth control with dicamba. Therefore, this research was conducted to evaluate control of GR-Palmer amaranth following postemergence application of glyphosate and dicamba.

Studies were conducted in 2012 at a grower field near Robinsonville, MS. The field site utilized in this experiment had a very high natural population of GR-Palmer amaranth. Herbicides treatments included the following: tank-mix of glyphosate + dicamba at 1.1 kg ae/ha + 0.6 kg ae/ha, respectively, applied one time; a tank-mix of glyphosate + dicamba at 1.1 kg ae/ha + 0.6 kg ae/ha, respectively, applied twice with the second application occurring 14 days after the first; a tank-mix of glyphosate + fomesafen at 1.1 kg ae/ha + 0.3 kg ai/ha, respectively, applied twice with the second application occurring 14 days after the first; an experimental pre-mix of glyphosate + dicamba at 1.1 kg ae/ha + 0.6 kg ae/ha, respectively, applied one time; an experimental pre-mix of glyphosate + dicamba at 1.1 kg ae/ha + 0.6 kg ae/ha, respectively, applied twice with the second application occurring 14 days after the first; and an experimental pre-mix of glyphosate + fomesafen at 1.1 kg ae/ha + 0.3 kg ai/ha, respectively, applied twice with the second application occurring 14 days after the first. Each of these herbicide programs was applied to GR-Palmer amaranth that was 10 cm and 25 cm in height at the time of application. All applications were made with a CO_2-powered backpack sprayer at an application volume of 140 L/ha at 324 kPa of pressure. Turbo Teejet induction tips were utilized for all herbicide applications. Visual evaluations of efficacy were made two and four weeks after the sequential application. These evaluations corresponded to four and six weeks after the non-sequential applications. Plots consisted of two – 97 cm rows that were 9.1 meters in length. This experiment was conducted using a factorial arrangement of treatments with a randomized complete block design with four replications. Visual evaluations of weed control were subjected to analysis of variance using the PROC Mixed procedure in SAS v. 9.2. Means were separated using Fisher's Protected LSD at p = 0.05.

Sequential applications provided the greatest control of GR-Palmer amaranth at both application timings. Two and four weeks after application to 10 cm Palmer amaranth, sequential applications of the tank-mix or pre-mix of glyphosate + dicamba provided 87 to 94% control while a single applications provided 72 to 78% control. Two and four weeks after application to 25 cm Palmer amaranth, sequential applications of the tank-mix or pre-mix of glyphosate + dicamba provided 90 to 96% control while a single applications provided 80 to 81% control. Application of the tank-mix or pre-mix of glyphosate + dicamba followed by glyphosate + fomesafen resulted in 90 and 91% control two and four weeks after application, respectively.

Future research is needed to determine effective control weed control programs in Roundup Ready Xtend® cropping systems. These weed control programs must be efficacious, cost effective for the grower, and sustainable.

RESULTS FROM YEARS ONE AND TWO OF A LONG-TERM STUDY DESIGNED TO DETERMINE WEED POPULATION DYNAMICS IN DICAMA-TOLERANT COTTON.Â Â . D. L. Jordan*[1], A. C. York[1], W. J. Everman[1], S. Bollman[2], J. K. Soteres[2]; [1]North Carolina State University, Raleigh, NC, [2]Monsanto Company, St. Louis, MO (37)

ABSTRACT

Cotton with a trait expressing tolerance to dicamba is being developed for the United States market. Determining the value of dicamba in systems to manage weed populations in the relative long term will assist growers and their advisors to formulate sustainable practices for weed management in cotton. A trial with dicamba-tolerant cotton was established in two separate fields in North Carolina during 2011 to document weed population dynamics over a 4-year period of time. Plot size was six rows (91-cm spacing) by 15 m in one field and eight rows by 11 m in the second field. Alleys between plots were 2.4 m. Herbicide programs over the 4-year study included various combinations of programs with preemergence (PRE) applications of diuron plus pendimethalin, glyphosate postemergence (POST) only, glyphosate plus dicamba, and glyphosate plus dicamba plus acetochlor. Data recorded in 2011 and 2012 included weed diversity and density by collecting soil cores from each plot immediately after planting but before application of PRE herbicides. Samples were stored at room temperature in opened plastic bags for 2 weeks prior to placing soil in flats in the greenhouse. Soil was irrigated with overhead sprinklers to promote germination of weed seed. Three weeks after establishment, weed seedlings were identified and treated with glyphosate at 840 g ae/ha during both years to determine the frequency of glyphosate resistance in Palmer amaranth. The frequency of Palmer amaranth surviving glyphosate application was also determined based on the percentage of surviving plants 2 weeks after application. Density of Palmer amaranth from the center four rows of each plot was determined in late August. Data for Palmer amaranth population were converted to plants per acre and log transformed for analysis. Data for the percentage of surviving Palmer amaranth and late-August density were subjected to ANOVA. In the analysis for Palmer amaranth populations in the field in late August, treatments that were similar during 2011 were pooled for the ANOVA. In 2012, ANOVA was performed using all treatments. Means were separated using Fisher's Protected LSD at $p \leq 0.05$.

Frequency of glyphosate resistance in Palmer amaranth populations ranged from 4 to 6% across all plots when cores were collected immediately after planting in 2011 but before preemergence herbicides were applied. When sampled in 2012 at the same timing, frequency of Palmer amaranth expressing resistance to glyphosate increased to 31% when glyphosate was the only herbicide applied during 2011. All other combinations included herbicides with other modes of action MOA (including combinations of dicamba, diuron, and pendimethalin) maintained the frequency of glyphosate resistance at 2 to 11%. In August 2011, the number of Palmer amaranth plants per acre following three applications of glyphosate only was 13,116. Palmer amaranth density following the combination of diuron plus pendimethalin followed by three applications of glyphosate or three applications of glyphosate plus dicamba ranged from 1,656 to 3,828 plants/acre. The combination of diuron plus pendimethalin followed by glyphosate plus dicamba or a POST herbicide program of glyphosate plus dicamba plus acetochlor followed by two applications of glyphosate plus dicamba resulted in populations of 157 to 499 plants/acre. When Palmer amaranth density was determined during August 2012, a density of 55,762 plants/acre were recorded following three applications of glyphosate alone while 28,375 plants/acre were noted when diuron plus pendimethalin preceded the three applications of glyphosate alone. For all other treatments containing glyphosate and herbicides with MOA different from glyphosate, Palmer amaranth density was 9 or fewer plants/acre. Results from these experiments thus far support previous findings where continued use of glyphosate alone increases the frequency of glyphosate resistance and that diversifying MOA maintains the frequency of resistance in populations. These results also indicate that dicamba is beneficial in preventing an increase in glyphosate resistance and has potential to be an important management tool in cotton where Palmer amaranth is present. This experiment is scheduled for two more years (2013 and 2014).

COMPARISONÂ OF FLURIDONE- AND FLUMIOXAZIN-BASED PREPLANT BURNDOWN PROGRAMS IN GLUFOSINATE-TOLERANT COTTON. M. W. Marshall*[1], A. C. York[2], A. S. Culpepper[3]; [1]Clemson University, Blackville, SC, [2]North Carolina State University, Raleigh, NC, [3]University of Georgia, Tifton, GA (38)

ABSTRACT

The spread of herbicide resistant weeds, including Palmer amaranth, across the southeastern United States has growers in need of new herbicide alternatives. Fluridone herbicide inhibits the carteniod biosynthesis pathway in susceptible plants. Cotton tolerance to fluridone was established during its early development as a herbicide in the late 1970's. However, fluridone was not marketed in cotton due to cost concerns. In the past, fluridone successfully controlled *Amaranthus* spp. Efficacy of fluridone on Palmer amaranth (AMAPA) was lacking. Therefore, field studies were initiated and conducted across the southeast to determine the efficacy of various combinations of preplant, preemergence, and postemergence herbicide programs for AMAPA control in cotton. Field experiments were conducted at the Clemson University Edisto Research and Education Center (EREC) located near Blackville, SC; a grower field located near Mt. Olive, NC, and a grower field located in Macon County, GA in 2012. Experimental design consisted of a randomized complete block design with 4 replications. Preplant burndown herbicides were applied on April 18, 2012; April 20, 2012; and April 13, 2012; at EREC, Macon County, and Mt. Olive, respectively. Preemergence (PRE) herbicides were applied on May 22, 2012; May 11, 2012; and May 7, 2012 at EREC, Macon County, and Mt. Olive, respectively. Postemergence (POST1) on June 13, 2012, May 30, 2012, and May 31, 2012 at EREC, Macon County, and Mt. Olive, respectively. Postemergence (POST2) on June 25, 2012, June 15, 2012, and June 13, 2012 at EREC, Macon County, and Mt. Olive, respectively. Preplant burndown herbicide treatments included glyphosate at 0.75 lb ae/A plus 2,4-D at 0.5 lb ai/A, glyphosate plus 2,4-D plus flumioxazin at 0.064 lb ai/A, glyphosate plus 2,4-D plus fluridone at 0.25 lb ai/A, and glyphosate plus 2,4-D plus fluridone 0.38 lb ai/A. Preemergence (PRE) treatments included paraquat at 0.75 lb ai/A, reflex at 0.25 lb ai/A, and diuron at 0.5 lb ai/A. All treatments were followed by two postemergence application of glufosinate at 0.53 lb ai/A, with the exception of the check. Preplant AMAPA percent control ratings were collected at the preemergence herbicide application timing, PRE AMAPA percent control ratings were collected at the POST1 timing, and POST1 AMAPA control ratings were collected at the POST2 timing. Palmer amaranth control data were analyzed using ANOVA and means separated at the P = 0.05 level. At the EREC site, approximately 0.5 in precipitation occurred within 7 days after preplant application. Flumioxazin and fluridone at 0.38 lb ai/A preplant treatments provided highest AMAPA control (96-99%). At POST1, all treatments containing a residual burndown and/or residual PRE treatment provided 94% or better AMAPA control. At the Mt. Olive site, approximately 0.6 in precipitation within 7 days after preplant application. At the POST1 application, PRE AMAPA control was greater than 95% with flumioxazin and fluridone at 0.38 lb ai/A preplant alone or followed by fomesafen plus diuron plus paraquat PRE. After POST2, POST 1 AMAPA control was 98% or better following two applications of glufosinate regardless of residual program. At the Macon County site, very little precipitation occurred within 7 days after preplant application. Palmer amaranth control at planting was better with preplant flumioxazin (77%) compared to both rates of preplant fluridone (52-59%). AT POST2, POST 1 glufosinate following either preplant flumioxazin or preplant fluridone following diuron plus fomesafen at plant provided greater than 99% AMAPA control. In conclusion, fluridone needed about 0.5 in rainfall within 7 days of application to activate. Under dry conditions, AMAPA control from preplant flumioxazin was greater than fluridone regardless of rate. In contrast, AMAPA control was similar between prelant flumioxazin and fluridone during normal precipitation. At POST1, benefit from residuals was evident compared to the glufosinate only programs. Fluridone did seem to slow emerged AMAPA allowing POST treatments better control of escapes and suppress future weed flushes.

COTTON TOLERANCE AND WEED MANAGEMENT WITH WARRANT. T. S. Morris*[1], P. A. Dotray[2], W. Keeling[2], J. D. Reed[2]; [1]Texas A&M Agrilife Research, Lubbock, TX, [2]Texas AgriLife Research, Lubbock, TX (39)

ABSTRACT

Warrrant™ is an encapsulated formulation of acetochlor for postemergence (over-the-top) use in cotton (*Gossypium hirsutum* L.), corn (*Zea mays* L.), and soybean (*Glycine max* L. Merr.), and for preplant incorporated and preemergence use in sorghum (*Sorghum bicolor* L. Moench). The encapsulation technology minimizes crop damage and lengthens the period of soil residual weed control. Warrant has good activity on several annual grass and broadleaf weeds including Palmer amaranth (*Amaranthus palmeri* S. Wats.), tall waterhemp (*Amaranthus tuberculatus* Moq. Sauer), common lambsquarters (*Chenopodium album* L.), and black nightshade (*Solanum nigrum* L.) following "activation" prior to weed seed germination and emergence. The objectives of this study were 1) to evaluate Palmer amaranth control when Warrant is applied at differing rates, application timings, and tank mix combinations; and 2) determine crop response and lint yields in cotton.

Field experiments were conducted in 2011 and 2012 near Halfway, TX.(clay loam soil) and near Lamesa, TX. (fine sandy loam soil) in 2012. Plots, 4 rows by 30 feet replicated four times, were arranged under center pivot irrigation systems at both locations. Herbicide applications were broadcast applied using a CO_2-pressurized backpack sprayer containing TurboTee 110015 spray tips calibrated to deliver 15 gallons per acre (GPA) in 2011 and 12 GPA in 2012 at Halfway and 10 GPA at Lamesa in 2012. Cotton response and weed control was estimated visually based on a standard scale of 0 to 100%, where 0 = no injury or weed control and 100 = crop death or complete weed control.

At both locations in 2011 and 2012, cotton injury ranged from 0 to 11% following Warrant at 48 oz/A applied PP, PRE, and PP followed by (fb) PRE. Warrant applied PP or PRE at 96 oz/A was more injurious than at 48 oz/A at either timing. No injury was observed at the end of the growing season. Roundup Powermax + Warrant (48 oz/A) applied PP or PRE controlled Palmer amaranth 90 to 100% six weeks after planting. Roundup Powermax + Warrant (48 oz/A) applied PP fb PRE improved late-season control of Palmer amaranth compared to either PP or PRE applications alone. A sequential application of Roundup Powermax + Warrant (48 oz/A) applied early-postemergence (3-leaf cotton) controlled Palmer amaranth 88% late-season compared to Warrant (48 oz/A) applied PP or PRE alone (30 to 59%). This control was similar to Roundup Powermax + Warrant (48 oz/A) applied PP fb PRE. Cotton lint yield ranged from 877 to 1061 lb/A at Halfway (2012) and no differences were observed relative to the non-treated (weed-free) control (993 lb/A). Cotton lint yield ranged from 1012 to 1349 lb/A at Lamesa and no differences were observed among treatments.

POST CORN HARVEST PALMER AMARANTH CONTROL. R. Hayes*[1], W. Crowe[2], L. E. Steckel[1]; [1]University of Tennessee, Jackson, TN, [2]University of Tennessee, Martin, TN (40)

ABSTRACT

Prevention of seed production from glyphosate resistant (GR) Palmer amaranth following corn harvest is essential to prevent seed production and replenishment of the soil seedbank for subsequent crops. While Gramoxone provides excellent initial desiccation of existing vegetation, regrowth can occur from larger plants and new seedling emergence can be problematic. Residual herbicides can reduce regrowth and manage new seedling emergence, however they increase costs and can potentially injure or limit planting of subsequent crops. In these two trials, conducted under limited moisture conditions, there was only about a 10 to 15% improvement in Palmer amaranth control with residuals over Gramoxone alone in one study and none in another study. Under these dry conditions, we were not able to detect any difference among the residual herbicides Dual Magnum, Sencor, Zidua, Valor and Sharpen. Had conditions been more conducive to seedling emergence, differences among residuals might be distinguished. In addition to palmer amaranth, hophornbeam copperleaf was controlled >80% with the treatments evaluated.

Wheat was injured and fresh weight reduced by treatments containing Finesse and Zidua PRE. POST treatments of Gramoxone with Zidua, Sharpen, Dual Magnum, and Sencor were least injurious to wheat. Evik or Princep did not injure wheat in this study, although Princep has plant back restrictions for wheat. Further research is needed to evaluate the efficacy of the residual herbicides under conditions more favorable (adequate moisture) for weed emergence and to evaluate shorter intervals for seeding wheat and other crops. While post-harvest tillage may be as effective as herbicides for managing GR Palmer amaranth, it may not be practical on soils prone to erosion. Strategies to manage Palmer amaranth in conservation tillage systems are necessary to preserve the production system).

IMPACT OF N SOURCE, RATE AND WEED REMOVAL TIME ON N AVAILABILITY IN CORN. A. M. Knight*, W. J. Everman, D. L. Jordan, R. Heiniger, T. J. Smyth; North Carolina State University, Raleigh, NC (41)

ABSTRACT

Two of the greatest factors, following genetics, impacting production and yield in agronomic crops are fertility and weed management. The uptake efficiency of nitrogen is dependent upon many factors including tillage system, soil type, crop, weeds, and the amount and type of nitrogen fertilizer applied. The relationship and interaction between crops and weeds is important, and determining how North Carolina corn production may be impacted by different fertilizers could improve nitrogen use efficiency and overall corn yields. Field studies were conducted in 2011 and 2012 at the Upper Coastal Plains Research Station near Rocky Mount, NC and at the Central Crops Research Station in Clayton, NC. Treatment factors included N source, N rate, and weed removal time with a factorial treatment arrangement. The N sources included urea ammonium nitrate (UAN), chicken litter (CCL) and sulfur coated urea (SCU) with rates of 0 kg N/A, 27.22 kg N/A, 54.43 kg N/A, and 81.65 kg N/A. Weed removal times were at 0 (weed free), 7.62, and 15.24 cm heights. Significant year, nitrogen source, and weed removal height effects were observed for corn yield. Differences based on year are not surprising considering the differences in weather patterns between the two seasons. Significance based on source could also have been predicted due to the different sources being used with an organic source, and two synthetic sources one of which was a time release fertilizer. When weeds were allowed to remain in the field with corn, the weeds were able to compete with the corn for nitrogen over a greater time period therefore reducing corn yield potential which showed the importance of the critical period of weed removal.

WEED CONTROL PROGRAMS IN SORGHUM CONTAINING DUPONT™ INZEN™ Z HERBICIDE TOLERANCE TRAIT. R. N. Rupp*[1], E. P. Castner[2], R. M. Edmund[3], M. T. Edwards[4], C. R. Medlin[5], D. Saunders[6]; [1]DuPont Crop Protection, Edmond, OK, [2]DuPont Crop Protection, Weatherford, TX, [3]DuPont Crop Protection, Little Rock, AR, [4]E. I. DuPont, Pierre Part, LA, [5]DuPont Crop Protection, Paradise, TX, [6]DuPont, Johnston, IA (42)

NO ABSTRACT SUBMITTED

RATES AND TIMING OF DESICCANT APPLICATION FOR SORGHUM IN NC. R. Riar*, W. J. Everman; North Carolina State University, Raleigh, NC (43)

ABSTRACT

Desiccants are important harvest aids in sorghum production. They are applied to terminate the green crop after it has reached physiological maturity, and to kill any weeds that may be present in the field. Three chemicals, Sodium Chlorate, Glyphosate, and Carfentrazone are labeled for use as desiccants in North Carolina. No research data exist in North Carolina regarding the efficacy of these chemicals in killing the crop and the weeds. Also, timing of desiccant application is vital for getting good yield and test weight, as too early application can hurt both yield and test weight, while late application might be a waste of money and time, as they may no longer be needed. Therefore, to get a better understanding of desiccant efficacy in NC, three desiccants were evaluated at three stages of seed head maturity. Sodium Chlorate at 4.5 and 6 lb/acre, Carfentrazone at 2 oz/acre, and Glyphosate at 1.5 lb a.e./acre were applied at 100% green head (early), 50% brown head (mid) and 100% brown head (late) stages. Non-treated controls were included for comparison. The plots were evaluated for yield, test weight, and moisture content of seeds. Sodium chlorate and glyphosate were effective in terminating the crop and causing desiccation and drying of the green leaves and stalk at all stages of head maturity. Carfentrazone was not effective as a crop desiccant because it did not kill or dry the plants. These plots resembled the non-treated checks during the season and in terms of yield as well, regardless of stage of application. Early and mid applications of Sodium Chlorate and Glyphosate caused a significant reduction in yield compared to late application and the non-treated check. Early application of both these desiccants dropped the test weight below the official figure of 55. It is clear from these results that early application of desiccants before most of the seeds in the head reach physiological maturity can cause a significant decline in yield and test weight. Growers should wait until most of the heads in a field have reached close to 90% brown head before terminating the crop.

RECOVERY AND YIELD POTENTIAL OF CONVENTIONAL AND HYBRID RICE FOLLOWING INJURY FROM PRE-APPLIED COMMAND. S. S. Rana*, J. K. Norsworthy, D. B. Johnson, Z. T. Hill, D. S. Riar, B. W. Schrage, M. T. Bararpour, H. D. Bell; University of Arkansas, Fayetteville, AR (44)

ABSTRACT

Clomazone, an isoxazolidinone herbicide, is effectively used for preemergence (PRE) grass control in rice. However, use of clomazone on light-textured soils can cause severe rice injury in the form of foliar bleaching. Recommended seeding rates for hybrid rice (6 seed/ft of row) are one-fourth those for conventional rice (24 seed/ft of row); hence, the ability to recover from early-season clomazone injury and establish a dense crop canopy may differ between conventional and hybrid rice. Therefore, a field trial was conducted at Stuttgart (silt loam soil), AR, in 2012 to determine the potential of conventional and hybrid rice to recover from PRE-applied clomazone injury as a function of seeding rate. Clearfield 152, the conventional variety, and Clearfield XL 745, a hybrid, were planted at 1/3 and 1 times (X) their respective recommended seeding rates. Clomazone is labeled for use in Arkansas rice at rate of 0.3 (medium-textured soils such as silt loams) to 0.6 lb ai/A (fine-textured soils). Clomazone was applied PRE at 0.3, 0.45, 0.6, and 0.75 lb/A. At 2 weeks after treatment (WAT), injury to both conventional and hybrid rice with clomazone at 0.75 lb/A (13 and 10%, respectively) was greater than clomazone applied at 0.3 (5 and 4%, respectively) and 0.45 lb/A (8 and 6%, respectively). However, both varieties recovered from injury over time and no foliar bleaching was observed at 2 wk after flooding. At 1 wk before flooding, canopy groundcover of conventional and hybrid rice was greater at the 1X (34 and 30%, respectively) compared to the 1/3X seeding rate (26 and 18%, respectively). At 2 WAT, the 1/3 and 1X seeding rates of conventional rice had greater stand count (55 and 145 plants/6.6 ft of row, respectively) than the corresponding seeding rates of hybrid rice (18 and 46 plants/6.6 ft of row, respectively). Likewise, 1/3 and 1X seeding rates of conventional rice produced more tillers (139 and 205 tillers/6.6 ft of row, respectively) than the corresponding seeding rates of hybrid rice (105 and 130 tillers/6.6 ft of row, respectively). However, rice yield did not differ among treatments. Data suggest that, although clomazone caused early-season foliar bleaching to rice regardless of cultivar and seeding rate used, at the level of injury seen here rice yield should not differ with rice variety or seeding rate.

BISPYRIBAC-SODIUM TOXICITY ON RICE AND PHYSIOLOGICAL ADAPTATION UNDER COLD STRESS. L. F. Martini*[1], J. A. Noldin[2], N. R. Burgos[3], L. A. Avila[1], J. P. Refatti[1], L. B. Piveta[1], I. M. Pacheco[1]; [1]Universidade Federal de Pelotas, Pelotas - RS, Brazil, [2]EPAGRI, Itajaï¿½ - SC, Brazil, [3]University of Arkansas, Fayetteville, AR (45)

ABSTRACT

Rice yield in Rio Grande do Sul state, Brazil has increased linearly over the years, currently averaging >7 t ha^{-1}. Early sowing is a primary contributor to yield improvement because this sets the reproductive stage with maximum availability of solar radiation. However, early sowing exposes rice seedlings to low temperature stress, which can cause herbicide injury on rice and reduce yield. Bispyribac-sodium, one of the most important non-Clearfield™ rice herbicide for barnyardgrass, occasionally causes high injury when used at early planting. This study aimed to evaluate the selectivity of bispyribac-sodium on rice exposed to cold stress. A growth chamber experiment was conducted in 2012 at the University of Arkansas, Fayetteville. The treatments were arranged in a factorial design, where factor A was rice cultivar: IRGA 424 (cold tolerant) and EPAGRI 109 (cold susceptible); factor B was herbicide treatment (with or without); and factor C was cold stress timing: cold stress for 48 h before herbicide application, cold immediately after herbicide application, cold since emergence, and a check grown at warm temperature. The cold and warm temperatures were 16/22C and 25/30C (night/day), respectively. Bispyribac was applied to 3-leaf rice. Crop injury (%), total phenols (mg g^{-1} FW) and lipid peroxidation (nmol malondialdehyde g^{-1}) at 7 d after application was recorded. Regardless of cultivar, bispyribac-sodium caused greater injury (25%) when applied to rice exposed to cold since emergence. Plants exposed to cold for 2 d before herbicide application showed lesser injury (5%) than the check and those exposed to cold since emergence. Significant interaction between cold treatment and herbicide was detected on lipid peroxidation levels. Without herbicide, both cultivars showed elevated levels of malondialdehyde (MDA) when exposed to cold stress; this was significant in plants grown in cold temperature since emergence (18.5 nmol MDA g^{-1}) compared with nonstressed plants (15 nmol MDA g^{-1}). Herbicide treatment caused higher peroxidation level (25 nmol MDA g^{-1}) in plants continuously exposed to cold than in other stress treatments and nonstressed plants. Averaged over cultivars, without herbicide treatment, plants in cold stress from emergence also had high total phenols (48 mg g^{-1} FW); those exposed to short-duration cold stress and nonstressed plants had similar phenol levels (19-28 mg g^{-1} FW). Herbicide application almost tripled the phenol level in continuously cold-stressed plants relative to nonstressed plants. Averaged over cold stress and herbicide treatments, the cultivars did not differ in injury and lipid peroxidation, but the cold-tolerant IRGA 424 had higher phenol concentration than the susceptible EPAGRI 109. We conclude that cold-acclimated rice plants, for a certain duration, have increased capability to counteract the toxic effects of bispyribac. Prolonged cold stress can decrease bispyribac selectivity on rice as shown by the level of injury and the indicators of oxidative stress. Cold tolerance in rice is partly achieved by increased total phenol production.

RESPONSE OF CONVENTIONAL AND IMIDAZOLINONE-RESISTANT RICE TO ACETOLACTATE SYNTHASE-INHIBITING HERBICIDES IN MIXTURE WITH MALATHION. D. S. Riar*, J. K. Norsworthy, D. B. Johnson, H. D. Bell, S. S. Rana, B. W. Schrage; University of Arkansas, Fayetteville, AR (46)

ABSTRACT

Addition of malathion, a known cytochrome P450 monooxygenase (CYP) –inhibitor, to herbicide programs for control of metabolism-based acetolactate synthase (ALS) -inhibiting herbicide-resistant weeds is not useful in conventional rice as injury to conventional rice can result. However, addition of malathion to herbicide programs might be useful in imidazolinone-resistant (Clearfield®) rice, which is resistant to imazamox and imazethapyr due to a target-site mutation. Studies were conducted at Keiser and Stuttgart, AR, in 2012, to determine the tolerance of conventional (Roy J) and Clearfield® (CL 152) rice to field rate applications of ALS-inhibiting herbicides in mixture with malathion. Clearfield® rice injury with all the herbicide treatments was $\leq$3% at Keiser and Stuttgart. In contrast, injury to conventional rice from bispyribac-sodium, imazamox, and imazethapyr applied in mixture with malathion (10 to 46%, 89 to 93%, and 88 to 89% respectively) was greater than these herbicides applied alone (2 to 13%, 59 to 74%, and 55 to 71%, respectively) at both locations. No difference in conventional rice injury was observed between penoxsulam alone (0 to 3%) and penoxsulam in mixture with malathion (5 to 11%). A similar trend was observed for the yield of Clearfield® and conventional rice following treatment with ALS-inhibiting herbicides alone and in mixture with malathion, except treatments with bispyribac-sodium alone yielded similar to bispyribac-sodium in mixture with malathion. These studies demonstrate that malathion in mixture with ALS-inhibiting herbicides can be included as a part of Clearfield® rice programs for the management of metabolism-based ALS-resistant weeds.

DIFFERENTIAL GENE EXPRESSION IN RICE AND RED RICE SEEDLINGS EXPOSED TO COLD AND SEEDING DEPTH STRESSÂ . C. Bevilacqua*[1], N. R. Burgos[1], A. Pereira[1], P. D. Zimmer[2]; [1]University of Arkansas, Fayetteville, AR, [2]Universidade de Pelotas, Pelotas, Brazil (47)

ABSTRACT

Plants have strategic adaptations to harsh environments especially after germination when stress avoidance is no longer possible. Temperature stress occurs at any ontogenic period during crop production affecting a large array of developmental processes. Rice seedlings are subjected to stress created by deep sowing as well as low temperatures at early planting times. Plant species have different capabilities to tolerate cold stress and to emerge from greater depth. It has been shown that weedy red rice is more physiologically adapted to deep sowing than rice cultivars. Likewise, some rice genotypes are more tolerant to cold stress than others. Such adaptations are driven by gene networks, of which very little is known but the responses of rice to cold temperature and depth stress are still poorly understood. The objective of this study was to characterize the response of weedy red rice accessions to depth stress, starting with measurements of seedling shoot length under seeding depths. We then selected the depth-tolerant red rice ecotype 116, and the cultivars BRS6 Chui (cold sensitive) and Diamante (cold tolerant) or further experiments. Esterase isoenzyme analysis was done on these plant materials under cold stress (18C-10 h/13C-14 h temperature). We observed two cold-inducible isoforms in all the three genotypes. We also analyzed the expression of different cold-inducible genes including Germin, ASR1, JRC2606 and JRC0937 under cold stress (18C-10 h/13C-14 h temperature) and at different seedling depths (1.5cm, 5cm, 10cm and 15cm respectively) by qPCR. ASR1, Germin, JRC3606 were induced by increasing sowing depths in all genotypes, while JRC3709 was repressed under cold stress and greater sowing depths. Germin was induced also by cold stress in all genotypes. ASR1 was cold-induced in the rice cultivars, but was repressed by cold stress in weedy red rice 116. JRC 2606 and JRC 3709 were down regulated in all genotypes under cold stress. These data will provide insight into the molecular mechanism of cold tolerance and the physiological responses of rice cultivars to cold stress and sowing depths as compared with weedy red rice.

PLANTING DATES EFFECT ON THE YIELD AND DYNAMICS OF RED RICE (*ORYZA SATIVA*). G. M. Sartori[1], E. Marchesan[1], G. M. Telo*[2], S. A. Senseman[2], C. Azevedo[1], L. Coelho[1], M. Oliveira[1]; [1]Federal University of Santa Maria, Santa Maria, Brazil, [2]Texas A&M University, College Station, TX (48)

ABSTRACT

Planting date and red rice competition are among the most important factors affecting rice grain yield. The objective was to evaluate the effect of planting date on red rice efficacy of sequential applications of the herbicide imazapyr + imazapic on control of red rice and grain yield of irrigated rice. The experiments were planted on the following dates (9/30, 10/19, 11/08 and 12/01) for the 2010/11 harvest season and (09/27, 10/17, 11/08 and 12/05) for the 2011/12 harvest season at Universidade Federal de Santa Maria, Santa Maria-RS, Brazil. The treatments included applications of the herbicide imazapyr + imazapic at 105+35 g a.i. ha^{-1} pre-emergence at the moment of emergence of the coleoptile (PRE); 52.5+17.5 g a.i. ha^{-1} PRE followed by 52.5+17.5 g a.i ha^{-1} post emergence the stage of plant development in V_3/V_4 (PRE + POST); and 105+35 g a.i. ha^{-1} POST and an untreated check. The cultivar used was the Puitá Inta CL, and the design was a randomized block design with four replications. There was less emergence of red rice and higher grain yield of irrigated rice from early planting period (09/30/10 and 09/27/11), with 10,578 and 8,653 kg ha^{-1}, respectively. Applications made later (12/01/10 and 12/05/11) responded with greater reductions in the red rice seed bank. Planting early provides more irrigated rice grain yield. The application of imazapyr + imazapic at a dose of 52.5+17.5 g a.i. ha^{-1} PRE + 52.5+17.5 g a.i. ha^{-1} POST, and 105+35 g a.i. ha^{-1} PRE or POST only were effective in controlling red rice.

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THE EFFICACY OF RICEBEAUX AND IMAZETHAPYR TIMINGS ON THE CONTROL OF RED RICE (*ORYZA SATIVA L.)*Â IN IMIDAZILINONE-TOLERANT RICE (*O. SATIVA).* T. N. Jones*[1], S. A. Senseman[1], G. N. McCauley[2], E. R. Camargo[1], B. M. McKnight[1]; [1]Texas A&M University, College Station, TX, [2]Texas A&M Agrilife Research, Eagle Lake, TX (49)

ABSTRACT

The Clearfieldâ„¢ rice production system, used in imidazolinone tolerant rice, has increasingly been used to control troublesome weeds such as red rice in Texas and in other rice producing areas.Â Research has shown cases of weed resistance to the imidazolinone herbicides that are used in this system.Â Due to the risk of red rice developing resistance, this program could quickly lose effectiveness if other herbicides are not utilized to limit red rice escapes.

Ricebeauxâ„¢ is a registered rice herbicide produced by Rice Co. that could prolong the effectiveness of the Clearfieldâ„¢ production system.Â It contains a photosystem II inhibitor, propanil, as well as a fatty acid and lipid biosynthesis inhibitor, thiobencarb.Â Research has indicated that when utilized with imazethapyr, a common imidazolinone herbicide, red rice control is increased. Â This could have a positive impact on rice producers currently using Clearfieldâ„¢ technology.Â One hypothesis is that the synergistic interaction is due to the emulsifiable concentrate formulation of Ricebeauxâ„¢.Â This might result in increased absorption and translocation of imazethapyr, which in turn, would provide enhanced red rice control.Â This study will focus on the efficacy of different timings of Ricebeauxâ„¢ and Newpathâ„¢ applications in red rice control.Â Future research will also investigate the interactions of Ricebeauxâ„¢ with the translocation and absorption of imazethapyr.

TIMING OF HERBICIDE PROGRAMS FOR BROADLEAF AND SEDGE WEED CONTROL IN RICE. N. D. Fickett*, E. P. Webster, B. M. McKnight, J. C. Fish; LSU AgCenter, Baton Rouge, LA (50)

ABSTRACT

Studies were established in 2011 and 2012 at the Louisiana State University Agricultural Center Rice Research Station (RRS) near Crowley, Louisiana and in 2012 at the Northeast Research Station near St. Joseph, Louisiana to evaluate herbicides for the control of Indian jointvetch (*Aeschynomene indica* L.), hemp sesbania [*Sesbania exaltata* (Raf.) Cory], Texasweed [*Caperonia palustris* (L.) St. Hil.], alligatorweed [*Alternanthera philoxeroides* (Mart.) Griseb.], and yellow nutsedge (*Cyperus esculentus* L.). Three studies with three site-years each evaluated the efficacy 15 herbicides in controlling Indian jointvetch, hemp sesbania, Texasweed, alligatorweed, and yellow nutsedge at two- to three-leaf rice or early-postemergence (EPOST), at three- to four-leaf rice or mid-postemergence (MPOST), and at four- to five-leaf rice or late-postemergence (LPOST). Texasweed and alligatorweed were only evaluated in 2012 at the RRS. The studies followed a randomized complete block design with four replications. Clomazone at 0.34 kg ai ha^{-1} was applied preemergence to each location. The treatments were: propanil at 3.4 kg ai ha^{-1}, halosulfuron at 53 g ai ha^{-1}, halosulfuron at 35 g ai ha^{-1} plus thifensulfuron at 4 g ai ha^{-1}, bensulfuron at 42 g ai ha^{-1}, orthosulfamuron at 70 g ai ha^{-1}, penoxsulam at 35 g ai ha^{-1}, quinclorac at 0.45 kg ai ha^{-1}, triclopyr at 0.28 kg ai ha^{-1}, carfentrazone at 18 g ai ha^{-1}, bispyribac at 28 g ai ha^{-1}, imazosulfuron at 0.16 kg ai ha^{-1}, saflufenacil at 50 g ai ha^{-1}, quinclorac at 0.42 kg ai ha^{-1} plus carfentrazone at 25 g ai ha^{-1}, penoxsulam at 48 g ai ha^{-1} plus triclopyr at 0.40 kg ai ha^{-1}, and orthosulfamuron at 62 g ai ha^{-1} plus halosulfuron at 17 g ai ha^{-1}. A crop oil concentrate was added at 1% v/v to all herbicides except propanil. A nontreated was added for comparison purposes. Visual ratings were recorded as percent control at 21 d after treatment (DAT) for the EPOST and the LPOST studies, and at 28 DAT for the MPOST study. Data were analyzed using an analysis of variances, and LSD at α=0.05 was used to determine mean differences. In the EPOST study, Indian jointvetch control was 97 and 98% with imazosulfuron, penoxsulam plus triclopyr, respectively, all other herbicides controlled Indian jointvetch less than 90%. Hemp sesbania control was 90 to 96% with orthosulfamuron, imazosulfuron, carfentrazone plus quinclorac, and orthosulfamuron plus halosulfuron. Texasweed control was 91 to 97% with imazosulfuron, saflufenacil, penoxsulam plus triclopyr, and orthosulfamuron plus halosulfuron. Penoxsulam was the only herbicide that controlled alligatorweed above 90%. Yellow nutsedge control was 93 to 98% with imazosulfuron and all halosulfuron containing herbicides. In the MPOST study, Indian jointvetch control was 47 to 83% when treated with bensulfuron, quinclorac, triclopyr, and carfentrazone all other herbicides resulted in 90 to 98% control. Hemp sesbania control was less than 70% when treated with triclopyr, carfentrazone, and penoxsulam plus triclopyr; however, all other herbicides resulted in 90 to 98% control. Texasweed control was 90 to 98% with bispyribac, imazosulfuron, saflufenacil, penoxsulam plus triclopyr, and orthosulfamuron plus halosulfuron. Penoxsulam, penoxsulam plus triclopyr, and bixpyrbac controlled alligatorweed 98, 98, and 87%, respectively; however, alligatorweed control was below 50% when treated with all other herbicides. Halosulfuron containing herbicides controlled yellow nutsedge above 90%, with 97 to 100% control. In the LPOST study, Indian jointvetch control was 42 to 70% when treated with propanil, bensulfuron, triclopyr, and carfentrazone all other herbicides controlled Indian jointvetch 84 to 98%. Hemp sesbania control was 98% with all halosulfuron containing herbicides. Texasweed control was 94 to 96% with bensulfuron, imazosulfuron, and saflufenacil. Alligatorweed control was 90 to 98% with penoxsulam, quinclorac, triclopyr, and penoxsulam plus triclopyr. Yellow nutsedge control was 91 to 98% with all halosulfuron containing herbicides and imazosulfuron. Rice injury was only present when treated with saflufenacil. This was primarily at the EPOST timing with 30% injury. In 2012 at RRS, the MPOST timing had 20% injury. In all cases, except for 2012 at RRS with saflufenacil EPOST, the rice recovered. In conclusion, the MPOST was the most consistent timing for all weeds evaluated. Imazosulfuron was the most consistent herbicide evaluated. The LPOST timing is probably too late to obtain acceptable weed control; also, when control is achieved at a high level, rice yield is already reduced due to prolonged competition. In many cases the EPOST study had weed emergence following the application.

THE IMPACT OF VOLUNTEER RICE INFESTATION ON RICE YIELD AND GRAIN QUALITY. V. Singh*[1], N. R. Burgos[1], S. Singh[1], R. A. Salas[1], D. R. Gealy[2]; [1]University of Arkansas, Fayetteville, AR, [2]USDA-ARS, Stuttgart, AR (51)

ABSTRACT

Volunteer rice (*Oryza sativa* L.) is a crop stand which emerges from shattered seeds of the previous crop and reduces the commercial value of cultivated rice products as kernel whiteness and uniformity are important component of milled rice market quality. To evaluate the effect of volunteer rice infestation on rice yield and grain quality, a survey of 10 farmers' fields was conducted in the fall of 2012. Samples were collected from 6 rice growing counties in Arkansas, targeting fields with a history of hybrid rice. Panicles were collected from 1-m^2 area representing different levels of infestation across the field. Culms of volunteer and cultivated rice were counted. The total grain yield of rice was significantly reduced by 0.6% for every one percent of volunteer rice in the field. The 1000-kernel weight, kernel length-width ratio, % protein and % chalk of cultivated rice grain were independent of the level of volunteer rice infestation. Fields with repeated use of Clearfield™ hybrid rice over three to four years reported highest infestation of volunteer rice. The level of potential crop losses in terms of yield loss, and grain quality due to volunteer rice has an economic impact on rice industry and requires effective management

NON-CHEMICAL STRATEGIES FOR HERBICIDE-RESISTANCE MANAGEMENT IN BARNYARDGRASS IN RICE. M. V. Bagavathiannan*[1], J. K. Norsworthy[1], K. L. Smith[2], P. Neve[3]; [1]University of Arkansas, Fayetteville, AR, [2]University of Arkansas-Extension, Monticello, AR, [3]University of Warwick, Warwick, England (52)

ABSTRACT

Herbicide-resistance in barnyardgrass is a serious problem in Midsouth rice production. As a result of resistance to a number of herbicides (propanil, quinclorac, clomazone, and imazethapyr), the herbicide options available for effective, season-long, barnyardgrass control are limited. The widespread adoption of Clearfield™ rice, often grown with limited or no crop rotation, has been exerting enormous selection pressure for resistance for the herbicides commonly used in this system. The common herbicide programs in Clearfield™ rice consists of the acetolactate synthase (ALS)-inhibiting herbicides (specifically imazethapyr and imazamax) and the acetyl-CoA carboxylase (ACCase)-inhibiting herbicides, notably fenoxaprop and cyhalofop. If resistance evolves to the ACCase-inhibiting herbicides, it will be very challenging to achieve effective barnyardgrass control in Clearfield™ rice. It is crucial that non-chemical strategies are integrated in the existing weed management programs to eliminate selection pressure and preserve the long-term utility of the few remaining herbicide options. A simulation model was developed to predict the simultaneous evolution of barnyardgrass resistance to ALS- and ACCase-inhibiting herbicides in Clearfield™ rice system and was used to understand the value of different non-chemical strategies in preventing/delaying resistance in barnyardgrass. Results suggest that preplant tillage, adjusting planting date, early flooding or rapid flooding, and increased seeding rate are useful strategies. Tillage can achieve total elimination of weed seedlings recruited prior to planting, whereas relying on a burndown herbicide such as glyphosate may lead to escapes due to ineffective spray coverage, environmental conditions, among others. In situations where preplant tillage is practiced, delayed rice planting is beneficial, whereas advancing rice planting is useful if a burndown herbicide (glyphosate) is relied upon. Because tillage can achieve total weed control, the benefits are well realized when a greater number of weed recruits is subjected to tillage. Flooding is an effective cultural strategy because it prevents the emergence of the majority of weeds, including barnyardgrass. In most rice fields in the Mississippi Delta region, it typically takes several days to flood the entire field. In such situations, the risk of resistance could be minimized by advancing the initiation of flooding. Increasing rice seeding rate can increase rice competition on barnyardgrass, but the benefits are minimal because of the poor canopy formation potential of rice particularly prior to flooding and the high cost of hybrid rice seeds. Although the benefits provided by each strategy are nominal, they can make a substantial difference when combined together. While rice culture provides limited opportunities for integrating diverse herbicide rotations with non-chemical strategies such as narrow-row spacing, planting density, cultivation, etc., such opportunities exist in the rotational crops. Research is underway to simulate crop rotation and a number of additional non-chemical strategies.

PALMER AMARANTH AND PITTED MORNINGGLORY CONTROL USING VARIOUS COMBINATIONS OF 2,4-D, GLYPHOSATE, AND GLUFOSINATE. D. D. Joseph*[1], C. H. Sanders[1], M. W. Marshall[2]; [1]Clemson University, Clemson, SC, [2]Clemson University, Blackville, SC (53)

ABSTRACT

Glyphosate- and ALS-resistant Palmer amaranth biotypes continue to spread throughout South Carolina, especially in areas where proactive resistance management is not practiced. Recent research has shown the limitations of our current herbicide portfolio in soybeans, especially when faced with glyphosate- and ALS-resistant Palmer amaranth. With dicamba- and 2,4-D-based herbicide programs on the horizon, weed size will play an important role in efficacy on broadleaf weeds. Current herbicide partners including glyphosate and glufosinate will continue to play a role in those new crop technologies. Therefore, research studies were initiated to quantify effectiveness of combinations of 2,4-D, glyphosate, gufosinate, and dicamba for control of Palmer amaranth and pitted morningglory. Field experiments were conducted in 2011 and 2012 at Clemson University Edisto Research and Education Center (EREC) located near Blackville, SC. Experimental design consisted of a randomized complete block with 4 replications with individual plot sizes of 6.3 by 35 ft. Non-crop field sites were chosen for these experiments with natural infestations of Palmer amaranth and pitted morningglory. In Study 1, postemergence herbicides were applied in water on July 21, 2012 at a carrier volume of 15 GPA with a pressure of 34 PSI. Palmer amaranth and pitted morningglory percent (%) visual control ratings were collected 7 and 14 days after herbicide treatments included combinations of dicamba at 0.5 and 1.0 lb ai/A, 2,4-D at 1.0 lb ae/A, glufosinate at 0.53 and 0.79 lb ai/A. application (DAT) on a 0 to 100% scale with 0 indicating no control and 100% equal to complete control. Weed control data and cotton yield data were analyzed using ANOVA and means separated at the P = 0.05 level. In Study 2, postemergence herbicides were applied in water on July 14, 2012 at a carrier volume of 15 GPA with a pressure of 34 PSI. Herbicide treatments included combinations of glyphosate at 0.75 lb ae/A, dicamba at 0.25, 0.375, and 0.5 lb ai/A, 2,4-D at 1.0 lb ae/A. Palmer amaranth percent (%) visual control ratings were collected 7 and 21 DAT on a 0 to 100% scale with 0 indicating no control and 100% equal to complete control. Weed control data and cotton yield data were analyzed using ANOVA and means separated at the P = 0.05 level. In Study 1, glufosinate (0.53 or 0.79 lb ai/A) plus dicamba or 2,4-D programs provided excellent control of mid-size Palmer amaranth (98% or better control). Palmer amaranth control with 2,4-D alone provided marginal control (83%) at 7 DAT; however, control decline to 75% due to regrowth from treated plants. Dicamba at 1.0 lb ai/A provided good to excellent control of Palmer amaranth. Pitted morningglory control was similar with dicamba and 2,4-D at 7 DAT; however, dicamba at 1.0 lb ai/A provided highest level of control at 14 DAT. Any glufosinate containing treatment provided 100% control of pitted morningglory. 2,4-D alone provided 93% or better control of mid-size, vining pitted morningglory. Dicamba (0.375 and 0.5 lb ai/A) improved glyphosate efficacy on small Palmer amaranth. Similar trend was observed with significantly higher levels of Palmer amaranth control with higher rates of dicamba. More variation in control of larger Palmer amaranth was observed in the glyphosate plus 2,4-D treatments. Dicamba at 0.375 and 0.5 lb ai/A plus improved the consistency of large Palmer amaranth control with glyphosate combinations. In summary, glufosinate plus dicamba or 2,4-D based combinations provided excellent control of small to mid-size Palmer amaranth. In 2,4-D alone treatments, Palmer amaranth control was more variable especially where height was greater than 3-inches. Palmer amaranth control declined significantly with dicamba-alone treatment as size increased (>6 inches); however, higher rates of dicamba were needed to offset this effect. Any combination of glufosinate or glyphosate plus dicamba provided excellent control of pitted morningglory.

ITALIAN RYEGRASS CONTROL WITH FALL RESIDUAL HERBICIDES. S. A. Shinkle*, J. A. Bond, T. W. Eubank, H. M. Edwards, G. B. Montgomery; Mississippi State University, Stoneville, MS (54)

ABSTRACT

Glyphosate-resistant (GR) Italian ryegrass (*Lolium perenne* ssp. *multiflorium*) was first documented in field crops in Washington County, Mississippi, in 2005. Thirty-one counties in Mississippi now contain populations of GR Italian ryegrass. Fields with GR Italian ryegrass not controlled at burndown will have significant plant residue at planting. Residue will impede planting practices, contribute to competition between crop seedlings and established GR Italian ryegrass, and hinder herbicide programs due to inadequate coverage. Populations of Italian ryegrass with multiple resistance to glyphosate, ALS inhibitors, and ACCase inhibitors in the Mississippi Delta greatly reduce the quantity of herbicides effective for control after crops emerge. Research demonstrated that residual herbicides applied in the fall (mid-October to mid-November) offer the best opportunity for controlling GR Italian ryegrass. The most effective fall residual herbicides have been identified as Boundary, Command, Dual Magnum, and Treflan. Understanding the response of GR Italian ryegrass to fall residual herbicides is important for developing effective management programs in Mississippi. The study was conducted in 2011-12 at an on-farm site near Elizabeth, MS, known to be infested with GR Italian ryegrass. Soil at the research site was a Dundee very fine sandy loam with a pH of 6.7 and 1.2% organic matter. Individual plots were 10 by 40 feet. The experimental design was a randomized complete block with four replications. Herbicide treatments were applied on November 7, 2011, and are listed in Table 1. All applications included Gramoxone SL (paraquat) at 0.75 lb ai/A and a crop oil concentrate at 1% (v/v). Treatments were applied with a tractor-mounted sprayer equipped with a compressed air sprayer set to deliver 15 GPA. A nontreated check was included for comparison. Glyphosate-resistant Italian ryegrass control was visually estimated at 42, 74, 107, and 134 d after treatment (DAT). Data were subjected to ANOVA with means separated by Duncan's multiple range test at P=0.05. All fall residual herbicides controlled GR Italian ryegrass at least 91% except Warrant. GR Italian ryegrass control with Sencor was less than that with Boundary although it was as effective as most treatments. Warrant controlled GR Italian ryegrass less than all other treatments. Fierce and Zidua at 0.11 lb/A controlled GR Italian ryegrass less than Zidua at 0.13 lb/A. Boundary controlled more GR Italian ryegrass than Alert, Axiom, Command, Fierce, Sencor, and the lower rate of Zidua. No treatments evaluated in the current research controlled GR Italian ryegrass better than currently recommended fall residual herbicides. Axiom, Fierce, Sencor, and Zidua at 0.11 lb/A did not provide the length of residual control that was observed with other fall residual herbicides. Fall applications of Warrant were ineffective for GR Italian ryegrass control. The lack of control with Warrant is likely due to its encapsulated formulation. Harness and Warrant contain the same active ingredient, and Harness controlled GR Italian ryegrass 86 to 94% at all evaluations.

RESPONSE OF RAGWEED PARTHENIUM (*PARTHENIUM HYSTEROPHORUS*) TO PYRAFLUFEN ETHYL.
J. V. Fernandez*[1], D. C. Odero[2], G. E. MacDonald[1], J. Ferrell[1]; [1]University of Florida, Gainesville, FL, [2]University of Florida, Belle Glade, FL (55)

ABSTRACT

Ragweed parthenium is an aggressive annual weed of tropical and subtropical environments. Increased occurrence of ragweed parthenium has been noted in the Everglades Agricultural Area (EAA) of southern Florida, where it is commonly found along field edges, canals, ditch banks, roadsides, and disturbed sites. Glyphosate is the predominant herbicide used for weed control along noncrop areas in the EAA. However, lack of response of ragweed parthenium to glyphosate has been reported. Therefore, field and container studies were conducted in Belle Glade, FL, in 2012 to evaluate pyraflufen-ethyl efficacy on POST burndown of flowering and rosette ragweed parthenium, respectively. Flowering and rosette ragweed parthenium were treated with 0, 0.46, 0.91, 1.82, 3.64, 7.3, and 14.6 g ha^{-1} of pyraflufen-ethyl. Visual control of flowering ragweed parthenium was assessed at 7, 14, and 21 d after treatment (DAT) on a scale of 0 to 100 (0 = no control, 100 = complete control). Rosette ragweed parthenium were harvested at the soil level 14 DAT and dried to determine aboveground dry weight. Log-logistic models were used to determine the herbicide rate required to produce 90% control (ED_{90}). The ED_{90} for flowering ragweed parthenium control was estimated to be 12.0, 14.5, and 11.3 g ha^{-1} of pyraflufen-ethyl at 7, 14, and 21 DAT, respectively. The rate required to cause 90% growth reduction of rosette ragweed parthenium at 14 DAT was 1.9 g ha^{-1} of pyraflufen-ethyl. The labeled use rate of pyraflufen-ethyl for burndown of broadleaf weeds is 0.91 to 3.64 g ha^{-1}. Our results show that pyraflufen-ethyl provides control of rosette ragweed parthenium within the labeled use rate. However, very high rates of pyraflufen-ethyl (>11.0 g ha^{-1}) are required for control of flowering ragweed parthenium. This demonstrates that pyraflufen-ethyl must be applied at the early stages of ragweed parthenium growth for effective control.

ENHANCED CONTROL OF *CONYZA* SPP. WITH SAFLUFENACIL PLUS LOW RATE COMBINATIONS WITH QUINCLORAC, DICAMBA AND SULFONYLUREA HERBICIDES. P. H. Munger[1], K. E. Keller*[2], G. W. Oliver[3], S. K. Bangarwa[4], J. S. Harden[2], S. J. Bowe[2]; [1]BASF, Dinuba, CA, [2]BASF, Research Triangle Park, NC, [3]BASF, Apex, NC, [4]BASF, Fresno, CA (56)

ABSTRACT

Saflufenacil is a protoporphyrinogen-oxidase (PPO) inhibiting herbicide. Resistance to PPO herbicides occurs relatively infrequently; however, resistant weed biotypes are known to exist. Several management strategies are recommended to reduce the potential for resistance development, such as tank mix applications with herbicides having different modes of action (MOA). Saflufenacil is an effective herbicide for burndown of *Conyza spp*., including biotypes resistant to glyphosate. Greenhouse and field studies were conducted to determine if treatments of saflufenacil plus herbicides with a different MOA would offer an effective strategy in managing potential development of PPO resistant *Conyza* biotypes. Combinations of saflufenacil with quinclorac, dicamba and sulfonylurea herbicides were tested to determine if efficacy and regrowth suppression could be achieved. Methylated seed oil (1% v/v) and ammonium sulfate (1 or 2% w/v) were applied with all treatments in both greenhouse and field studies**.** In the greenhouse, good control and regrowth suppression of glyphosate resistant *C. bonariensis* and *C. canadensis* were achieved when saflufenacil plus glyphosate (6, 12.5 g ai ha^{-1} + 300 g ai ha^{-1}) were tank mixed with rimsulfuron ($\geq$17.5 g ai ha^{-1}), tribenuron ($\geq$ 4.4 g ai ha^{-1}) and dicamba ($\geq$ 140 g ai ha^{-1}) . The most effective treatments were mixtures of saflufenacil plus glyphosate with metsulfuron (0.5 to 2 g ai ha^{-1}), quinclorac (35 to 560 g ai ha^{-1}) or dicamba (140 g ai ha^{-1}). Compared to saflufenacil alone, regrowth following these treatments was eliminated or significantly reduced, exhibiting compaction of internodes, as well as epinasty and/or chlorosis. In a North Carolina field study, combination of saflufenacil (12.5 and 25 g ai ha^{-1}) and quinclorac at 53 and 105 g ai ha^{-1} provided excellent control and significantly inhibited regrowth of non-glyphosate resistant *C. canadensis.* Similar results were seen in California field trials with glyphosate resistant *C. bonariensis* when quinclorac (25, 50, and 100 g ai ha^{-1}) was combined with glyphosate plus saflufenacil (12.5 and 25 g ai ha^{-1}). Results suggest that tank mixes of saflufenacil +/- glyphosate with certain ALS inhibitor herbicides, dicamba or quinclorac may provide more effective control and offer an effective treatment approach in managing development of PPO herbicide resistance in *Conyza spp.* and potentially other weeds.

EVALUATION OF PREEMERGENCE HERBICIDES IN PEANUT.
T. A. Baughman*[1], H. Curry[2], P. A. Dotray[3], W. Grichar[4]; [1]Oklahoma State University, Ardmore, OK, [2]Oklahoma State University, Stillwater, OK, [3]Texas AgriLife Research, Lubbock, TX, [4]Texas AgriLife Research, Yoakum, TX (57)

ABSTRACT

Peanut is both a slow and low growing crop making early season weed control essential to producing a high yielding and quality crop. One of the most effective ways to ensure this is through the use of preemergence (PRE) herbicides as part of an overall weed management system. As weed resistance continues to be an increasing problem in crop production, this also often allows the use of different modes of action, which assist in a reducing potential resistance issues. Herbicide studies were conducted in Oklahoma and Texas to evaluate the effectiveness of various PRE herbicides applied alone and in combination for weed control in peanut. Typical small plot research techniques were employed in all trials. Trials were conducted at the Wes Watkins Agricultural Research and Extension Center near Lane, OK, and the Texas A&M AgriLife Research Stations near Halfway and Yoakum, TX. Two trials were conducted in Oklahoma and Texas during the 2012 growing season evaluating Valor SX and Fierce PRE programs alone. Injury was less than 10% season long at both locations with PRE applications of Valor SX and Fierce. Pigweed (Tumble - *Amaranthus albus*, Oklahoma, and Palmer – *Amaranthus palmeri*, Texas) control was at least 98% with all treatments. Southern crabgrass [*Digitaria ciliaris* (Retz.) Koel.] control was over 90% early season with the 4.5 oz/A rate of Fierce and 65% late season in Oklahoma. Southern crabgrass control was never over 55% with Valor SX at any time during the season. Citronmelon (*Cucumis melo* L.) control was at least 85% control season long with Fierce at 4.5 oz/A in Oklahoma. Devil's-claw [*Proboscidea louisianica* (Mill.) Thellung] control was at least 80% with all treatments in Texas. Four trials were conducted in Texas during the 2011 and 2012 growing season evaluating Valor SX, Dual Magnum, and Warrant either alone or followed postemergence by Cobra. No injury was reported in Yoakum in either year and injury was less than 5% with all treatments at Halfway in 2012. Peanut injury was 10% midseason at Halfway in 2011 with both Valor SX and Dual Magnum. No injury was observed with Warrant in either year at Halfway. Palmer amaranth control with all PRE treatments was 99% or greater early season at both locations. Only Dual Magnum followed by Cobra controlled Palmer amaranth at least 85% in 2011 at Halfway while all PRE treatments followed by Cobra provide at least 90% control in 2012. Palmer amaranth control was 100% with all treatments at Yoakum later in the season except Dual Magnum alone in 2011. All PRE treatments followed by Cobra controlled devil's- claw (2012 – Halfway) and smellmellon (2011 and 2012 – Yoakum) at least 90%. Horse purslane (*Trianthema portulacastrum*) control was at 94% with all treatments at Yoakum in 2011. The only treatment that controlled Texas millet (*Urochloa texana*) at least 90% late season was Warrant followed by Cobra at Yoakum in 2012.

IMPACT OF POST EMERGENCE APPLICATIONS OF 2,4-D AND DICAMBA ON PEANUT. S. Berger*[1], J. Ferrell[1], R. G. Leon[2]; [1]University of Florida, Gainesville, FL, [2]University of Florida, Jay, FL (58)

ABSTRACT

Peanut is susceptible to the synthetic auxin herbicides dicamba and 2,4-D. With the release of cotton varieties resistant to these herbicides, unintentional post emergence applications to peanut are possible, either by drift or tank contamination. Therefore, the objective of this research was to document of the response of peanut to varying rates and timings of dicamba and 2,4-D. Each herbicide was applied 30 or 60 days after planting (DAP) at rates of 0.035, 0.07, 0.14, 0.28, and 0.56 kg ha^{-1}. Peanut injury and yield were evaluated in 2012 in Citra, FL. For dicamba, application timing was not significant and data were pooled. Dicamba was observed to reduce peanut yield up to 85% at 0.56 kg ha^{-1} and 29% at 0.035 kg ha^{-1}, both of which were significant from the untreated. Conversely, 2,4-D applications of 0.035 to 0.14 kg ha^{-1} at 30 DAP did not affect yield nor cause observable injury past 7 DAT. When 2,4-D was applied at 0.56 kg ha^{-1}, yield was reduced to 54% relative to the untreated. Applications made at 60 DAP had less impact on yield and injury than those made 30 DAP. From these data it was observed that postemergence dicamba applications cause more severe peanut injury than identical rates of 2,4-D. Therefore, all care should be taken if either of these herbicides, but particularly dicamba, is to be applied near peanuts.

PEANUT RESPONSE TO 2,4-DB + LACTOFEN COMBINATIONS. J. Ferrell*[1], R. G. Leon[2]; [1]University of Florida, Gainesville, FL, [2]University of Florida, Jay, FL (59)

ABSTRACT

Lactofen plus crop oil adjuvants are increasingly being used to combat ALS-resistant weeds in peanut production. To control a broader spectrum of weeds, it is desirable to mix 2,4-DB with lactofen. However, lactofen can be highly injurious to peanuts and it is unknown if the addition of 2,4-DB will exacerbate or prolong the injury observed by lactofen. Experiments were conducted in Citra and Jay, FL in 2011 and 2012 to examine the impact of lactofen, 2,4-DB and lactofen + 2,4-DB applied at 15, 30, and 45 days after planting (DAP) on peanut injury and yield. It was observed that 2,4-DB did not increase foliar injury or stunting (as measured by canopy width) compared to lactofen alone. Additionally, yield was not impacted by any herbicide combination or application timing. From these data, lactofen plus 2,4-DB combinations, applied with crop oil adjuvants, can be used with little concern for exacerbating effects peanut on growth or yield relative to lactofen applied alone.

WEED CONTROL AND PEANUT TOLERANCE TO ACETOCHLOR. W. Grichar*[1], P. A. Dotray[2], L. M. Etheredge[3]; [1]Texas AgriLife Research, Yoakum, TX, [2]Texas AgriLife Research, Lubbock, TX, [3]Monsanto, Llano, TX (60)

ABSTRACT

Field studies were conducted in south Texas and the High Plains of Texas during the 2011 and 2012 growing seasons to evaluate weed control and peanut tolerance to acetochlor. Warrant (acetochlor) is an encapsulated herbicide currently labeled for use in soybean and cotton, and may be available for use in peanut in 2014. In one study, pendimethalin at 2.3 L/ha, flumioxazin at 210 g/ha, *S*-metolachlor at 1.6 L/ha, and acetochlor at 3.7 L/ha were applied alone or in a tank-mix combination. In a separate series of treatments, acetochlor PRE was followed by (fb) postemergence (POST) applications of either imazapic at 0.07 kg ai/ha, lactofen at 0.22 kg ai/ha, lactofen plus *S*-metochlor, or lactofen plus acetochlor. The objective of this research was to examine control of various weeds found in the Texas peanut growing regions including Palmer amaranth (*Amaranthus palmeri* S. Wats.), pitted morningglory (*Ipomoea lacunose* L.), horse purslane (*Trianthema portulacastrum* L.), Texas millet [*Urochloa texana* (Buckl.) R. Webster], devil's claw [*Proboscidea louisianica* (P. Mill.) Thellung] and smellmelon (*Cucumis melo* L.) using these PRE herbicides alone or as part of a "system" for season-long weed control. When rated five to six weeks after PRE application, Palmer amaranth was controlled 83 to 100% following all PRE treatments with the exception of pendimethalin alone which provided < 80% control. Pitted morningglory was controlled at least 90% with all PRE treatments. Horse purslane control with pendimethalin, flumioxazin, or acetochlor alone was ≤ 84% while *S*-metolachlor alone controlled 98% and the combination of pendimethalin followed by either imazapic or lactofen controlled 100 %. Texas millet control with acetochlor or S-metolachlor alone or pendimethalin + acetochlor was ≤ 86% while all other herbicide treatment controlled at least 95%. Only pendimethalin PRE followed by imazapic provided acceptable devil's-claw control (100%). Flumioxazin alone, pendimethalin + *S*-metolachlor, and pendimethalin followed by lactofen + acetochlor POST controlled devil's-claw 75%. Smellmelon control with pendimethalin and *S*-metolachlor alone was 74 to 79% while flumioxazin and acetochlor alone controlled 83 to 85%. Pendimethalin followed by either imazapic or lactofen POST improved smellmelon control to at least 99%. In another study, runner (FlavorRunner 458, McCloud, Tamrun OL01, Tamrun OL02, Tamrun OL07), Spanish (OLIN), and Virginia (Brantley, Gregory) market-type peanut cultivars were evaluated following acetochlor at 3.6 (1X) or 7.2 (2X) L/ha applied preplant incorporated (PPI), PRE, early-postemergence (EPOST), and POST. No peanut stunting or yield loss was noted on any peanut cultivar with either acetochlor rate or application timing. In summary, acetochlor was efficacious on a number of weed species in Texas peanut and several cultivars appear to be very tolerant.

CRITICAL PERIOD OF WEED CONTROL IN SNAP BEAN IN SOUTHERN FLORIDA. D. C. Odero*, A. L. Wright; University of Florida, Belle Glade, FL (61)

ABSTRACT

Field studies were conducted in 2011 and 2012 at Belle Glade, FL to evaluate the critical period of weed control (CPWC) in snap bean grown in high organic matter soils of the Everglades Agricultural Area (EAA) of south Florida. Treatments of increasing duration of weed interference and weed-free period were imposed at weekly intervals from 0 to 7 wk after snap bean emergence (WAE). The beginning and end of the CPWC based on 2.5, 5, and 10% snap bean acceptable yield loss was determined by fitting log-logistic and Gompertz models to represent increasing duration of weed interference and weed-free period, respectively. Based on 2.5% yield loss, the CPWC was 6.6 wk beginning 1.1 (first trifoliate leaf) and ending 7.7 WAE (mid pod set, 50% of pods had reached maximum length). At 5% yield loss, the CPWC was 4.9 wk, beginning 1.5 (first to second trifoliate leaf) and ending 6.4 WAE (early pod set, one pod had reached maximum length). At 10% yield loss, the CPWC was 3.1 wk, beginning 1.9 (second trifoliate) and ending 5.0 WAE (early flowering, one open flower). Beginning of the CPWC was hastened while the end of the CPWC was delayed at the different yield loss levels showing that acceptable weed control in snap bean is required throughout much of the growing season to maximize on yields. Therefore, snap bean growers in the EAA should consider use of residual PRE or POST herbicides or a combination of both supplemented with tillage to minimize weed interference throughout much of the growing season.

S-METOLACHLOR AND RAINFALL ALTERS SWEETPOTATO GROWTH AND STORAGE ROOT DEVELOPMENT. I. A. Abukari*[1], M. W. Shankle[2], R. K. Reddy[1], T. F. Garrett[2]; [1]Mississippi State University, Starkville, MS, [2]Mississippi State University, Pontotoc, MS (62)

ABSTRACT

The herbicide *S*-metolachlor is used to control or suppress yellow nutsedge, annual grasses, and several broadleaf weeds in sweetpotato. However, it is perceived that weather conditions may increase the potential risk of herbicide injury to storage roots and lower net profit to the grower. Therefore, information regarding the impact of *S*-metolachlor rate and/or a rainfall event soon after transplanting would be useful for predicting storage root quality at harvest. An experiment was conducted in sunlit, computer-controlled plant growth chambers to evaluate herbicide rate with and without rainfall immediately after transplant with plants grown at 30/22°C, day/night temperatures and 360 ppm of CO_2. Treatment combinations include five levels of *S*-metolachlor (0.0, 0.86, 1.72, 2.58 and 3.44 kg ha^{-1}) and two levels of rainfall (0 and 38 mm) arranged in a completely randomized design with four replications. Beauregard (B14) slips cut from field seedbeds were transplanted in white polyvinyl chloride pots (20 cm diameter and 30 cm height) filled with sandy loam soil. The various *S*-metolachlor rates were applied POST-transplant and half of the pots were subjected to 38 mm of rainfall at 50.8 mm h^{-1} intensity within 24 h after the application. Growth and yield measurements were recorded at 60 days after transplant. Plant component parts were separated, oven-dried and weighed for biomass determination. Fresh storage roots were separated into marketable and non-marketable grades, counted, and weighed before oven drying. Visual observations indicate that a rainfall event immediately after transplanting may result in the production of more fibrous roots compared to no-rainfall. Treatments of *S*-metolachlor and rainfall applied alone reduced total biomass, total storage root yield, marketable storage root numbers, and yield compared to the untreated check. There was a treatment interaction between *S*-metolachlor and rainfall event on total biomass and storage root yield. There was no interaction between *S*-metolachlor and rainfall event on number of total and marketable grade storage roots. Total and marketable storage root numbers and yield declined in response to increasing *S*-metolachlor levels with or without rainfall. However, the reduction was more severe when both *S*-metolachlor and rainfall were present. Rainfall enhanced total and marketable storage root yield in the absence of *S*-metolachlor. All biomass components, leaf, stem, roots, and total biomass yield, declined with increasing *S*-metolachlor rate and the reduction in biomass yield was exacerbated by a 38mm rainfall event immediately after herbicide application. There was a quadratic response of marketable storage root quality decline to *S*-metolachlor rate increase in the presence of rainfall, but the response was linear when rainfall was absent. Marketable storage root yield declined 18 and 31%, with low and high labeled rates, respectively, in the absence of rainfall and a 55 and 79% decline when rainfall occurred immediately after treatment application. Yield reduction was directly proportional to the quantity of *S*-metolachlor applied in the presence or in the absence of rainfall. The lowest recommended rate of *S*-metolachlor should always be applied based on soil type to minimize potential storage root injury. The data presented here in conjunction with weather forecast information could be used to manage early season production practices such as time of transplanting, *S*-metolachlor rate, and irrigation scheduling decisions.

USE OF CULTIVATION AND GLYPHOSATE DURING SUMMER FALLOW PERIOD FOR NUTSEDGE (*CYPERUS SPP*.) CONTROL IN BELL PEPPER (*CAPSICUM ANNUUM L*.). M. R. Miller*[1], P. J. Dittmar[2]; [1]Univeristy of Florida, Gainesville, FL, [2]University of Florida, Gainesville, FL (63)

ABSTRACT

Due to the phase out of methyl bromide and the few herbicides registered, nutsedge (*Cyperus spp*. L) is a problematic weed in Florida bell pepper (*Capsicum annuum* L.) production. In the spring of 2012, field studies were established to evaluate the efficacy of glyphosate and cultivation applied during the fallow season on nutsedge control in bell pepper. Locations included the Plant Science Research and Education Unit in Citra, FL and the Gulf Coast Research and Education Center in Balm, FL. Both sites initially had nutsedge populations in the range of 100 to 200 shoots/m^2. Experimental design was split plot randomized complete block design with 4 replications. Treatments included 8 fallow programs and 3 fumigant treatments. The fallow season was 18-weeks, with treatments occurring 4,6,9,12 and 14 weeks after initial (WAI) field cultivation. The 8 fallow programs included glyphosate (G) or cultivation (C) at 9 WAI: GG, CC, GC or CG at 6 and 12 WAI: GCG at 4,9 and 14 WAI: and a nontreated (NT). Glyphosate was applied at 5.51 kg ae/ha with a backpack sprayer calibrated to deliver 287 L/ha. The 3 fumigants included 1,3-dichloropropene+chloropicrin (337 kg/ha), dimethyl-disulfide (595 kg/ha), and a nontreated check. Bell pepper 'Tomcat' (*Capsicum annuum* L. 'Tomcat') were transplanted 26 WAI at both locations. Nutsedge counts were taken 0,14,28 and 42 days after planting (DAP) using a 1 m^2 quadrant. Bell pepper were harvested on October 31 in Citra and November 26 in Balm. Data were analyzed with analysis of variance and means were separated with Duncan's multiple range test ($P<0.05$). Locations were not significantly different for nutsedge counts and locations were combined. At 14 DAP, NT had the highest nutsedge counts and was similar to C. The lowest nutsedge population was GG (3 nutsedge/m^2) and GCG (3 nutsedge/m^2) 42 DAP, and was similar to CC (6 nutsedge/m^2), CG (4 nutsedge/m^2) and GC (4 nutsedge/m^2) treatments 42 DAP. In the NT fallow program, 1,3-dichloropropene+chloropicrin had the lowest nutsedge counts (4 nutsedge/m^2). In plots with the GG and GCG fallow program, 1,3-dichloropropene+chloropicrin and dimethyl-disulfide were similar to the NT. Locations were different for yield (fruit number and weight) and locations were separated. The application of a fumigant resulted in higher yields compared to the nonfumigated in both locations. In Balm, total number (131,503 peppers/ha) and total weight (11,931 kg/ha) yield was highest with 1,3-dichloropropene+chloropicrin. In Citra, no difference in fruit number or weight between 1,3-dichloropropene+chloropicrin and dimethyl-disulfide was seen, while the application of a fumigant resulted in higher yields in both locations. Nutsedge counts in GG and GCG fallow programs did not differ between fumigated and nonfumigated plots. However, in reduced fallow programs the fumigant was required to reduce nutsedge populations. Further research including different modes of action in a fallow weed management program should be evaluated to prevent glyphosate resistant weed species.

TOLERANCE OF VARIOUS LANDSCAPE ORNAMENTALS TO POSTEMERGENCE APPLICATIONS OF AMICARBAZONE AND FLUCARBAZONE. T. Campbell*, J. Brosnan, J. J. Vargas; University of Tennessee, Knoxville, TN (64)

ABSTRACT

Amicarbazone and flucarbazone are herbicides being evaluated for weed control in turf and ornamentals. Research was conducted in 2012 at the East Tennessee Research and Education Center (Knoxville, TN) evaluating the tolerance of ten landscape ornamental species to applications of amicarbazone, flucarbazone, and a commercial standard, bentazon. Ornamental species evaluated in this research included rose-of-sharon (Hibiscus syriacus), wintercreeper euonymus (Euonymus fortunei), 'Lynwood Gold' forsythia (Forsythia x intermedia), 'Knockout' rose (Rosa sp.), 'Natchez' crape myrtle (Lagerstroemia indica x L. faurei), autumn olive (Eleagnus umbellata), Virginia sweetspire (Itea virginica), buttonbush (Cephalanthus occidentalis), 'Flore-Pleno' fuzzy deutzia (Deutzia scabra), and Chinese dogwood (Cornus kousa). Rooted cuttings of each species were grown for six weeks in 3.8 L containers filled with 100% aged pine bark before being transplanted into in-ground field plots on 18 June 2012. Soil series of the field plots was a Sequatchie silt loam. Plant heights at transplanting were as follows: rose-of-sharon (8 to 25 cm), wintercreeper (10 to 28 cm), forsythia (10 to 28 cm), rose (15 to 20 cm), crape myrtle (15 cm), autumn olive (30 cm), Virginia sweetspire (38 to 61 cm), buttonbush (51 to 91 cm), deutzia (61 to 91 cm), and Chinese dogwood (51 to 91 cm). Treatments were arranged in a randomized complete block design with three replications and applied to plots (3 x 15 m) containing each species planted on a 1.5 m spacing. Treatments included post-directed applications of amicarbazone (49.5 and 446 g ha-1), flucarbazone (29 and 88 g ha-1), and bentazon (1120 g ha-1). Over-the-top applications of amicarbazone (980 g ha-1) and flucarbazone (29 g ha-1) were also evaluated. Flucarbazone treatments included a non-ionic surfactant at 0.25% v/v. All treatments were applied on 28 June 2012 using a CO2 powered boom sprayer calibrated to deliver 23 gpa using a 6504E nozzle at 60 psi. Both post-directed and over-the-top applications were made with this equipment. Ornamental injury was evaluated 14, 28 and 42 days after treatment (DAT) on a 0 (i.e., no injury) to 100% (i.e., complete plant death) scale relative to an untreated check. Ornamental injury was greatest 28 DAT and ranged from 2 to 18% for post-directed applications. Over-the-top applications of amicarbazone and flucarbazone were more injurious than those applied post-directed with injury ranging from 25 to 67% at 28 DAT. By 42 DAT, recovery was apparent as injury only ranged from 0 to 13% across all species regardless of application method. Results of this research indicate that the risk of ornamental injury with post-directed applications of amicarbazone and flucarbazone at the rates evaluated in this study is low, and that plants will outgrow injury after post-directed applications. Additionally, over-the-top applications of amicarbazone and flucarbazone can be more injurious than post-directed treatments and are not recommended at the rates evaluated in this study.

ENERGY BEETS IN GEORGIA: A POTENTIAL WINTER CASH CROP. T. M. Webster*[1], T. L. Grey[2], B. T. Scully[1], R. F. Davis[1]; [1]USDA-ARS, Tifton, GA, [2]University of Georgia, Tifton, GA (65)

ABSTRACT

Energy beets are a potential winter cash crop for growers in the Southeast U.S. that are planted in the autumn and harvested in the spring, complementing current summer crop rotations. The end-product from energy beets will be industrial sugars that can be processed into ethanol or biodegradable plastics. Unlike other potential energy crops, beets have established varieties, agronomic practices, pesticides, and equipment. The challenge will be to adopt those practices developed in other regions of the U.S. to a winter-based system in the Southern U.S. A study was conducted in Tifton, GA at the USDA-ARS Jones Research Farm to evaluate the yield potential of energy beets. The experiment included four varieties (EGC-183, EGC-184, EGC-185, and ENC-115) planted 6 October 2011 in three rows spaced 45 cm apart on a standard bed with 182 cm wheel tracks. The herbicide program included Nortron PPI, followed by two POST applications of Nortron+UpBeet+Stinger+Betamix. Maintenance fungicides were applied as needed. There were seven harvest times, initiated in April and continuing every three weeks through August. At harvest, root biomass was measured, as was the total solids of the beet juice, measured as Brix. Beet yields were lowest at the first harvest (53-63 Mg/ha) and were maximized (103-128 Mg/ha) on 12 June. There were slight reductions in yield over the remainder of the season (70-110 Mg/ha at the final harvest on 17 August). Beet yields were at least equivalent to average yields in the Midwest U.S., approaching those in California 134 Mg/ha (60 tons/acre). Plant pathogens (*Sclerotium* root rot and *Cercospora* leaf spot) were low at early harvests, increasing in intensity as summer approached. Yields leveled off after the fourth harvest, but fungicide applications continued to be necessary. Measured Brix levels were ≥20% in late April and May, slowly declining to values between 14.5% and 17.5% at the final harvest. Based on these sugar levels, theoretical ethanol yields ranged from 5570 l/ha (595 gal/a) at the first harvest on 9 April to 11,320 l/ha (1,210 gal/a) at the 12 June harvest. There is high potential for beet production as a cash crop during the typical winter fallow period with minimal disruption to traditional summer cash crops.

GLYPHOSATE-RESISTANT PALMER AMARANTH CONTROL IN DICAMBA TOLERANT SOYBEANS. W. J. Everman*[1], S. Seifert-Higgins[2], D. H. Williamson[3]; [1]North Carolina State University, Raleigh, NC, [2]Monsanto Company, St. Louis, MO, [3]Monsanto, St. Louis, MO (66)

ABSTRACT

The greatest weed management issue for Southeastern soybean producers is glyphosate-resistant Palmer amaranth. Monsanto is currently developing soybean tolerant to both dicamba and glyphosate, which will be a new tool to address this challenge. To investigate crop tolerance and efficacy, research was conducted in North Carolina and South Carolina in 2012. Fourteen treatments arranged in a factorial plus a commercial standard were evaluated at three locations in North Carolina and one in South Carolina. Factorial treatments consisted of dicamba at 1 lb a.e./A or flumioxazin at 0.0638 lb a.i./A applied PRE, a premix of dicamba plus glyphosate at 1.5 lb a.e./A, dicamba plus glyphosate plus acetochlor at 1.125 lb a.i./A, or dicamba plus glyphosate plus acetochlor plus fomesafen at 0.3 lb a.i./A applied early POST, and dicamba plus glyphosate applied 2 weeks after early POST. A standard treatment of flumioxazin PRE fb glyphosate at 1 lb a.e./A plus a premix of S-metolachlor plus fomesafen at 1.33 lb a.i./A applied POST. Excellent crop tolerance was observed for all treatments. Palmer amaranth control was greater than 95% for all sequential treatments. Results from this study confirm the importance of a diversified weed management program for Palmer amaranth that utilizes multiple mode of actions including dicamba.

SELECTIVITY OF AN HPPD-TOLERANT SOYBEAN EVENT. J. Allen*[1], J. Hinz[2]; [1]Bayer CropScience, Research Triangle Park, NC, [2]Bayer CropScience, Story City, IA (67)

ABSTRACT

MS Technologies and Bayer CropScience are codeveloping a soybean event tolerant to glyphosate and p-hydroxyphenyl pyruvate dioxyegenase (HPPD) inhibiting herbicides. Soybeans containing this soybean event were also stacked with a Bayer CropScience glufosinate tolerant (LibertyLink) soybean event to generate soybean plants tolerant to all three herbicides. Tolerance to glyphosate and glufosinate are similar to commercially available varieties. These lines have commercially acceptable tolerance to pre-emergence applied isoxaflutole and mesotrione.

IMPACT OF ROW WIDTH, SEEDING RATE, AND HERBICIDE PROGRAMS ON PALMER AMARANTH CONTROL IN LIBERTY LINK SOYBEAN. H. D. Bell*, J. K. Norsworthy, D. B. Johnson, S. S. Rana, Z. T. Hill, B. W. Schrage; University of Arkansas, Fayetteville, AR (68)

ABSTRACT

Palmer amaranth is the biggest problem facing Arkansas soybean producers, thus making producers rely heavily on premergence (PRE) in addition to postemergence (POST) herbicide programs. In 2012, a field experiment was conducted at the University of Arkansas Research and Extension Center in Fayetteville, AR, to determine the effect of soybean row spacing, seeding rate, and herbicide program in Liberty Link soybean on Palmer amaranth survival and seed production. This experiment was arranged in a split-split plot design replicated four times. The main plot factor was row widths (17.5-, 45-, and 90-cm). The subplot factor was seeding rates (250,000- and 437,500-seed/ha) and the sub-subplot factor was herbicide programs [*S*-metolachlor + metribuzin applied PRE followed by (fb) glufosinate + *S*-metolachlor + fomesafen applied at 21 days after planting (DAP) (PRE fb POST at 21 DAP), *S*-metolachlor + metribuzin applied PRE fb glufosinate + *S*-metolachlor + fomesafen applied 21 DAP fb glufosinate + acetochlor applied 42 DAP (PRE fb POST at 21 and 42 DAP), glufosinate + *S*-metolachlor + fomesafen applied 21 DAP fb glufosinate + acetochlor applied 42 DAP (POST-only), and a nontreated control] applied at labeled field rates. Palmer amaranth density (plants/m^2) was evaluated at 21 DAP, 42 DAP, and harvest. Palmer amaranth seed count (seed/m^2) was evaluated at harvest. At 21 DAP, Palmer amaranth density did not differ between PRE fb POST programs, but was less (<0.1 plants/m^2) than nontreated control (<794 plants/m^2). Palmer amaranth density at 42 DAP and at harvest did not differ between PRE fb POST programs, but was less (<6, 1 plants/m^2) than nontreated control (<655, 122 plants/m^2) and POST-only program (<619, 139 plants/m^2), respectively. Palmer amaranth seed count, at harvest, with PRE fb POST programs was less (<27,000 seed/m^2) than POST-only program (<280,000 seed/m^2) and nontreated control (<340,000 seed/m^2). In conclusion, Palmer amaranth survival and seed production with the POST-only program were generally similar to the nontreated control and inclusion of PRE herbicides in weed control programs is vital in reducing Palmer amaranth density and seed production; thus, depleting the soil seedbank.

HERBICIDE PROGRAMS FOR PALMER AMARANTH CONTROL IN A GLUFOSINATE TOLERANT SOYBEAN SYSTEM. A. Brown*[1], J. Irby[1], D. B. Reynolds[1], T. W. Eubank[2]; [1]Mississippi State University, Mississippi State, MS, [2]Mississippi State University, Stoneville, MS (69)

ABSTRACT

Palmer amaranth (*Amaranthus palmeri*) is a highly troublesome weed in soybean production as well as many other agronomic crops. In 2005, it was confirmed that Palmer amaranth had been found resistant to glyphosate in Georgia, and since has been found in 16 other states including Mississippi. Many practices are being incorporated into soybean management to better assist with the control of this weed. One such management option is the use of a glufosinate tolerant cropping system. Adoption of glufosinate tolerant soybean systems has been relatively slow for various reasons. However, with the continued development of GR Palmer amaranth, many producers are shifting to the use of glufosinate tolerant soybean varieties. The objective of this experiment was to evaluate preemergence (PRE) and postemergence (POST) applied herbicide programs for Palmer amaranth control in glufosinate tolerant soybean. Halo 4:94 LL soybean was planted on May 11, 2012 near Dundee, MS. The PRE timing was applied at planting and the POST applications were made at the V2 crop stage. Herbicide programs evaluated included the following: Gramoxone® plus Canopy® or Gramoxone plus Envive® applied PRE followed by either Liberty® plus Cinch® or Liberty plus Prefix® POST; Gramoxone plus Authority® MTZ or Gramoxone plus Authority® XL applied PRE followed by Liberty plus Prefix POST; Gramoxone plus Boundary® applied PRE followed by Flexstar® POST; Canopy® EX or Envive applied PRE followed by a tankmix of Liberty, Cinch, and Classic® POST; and Gramoxone applied PRE followed by Liberty POST. An untreated check was included for comparison purposes. Visual ratings for Palmer amaranth control were recorded 28 days after (DA) the PRE as well as 7 and 21 DA the POST applications. Crop injury ratings were also recorded at these evaluation timings. Gramoxone combined with any PRE herbicide treatment consistently provided > 92% GR Palmer amaranth control 28 DA the PRE application. All POST applications which followed a PRE where Gramoxone was a tankmix component provided > 92% control 21 DA the POST timing. Gramoxone applied alone at the PRE application timing did not provide adequate Palmer amaranth control. No herbicide program resulted in significant crop injury after the PRE application. Minimal crop injury was noted 7 DA the POST application. However, no injury was detected 21 DA the POST application timing. These data indicate that herbicide programs using multiple modes of action can provide effective Palmer amaranth control in a glufosinate tolerant soybean system.

BROADLEAF WEED CONTROL PROGRAMS IN EDAMAME SOYBEAN. R. A. Salas*[1], N. R. Burgos[1], B. Scott[2], G. M. Botha[1], H. B. Tahir[1], V. Singh[1], L. Estorninos[1]; [1]University of Arkansas, Fayetteville, AR, [2]University of Arkansas, Lonoke, AR (70)

ABSTRACT

Edamame is a vegetable soybean harvested when the seeds are at the immature R6 stage. Few herbicides are registered for use on edamame, which constrains expanded commercial production in the US. A field study was conducted in the summer 2012 at Fayetteville and Newport, AR to evaluate the effectiveness of different herbicide programs and the tolerance of edamame to different herbicides. The experiment was conducted in a randomized complete block design with nine herbicide programs and four replications. Herbicide programs included various combinations and sequences of Dual Magnum (*S*-metolachlor), 1 lb ai; Flexstar (fomesafen), 0.29 lb ai; Sencor (metribuzin), 0.38 lb ai/A; Linex (linuron), 1 lb ai/A; Â Blazer (acifluorfen), Â 0.25 lb ai/A; Basagran (bentazon), 0.5 lb ai/A; Prefix (fomesafen, 0.24 lb ai/A + *S*-metolachlor), 1.08 lb ai/A; and a weedy check. Postemergence herbicides were sprayed to V3 soybean and 2- to 3-in Palmer amaranth. In Newport, tank mixes of Dual + Sencor, Linex + Dual, and Linex + Sencor controlled Palmer amaranth 91-94% at 2 WAT PRE. Control of Palmer amaranth was 98-100% with Linex + Sencor PRE fb Prefix or Flexstar and Dual + Sencor PRE fb Flexstar at 2 WAT POST, but decreased to 88-96% at 14 WAT POST. Season-long control of Palmer amaranth (91-96%) was achieved with Dual + Sencor PRE fb Flexstar POST and Linex + Sencor PRE fb Prefix. Crop injury was minimal (4% at most) at 2 WAT PRE with Linex + Sencor PRE treatment. In Fayetteville, the field was overseeded with Palmer amaranth, morningglory, hemp sesbania, and prickly sida. All herbicide treatments controlled Palmer amaranth 94-100% at 3 WAT PRE and at 1, 2, and 4 WAT POST. Morningglory was controlled (≥92%) by Dual Magnum PRE fb Flexstar POST and Linex + Sencor PRE fb Prefix POST. All herbicide treatments, except Dual Magnum PRE fb Blazer + Basagran POST, controlled hemp sesbania and prickly sida ≥90%. Soybean injury at 1 WAT POST was highest with Prefix (50%), followed by Flexstar (30-35%) treatments; however, the crop recovered fully at 4 WAT POST. Plant density, number of pods, and grain weight per plant did not differ among treatments. Each plant produced 50-70 pods on average, with 16-26 g seed weight. Plants treated with Linex + Sencor PRE fb Flexstar POST produced the highest grain yield (2706 lb/A). All other herbicide treatments, except Linex + Dual PRE fb Blazer + Basagran, had similar yield (2180-2602 lb/A) as the leading herbicide program. Therefore, broadleaf weed control programs for edamame should include Linex or Dual Magnum or in combination with Sencor PRE, followed by Flexstar or Prefix or Blazer + Basagran POST.

IMPACT OF METRIBUZIN OR SULFENTRAZONE HERBICIDES ON SENSITIVE AND TOLERANT SOYBEAN (*GLYCINE MAX*) VARIETIES. B. W. Thomason*[1], T. W. Eubank[2], D. H. Poston[3], J. Irby[1]; [1]Mississippi State University, Mississippi State, MS, [2]Mississippi State University, Stoneville, MS, [3]Pioneer, Huntsville, AL (71)

ABSTRACT

Glyphosate resistant (GR) Palmer amaranth is becoming increasingly problematic in soybean production in the Mid-South. Previous research has shown 21% reduction in soybean yield due to Palmer amaranth infestations. Current management recommendations for the control of GR Palmer amaranth focus on using herbicides with different modes of action. Consequently, many producers are reverting to the use of older herbicide chemistries such as metribuzin or sulfentrazone. Recent studies have shown metribuzin and sulfentrazone to be effective in controlling GR palmer amaranth while maintaining yield. While metribuzin and sulfentrazone can cause significant injury on soybeans when applied preemergence (PRE), tolerant varieties have the ability to outgrow the injury and in many cases sensitive varieties may be grown safely if precautions are taken to reduce the likelihood of injury. With the rapid development and release of modern soybean varieties, it is important to evaluate crop injury and yield implications which may occur after application of metribuzin or sulfentrazone. The objective of this research was to determine the impact of metribuzin or sulfentrazone on yield of sensitive and tolerant soybean varieties. This experiment was conducted on a silty clay soil near Brooksville, MS. A single variety representing either a tolerant or sensitive soybean was selected and planted in 2 row plots measuring 6.3 feet wide by 30 feet long. Metribuzin or sulfentrazone was applied at both a standard and high use rate using the following products: Canopy®, Authority® MTZ, Boundary®, Sencor®, and Spartan®. Dual Magnum® was applied in combination with Canopy and Authority MTZ. In addition, Dual Magnum was applied alone for comparison purposes. Minimal stunting was observed for the treatments containing the high application rate of Canopy 14 and 28 days after emergence for both the sensitive and tolerant varieties. No crop injury was detected for either variety 14 days after emergence. At 28 days after emergence, visual injury was present only where the high application rate of Canopy was applied. Although differences in both stunting and injury were present, overall yield influence on the two varieties was not detected. These data indicate that sensitive and tolerant soybean varieties may be grown safely in the presence of metribuzin and sulfentrazone-containing herbicides. Additional research is needed in order to evaluate current commercially available soybean varieties for tolerance to metribuzin and sulfentrazone.

COMPARISON OF ROUNDUP READYÂ® AND CONVENTIONAL SOYBEAN (GLYCINE MAX L.) GROWING SYSTEMS FOR WEED CONTROL, YIELD AND ECONOMIC PROFITABILITY. B. L. Gaban*[1], L. E. Steckel[2], T. C. Mueller[1]; [1]University of Tennessee, Knoxville, TN, [2]University of Tennessee, Jackson, TN (72)

ABSTRACT

Research was conducted in 2010, 2011 and 2012 at the East Tennessee Research and Education Center in Knoxville, TN in order to compare differences in soybean yield among different levels of weed control within Roundup Ready (RR) and conventional soybean cultivar for a better understanding of the impact different intensities of weed control has on RR and conventional cropping systems. Our results determined that after applying the weed control regimens, there was no significant difference ($p<0.05$) in yield (kg ha^{-1}) between soybean cultivars at any level of weed control at any date or location. Additionally, no significant difference in yield was found between the two highest levels of weed control used. Glyphosate resistant weeds introduce new challenges and create a more costly weed control regimen, specifically when using a RR based soybean cultivation operation. Therefore, calculated economic returns of RR and conventional weed management technologies used in this study were contrasted to determine profitability of each system. In a glyphosate resistant-free environment, the conventional soybean cultivar had a net return of only 0.4% greater than that of the RR cultivar.

GLYPHOSATE-RESISTANT JOHNSONGRASS (*SORGHUM HALEPENSE*) CONTROL IN SOYBEAN (*GLYCINE MAX*) WITH CHLORIMURON, CLETHODIM, FOMESAFEN, AND GLUFOSINATE. R. L. Landry*, D. Stephenson, B. C. Woolam; LSU AgCenter, Alexandria, LA (73)

ABSTRACT

Experiments were conducted at the LSU AgCenter Dean Lee Research and Extension Center near Alexandria, LA in 2011 and 2012. Experiments assessed the efficacy of chlorimuron, clethodim, fomesfaen, and glufosinate on glyphosate-resistant johnsongrass in soybean. Experiments were a randomized complete block design with 4 replications. Rates of herbicide include 0.01 kg ha^{-1} chlorimuron, 0.1 kg ha^{-1} clethodim, 0.3 kg ha^{-1} fomesafen, and 0.5 kg ha^{-1} glufosinate. Application timings were soybean growth stages V2 followed by (fb) V5 fb V8. Treatments include: (1) chlorimuron fb fomesafen fb clethodim, (2) chlorimuron fb clethodim fb fomesafen, (3) fomesafen fb chloriumron fb clethodim, (4) fomesafen fb clethodim fb chlorimuron, (5) clethodim fb chlorimuron fb fomesafen, (6) clethodim fb fomesafen fb chlorimuron, (7) glufosinate fb glufosinate fb glufosinate. Glufosinate applied at V2 fb V5 fb V8 controlled johnsongrass 90% 35 DA V8. Clethodim fb chlorimuron fb fomesafen provided equal control to glufosinate applied at V2 fb V5 fb V8 35 DA V8 and at harvest. At harvest, treatments where clethodim was applied at V2 (82% and 73%) provided better control of johnsongrass than when fomesafen was applied at V2 (54% and 49%). Clethodim fb chlorimuron fb fomesafen (32 cm) reduced johnsongrass heights greater than all other treatments except sequentially applied glufosinate (46 cm) and fomesafen fb chlorimuron fb clethodim (51 cm) 35 DA V8 treatments. At harvest, no treatments were significantly different when comparing heights (99-118 cm). Soybean yields following glufosinate applications were greater than all other treatments, except treatments where clethodim was applied at V8. Data indicates that three glufosinate applications or clethodim fb chlorimuron fb fomesafen applied is needed to effectively manage johnsongrass.

EVALUATION OF ANTHEM IN LOUISIANA SOYBEAN PRODUCTION SYSTEMS. D. K. Miller*[1], D. Stephenson[2], M. M. Mathews[1], R. L. Landry[2], B. C. Woolam[2]; [1]LSU AgCenter, St. Joseph, LA, [2]LSU AgCenter, Alexandria, LA (74)

ABSTRACT

A field study was conducted at the Northeast Research Station near St. Joseph, La, to evaluate residual herbicide programs that included Anthem herbicide for control of weeds commonly found in Louisiana soybean production systems and potential for crop phytotoxicity. The study design was a randomized complete block with 4 replications. Soil was a silt loam with pH 6.8. Pioneer 94Y82RR soybean was planted on May 2. Preemergence soil (Pre) treatments were applied on May 4 while the 1 to 2 trifoliate treatment was applied on May 22. Treatments evaluated included Anthem @ 8 oz/a Pre, Anthem @ 6 oz/a + Authority XL @ 4 oz/a Pre, Authority XL @ 4 oz/a Pre, Authority MTZ @ 12 oz/a Pre, Valor XLT @ 4 oz/a Pre, Fierce @ 3 oz/a Pre, Prefix @ 32 oz/a Pre, and Authority XL @ 4 oz/a Pre followed by Anthem @ 5 oz/a + Roundup Powermax @ 22 oz/a at the 1 to 2 trifoliate stage. All treatments received a follow-up application of Roundup Powermax @ 22 oz/a on June 1 (4 to 5 trifoliate stage) and the entire trial area received an application of Roundup Powermax @ 22 oz/a on August 22. Parameter measurements included visual crop injury and weed control 18 & 32 d after the Pre application and 32 d after the 1 to 2 trifoliate application, and yield. At 18 d after Pre application, Fierce resulted in 21% visual injury. No other treatment resulted in injury greater than 3%. With the exception of hemp sesbania (70% control), control of barnyardgrass, broadleaf signalgrass, goosegrass, sicklepod, pitted and entireleaf morningglory, large crabgrass, horse purslane, and redroot pigweed was maximized with Anthem applied at 8 oz/a. At 32 d after Pre application, no treatment resulted in greater than 4% visual injury. With the exception of hemp sesbania (65% control), weed control was maximized with Anthem applied at 8 oz/a. At 32 d after the 1 to 2 trifoliate application, visual injury was not observed for any treatment. Anthem applied @ 8 oz/a Pre followed by Roundup Powermax @ 22 oz/a applied at the 4 to 5 trifoliate stage controlled hemp sesbania only 59%. Control of all other weeds evaluated with Anthem was maximized and at least 91%. Weed control from Anthem @ 8 oz/a Pre followed by Roundup Powermax @ 22 oz/a applied at the 4 to 5 trifoliate stage resulted in a soybean yield of 39 bu/a, which was equal to or greater than that observed for all other treatments (18-42 bu/A). Anthem applied Pre @ 8 oz/a resulted in no phytotoxicity to soybean. With the exception of hemp sesbania, control of all weeds evaluated was good to excellent. Anthem provides a viable preemergence foundation for weed management programs in Louisiana soybean production systems.

EVALUATION OF CANOPY, CANOPY EX, ENVIVE, FIERCE, AND ZIDUA IN LOUISIANA SOYBEAN PRODUCTION SYSTEMS. M. M. Mathews*, D. K. Miller; LSU AgCenter, St. Joseph, LA (75)

ABSTRACT

A field study was conducted at the Northeast Research Station near St. Joseph, La to evaluate residual herbicide programs that included Canopy, Canopy EX, Envive, Fierce and Zidua herbicides for control of weeds commonly found in Louisiana soybean production systems and potential for crop phytotoxicity. Study design was a randomized complete block with 4 replications. Soil was a silt loam soil with pH 6.8. Pioneer 94Y82RR soybean was planted on May 2. Preemergence soil (Pre) treatments were applied on May 3. The 3 to 4 trifoliate growth stage treatment was applied on May 25. Treatments evaluated included Envive @ 3.5 oz/a Pre followed by (fb) Roundup Powermax @ 22 oz/a + Prefix @ 32 oz/a 3 to 4 trifoliate, Canopy @ 6 oz/a Pre fb Roundup Powermax @ 22 oz/a + Prefix @ 32 oz/a 3 to 4 trifoliate, Canopy @ 4 oz/a + Cinch @ 16 oz/a Pre fb Roundup Powermax @ 22 oz/a + Prefix @ 32 oz/a 3 to 4 trifoliate, Canopy @ 6 oz/a + Cinch @ 16 oz/a Pre fb Roundup Powermax @ 22 oz/a + Prefix @ 32 oz/a 3 to 4 trifoliate, Canopy EX @ 2 oz/a Pre fb Roundup Powermax @ 22 oz/a + Cinch @ 16 oz/a + Classic @ 0.33 oz/a 3 to 4 trifoliate, Envive @ 3.5 oz/a Pre fb Roundup Powermax @ 22 oz/a + Cinch @ 16 oz/a + Classic @ 0.33 oz/a 3 to 4 trifoliate, Fierce @ 3 oz/a Pre fb Roundup Powermax @ 22 oz/a + Prefix @ 32 oz/a 3 to 4 trifoliate, Fierce @ 3 oz/a Pre fb Roundup Powermax @ 22 oz/a + Cinch @ 16 oz/a + Classic @ 0.33 oz/a 3 to 4 trifoliate, Zidua @ 2 oz/a Pre fb Roundup Powermax @ 22 oz/a + Prefix @ 32 oz/a 3 to 4 trifoliate, and Zidua @ 2 oz/a Pre fb Roundup Powermax @ 22 oz/a + Cinch @ 16 oz/a + Classic @ 0.33 oz/a 3 to 4 trifoliate. The entire test area received an application of Roundup Powermax @ 22 oz/a on July 25. Parameter measurements included visual crop injury and weed control 14 d after Pre application, 14 and 42 d after the 3 to 4 trifoliate application, and yield. At 14 d after Pre application, Fierce resulted in 21-28% visual injury while all other treatments injured soybean no greater than 8%. Control of hemp sesbania (71 to 98%), goosegrass (93 to 100%), sicklepod (83 to 97%), pitted morningglory (96 to 100%), entireleaf morningglory (98 to 100%), redroot pigweed (97 to 100%), and yellow nutsedge (73 to 90%) was equal for all treatments. Barnyardgrass control was greatest with Canopy at 6 oz/a, Fierce, and Zidua (100%). At 14 d after 3 to 4 trifoliate application, plots receiving Roundup Powermax + Prefix at 3 to 4 trifoliate exhibited 20 to 25% visual injury while those receiving Roundup Powermax + Cinch and Classic exhibited 8 to 19% visual injury. Control of all weeds was equal for all treatments evaluated. At 42 d after 3 to 4 trifoliate application, visual injury was not observed for any treatment. Control of broadleaf signalgrass (97 to 100%), hemp sesbania (73 to 99%), goosegrass (93 to 100%), sicklepod (51 to 72%), pitted morningglory (77 to 100%), entireleaf mornningglory (96 to 100%), crabgrass (96 to 100%), and redroot pigweed (100%) was equal for all treatments. Envive followed by Roundup Powermax + Prefix resulted in 79% barnyardgrass control while all other treatments controlled the weed greater than 86%. All weed control programs resulted in equivalent soybean yield ranging from 36 to 48 bu/A. Fierce resulted in greatest phytotoxic response but did not result in yield reduction. All at planting herbicides resulted in good to excellent control of weeds evaluated. Canopy, Canopy EX, Envive, Fierce & Zidua provide a viable preemergence foundation for weed management in Louisiana soybean production systems.

EVALUATION OF ZIDUA CO-APPLIED WITH CANOPY OR ENVIVE IN LOUISIANA SOYBEAN PRODUCTION SYSTEMS . M. M. Mathews*, D. K. Miller; LSU AgCenter, St. Joseph, LA (76)

ABSTRACT

A field study was conducted near the Northeast Research Station near St. Joseph, La to evaluate residual herbicide programs that included Zidua co-applied with Canopy or Envive for control of weeds commonly found in Louisiana soybean production systems and potential for crop phytotoxicity. Study design was a randomized complete block with 4 replications. Soil was a silt loam with pH 6.8. Pioneer 94Y82RR soybean was planted on May 2. Preemergence soil (Pre) treatments were applied on May 13. Treatments evaluated included Envive @ 3.5 oz/a + Zidua @ 1.5 oz/a, Envive @ 3.5 oz/a + Zidua @ 1 oz/a, Envive @ 3.5 oz/a, Canopy @ 4 oz/a + Zidua @ 1.5 oz/a, Canopy @ 4 oz/a + Zidua @ 1 oz/a, Canopy @ 6 oz/a + Zidua @ 1.5 oz/a, Canopy @ 6 oz/a + Zidua @ 1 oz/a, Canopy @ 4 oz/a + Cinch @ 1 pt/a, Canopy @ 6 oz/a + Cinch @ 1 pt/a, Zidua @ 2 oz/a, and Fierce @ 3 oz/a. All treatments received a follow-up application of Cinch @ 1 pt/a in combination with Abundit @32 oz/a on May 25 (3 to 4 trifoliate stage) and the eintrie test area received Roundup Powermax @ 22 oz/a on July 25. Parameter measurements included visual crop injury & weed control 14 d after Pre application, 29 and 56 d after the 3 to 4 trifoliate application, and yield. At 14 d after the Pre application, Envive and Zidua combinations resulted in 8 and 14% visual injury while Fierce injured soybean 16%. All other treatments resulted in minimal to no injury. All treatments resulted in equal control of broadleaf signalgrass (91 to 100%), sicklepod (80 to 95%), pitted and entireleaf morningglory (98 to 100%), large crabgrass (95 to 100%), and redroot pigweed (100%). Envive alone and Canopy @ 4 oz/a in combination with Zidua controlled barnyardgrass 84% while other treatments provided at least 95% control. Zidua applied alone @ 2 oz/a or plus Canopy @ 4 oz/a or 6 oz/a (1 oz/a Zidua rate) controlled hemp sesbania only 63-78%. At 29 d after the 3 to 4 trifoliate application, injury was not observed for any treatment. All treatments resulted in equivalent control of weeds evaluated. At 56 d after 3 to 4 trifoliate application, Injury was not observed for any treatment. All treatments resulted in equivalent control of broadleaf signalgrass (82 to 100%), hemp sesbania (60 to 80%), goosegrass (84 to 100%), sicklepod (45 to 65%), pitted morningglory (100%), crabgrass (91 to 100%) and redroot pigweed (90 to 100%). Programs including Zidua alone at 2 oz/a maximized barnyardgrass control. Entireleaf morninglgory control was equivalent for Envive and Canopy combinations with Zidua. All weed control programs resulted in equivalent soybean yield ranging from 42-52 bu/A. Fierce and Zidua in combination with Envive resulted in greatest phytotoxc response, however, yield was not reduced. Zidua applied with Envive or Canopy @ 6 oz/a provided good to excellent control of weeds evaluated. Zidua in combination with Canopy or Envive provides a viable preemergence foundation for weed management programs in Louisiana soybean production systems.

WEED MANAGEMENT IN LIBERTYLINK VERSUS ROUNDUP READY SOYBEAN. T. E. Besancon*, W. J. Everman; North Carolina State University, Raleigh, NC (77)

ABSTRACT

Herbicide resistant weeds are becoming a greater concern within field crops and specifically soybeans. Currently, one of the greatest weed problems in North Carolina is Palmer amaranth (*Amaranthus palmeri*). Resistance to ALS inhibiting herbicides as well as glyphosate was observed in North Carolina in 1995 and 2005, respectively. Resistance in the state is currently shown as 98.5% glyphosate resistant and the study of the level of ALS resistance is underway but estimated at 75%. These results stress the need for other method of control that should be used and rotated in order to delay or prevent further resistance. PRE herbicides included metribuzin at 280, 420 and 560 g ai.ha^{-1} or flumioxazin at 70 g ai.ha^{-1}. POST treatments included acifluorfen at 280 and 420 g ai.ha$^{\text{â€˜1}}$and acifluorfen at 280 g ai.ha^{-1}+bentazon at 560 g ai.ha^{-1} alone or associated with gluphosinate at 595 g ai.ha^{-1} or glyphosate at 1060 g ai.ha^{-1}, lactofen at 175 g ai.ha^{-1} and fomesafen at 395 g ai.ha$^{\text{â€˜1}}$ associated with gluphosinate at 595 g ai.ha^{-1} or glyphosate at 1060 g ai.ha^{-1}. LibertyLink and Roundup Ready soybeans were rated for the percentage of chlorosis, stunting and injury as well as the percentage of control for large crabgrass (*Digitaria sanguinalis*), common ragweed (*Ambrosia artemisiifolia*), and ivyleaf morningglory (*Ipomoea hederacea*) five weeks after PRE herbicide application, and 3 weeks after POST herbicide treatments. In this study, LibertyLink soybeans presented a greater rate of stunting with metribuzin applied at 420 g ai.ha^{-1} or 560 g ai.ha^{-1} than at 280 g ai.ha^{-1}. POST applications of acifluorfen, acifuorfen+bentazon, and lactofen resulted immediately after treatment in injuries (up to 25%) primarily made up of chlorosis and necrosis. However, injuries were transient and no injury was observed at the time of the final rating. Common ragweed control was greater than 90% with all PRE treatments and greater than 95% with all POST applications. Large crabgrass control averaged 50 to 60% for PRE applications of metribuzin at 280 g ai.ha^{-1} and 420 g ai.ha^{-1} or flumioxazin but increased to 80% with metribuzin at 560 g ai.ha^{-1}. For POST applications, large crabgrass control was greater than 95% when glyphosate or gluphosinate were applied and lower than 15% when these herbicides were not applied. Ivyleaf morningglory control was greater than 90% for all treatments except for metribuzin applied PRE at 280 g ai.ha^{-1} with 85% of control. No differences of yields between the treatments were observed for the Roundup Ready soybeans. The yields for LibertyLink soybeans presented higher results for the treatments associating PRE applications of metribuzin at 280 g ai.ha^{-1} or flumioxazin with POST applications of gluphosinate whereas PRE applications of metribuzin at 420 g ai.ha^{-1} and 520 g ai.ha$^{\text{â€˜1}}$ alone resulted in lower yields than the non-treated control.

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SOYBEAN RESPONSE TO DIURON. E. P. Prostko*, P. M. Eure, R. M. Merchant; University of Georgia, Tifton, GA (78)

ABSTRACT

Diuron is applied preplant (PPLNT) or preemergence (PRE) in cotton for the control of Palmer amaranth (*Amaranthus palmeri*). Frequently, cotton stands are lost due to drought, insects, herbicide injury, poor seed quality, and hail. When cotton stand loss occurs, growers often consider re-planting an alternative crop. If diuron was used PPLNT or PRE in a failed cotton stand, only cotton can be legally re-planted according to the current label. Because of high commodity prices, growers would prefer to re-plant soybeans after a failed stand of cotton. The tolerance of soybeans to diuron has not been investigated in recent years. Therefore, the objective of this research was to evaluate the tolerance of soybeans to PRE applications of diuron. Small-plot field trials were conducted in 2011 and 2012 at the UGA Ponder Research Farm located near Ty Ty, Georgia to evaluate the influence of PRE applications of diuron on soybean growth and yield. 'AGS 758RR' soybeans were planted on June 30, 2011 and May 22, 2012 in 36" rows. Diuron (Direx 4L) was applied immediately after planting at 0, 2, 4, 8, 16, 32, and 64 oz/A. In the 30 day period after planting, 6.6" and 5.1" of irrigation/rainfall occurred in 2011 and 2012, respectively. The plot area was maintained weed-free throughout the season. The soil types at these locations were a Dothan or Fuquay sand (0.43% OM; 92-94% sand; 2-6% silt; 2-4% clay). The herbicide treatments were arranged in a RCB design with 3-4 replications. Herbicides were applied with a CO_2-powered backpack sprayer calibrated to deliver 15 GPA. All data were subjected to ANOVA and means separated using Fisher's Protected LSD Test (P = 0.10) when appropriate. Soybean plant populations at harvest were significantly reduced by 64 oz/A of diuron in 2011. No other rates of diuron resulted in soybean population loss. Soybean plant heights at harvest were not significantly reduced by any rate of diuron. In 2011, soybean yields were significantly reduced by 32 and 64 oz/A of diuron (23-41% yield reductions). In 2012, soybean yields were not reduced by any rate of diuron.

EVALUATINGÂ DIFFERENTIAL VOLATILITYÂ OF AUXIN-TYPE HERBICIDES UTILIZING NOVEL FIELD METHODOLOGY. D. H. Perry*[1], B. Braxton[2], A. T. Ellis[1], R. A. Haygood[3], R. B. Lassiter[4], J. S. Richburg[5], L. C. Walton[6]; [1]Dow AgroSciences, Greenville, MS, [2]Dow AgroSciences, Travelers Rest, SC, [3]Dow AgroSciences, Germantown, TN, [4]Dow AgroSciences, Little Rock, AR, [5]Dow AgroSciences, Dothan, AL, [6]Dow AgroSciences, Tupelo, MS (79)

ABSTRACT

The Enlist ™ Weed Control System consists of a new family of herbicide-tolerant traits that provide robust crop tolerance to 2,4-D, including a new form of 2,4-D (2,4-D choline salt). This technology, developed by Dow AgroSciences, will provide growers with another management tool to control herbicide resistant and hard-to-control weed species. A key component of the Enlist system is Enlist Duo ™ herbicide (GF-2726) with Colex-D ™ Technology. Enlist Duo ™ is a premix of glyphosate dimethylamine salt and 2,4-D choline salt that exhibits ultra-low volatility, minimized potential for physical drift, and low odor. Unlike the ester or amine formulations, the choline formulation is a quaternary ammonium salt which forms a more stable complex between the 2,4-D acid anion and choline cation. Over the past several years, Dow AgroSciences LLC and university researchers have evaluated differential volatility of auxin herbicide formulations utilizing small-scale, field volatility methods. The primary objective of these studies was to develop a novel, easy-to-use method for demonstrating reduced volatility of 2,4-D choline compared to other auxinic herbicides. The parameters that have been evaluated include, but are not limited to dome size, shape, and structure, herbicide rate, target crops, total herbicide applied under domes, and treated surface area among others. These demonstrations do not quantitatively predict vapor movement from field-scale applications but do provide a useful demonstration of reduced volatility from 2,4-D choline as compared to other forms of 2,4-D. Future plans are to continue promoting the most recent dome structure design for use in volatility demonstrations and education.

SOUTHERN SANDBUR (*CENCHRUS ECHINATUS*)Â EMERGENCE AND DEVELOPMENT AS INFLUENCED BY SOIL DEPTH AND LIGHT INTENSITY IN FIELD CONDITIONS.Â Â Â . D. Martins*[1], G. S. F Souza[1], M. R. R Pereira[1], J. S. McElroy[2]; [1]Universidade Estadual Paulista - UNESP, Botucatu, Brazil, [2]Auburn University, Auburn, AL (80)

ABSTRACT

The depth in the soil in which a seed can germinate and produce seedlings is variable between species and has ecological and agronomic importance. Many weed species especially those with have few reserves seeds germinate when placed in shallow depths in the soil, because mostly these seeds need the light stimulus and with increases on the depth in the ground the light is strongly attenuated making these seeds not able to germinate and emerge. However, there are species that do not require light stimulus for initiating the germination process and which can therefore emerge from greater depths. In Brazil, few field studies related to the mechanisms involved in the emergence of weeds was related, as the seeds depth in the soil profile and light intensity from which the seeds are able to emerging and develop into the reproductive phase. The aim of this research was to study in flied conditions the emergence and development of *Cenchrus echinatus* plants in different sowing depths and various light intensities. The experiment was conducted under field conditions at the Faculty of Agricultural Sciences from the Sao Paulo State University - UNESP, Botucatu / Sao Paulo, Brazil. The weed species evaluated was *C. echinatus* and the treatments were arranged in a 6x4 factorial design, with the first factor corresponding to six different sowing depths (0.5, 1.0, 2.0, 4.0, 8, 0 and 12.0 cm) and factor B to four light intensities (100%, 70%, 50% and 30% of solar intensity) obtained through the use of agricultural shade cloth to 80 cm from the soil. The experimental unit was made of beds with 1.0 m wide per 2.0 m long, raised with the aid of a rotary hoe. In each experimental unit was seeded 6 rows with 25 viable seeds of *C. echinatus* per row and one row per depth. Seedling emergence was monitored daily for 30 days from sowing for obtained the percentage of emergency and the mean day for emergency. The experiment was repeated in time and the first three emerged plants per row were preserved for the data collection such as plant height in the flowering day and daily mass gain per plant from emergence to flowering. Relevant characteristics of each solar intensity, such as air temperature, soil temperature at depths studied and, photosynthetically active radiation (PAR) was collected. Soil temperature varied during a day and at 6:30 am the soil temperatures in the different depths were very similar in all lighting conditions but after this time in the more shallow sowing depths (0.5cm to 4.0cm) were the most affected for the light conditions with high temperature in periods from 12:30 pm to 15:30 pm and being colder than the depths of 4cm, 8cm and 12cm with the evening. The behavior of PAR is similar for all light conditions with elevated PAR until 12:30 pm and reduction after 12:30 pm. *C. echinatus* seedlings sown up to 4cm of depth and in 30% of sunlight required more days to emerge than all other plants. At depths between 4cm and 8cm seedlings emerged in the same time in all light conditions but in greater soil depths such as 12cm and 30% of sunlight the seedlings needed more time to emerge. The highest percentage of germination on 0.5cm to 2cm depth were obtained from treatments with some sunlight retention and after this layer seeds kept in 100%, 70% and 50% of sunlight emerged more than other seeds maintained in 30% of sunlight. With sowing depth increasing there was a decrease in the southern sandbur emergence, however the *C. echinatus* plants emerge in all evaluated depths. Plant height at flowering was influenced by the light conditions but within each light condition there was no significant difference between the sowing depths. The condition of 30% light promoted increases in plant height due to etiolation. Plants grown in 100% and 70% of sunlight resulted in very constant and similar heights in all seeding depth, however plants in 50% of sunlight had lower height values â€‹â€‹in all sowing depths. All solar radiation reductions negatively influenced the daily dry mass gain by plants. Developed plants in full light accumulated more dry matter per day than grown plants from other treatments.

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INTERACTION OF PALMER AMARANTH (*AMARANTHUS PALMERI*) GROWTH AND GLUFOSINATE ACTIVITY. W. K. Vencill*; University of Georgia, Athens, GA (81)

ABSTRACT

Field studies were conducted to determine the optimum time of glufosinate application for Palmer amaranth control in cotton. Treatments were set up so that each plot received a single glufosinate application at five-day intervals after the initial flush of Palmer amaranth for 30 days. Glufosinate was applied at 480 g ai/ha. Palmer amaranth height was measured at each application and visual control was evaluated five days after treatment. The final height of Palmer amaranth ranged from 0.18 to 0.22 cm per Growing Degree Day (GDD) for the three year study. After 10 day after germination, glufosinate control decreased 1.7% per day or 0.5% per GDD. This study confirms the small window of application of glufosinate to obtain optimum Palmer amaranth control in cotton.

EFFECT OF NOZZLE TYPE AND SPRAY VOLUME ON PALMER AMARANTH CONTROL. H. M. Edwards*, J. A. Bond, T. W. Eubank, S. A. Shinkle, G. B. Montgomery; Mississippi State University, Stoneville, MS (82)

ABSTRACT

The widespread use of glyphosate in Roundup Ready crops was partially responsible for changing common herbicide application techniques. Roundup Ready systems allowed growers to reduce equipment costs and labor requirements because only glyphosate was required for weed control. As technology progressed, large high-clearance sprayers were developed for applying glyphosate. However, glyphosate is prone to off-target movement. Therefore, nozzles capable of producing larger droplets over a wide range of operating pressures were developed. Application of Liberty 280 (glufosinate) or Gramoxone SL (paraquat) immediately prior to planting have become increasingly common in midsouthern U.S. crop production because of glyphosate-resistant Palmer amaranth. More information is needed to identify which spray nozzles and spray volumes produce optimum Palmer amaranth control with these herbicides. Research was conducted to compare the efficacy of Liberty 280 and Gramoxone SL applied at two spray volumes with standard flat fan or venturi-type drift reduction nozzles. The study was conducted in 2012 at the Mississippi State University Delta Research and Extension Center in Stoneville, MS, in a non-crop area known to be infested with Palmer amaranth. Plot size was 6.67 by 20 feet. The experimental area was conventionally tilled prior to study initiation. Treatments were arranged as a three-factor factorial within a randomized complete block experimental design with four replications. Factor 1 was herbicide and included Liberty 280 at 0.53 lb ai/A and Gramoxone SL at 0.75 lb ai/A. Gramoxone SL applications included nonionic surfactant at 0.5% (v/v). Factor 2 was spray volumes consisting of 10 and 20 gallons/A (GPA). Factor 3 was nozzle type and included a standard flat fan (FF) and venturi-type drift reduction nozzle [air induction (AI)]. The lower spray volume (10 GPA) was achieved with 110015 spray nozzles, while 11003 spray nozzles were utilized for the higher spray volume (20 GPA). Spray pressure was held constant at 37 psi. Treatments were applied to six-leaf Palmer amaranth that averaged 4 inches in height. Palmer amaranth control was visually estimated at 7, 14, and 21 days after treatment (DAT). All data were subjected to ANOVA and means were separated using Fisher's protected LSD at $p \leq 0.05$. Gramoxone SL controlled Palmer amaranth better than Liberty 280 regardless of nozzle type at 7 and 21 DAT. Pooled across 10 and 20 GPA spray volumes, Liberty 280 controlled more Palmer amaranth 7 and 21 DAT when applied with FF nozzles compared with AI nozzles. Palmer amaranth control at 7 DAT was similar following Gramoxone SL applied with FF or AI nozzles; however, Palmer amaranth control was greater when Gramoxone SL was applied with FF nozzles 21 DAT. Pooled across herbicide treatment and nozzle type, Palmer amaranth control was greater 21 DAT following applications at 20 GPA compared with those at 10 GPA. Gramoxone SL controlled Palmer amaranth better than Liberty 280 14 DAT regardless of nozzle type or spray volume. Pooled across Liberty 280 and Gramoxone SL herbicide treatments, Palmer amaranth control was greater 7 and 14 DAT when applications were made with FF nozzles at 10 GPA. With a 20 GPA spray volume, Palmer amaranth control was greater following applications with FF nozzles at 7 DAT, but control was similar 14 DAT for both nozzle types following 20 GPA applications. For each nozzle type, Palmer amaranth control was greater 7 and 14 DAT when applications were made at 20 GPA compared with 10 GPA. Data from the current experiment indicate that Liberty 280 and Gramoxone SL applications targeting Palmer amaranth should be applied with FF nozzles. Flat fan nozzles are preferred over AI nozzles for spray volumes of 10 and 20 GPA.

IMPACT OF SPRAY NOZZLE TECHNOLOGY ON ENLIST DUO ™ WEED CONTROL AND CROP TOLERANCE. B. Braxton*[1], J. Huff[2], D. H. Perry[3], D. Ruen[4], L. C. Walton[5]; [1]Dow AgroSciences, Travelers Rest, SC, [2]Dow AgroSciences, Herrin, IL, [3]Dow AgroSciences, Greenville, MS, [4]Dow AgroSciences, Lanesboro, MN, [5]Dow AgroSciences, Tupelo, MS (83)

ABSTRACT

Dow AgroSciences is developing a new family of herbicide tolerance traits that provide robust tolerance to 2,4-D and a new form of 2,4-D (2,4-D choline salt) for use in corn, soybean, and cotton. This novel 2,4-D choline salt will be combined with glyphosate in the formulation, Enlist Duo™ with Colex-D TM Technology that provides ultra-low volatility and reduced potential for drift. Trials were conducted in 2012 to evaluate the impact of low-drift spray nozzle technology and application volume on Enlist Duo TM weed control and crop tolerance. There were minimal differences in weed control among nozzle types, XR (medium), AIXR (coarse), and TTI (extremely coarse), tested within a given spray volume (7.5 or 15 GPA). Differences in weed control between spray volumes tested were insignificant but increasing herbicide rate did reduce variability in weed control. In crop tolerance evaluations, spray volume did not appear to affect injury in Enlist™ soybean or corn at 3, 7 or 14 days after application (DAA). Enlist soybean and corn tolerance was generally equivalent with XR (medium droplet) and AIXR (coarse droplet) producing nozzle types. TTI nozzles (extremely coarse droplet) typically resulted in more injury in both crops.

CYTOGENETICS OF *EUPHORBIA HETEROPHYLLA* (L.) (EUPHORBIOIDEAE, EUPHORBIACEAE) BIOTYPES WITH MULTIPLE RESISTANCE TO HERBICIDES. A. C. Roso*[1], D. Guerra[2], M. T. Schifino-Wittmann[2], R. A. Vidal[2], M. Trezzi[3], N. R. Burgos[1]; [1]University of Arkansas, Fayetteville, AR, [2]Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil, [3]Universidade Tecnologica Federal do Parana, Pato Branco, Brazil (84)

ABSTRACT

Euphorbia L. (Euphorbiaceae) is the second major genus of the angiosperms with different chromosome numbers and basic numbers. The species *Euphorbia heterophylla* (L.), wild poinsettia, is an important weed in this genus which is reported to contain 7 base chromosomes number (X=7). We studied the cytogenetics of three ecotypes of wild poinsettia to determine the (i) somatic chromosome number and the karyotype, (ii) meiotic behavior and pollen viability and (iii) ploidy level of wild poinsettia. The ecotypes used were: resistant to ALS (R ALS), resistant to ALS and PPO inhibitors (R ALS / PPO), and susceptible (S). These plant materials were collected from soybean fields in south Brazil. Somatic chromosome number was determined from somatic cells of root tips from 5 plants per ecotype. The root tips were prepared on glass slides and the chromosomes of dividing cells were counted from 50 cells per plant using an optical microscope. This would indicate the ploidy level. The young inflorescences were used to analyze the meiotic behavior and pollen viability. Pollen viability was determined by staining pollen grain on microscope slides with propionic carmin, which red colors indicate viable pollen. Five slides per plant were prepared, totaling 25 slides per ecotype. Total pollen and viable pollen were counted per slide. Meiotic cells at stage I and II were also counted. The analysis of approximately 250 meristematic cells per ecotype showed a karyotype with 12 pairs of meta or submetacentric chromosomes, one acrocentric pair, and a pair of chromosomes with satellites. The chromosome pairing was generally regular with bivalent association, but other organizations such as uni-, tri- and quadrivalents were also observed. Regular disjunction of chromosomes was observed at the end of meiotic phase, which explains the high viability of pollen grains (>94%). We conclude that wild poinsettia is tetraploid with 2n=4X=28. No cytogenetic differences were observed between herbicide-susceptible and –resistant plants. Polyploid species exhibit different inheritance patterns of (resistance) traits than diploid ones, which affect the rate of resistance evolution and the spread of resistance among populations.

POSTEMERGENCE CONTROL OF *LOLIUM MULTIFLORUM* RESISTANT TO IODOSULFURON-METHYL-SODIUM HERBICIDE. F. Mariani*[1], L. Vargas[2], D. Agostinetto[3], S. A. Senseman[1], L. A. Avila[4]; [1]Texas A&M University, College Station, TX, [2]Embrapa Trigo, Passo Fundo, Brazil, [3]UFPel, Pelotas, Brazil, [4]Universidade Federal de Pelotas, Pelotas - RS, Brazil (85)

ABSTRACT

Herbicide-resistant ryegrass has caused concern in many parts of the world. With the evolution of resistance it is evident that rotation of herbicide modes of action is imperative to reduce the number of new herbicide-resistant cases. Therefore, the aim of this study was to evaluate postemergence herbicide alternatives for the control of ryegrass resistant to iodosulfuron-methyl sodium herbicide. This experiment was conducted in a greenhouse at the Universidade Federal of Pelotas, Brazil. The herbicides from the group of the acetolactate synthase (ALS) inhibitors, acetyl CoA carboxylase (ACCase) inhibitors, enolpyruvyl shikimate-3-phosphate (EPSP) synthase inhibitors, carotenoid biosynthesis inhibitors, glutamine synthetase inhibitors, photosystem I and II inhibitors and an untreated were evaluated. The variables evaluated were visual control at 14 and 28 days after herbicide application (DAA) and shoot dry matter at 28 days. The control of the resistant biotype was less than 40% at 28 DAA to all the ALS inhibitors herbicides used and was greater than 80% to the susceptible biotype. These results suggest cross-resistance to this group of herbicide to the ryegrass. The Clodinafop-propargyl was the only molecule tested that can be utilized as alternative to control ryegrass resistant to iodosulfuron-methyl sodium in wheat. All the herbicides with the exception of ALS inhibitors and inhibitors of carotenoids presented themselves as alternatives for controlling resistant ryegrass to iodosulfuron-methyl sodium herbicide.

RESPONSE OF GLYPHOSATE-RESISTANT JOHNSONGRASS TO ACCASE-INHIBITING HERBICIDES. M. T. Bararpour*[1], J. K. Norsworthy[1], D. S. Riar[1], D. B. Johnson[1], B. Scott[2]; [1]University of Arkansas, Fayetteville, AR, [2]University of Arkansas, Lonoke, AR (86)

ABSTRACT

Johnsongrass is one of the most recent weeds to evolve glyphosate resistance (GR) in the United States. Greenhouse studies were conducted in 2012 to evaluate the response of GR johnsongrass to ACCase-inhibiting herbicides. The experiment was designed as a two (johnsongrass biotype) by ten (herbicide treatment) factorial in a randomized complete block design. Rhizomes of a susceptible johnsongrass biotype were collected from Fayetteville, Arkansas, and a GR johnsongrass biotype was collected from West Memphis, Arkansas. Ten herbicide treatments were evaluated including: sethoxydim at 0.188 lb ai/A, cyhalofop at 0.28 lb ai/A, clodinafop at 0.0625 lb ai/A, clethodim at 0.121 lb ai/A, fluazifop at 0.188 lb ai/A, tralkoxydim at 0.177 lb ai/A, quizalofop at 0.0625 lb ai/A, diclofop at 0.75 lb ai/A, fenoxaprop at 0.109 lb ai/A, and a nontreated check. Johnsongrass control was rated and then harvested (for dry weight measurement) four weeks after application (WAA). Pots were watered after harvesting johnsongrass to evaluate regrowth. Johnsongrass regrowth was rated and then harvested a second time, six weeks after first harvest. Glyphosate-resistant and -susceptible johnsongrass biotypes responded differently to herbicides in terms of percent control or dry weight production at first and second harvest. The resistant biotype had more than twice the dry weight (averaged over herbicides) of the susceptible biotype at both harvests. Johnsongrass dry weight was lowest from the application of clethodim and sethoxydim at first harvest, regardless of biotype. There was johnsongrass regrowth from all herbicide applications, except from clethodim after first harvest. Diclofop, fenoxaprop, cyhalofop, clodinafop, fluazifop, and quizalofop provided 16, 22, 38, 52, 68, and 74% control of the GR biotype and 54, 73, 70, 99, 98, and 99% control of the susceptible biotype, respectively. Sethoxydim provided excellent control (93 to 97%) of both johnsongrass biotypes. Clethodim was the only herbicide that provided complete (100%) control of johnsongrass shoots and rhizomes, regardless of biotype. The results indicated that the GR biotype appears to exhibit multiple resistance to the aryloxyphenoxypropionate (fops), but not to the cyclohexanedione (dims) herbicides.

GLYPHOSATE RESISTANT GOOSEGRASS (*ELEUSINE INDICA*) IN SPANISH CITRUS ORCHARDS. F. Gonzalez-Torralva*, M. Perez Lopez, R. De Prado; Cordoba University, Cordoba, Spain (87)

ABSTRACT

The herbicide glyphosate has been used for a long time in citrus orchards to control a wide range of weeds. A suspected glyphosate-resistant population of goosegrass (*Eleusine indica* [L.] Gaertn.) was reported in a citrus farm in Huelva (southern Spain). This suspected resistant population (R1) was subjected to a further selection with two different glyphosate rates: 445 (R2) and 740 (R3) g ae ha^{-1}; surviving plants were maintained in order to collect seeds. With the aim of determining the resistance level, dose-response curves and % of survival, the experiments were carried out under greenhouse conditions with the selected individuals from both doses. The results showed a Resistance Index of 2,05 and 2,81 for R2 (ED_{50} = 331,9 g ae ha^{-1}) and R3 (ED_{50} = 454,9 g ae ha^{-1}) populations, respectively, compared with a susceptible population (ED_{50} = 162,0 g ae ha^{-1}). Plants treated at the rate of 222 g ae ha^{-1} showed survival rates for S of 60 and for R2 and R3 of 100%, while at the rate of 445 g ae ha^{-1} the survival was of 30 (S), 75 (R2) and 100% (R3). These results show that under greenhouse conditions *E. indica* is still controlled with the recommended glyphosate rates.

COMPARATIVE ASSESSMENT OF THE SUSCEPTIBILITY OF THE SPECIESÂ *BRACHIARIA DECUMBENS* ANDÂ *BRACHIARIA BRIZANTHA* TO GLYPHOSATE DUE TO THE STAGE OF DEVELOPMENT IN THE APPLICATION. M. Nicolai*[1], P. J. ChristoffoletiJC[2], F. B. Obara[3], M. C. Melo[3], A. A. Prado[3], D. Dourado Neto[3]; [1]University of Sao Paulo, Piracicaba, Brazil, [2]University of Sao Paulo, Piracicaba, Brazil, [3]Escola Superior de Agricultura "Luiz de Queiroz", Piracicaba, Brazil (88)

ABSTRACT

The weeds commonly named as braquiária grass are species which belong to the *Brachiaria* genus. This weed group is highly aggressive to crops which use glyphosate as an weed control method such as soybeans, eucalyptus, citrus and very important to sugarcane, that many times uses this herbicide in directed applications. Therefore, to investigate the different glyphosate susceptibility between *Brachiaria decumbens* and *Brachiaria brizantha* which are very similar morphologically, in different growth stages. This generates a different glyphosate dose which will be recommended according to growth stage, avoiding reapplications in the field. The experiment was conducted in Piracicaba – SP (Brazil) in Crop Production Department greenhouse from ESALQ/USP, from september to december 2012. Seven dose-response curves were made for each species, *Brachiaria decumbens* and *Brachiaria brizantha*, spraying glyphosate at different growth, which were seedling, 3 to 4 leaves, 1 tiller, 2 tillers, 3 tillers, 4 tillers and 5 tillers. The glyphosate treatments sprayed were 0, 60, 120, 240, 480, 960, 1920 and 3840 grams of acid equivalent per hectare. ED 90 (90% of control) was defined as the comparable one between the species and with it a graph was made. The results show that the initial development of both species is very similar. The species *Brachiaria decumbens* is less sensitive to glyphosate than the species Brachiaria brizantha in the seedling stages, 3 to 4 leaves, 1 and 2 tillers. From the 3-tiller stage it is reversed. Unable to generate a curve adjustable from the control rates of 90% and the stage of the weeds, because there was a peak in the low susceptibility of 2 tiller stage. That certainly was due to physiological changes in weed stadium quoted, probably due to early flowering, returning to normal at the stage of application of 3 tillers.

COMPARATIVE ASSESSMENT OF THE SUSCEPTIBILITY OF THE SPECIES *IPOMOEA GRANDIFOLIA* AND *IPOMOEA NIL* TO GLYPHOSATE DUE TO THE STAGE OF DEVELOPMENT IN THE APPLICATION.
P. J. ChristoffoletiJC*[1], M. Nicolai[2], F. B. Obara[3], M. C. Melo[3], A. A. Prado[3], D. Dourado Neto[3]; [1]University of Sao Paulo, Piracicaba, Brazil, [2]University of Sao Paulo, Piracicaba, Brazil, [3]Escola Superior de Agricultura "Luiz de Queiroz", Piracicaba, Brazil (89)

ABSTRACT

The weeds commonly named as morning glory are species which belong to the *Ipomoea* genus. This weed group is highly aggressive to crops which use glyphosate as an weed control method such as soybeans, eucalyptus, citrus and very important to sugarcane, that many times uses this herbicide in directed applications. Therefore, to investigate the different glyphosate susceptibility between *Ipomoea grandifolia* and *Ipomoea nil* which are very similar morphologically, in different growth stages. This generates a different glyphosate dose which will be recommended according to growth stage, avoiding reapplications in the field. The experiment was conducted in Piracicaba – SP (Brazil) in Crop Production Department greenhouse from ESALQ/USP, from september to december 2012. 7 dose-response curves were made for each species, *Ipomoea grandifolia* and *Ipomoea nil*, spraying glyphosate at different growth, which were seedling, 2 leaves, 4 leaves, 6 leaves, 8 leaves, 10 leaves and more than 10 leaves stage. The glyphosate treatments sprayed were 0, 60, 120, 240, 480, 960, 1920 and 3840 grams of acid equivalent per hectare. ED 90 (90% of control) was defined as the comparable one between the species and with it a graph was made. The results from this study shows a slower initial growth of *Ipomoea nil*, which is less sensitive to glyphosate than *Ipomoea grandifolia*. At the 2 leaves stage the difference between species was more evident being *Ipomoea nil* less susceptible to glyphosate.

GLYPHOSATE TOLERANCE IN *COLOGANIA BROUSSONETII* IS CONFERRED BY A REDUCED GLYPHOSATE TRANSLOCATION. M. Perez Lopez[1], F. Gonzalez-Torralva*[1], J. A. Dominguez-Valenzuela[2], R. De Prado[1]; [1]Cordoba University, Cordoba, Spain, [2]Chapingo Autonomous University, Mexico State, Mexico (90)

ABSTRACT

In Mexico, some legumes such as *Canavalia ensiformis*, *Neonotonia wightii* and *Arachis pintoi*, have traditionally been used as cover crops mainly in citrus groves. *Cologania broussonetii* is another important legume that has been used in the last years as cover crop and forage in a mild climate grove. With the aim of determining the glyphosate efficacy in this species, dose-response and shikimic acid accumulation assays, besides the uptake of (^{14}C)-glyphosate by leaves and translocation to meristematic tissues were performed and compared with a known susceptible population of *Conyza bonariensis*. Glyphosate rates were: 0, 50, 100, 200, 300, 400,800 and 0, 22.5, 45, 90, 180, 360 g ai ha^{-1} for *C. broussonetii* and *C. bonariensis*, respectively. Dose-response curves displayed ED_{50} values of 174.5 and 47.3 g ai ha^{-1} for *C. broussonetii* and *C. bonariensis*, respectively. For shikimic acid accumulation plants of both species were sprayed at 360 g ai ha^{-1}, showing that at 96 h *C. bonariensis* accumulated 2.3 times more shikimic acid than *C. broussonetii.* This last species, exhibited limited uptake and impaired translocation of glyphosate to meristematic tissues with respect to *C. bonariensis.* Accordingly, the tolerance of *C. broussonetii* to glyphosate is possibly the result of the combined action of limited uptake and impaired translocation.

EFFECT OF SOILÂ DEPTH AND LIGHT INTENSITY ON PLATAIN SIGNALGRASSÂ (*UROCHLOA PLANTAGINE*) EMERGENCE AND DEVELOPMENT IN FIELD CONDITIONS. G. S. F Souza*[1], D. Martins[1], M. R. R Pereira[1], J. S. McElroy[2]; [1]Universidade Estadual Paulista - UNESP, Botucatu, Brazil, [2]Auburn University, Auburn, AL (91)

ABSTRACT

The introduction of integrated management has been of fundamental importance to studies of basic biology of the common weeds occurrence in the world, already the growth of each individual, for the most part, is not determined by genetic potential of the species, but the availability resources and ability to adapt in an extremely concurred environment. The germination of the plants can be affected by a number of intrinsic conditions of the seed and environmental factors such as availability of water, oxygen, temperature and light. The combination of all these factors results in the dynamic of population of various species, therefore, knowledge of the dynamics of germination and emergence of weed seedlings in different soil depths is essential for proposing more rational methods of weeds management. The aim of this research was to study in flied conditions the emergence and development of *Urochloa plantaginea* (Link) Hitchc. plants in different sowing depths and various light intensities.The experiment was conducted under field conditions at the Faculty of Agricultural Sciences from the Sao Paulo State University - UNESP, Botucatu / Sao Paulo, Brazil. The weed species evaluated was *U. plantaginea* and the treatments were arranged in a 6x4 factorial design, with the first factor corresponding to six different sowing depths (0.5, 1.0, 2.0, 4.0, 8, 0 and 12.0 cm) and factor B to four light intensities (100%, 70%, 50% and 30% of solar intensity) obtained through the use of agricultural shade cloth to 80 cm from the soil. The experimental units was made of beds with 1.0 m wide per 2.0 m long, raised with the aid of a rotary hoe. In each experimental unit was seeded 6 rows with 25 viable seeds of U. *plantaginea* per row and one row per depth. Seedling emergence was monitored daily for 30 days from sowing for obtained the percentage of emergency and the mean day for emergency. The experiments were repeated in time and the first three emerged plants per row were preserved for the data collection such as plant height in the flowering day and daily mass gain per plant from emergence to flowering. Relevant characteristics of each treatment intensity, such as air temperature, soil temperature at depths studied and, photosynthetically active radiation (PAR) was collected. At 6:30 am the soil temperatures at different depths were very similar in all lighting conditions, but over time, the more shallow treatments (0.5cm to 4.0cm) were the most affected with large temperature elevations in periods from 12:30 pm to 15:30 pm and being colder with the evening than soil depths of 4cm, 8cm and 12cm. The behavior of PAR is similar for all light conditions, with elevated PAR until 12:30 pm and reduction after 12:30 pm. *Urochloa plantaginea* seeds emergence was affected by seeding depth and the light intensity, and the increase of sowing depth result on lower seedling emergence. The *U. plantaginea* seeds germinated in all soil depths regardless of light conditions. In the treatments with 100% and 50% of sunlight had higher emergence on 2 cm and 4 cm of soil depth and smaller emergency on greater depths. Already, for the light conditions with 70% and 30% of sunlight the seeds emerged better in up to 2cm deep. Only the sown seeds in 100% of the sunlight and at depths up to 4cm delayed in emergence. In the other light conditions for germination time remained constant up to 8cm deep. After 8cm deep the time for the seedlings emergence are raised for all light conditions, but no differences between light conditions. The plant height at flowering was closely linked to the depth at which seeds were deposited. Plants subjected to 30% of sunlight increase in height until 8cm deep and after this point had reducers. Plants under 100% and 50% of sunlight kept height constant from 0.5cm to 8.0cm deep, reducing after this point. Plants grown under 70% of sunlight presented constant height from 0.5cm to 2cm followed by increase until 8cm and decrease when sown in 12cm of soil depth. The daily gain of dry mass by plants to flowering was influenced by sowing depth. The condition of 100% of sunlight provided the largest dry mass accumulation per day in *U. plantaginea* plants compared with other light conditions, with the greatest dry mass accumulation in 8.0cm depth.

The authors express their gratitude to FAPESP (Sao Paulo research Foundation, Sao Paulo, Brazil) for supporting this project and for the scholarship granted by a project number 2010/18742-5.

MEASUREMENT OF DICAMBA OFF-SITE MOVEMENT IN THE FIELD. H. Smith*[1], D. Findley[2], K. M. Remund[3], D. R. Wright[3], E. D. Sall[1]; [1]Monsanto Co, St. Louis, MO, [2]Monsanto, St. Louis, MO, [3]Monsanto Ag Products, St. Louis, MO (92)

NO ABSTRACT SUBMITTED

RYEGRASS CONTROL AND SOFT RED WINTER WHEAT TOLERANCE TO PYROXASULFONE HERBICIDE. B. Scott*[1], J. W. Dickson[1], B. Davis[2], T. W. Dillon[1]; [1]University of Arkansas, Lonoke, AR, [2]University of Arkanas, Lonoke, AR (93)

ABSTRACT

Studies were conducted during the 2011-12 and the 2012-13 wheat growing seasons in Arkansas to evaluate crop tolerance and ryegrass control with pyroxasulfone herbicide. The objective of this work was to determine if pyroxasulfone could be a viable option for the ever growing populations of accase- and als-resistant ryegrass populations documented in Arkansas over the past few years. In the 2011-12 study, 1.25 and 5.0 oz/A of pyroxasulfone was applied 20 days prior to plant (DPP) and preemergence (PRE). The 1.25 oz/A rate was also applied to 1-3 lf Wheat. No crop injury was observed in this trial. The wheat variety in this test was AgriPro Coker 9553. Wheat yield with the highest rate of pyroxasulfone applied pre was 80 Bu/A compared to only 30 Bu/A in the check. Ryegrass control at 140 days after application with 1.25 oz/A DPP and all 5.0 oz/A treatments was over 91%. The study conducted and currently ongoing in the 2012-2013 crop season was designed to further evaluate crop tolerance of wheat to pyroxasulfone. Using rainfall and center pivot irrigation treatments were activated following the PRE application and between the two POST applications. The test was maintained moist from burndown (14 DPP) through the application of the early POST treatments (1 lf and 2 lf timings). Two varieties: AGS2056 and P26R10 were selected based on suspected differences in crop tolerance based on previous work (source BASF). Pyroxasulfone as Zidua® herbicide was applied at 0.75, 1.5 and 3.0 oz/A. In the 2012-2013 test, variety AGS 2056 was more sensitive to pyroxasulfone than was variety P26R10. Injury as high as 19% was observed in the form of stunting and overall decreased plant growth from the 3.0 oz/A rate of pyroxasulfone applied to AGS2056 either 14DPP or PRE. Injury to the Pioneer variety 26R10 was less than 5% or less for all treatments. These treatments are ongoing and evaluations reported here were made on 11-7-2012, 22 days after planting. Although varietal sensitivity seems to be an issue pyroxasulfone has the potential to be an effective wheat herbicide in Arkansas for the control of Italian ryegrass.

EFFECT OF PYROXASULFONE RATE AND TIMING ON WINTER WHEAT. L. A. Grier*[1], W. J. Everman[1], T. E. McKemie[2], S. Tan[2]; [1]North Carolina State University, Raleigh, NC, [2]BASF Corporation, Research Triangle Park, NC (94)

ABSTRACT

Pyroxasulfone, a new isoxazoline compound that inhibits growth of germinating weeds by inhibiting very long chain fatty acid synthesis, is active on a wide range of weeds species including annual grasses and many broadleaf weeds. Two field studies were conducted in the fall/winter of 2011 in NC to evaluate the effect of pyroxasulfone rate and timing on winter wheat (Triticum aestivum). Study 1 was conducted in Clayton and Salisbury, NC. Treatments included 3 rates of pyroxasulfone (74, 149 and 298 g a.i. ha-1) at 3 application timings (preplant (PPL), preemergence (PRE) and postemergence (POST)) and a treatment with 60 g a.i. ha-1 pyroxasulfone PRE followed by 89 g a.i. ha-1 POST. Study 2 was conducted in Kinston and Salisbury, NC. Treatments included 3 rates of pyroxasulfone (60 , 74 and 89 g a.i. ha-1) at 6 application timings (14 days preplant (EPP), 7 days preplant (PPL), PRE, at spike, at tillering and at topdress fertilization timing in the spring). In both studies, wheat was rated for overall crop injury, chlorosis and stunting, and yield measurements were taken. No injury was noted in trials in Kinston and Salisbury in either study. In study 1 in Clayton, the highest wheat injury occurred in PPL treatments, then PRE treatments, and yield was lowest with 298 g a.i. ha-1 PPL. In study 2 in Kinston and Salisbury, all treatments had the same or higher yield than the untreated plot.

COMPETITIVENESS OF WHEAT IN ASSOCIATION WITH THE RYEGRASS. C. P. Tarouco*[1], D. Agostinetto[2], S. A. Senseman[1], R. Manica-Berto[2], L. A. Avila[3]; [1]Texas A&M University, College Station, TX, [2]UFPel, Pelotas, Brazil, [3]Universidade Federal de Pelotas, Pelotas - RS, Brazil (95)

ABSTRACT

The presence of weeds in wheat exerts a negative impact on productivity resulting from ryegrass competition for water, light and nutrients. The objective of this study was to investigate the relative competitive ability of wheat with ryegrass. This experiment was conducted in a greenhouse at the Federal University of Pelotas, in the growing season 2011. The experimental design was completely randomized with six replications. The experiment was conducted in a replacement series with a population of 1,542 plants m^{-2}. In each series, the proportions of wheat and ryegrass were 100:0, 75:25, 50:50, 25:75 and 100:0%. Shoot dry matter was measured at 30 days after emergence. Competitive analysis was performed by diagrams applied to the replacement and interpretations of competitiveness indices. The results may imply that wheat has competitive superiority compared to ryegrass.

DIFFERENTIAL RESISTANCE TO GLUFOSINATE BETWEEN A WILD AND A GM *TRITICUM AESTIVUM* LINE. A. M. Rojano-Delgado*[1], F. Jimenez[2], F. Priego-Capote[1], M. Luque de Castro[1], R. De Prado[3]; [1]University of Cordoba, Cordoba, Spain, [2]IDIAF, Santo Domingo, Dominican Republic, [3]Cordoba University, Cordoba, Spain (96)

ABSTRACT

The introduction of a gene to produce herbicide resistance in plants is a novel technology that allows to control many herbicide resistant weeds which invade a large number of crops. The resistance to glufosinate of two lines —genetically modified with the *pat* gene (GM) and unmodified (T-590 and T-549, respectively)— of *Triticum aestivum* population has been studied. Experiments in controlled conditions showed that line T-590 presented a high resistance to glufosinate with an ED_{50} value of 478.59 g active ingredient per hectare (g ai ha^{-1}) versus 32.65 g ai ha^{-1} for line T-549. The activity of glutamine synthetase (GS) in leaf extracts from both lines was investigated. The I_{50} for line T-590 was 694.100 µM *versus* 55.46 µM of glufosinate for line T-549, with a resistance factor of 12.51. Metabolism studies revealed a higher and faster penetration of glufosinate in line T-549 than in line T-590, and at 48 h after herbicide treatment (300 g ai ha^{-1}) an 83.4% of the herbicide was conversed (66.5% in N-acetyl-glufosinate metabolite) in line T-590, while in line T-549 conversion of the herbicide was about 40% (0% in N-acetyl-glufosinate). These results suggest that metabolism of glufosinate by the *pat* gene is a key mechanism of resistance in line T-590 that explains such high levels of herbicide tolerated by the plant, together with other mechanisms due to unmodified pathway, absorption and loss of glufosinate affinity for its target site.

BASF'S ON-TARGET APPLICATION ACADEMY: EDUCATING GROWERS. W. E. Thomas*[1], M. Staal[1], S. J. Bowe[2], L. L. Bozeman[3], D. Pepitone[1]; [1]BASF Corporation, Research Triangle Park, NC, [2]BASF, Research Triangle Park, NC, [3]BASF, Raleigh, NC (97)

ABSTRACT

The On-Target Application Academy is a one-of-a-kind educational opportunity to provide growers extensive hands-on training for better awareness of herbicide application best practices that help mitigate spray drift – which is a continuous area of focus for the agricultural industry. Understanding that today’s herbicide environment is more complex, BASF wants to continually support growers and help them achieve the most effective weed control possible with today’s emerging product and equipment innovations. According to the BASF Grower Perception Survey conducting in 2011, 80% of the respondents indicated that they self-apply herbicides to their crops. In addition, more than one-third said they were interested in taking a herbicide self-application training seminar. Based on the responses from growers, BASF and TeeJet® jointly initiated the On-Target Application Academy to provide field based training utilizing recognized application technology experts. The Academy has focus areas that are derived from herbicide application best practices including proper nozzle selection, appropriate calibration and boom placement and impact of environmental conditions. The On Target Application Academy will be conducted at various locations throughout the US in 2013.

DUPONT'S PERSPECTIVES ON MANAGING WEED RESISTANCE IN SOUTHERN STATES. D. Saunders[1], J. Smith[2], H. A. Flanigan*[3]; [1]DuPont, Johnston, IA, [2]E. I. DuPont, Wilmington, DE, [3]DuPont Crop Protection, Greenwood, IN (98)

ABSTRACT

Since the 1990's there have been 3 successive waves of new tools brought to the marketplace that have fundamentally changed weed control in row crops – the ALS herbicides, glyphosate tolerance, and most recently, auxin tolerance traits. Each new tool brought or is anticipated to bring expectations for significant improvement in efficacy against troublesome weeds while at the same time lowering costs and simplifying management practices. Early adopters of ALS herbicides, such as imazethapyr in soybeans, saw their expectations for improved efficacy versus older established herbicides met or exceeded. Initial good product performance lead to over-simplified product use patterns, questionable crop rotational practices, and intense selection pressure for weeds resistant to ALS herbicides. The same pattern of over-use, over-simplification, and resulting weed resistance was repeated with the advent of glyphosate-tolerant crops and is poised to repeat itself yet again with the auxin tolerance technologies. Questions arise on how best to encourage product use patterns that extend the useful life of new technologies in spite of the fact that excellent initial effectiveness, reasonable cost, and simplicity will likely drive use patterns that promote short-term effectiveness. It is important to recognize that a company's product portfolio will likely contain a range of herbicide products designed for use with new technologies that are appropriate for addressing a wide range of field needs. Different products and use patterns may be appropriate for well-managed fields with routine weed control needs, fields containing "at-risk" weeds where the potential for resistance exists but where no immediate threat has been identified, or "high-risk" fields where resistance is an established problem that must be addressed. DuPont Crop Protection believes key considerations for driving sustainable product use patterns include; designing single and multiple active ingredient products with efficacious use rates and realistic performance claims, pricing and servicing products so favorable behavior is incentivized and irresponsible use is penalized, and promoting and positioning products to meet specific field needs.

GROWERS' SURVEY ON THE CURRENT WEED MANAGEMENT PRACTICES AND HERBICIDE RESISTANCE IN FLORIDA CITRUS. A. M. Ramirez*, S. H. Futch, M. Singh; University of Florida, Lake Alfred, FL (99)

ABSTRACT

Citrus is an important crop in Florida. Weeds are major problem in citrus production. There is limited information on current weed management practices in citrus and on the occurrence of herbicide resistance. A survey was conducted in 2011 to determine the current weed management practices in citrus and the level of awareness on herbicide resistance among growers. Questionnaires were sent to growers all over the state and 50% of them responded. This represented 18% of the total citrus acreage in Florida. The size of the grove covered by the survey ranged from 35 to 14,000 acres. The survey indicated that Spanish needles (*Bidens alba* L.) was the most problematic weed, followed by *Panicum* spp. Growers have indicated that the weed situation and problem in citrus has not changed over the last three to five years but the weed composition was a mix of old and new species. The use of various herbicide types and combination is the method of choice among growers for controlling weeds in the tree rows. Additional weed control such as mowing, hand hoeing and physical removal of weeds is employed by 13% of growers surveyed. In the middles, chemical mowing is the predominant method of control. All of the respondents used glyphosate three to five times in a year. Citrus growers in Florida are aware of the occurrence of herbicide resistance and tolerance. Weed species such as Spanish needles and ragweed parthenium (*Parthenium hysterophorus*), have been identified as being poorly controlled by glyphosate at the recommended rate however, this might be due to application of the herbicide on older/mature plants rather than due to herbicide resistance. Despite the high application frequency of glyphosate, there is no confirmed herbicide resistance case in Florida citrus. This may be due to the use of herbicide tank mixes and rotation which is predominant practice among citrus growers. However, weed species that have been identified by growers as not being controlled by herbicides should be evaluated for possible herbicide resistance.

FLAG THE TECHNOLOGY: A SIMPLE AND NOVEL APPROACH TO FIELD HERBICIDE TECHNOLOGY IDENTIFICATION. R. Baker*, B. Scott; University of Arkansas, Lonoke, AR (100)

ABSTRACT

Flag the Technology is a quick and inexpensive method to prevent misapplication of pesticides and warn of technology that is sensitive to potential off-target drift. Advanced technology continues to improve the way we manage weeds in agricultural crops. Recently, herbicide-tolerant crops have been developed that allow certain non-selective or broad-spectrum herbicides to kill weeds without injury to the crop. The use of non-selective herbicides on tolerant crops presents special challenges to ensure crops without the trait are protected from accidental misapplications and off-target movement. The objective of the Flag the Technology program is to significantly reduce herbicide application errors and to foster good community relations. This program is presented by the University Of Arkansas Division Of Agriculture, Cooperative Extension Service and is endorsed by the Arkansas Agricultural Industry. The Flag the Technology idea is simple. Colored bicycle-type or marker flags that represent a particular herbicide technology are placed at the field entrance or in conspicuous locations in the field visible from ground and air. The color of the flag represents the technology. Multiple flags may be used if needed to ensure visibility. In fields where stacked technology (such as Roundup Ready® and Liberty Link®) is utilized, flags representing both technologies are placed together. The flag colors are as follows: white represents the Roundup Ready technology, yellow represents ALS tolerance (Clearfield® rice or STS® soybean), bright green represents Liberty Link® and red is reserved for conventional fields of all kinds. In 2012 it is estimated that over 25,000 flags were distributed by the University of Arkansas, Cooperative Extension Service through a grant from the Arkansas Soybean Promotion Board. More information on Flag the Technology can be found at www.uaex.edu.

BENCHMARK STUDY: OVERALL LONG-TERM ECONOMIC VIABILITY OF HERBICIDE RESISTANCE MANAGEMENT PROGRAMS. B. Edwards*[1], D. R. Shaw[2], M. D. Owen[3], P. Dixon[3], B. Young[4], R. Wilson[5], D. L. Jordan[6], S. Weller[7]; [1]Mississippi State University, Starkville,MS, MS, [2]Mississippi State University, Mississippi State, MS, [3]Iowa State University, Ames, IA, [4]Southern Illinois University, Carbondale, IL, [5]University Nebraska Lincoln, Lincoln, NE, [6]North Carolina State University, Raleigh, NC, [7]Purdue University, West Lafayette, IN (101)

ABSTRACT

The introduction of glyphosate-resistant (GR) crops led to an almost exclusive reliance on glyphosate-only weed management programs. Due to this, many weeds have evolved resistance to glyphosate and are now widespread across U.S. cropland. Long-term research is needed to evaluate the sustainability of herbicide best management programs (BMPs) to mitigate and/or manage herbicide resistance. The Benchmark Study was implemented to compare long-term field-scale weed management programs and economics of a typical grower standard program (SP) and an academic recommended BMP. The study consisted of 641 grower fields in six states for a period of five years. Crop yields, weed management costs, and weed population changes over time were compared for the SP versus BMP approach across states, years, crops, rotation and tillage systems, and geographical regions. The crops consisted of maize (*Zea mays* L.), cotton (*Gossypium hirsutum* L.), soybean [*Glycine max* (L.) Merr.], and rice (*Oryza sativa* L.). Three crop rotational systems consisted of continuously grown GR crop, a rotation of GR crops, and a GR crop rotated with a non-GR crop, such as rice or maize. Also, various tillage systems were included and consisted of conventional, minimum, and no-tillage. Results from this study indicate that the more intensive herbicide BMP do not result in economic loss to manage evolved herbicide resistant weeds. Results also indicate that net returns among SPs and BMPs are equivalent in the near and long-term while maximizing herbicide load in the environment.

LOBLOLLY PINE TOLERANCE TO GROUND SPRAYING APPLICATIONS OF AMINOCYCLOPYRACHLOR. A. W. Ezell*[1], A. B. Self[2]; [1]Mississippi State University, Starkville, MS, [2]Mississippi State University, Strakville, MS (102)

NO ABSTRACT SUBMITTED

ASSESSMENT OF DIFFERENT BASAL BARK CARRIERS ON CONTROL OF RUSSIAN OLIVE (*ELAEAGNUS ANGUSTIFOLIA* L.) THROUGH CUT STUMP APPLICATIONS OF AMINOCYCLOPYRACHLOR. R. J. Edwards*[1], K. Beck[2], M. T. Edwards[3]; [1]Mississippi State University, Starkville, MS, [2]Colorado State University, Ft. Collins, CO, [3]E. I. DuPont, Pierre Part, LA (103)

ABSTRACT

Field trials were conducted in Colorado on Russian olive (*Elaeagnus angustifolia* L.) trees testing aminocyclopyrachlor (DPX-MAT 28 SL) efficacy for cut stump applications when mixed with differing carriers. Two experiments were performed; 1) Efficacy of two commercial basal bark oils (petroleum based Bark Oil Blue LT, and vegetable based JLB oil PLUS) for use in cut stump applications and 2) Efficacy of DPX-MAT 28 when tank mixed with methylated seed oil (MSO). In both studies, trees were cut down and herbicides applied within 30 minutes using a CO_2 backpack sprayer with either a AA30A MeterJet spray gun (10 ml per trigger pull) or a single nozzle boom (40-03 E tip) and applied at 1 fluid oz per inch of trunk diameter to the entire stump. For the first study, DPX-MAT 28 SL was applied at 1, 2.5, and 5% v/v and compared to a 100% oil/no herbicide control and a no herbicide/oil applied control stump. For the second study, DPX-MAT 28 SL was applied at a constant rate of 2.5% v/v with 1%, 5%, 10% or 20% MSO v/v and compared to 2.5% DPX-MAT 28 SL mixed with the bark oil standards (Bark Oil Blue LT and JLB oil PLUS) and a no herbicide/oil control stump. Both experiments were designed as a RCB with 6 replications (1 tree per replicate) and conducted at 2 sites to be replicated in space. Visual control data were collected 1year after treatment (YAT) based on a binomial scale for dead trees and living trees. Data were subjected to ANOVA and means separated by LSD (α= 0.05). For experiment 1, site differences prevented data from being averaged over sites. At the Greeley site, Bark Oil Blue LT control ranged from 50% when applied alone to 100% when mixed with aminocyclopyrachlor at 1, 2.5 and 5% v/v. JLB oil PLUS control ranged from 50% when applied alone, to 84%, 92% and 100% (1%, 2.5%, and 5% DPX-MAT 28 respectively. At the other site, control was 100% for each treatment except the control. For experiment 2, at both sites control was 100% for all treatments except the control. Differences were only detected between the treated trees and the control trees. In conclusion, for experiment 1, site differences prevented any definitive conclusion as the results and further testing is required to sort out differences in oil carriers. For experiment2, inclusion of MSO is a viable option for cut stump applications of DPX-MAT 28. However, a combination of DPX-MAT 28 SL and water alone provided excellent (100%) control compared to other factors tested.

RESIDUAL HERBACEOUS WEED CONTROL USING SITE PREPARATION MIXTURES INCLUDING FLAZASULFURON AND SULFOMETURON METHYL. A. W. Ezell*[1], A. B. Self[2]; [1]Mississippi State University, Starkville, MS, [2]Mississippi State University, Strakville, MS (104)

NO ABSTRACT SUBMITTED

BROWNOUT OF BOXELDER AND TRI-FOLIATE ORANGE IN TEXAS WITH AMINOCYCLOPYRACHLOR BASAL BARK APPLICATIONS. J. Grogan*, J. L. Yeiser; Stephen F Austin State University, Nacogdoches, TX (105)

ABSTRACT

Two sites near Kennard and Lovelady (Houston County), TX were selected to contrast low volume basal bark treatments to stems of boxelder and tri-foliate orange with MAT28-360 (aminocyclopyrachlor)+basil oil against a standard treatment. Treatments are (1) 6.67%, (2) 10% and (3) 13.33% of aminocyclopyrachlor at 360 grams/liter, (4) 10% at 2 liter/gallon aminocyclopyrachlor and (5) 25% Garlon 4. All treatments were mixed with Oil Blue by Crop Production Services and applied with a Teejet 5500 Adjustable Conejet with 8x orifice. Test boxelder trees occurred between rows in a loblolly pine plantation and were selected for equal representation in 1-in and 2-in gld classes, and tri-foliate orange in the 1-in, 2-in and 3-in gld classes for each treatment. Twenty-four test trees were present in each treatment. Stems of boxelder were treated on August 6, 2012 and trifoliate orange on August 21, 2012 by applying the herbicide mixture to the bottom 14-in of the stem until the bark was saturated but without runoff and puddling on the ground. Trees were visually evaluated for brownout on October 3, 2012 (43 DAT). Herbicide for boxelder was mixed at 6am and applied about 11am. MAT28-360 was applied with no problems in the <6.67% solutions. At 10%, MAT28-360 required constant agitation. The 10% MAT28 (2LG) turned to a mayonnaise-like consistency and was applied with difficulty. Herbicide for tri-foliate orange was mixed immediately prior to spraying each treatment and were applied with no separation and consistency issues, such as described for boxelder. Brownout of boxelder was excellent with all herbicide treatments exceeding 99% brownout at the same time only 5% brownout was observed on check trees. For tri-foliate orange, brownout of foliage (99%) and stems (65%) was rapid with Garlon 4. Results from the amnocyclopyrachlor (360ml/liter) treatments were statistically similar to the Garlon treaments for 1” and 2” trees, yet substantially lower for 3” trees. Perhaps 43 DAT was soon to evaluate aminocyclopyrachlor, which conditioned foliage and stems significantly less than Garlon 4. Percent control will be evaluated in September 2013.

SCREENING FOLIAR RATES OF STREAMLINE AND VIEWPOINT FOR INDIVIDUAL PLANT TREATMENT AND BROWNOUT OF YAUPON AND OAK. J. L. Yeiser*, J. Grogan; Stephen F Austin State University, Nacogdoches, TX (106)

ABSTRACT

A site near Corrigan (Polk County), TX was selected for testing individual plant foliar treatments of Streamline and Viewpoint for control of unwanted mixed red oaks and yaupon. Test treatments were: (1) MAT28+Escort XP (Streamline) 124+32 grams material/100 liter (GML), (2) MAT28+Escort XP (Streamline) 225+61 GML, (3) MAT28+Escort XP (Streamline) 404+108 GML, (4) MAT28+imazapyr+Escort XP (Viewpoint) 87.2+79.3+23.0 GML, (5) MAT28+imazapyr+Escort XP (Viewpoint) 180+159+48 GML, (6) MAT28+imazapyr+Escort XP (Viewpoint) 346+320+92 GML, (7) MAT28+Garlon 3A 0.5%+0.667, (8) Capstone+Arsenal Powerline+Accord XRTII 5%+0.5%+6%. In treatments 1-6 MAT28 was formulated as a 50% SG and in treatment 7 a 2lb SL. All herbicide treatments included 1% NIS and were applied with a Teejet 8002VS nozzle supported by a back-pack sprayer. The oak group was heavily composed of southern red oak with lesser amounts of water and willow oaks. Test oaks and yaupon trees occurred between rows in a loblolly pine plantation and were selected for equal representation in 1-in and 2-in dbh classes for each treatment. Thirty test trees were present in each treatment. Herbicides were applied on 27-Sep-12 and brownout was visually evaluated on 13-Nov-12. Approximately 7 weeks after treatment, the Capstone mixture provided 100% and significantly more oak brownout than other test treatments. MAT28+Escort XP (high rates) treatments were intermediate in brownout ranging from 70% to 55%. MAT28+Escort XP (124+32 grams of material per 100L) provided least brownout at 43%. The untreated check exhibited 21% brownout, which was significantly less than all herbicide treatments. Yaupon brownout was 94% and best for the Capstone tank mixture. All remaining treatments provided 37% or less brownout. Percent control of oaks and yaupon will be evaluated in September 2013.

PREEMERGENCE WEED CONTROL FOR CABLE BARRIER SYSTEMS USING SELECTED HERBICIDE TREATMENT COMBINATIONS. D. Montgomery*, D. L. Martin; Oklahoma State University, Stillwater, OK (107)

ABSTRACT

A research study was conducted at the Cimarron Valley Research Station in Perkins, Oklahoma during 2012 to evaluate the effectiveness of several herbicide treatments for long-term preemergence control of summer annual weeds. This study was an initial screening for developing a safe long-term residual annual weed control program for cable barrier systems along Oklahoma highways. To evaluate preemergence control, only glyphosate at 2.0 lb.a.i./A was applied to the research area to control existing winter annual weeds prior to the application of the residual treatments. Treatments were applied on 5 March using a CO2-pressurized sprayer calibrated to deliver 30 gallons of water/A. Treatments were arranged in a randomized complete block design with three replications. Preemergence treatments evaluated included Oust Extra at 3.66 oz.a.i./A, diuron at 6.4 lb.a.i./A, diuron at 4.0 lb.a.i. plus Oust Extra 2.85 oz.a.i./A, Gallery at 1.0 lb.a.i./A, Gallery at 0.75 lb.a.i. plus Oust Extra at 2.85 oz.a.i./A, Milestone VM at 1.75 oz.a.i./A, Milestone VM at 1.25 oz.a.i. plus Oust Extra at 2.85 oz.a.i./A, indaziflam at 1.0 oz.a.i./A, indaziflam at 1.0 oz.a.i. plus Oust Extra at 2.85 oz.a.i./A, prodiamine at 1.5 lb.a.i./A, pendimethalin at 4.56 lb.a.i./A, Plainview at 5.94 oz.a.i./A, Streamline at 3.17 oz.a.i. plus Oust XP at 2.25 oz.a.i./A, and Perspective at 4.42 oz.a.i. plus Oust XP at 2.25 oz.a.i./A. Plots were visually evaluated at 63, 98, 186, and 248 days-after-application (DAA) for percent weed control by species as compared to paired checks and untreated plots. The study area received suitable rainfall after applications to activate all herbicides. However, mid to late summer conditions were severely dry and hot, limiting vegetation growth and development as well as new seedling emergence. All treatments, excluding Milestone VM alone, produced and sustained excellent season-long control of large crabgrass (*Digitaria sanguinalis*). The level of control ranged from 96-100% and was sustained through the final 186 DAA evaluations. Several treatments also produced excellent season-long control of Palmer amaranth (*Amaranthus palmeri*). Treatments including diuron alone, diruon + Oust Extra, Gallery + Oust Extra, indaziflam alone, indaziflam + Oust Extra, prodiamine alone, pendimethalin alone, Streamline + Oust XP, and Perspective + Oust XP produced and sustained 96-100% control of Palmer amaranth through 186 DAA evaluations. Treatments of Gallery alone and Plainview produced good palmer amaranth control at 89 & 93%, respectively, at that same time. All treatments, excluding Milestone VM alone and Gallery alone, produced and sustained excellent season-long control of carpetweed (*Mollugo verticillata*). The level of control ranged from 97-100% and was sustained through the final 186 DAA evaluations. Treatments of Milestone VM alone produced fair carpetweed control (55%) and Gallery alone good control (89%) at 186 DAA. While early season moisture conditions were very good there was very little mid to late summer weed seed germination and emergence due to extreme hot and dry conditions. These conditions no doubt accounted for some of the late season weed control that was present in this study. On a final note there was very little lateral chemical movement documented throughout the duration of this study.

VEGETATION MANAGEMENT UNDER HIGHWAY GUARDRAILS WITH ESPLANADE - SOUTHEAST REGIONAL SUMMARY. D. R. Spak*[1], J. Brosnan[2], P. L. Hipkins[3], P. McCullough[4], J. Omielan[5], J. J. Vargas[2], R. H. Walker[6]; [1]BayerCropScience, Cary, NC, [2]University of Tennessee, Knoxville, TN, [3]Virginia Tech University, Blacksburg, VA, [4]University of Georgia, Griffin, GA, [5]University of Kentucky, Lexington, KY, [6]Auburn University, Auburn, AL (108)

ABSTRACT

ï»¿Esplanade 200SC is a newly-registered pre-emergence herbicide registered in the U.S. for bareground weed control in non-crop settings such as highway guardrail and cable barriers. Esplanade contains the active ingredient indaziflam, a cellulose biosynthesis inhibitor. Esplanade is labeled for preemergence control of many annual grasses and broadleaf weeds. In 2012, herbicide programs containing Esplanade were evaluated for bareground weed control under highway guardrails in Alabama, Georgia, Kentucky, Tennessee, and Virginia. Esplanade was evaluated alone (5 oz/A) and in combination with various preemergence- and postemergence-applied herbicides including: Oust Extra (sulfometuron+metsulfuron) at 4 oz/A, Milestone plus Escort (aminopyralid+metsulfuron) at 7 fl oz + 1 oz/A, Streamline (aminocyclopyrachlor+metsulfuron) at 7.5 oz/A, and Frequency (topramezone) at 4 oz/A. All treatments were tank-mixed with glyphosate (1.5 to 2 lb ae/A) and 0.25% v/v non-ionic surfactant to control any existing vegetation. Glyphosate-alone and local herbicide standards were included for comparison. Treatments were applied in the spring or early-summer using hand-held, CO_2 pressurized sprayer with flat-fan nozzles at a spray volume of 25 to 40 GPA. Bareground weed control and percent weed cover (by species) were evaluated at monthly intervals through late-fall, roughly 5-6 months after treatment. Sites in Alabama and Georgia contained a significant amount (20-25%) of bermudagrass (*Cynodon dactylon*) which may or not be considered a weed depending on the local situation. Bermudagrass can reduce soil erosion, but may cause deterioration of infrastructure and may require regular trimming. In Alabama, all treatments containing Esplanade gave greater than 90% control of spotted spurge (*Euphorbia macrolata*), large crabgrass (*Digitaria sanguinalis*), and buckhorn plantain (*Plantago lanceolata*) for at least 5 months. Control of buckhorn plantain is believed to be a result of postemergence activity of indaziflam. Esplanade treatments increased bermudagrass cover (bermudagrass “release”) compared to glyphosate applied alone as a result of better weed control. Treatments containing local standards of sulfometuron and/or diuron reduced bermudagrass cover due to phytotoxicity and poor weed control. Conversely, in Georgia, all treatments reduced bermudagrass cover and resulted in similar weed control. Bermudagrass was absent or not a significant species at other locations. In Kentucky, where the primary species included large crabgrass, yellow foxtail (*Setaria pumila*), and purpletop (*Tridens flavus*), Esplanade alone gave 85% bareground weed control for 5 months, and was not significantly different than Esplanade tank-mixtures. Esplanade alone was comparable to Sahara (imazapyr+diuron) (10 lb/A), Proclipse (prodiamine) + Oust Extra (2.3 lb + 4 oz/A), and was better than diuron+Oust Extra (8 lb + 4 oz/A). In Tennessee, the primary species included spotted spurge and large crabgrass. Esplanade tank-mixes performed better than Esplanade alone. Esplanade tank-mixes gave 90% bareground weed control for 5 months and were slightly better than the local standards. In Virginia, the primary species included giant foxtail (*Setaria faberi*), yellow foxtail, and teasel (*Dipsacus fullonum*). After 5 months, Esplanade alone and Esplanade tank-mixtures gave 89 and 98% bareground weed control, respectively. Overall, Esplanade applied at 5 oz/A gave long-term residual control of many annual grasses and some broadleaf weeds. However, due to the diversity of weeds and conditions across the region and even within locations, tank-mixes of Esplanade with other herbicides were necessary to achieve 90%+ bareground weed control.

INDAZIFLAM FOR WEED CONTROL ALONG WARM-SEASON ROADSIDES IN NORTH CAROLINA. T. Gannon*[1], F. Yelverton[2], L. Warren[1], M. Jeffries[2], D. R. Spak[3]; [1]North Carolina State University, Raleigh, NC, [2]NCSU, Raleigh, NC, [3]BayerCropScience, Cary, NC (109)

ABSTRACT

Indaziflam is a cellulose biosynthesis-inhibiting herbicide for preemergence control of annual broadleaf and grass weed species in warm-season turf systems. Bayer Crop Science recently registered this alkylazine chemical family member under the trade name Esplanade 200 SC® for use sites including, but not limited to non-irrigation ditch banks, rights-of-way, and roadsides. Field trials were conducted along North Carolina guardrails in 2009 and 2012 to evaluate weed control with indaziflam. Regimens included indaziflam (20 or 40 g ha^{-1}) and prodiamine (1.7 kg ha^{-1}) + simazine (2.2 kg ha^{-1}) in 2009, while indaziflam (51 or 73 g ha^{-1}) coupled with combinations of aminocyclopyrachlor (208 g ha^{-1}), aminopyralid (123 g ha^{-1}), metsulfuron (42 or 67 g ha^{-1}), sulfometuron (158 g ha^{-1}), or topramazone (92 g ha^{-1}) were compared to current roadside vegetation management regimens in 2012. Trials in 2012 were initiated early May or June. All regimens included glyphosate applied at 3.2 or 2.2 kg ha^{-1} in 2009 and 2012, respectively. In 2009, indaziflam (40 g ha^{-1}) + glyphosate provided $\geq$ 90% cudweed (*Gnaphalium* spp.), dogfennel (*Eupatorium capillifolium*), large crabgrass (*Digitaria sanguinalis*), and spiny sowthistle (*Sonchus asper*) control through 138 days after treatment. In 2012, regimens including indaziflam (73 g ha^{-1}) did not improve broomsedge (*Andropogon virginicus*) control compared to glyphosate applied alone; however, its addition increased large crabgrass control $\geq$ 32 and 20 % following May and June application timings, respectively. In general, regimens initiated in early June provided greater control than early May. Finally, all regimens including indaziflam at 73 g ha^{-1} provided comparable or greater control to currently utilized regimens; however, the addition of all evaluated herbicide combinations did not improve efficacy compared to indaziflam + glyphosate. These data indicate indaziflam offers an effective herbicide option for select species and compliments existing treatment regimes along warm-season roadsides.

THE IMPORTANCE OF CONSIDERING GENOTYPE — ENVIRONMENT INTERACTIONS TO ASSESS THE RISK OF WEEDINESS OF ENERGYCANE CULTIVARS. R. G. Leon*[1], R. A. Gilbert[2], J. C. Comstock[3]; [1]University of Florida, Jay, FL, [2]University of Florida, Belle Glade, FL, [3]USDA-ARS, Canal Point, FL (110)

ABSTRACT

Energycane (*Saccharum* spp. × *S. spontaneum*) is one of the crops with more potential for high biomass production for bioenergy purposes in the Southern United States, especially in areas where sugarcane is commonly grown, and the production techniques and logistics for a crop with characteristics similar to sugarcane are already in place. Because energycane has a high competitive ability due to high growth rates, tall canopies, and high stalk population densities, some people have expressed concerned about the risk of this new crop showing a weedy or invasive behavior. However, little is known about key traits that are important to assess weedy behavior such as flowering and seed production, vegetative growth, climatic range. In order to determine vegetative and reproductive growth variability among different energycane clones, we conducted experiments in tropical (Guacimo, Costa Rica) and subtropical environments (Jay, FL), and evaluated stalk height and population density, biomass production, flowering, and pollen and seed viability. Under tropical conditions, energycane clones showed high variation in biomass production and growth parameters across the different clones. Several energycane clones produced biomass at levels that were significantly higher (>32 ton/A) than previous reports for energycane and other feedstocks. All evaluated clones flowered under tropical conditions, but inflorescence density varied among clones from 162 to >22,000 inflorescences/A. Additionally pollen viability ranged from 30 to 60%, for all clones. Most clones produced seed showing a germination ranging from 2 to 40%. Conversely, under subtropical conditions, energycane biomass yield was considerably lower (<13 ton/A). Also, inflorescence density ranged from 0 to 17,424 inflorescences/A. However, there were large differences in flowering between clones, and at least two clones did not flower at all. Pollen viability averaged 13% and no viable seeds were found in the first year of the study. The results suggest that the risk of weedy and/or invasive behavior is higher in tropical than subtropical conditions. Also, it seems viable to select clones with low flowering potential to reduce the risk of seed production. This study illustrates how energycane clones can show different vegetative and reproductive growth depending on strong genotype × environment interactions. It is concluded that it is critical to assess the agronomic as well as the weedy and invasive potential of energycane individually per clone and environment, and that generalizations at the crop level might be misleading.

HERBICIDE REGISTRATION REVIEW IN THE U.S. J. W. Wells*; Syngenta, Greensboro, NC (111)

ABSTRACT

The Environmental Protection Agency is required by an amendment to the Federal Insecticide, Fungicide and Rodenticide Act to reassess all pesticides registered for use in the United States on a 15 year cycle. The scope, objective and process for this reassessment (or registration review program) will be discussed. The status of herbicide active ingredients in the current registration review program and potential impact of the current review cycle on herbicide registrations and uses will also be discussed.

EMERGING PROCEDURES FOR ASSESSING POTENTIAL EFFECTS OF HERBICIDES ON ENDANGERED SPECIES. D. D. Campbell*; Syngenta Crop Protection, Greensboro, NC (112)

NO ABSTRACT SUBMITTED

HERBICIDE REGISTRANT INTERACTIONS WITH STATE LEAD AGENCIES. L. Zang*; Syngenta Crop Protection, Greensboro, NC (113)

ABSTRACT

State Lead Agencies (SLA's) have lead role in regulation of pesticides at state level. Federal law provides states with mechanisms to obtain special labels that meet the needs of their user community. Registrants interact with SLA's on federal and state registrations, special labels, stewardship, compliance, enforcement, and legislative matters.

SOYBEAN PERFORMANCE FOLLOWING ITALIAN RYEGRASS CONTROL PROGRAMS. S. A. Shinkle*, J. A. Bond, T. W. Eubank, H. M. Edwards, G. B. Montgomery; Mississippi State University, Stoneville, MS (114)

ABSTRACT

Populations of glyphosate-resistant (GR) Italian ryegrass (*Lolium perenne* ssp. *multiflorum*) are present in 31 Mississippi counties. GR Italian ryegrass not controlled at burndown will leave substantial amounts of residue on the field, which will promote crop seedling-Italian ryegrass competition, hinder planting practices, and jeopardize the efficacy of herbicide programs. Previous research at the Delta Research and Extension Center has demonstrated a minimum of two herbicide applications were required for >90% GR Italian ryegrass control. Problematically, little is known about the effects of GR Italian ryegrass that survives burndown management programs. Therefore, research was initiated in 2011-12 to evaluate the impact of GR Italian ryegrass management programs on growth, development, and yield of soybean. Research was established in Elizabeth, MS, at a site known to be infested with GR Italian ryegrass. The soil series was a Dundee very fine sandy loam with a pH of 6.7 and 1.2% organic matter. Treatments were arranged as a three-factor factorial in a randomized complete block design with four replications. Factor A was fall application and included no fall treatment, tillage, or application of a mixture of *S*-metolachlor (1.27 lb ai/A) plus paraquat (0.75 lb ai/A), and was applied November 7, 2011. Factor B was winter application and included no winter treatment or clethodim (0.094 lb ai/A) applied January 31, 2012. Factor C was spring application and included no spring treatment or paraquat (1 lb/A) 4 wk after winter treatments on March 6, 2012. Treatments were designed to demonstrate a range of control of GR Italian ryegrass. Soybean ('Pioneer 94Y80') were planted April 2, 2012, and managed throughout the growing season to optimize yield. Soybean seedling density was recorded at 14 days after emergence (DAE). A normalized difference vegetative index (NDVI) reading was taken July 2, 2012 as an indication of crop health. Soybean node number was recorded prior to harvest. Plots were harvested and soybean yields adjusted to 13% moisture content. All data were subjected to ANOVA with means separated using Fisher's protected LSD at p=0.05. GR Italian ryegrass control was greatest following programs that included both *S*-metolachlor and clethodim. Soybean density 14 DAE and green-NDVI were reduced in plots receiving no fall treatment or those that were only tilled in fall. Pooled across spring treatments, soybean node number and yield were greatest following programs that contained *S*-metolachlor and/or clethodim. Pooled across fall treatments, soybean node number and yield were greatest following programs that contained clethodim. GR Italian ryegrass not controlled prior to planting negatively influenced soybean growth. In plots receiving a burndown herbicide application, soybean were able to compensate for negative, early-season effects of GR Italian ryegrass. Although two herbicide applications were required to completely control GR Italian ryegrass, data indicate that complete control was not necessary to optimize soybean yield.

WEED MANAGEMENT AND CROP RESPONSE WHEN INTERCROPPING CANTALOUPE AND COTTON.
P. M. Eure*, A. S. Culpepper, R. M. Merchant; University of Georgia, Tifton, GA (115)

ABSTRACT

Traditionally, spring planted cantaloupe in southern Georgia are harvested by July allowing that land to be planted to sorghum. Returns on sorghum following cantaloupe are often marginal, prompting growers to seek other alternatives. One such strategy is a cantaloupe-cotton intercropping system. Research was conducted to (1) Identify herbicide systems to manage troublesome weeds in cantaloupe-cotton intercropping production and to (2) Determine the profitability of cantaloupe-cotton intercropping versus a monoculture of cantaloupe or cotton. Three field studies were conducted at the UGA Ponder Research Farm near Ty Ty, Georgia on a Tifton loamy sand; two during 2011 and one during 2012. Athena cantaloupe was transplanted into a 0.8 mil plastic mulch having an 46 cm wide bed top on April 5, 2011, April 20, 2011, and March 26, 2012. Plots were 1.8 m wide and 12 m long with a single row of cantaloupe placed 0.6 m apart. Overhead irrigation was the primary water source. Each study consisted of three herbicide systems and a non-treated control. Herbicide systems included ethalfluralin (840 g ai/ha) or ethalfluralin + fomesafen (280 g ai/ha) preplant as well as ethalfluralin + fomesafen preplant followed by halosulfuron (36 g ai/ha) + a NIS (0.25 % v/v) applied topically to cantaloupe 10 days after transplanting. All herbicides were applied broadcast and preplant applications were washed off of the mulch prior to planting by 1.3 cm of overhead irrigation. Cotton (`PHY 499`) was planted when the initial cantaloupe vine reached the mulch edge just prior to touching the soil (April 23, 2011, May 5, 2011 and April 16, 2012). For profitability comparisons, monoculture cotton and cantaloupe were planted during their ideal planting windows and maintained weed free with standard herbicide programs coupled with hand weeding. Intercropping systems were managed for cantaloupe production until harvest in late June. Immediately following cantaloupe harvest, vines were desiccated with topical applications of glyphosate (910 g ae/ha) and a second topical application of glufosinate (595 g ai/ha). A layby application of glufosinate + diuron (450 + 1,120 g ai/ha) or MSMA + diuron (1,680 + 1,120 g ai/ha) was made just prior to cotton canopy closure. Palmer amaranth control, cantaloupe and cotton injury, cotton height, and cantaloupe vine length were recorded throughout the season. Cantaloupe was harvested 9 to 12 times by hand while cotton was harvested mechanically. Herbicide systems did not injure cantaloupe or impact vine growth or maturity. Palmer amaranth control with ethalfluralin alone was 69%. Fomesafen based systems controlled Palmer amaranth greater than 95% and halosulfuron did not improve control. Cantaloupe yields of 16,760 fruit/ha were noted in the ethalfluralin only system while the addition of fomesafen to the system increased yields at least 30% in response to greater Palmer amaranth control. When comparing cantaloupe intercropped with cotton using a fomesafen system to the monoculture cantaloupe; no differences in growth, maturity or yield were noted. Halosulfuron was the only herbicide to injure cotton (10-15% stunting maximum). Immediately following cantaloupe harvest, cotton height was reduced 41 to 71% in the ethalflurain only system in response to reduced Palmer amaranth control when compared to the monoculture cotton system. In treatments where fomesafen was used and Palmer amaranth was controlled, cotton height was reduced 21% due to competition with cantaloupe. The addition of halosulfuron further reduced cotton growth by an additional 10%. At boll set, height reduction caused by halosulfuron was no longer present but cotton intercropped with cantaloupe was 13 to 15% shorter than cotton growing in monoculture. Greater cotton height reduction (27%) was observed in systems that used ethalfluralin alone due to competition with cantaloupe and Palmer amaranth. Intercropping seed cotton yields were 1,985 kg/ha when using ethalfluralin and 3,560 to 3,720 kg/ha when using a fomesafen based systems. Intercropped cotton produced 11 to 15% lower yields than monoculture cotton. Intercropping cantaloupe and cotton increased total value/ha 26 to 31% when compared to cantaloupe grown in monoculture and 2,135 to 2,355% when compared to cotton grown in monoculture. Although cotton yield was reduced when intercropped with cantaloupe, these data suggest that cantaloupe-cotton intercropping systems would improve grower profitability when compared to monoculture production practices. Results indicate that herbicide options do exist for cantaloupe-cotton intercropping systems; however, fomesafen is not currently labeled for use in cantaloupe and neither halosulfuron nor ethalfluralin are currently labeled for use in cotton. Future research efforts will focus on obtaining these labels.

COMPARISON OF ROUNDUP READYÂ® AND CONVENTIONAL SOYBEAN (*GLYCINE MAX* L.) GROWING SYSTEMS FOR WEED CONTROL, YIELD AND ECONOMIC PROFITABILITY. B. L. Gaban*[1], L. E. Steckel[2], T. C. Mueller[1]; [1]University of Tennessee, Knoxville, TN, [2]University of Tennessee, Jackson, TN (116)

ABSTRACT

Research was conducted in 2010, 2011 and 2012 at the East Tennessee Research and Education Center in Knoxville, TN in order to compare differences in soybean yield among different levels of weed control within Roundup Ready (RR) and conventional soybean cultivar for a better understanding of the impact different intensities of weed control has on RR and conventional cropping systems. Our results determined that after applying the weed control regimens, there was no significant difference ($p<0.05$) in yield (kg ha^{-1}) between soybean cultivars at any level of weed control at any date or location. Additionally, no significant difference in yield was found between the two highest levels of weed control used. Glyphosate resistant weeds introduce new challenges and create a more costly weed control regimen, specifically when using a RR based soybean cultivation operation. Therefore, calculated economic returns of RR and conventional weed management technologies used in this study were contrasted to determine profitability of each system. In a glyphosate resistant-free environment, the conventional soybean cultivar had a net return of only 0.4% greater than that of the RR cultivar.

MANAGING PALMER AMARANTH IN COTTON SYSTEMS UTILIZING COVER CROPS. M. S. Wiggins*, L. E. Steckel; University of Tennessee, Jackson, TN (117)

ABSTRACT

Glyphosate-resistant (GR) weeds continue to be the most problematic weeds to control in most cropping systems in the Mid-South region of the United States. There are now no less than ten GR weed species in the Mid-South and no less than six confirmed species GR species in Tennessee. Of these, Palmer amaranth (*Amaranthus palmeri*) is the most difficult of these to control. This dioecious, broad-leaf species has a robust growth habit, a wide germination window and will out compete crops for essential resources. Successful management schemes for controlling GR weeds include the use of PRE-emergence (PRE) herbicides, overlaying residual chemistries, making timely applications of POST-emergence (POST) herbicide and integrating cultural control methods. Unfortunately, rainfall to activate PRE's and residual herbicides can be sporadic at best in Tennessee. Therefore, timely applications of POST herbicides are essential for many producers to grow a profitable crop. This heavy reliance on POST herbicide applications increases selection pressure and the possibility of herbicide resistance. Integrating cultural control methods, such as cover crops, is a viable option available for area producers to reduce selection pressure and gain early season weed control. Since winter-annual cover crops have readily been used in the Southeastern United States as a conservational practice and have been proven to increase soil quality, as well as provide early season weed suppression. With more interest in cover crops a better understanding of herbicide and cover crop integration is essential for producers to make effective weed management decisions. Thus a study was conducted in 2012 to investigate Palmer amaranth control in a cotton system where treatments of cover crops and POST applications of glyphosate and glufosinate were applied. The cover crops evaluated were crimson clover (*Trifolium incarnatum* L.) and hariy vetch (*Vicia vilosa* L.). Seeding rates were 16.8 kg $hectare^{-1}$ and 23.6 kg $hectare^{-1}$ of viable seed for crimson clover and hairy vetch, respectively. The cover crops were drilled on September 8, 2011 using a no-till drill and allowed to over winter. Approximately four weeks prior to estimated cotton planting date, all plots were desiccated using glyphosate + dicamba tank mixture. However, adequate control of the cover crops was not achieved. A sequential application consisting of paraquat + flumeturon was applied, which adequately controlled both cover crops and the winter-annual weeds present in the no cover plots. Cover crop biomass yields were obtained by clipping a 0.1 m^2 quadrat above the ground. The cover crop samples were dried in a forced-air oven at 60°C and weights were recorded after drying for 48 hours. Herbicide applications commenced when Palmer amaranth populations were 10-12 centimeters in height. Plots receiving herbicide applications were treated with a sequential herbicide application 7 days after initial application (7 DAA), as is common in these production scenarios to control GR Palmer amaranth. Palmer amaranth control was assessed 7, 14, 21, and 28 DAA. Experimental design was a randomized complete block design with four replications and a split plot arrangement of treatments. Means were separated using Fisher's Protected LSD at $P \leq 0.05$. Hairy vetch accumulated the more biomass than crimson clover, adding 6750 kg $hectare^{-1}$. Crimson clover accumulated 4960 kg $hectare^{-1}$ of biomass, still adding to early season weed suppression. Application of the first postemergence herbicide was 31 days after planting the cotton crop, or 45 days after termination of the cover crops. This cover crop system effectively replaced a PRE or early POST application. Palmer amaranth control was increased at 7, 14, 21, and 28 DAA by utilizing POST herbicide treatments. Palmer amaranth population evaluated was variable in susceptibility to glyphosate, thus glyphosate did add some efficacy when applied POST. However, a glufosinate based systems provided the highest amount of control throughout the assessment period, resulting in 94% control of Palmer amaranth. Cover crop presence had no effect on Palmer amaranth control during the assessment period. Cotton yield was impacted by both cover crop and herbicide application, but no interaction effect was observed. Cotton yield was increased by using POST herbicides when compared to control. However, yield was diminished in plots where cover crops were present. These results indicate that cover crops may remove early season moisture from the soil profile and lessen yield potential. In summary, effective early season control of Palmer amaranth is attainable in a system utilizing cover crops. However, for season long control timely applications of POST herbicides are essential.

A COMPARISON OF AUXIN HERBICIDE VOLATILITY WHEN APPLIED UNDER FIELD CONDITIONS. C. A. Hayden*[1], D. B. Reynolds[1], A. N. Eytcheson[1], L. C. Walton[2], D. H. Perry[3]; [1]Mississippi State University, Mississippi State, MS, [2]Dow AgroSciences, Tupelo, MS, [3]Dow AgroSciences, Greenville, MS (118)

ABSTRACT

Auxin mimicking herbicides have been used for more than 40 years to control broadleaf weeds in monocot crops. Volatilization and vapor drift are issues for some synthetic auxin herbicides like 2,4-D and dicamba. The volatility of a herbicide is important and herbicide vapors may result in an economic loss to sensitive crops. Cotton and soybeans are some of the most sensitive agronomic crops to auxin herbicides. With the development of auxin herbicide tolerant crops, the need for decreased volatility is essential to prevent injury to non-tolerant crops. Dow AgroSciences is developing a new low volatile quaternary ammonium salt formulation of 2,4-D. Enlist Duo™ herbicide with Colex-D™ Technology is a proprietary blend of the new 2,4-D choline salt with glyphosate. In 2012, two experiments were conducted at the Blackbelt Branch Experiment Station in Brooksville, MS along with an experiment at the R.R. Foil Plant Science Research Facility in Starkville, MS. The purpose was to compare the volatility and movement of herbicide vapor from Enlist Duo™ with 2,4-D amine, 2,4-D ester, and the diglycolamine (DGA) salt of dicamba tank-mixed with glyphosate, using cotton and soybean plants as a bio-indicator. Herbicide treatments included Clarity™ + Roundup PowerMax™(1.12 kg ae/ha dicamba + 2.24 kg ae/ha glyphosate), Enlist Duo™ at 4.37 kg ae/ha (2.13 kg ae/ha 2,4-D choline + 2.24 kg ae/ha glyphosate), DMA4 + Durango™ DMA (2.13 kg ae/ha 2,4-D amine + 2.24 kg ae/ha glyphosate), AgriStar™ 2,4-D LV4 + Durango™ DMA (2.13 kg ae/ha 2,4-D ester + 2.24 kg ae/ha glyphosate) as well as an untreated check. Each treatment was applied to greenhouse flats filled with soil and wetted to field capacity. The soil was treated at a remote location and transported to the test site. Treated flats were placed between a row of cotton and soybeans in the center of each 15.2 meter plot. A 4.6 x 1.5 meter dome covered with plastic was placed over a row each of cotton and soybeans, in the center of each plot, and was not removed until 48 hours after application. Visual injury (%) was recorded for cotton and soybean in 30 cm increments in both directions out to 762 cm from the treated area 3, 7, 14, 21, and 28 day after treatment (DAT). Data were subjected to analysis with PROC GLIMMIX and means were separated by LSMEANS (α=0.05). Greater crop injury was observed in cotton out to 360 cm with the 2,4-D ester formulation than with all other herbicides. Cotton injury within 90 cm of the treated area ranged from 12 to 15% for the ester formulation. The cotton injury response from 2,4-D amine, 2,4-D choline, and dicamba did not differ under these environmental conditions and averaged no more than 3% injury. Greater soybean injury was observed with dicamba out to 360 cm than with all other herbicides, 28 DAT. Soybean injury with dicamba ranged from 11% in the treated area to 1% 180 cm away, 28 DAT. No differences in soybean injury were observed among 2,4-D ester, 2,4-D amine, and 2,4-D choline treatments and injury was the same as the untreated check.

INFLUENCE OF CARRIER VOLUME AND NOZZLE SELECTION ON PALMER AMARANTH CONTROL. S. Berger*[1], J. Ferrell[1], T. M. Webster[2], R. G. Leon[3]; [1]University of Florida, Gainesville, FL, [2]USDA-ARS, Tifton, GA, [3]University of Florida, Jay, FL (119)

ABSTRACT

Palmer amaranth (*Amaranthus palmeri* S Wats.) is largely viewed as one of the most troublesome weeds in the southeast. Effective control is essential in order to avoid reductions of crop yield. Due to wide-spread resistance to the ALS chemistry, postemergence contact herbicides are often the only in-season option to control Palmer amaranth. Lactofen is a postemergence protoporphyrinogen oxidase inhibiting herbicide that is commonly used to control Palmer amaranth in peanut. However, control with lactofen decreases sharply after Palmer amaranth reaches heights greater than 10 cm. It is unknown if using elevated carrier volumes and fine droplet spray tips will improve spray coverage and increase control on larger weeds. A factorial treatment structure of carrier volume (94, 187, 281 L ha^{-1}), nozzle selection (AI Teejet® and XR Teejet®), and application timing (5-10 cm weeds and 15-20 cm weeds) was conducted in 2008 in Williston, FL and in 2012 in Tifton, GA and Citra, FL to determine the best control strategy with this contact herbicide. Palmer amaranth control was recorded 7, 14, and 21 days after treatment (DAT). Nozzle selection was not significant as a main effect or as an interaction at any location. However, the carrier volume by application timing interaction was significant at each location. In 2008 at Williston, FL and in 2012 at Tifton, GA application at 5-10 cm Palmer amaranth with 94, 187, or 281 L ha^{-1}provided >90% control. Applications made to 15-20cm weeds provided less control, around 80%. In 2012 in Citra, FL, all applications made to 5-10 cm weeds provided >90% control at each evaluation date. However, applications made to 15-20 cm weeds provided approximately 60% control at 7 DAT, declining to 20% control by 21 DAT. The results likely differ at these locations because of variation in the 15-20 cm timing. The 2008 Williston, FL and 2012 Tifton, GA applications were made to 15 cm Palmer amaranth while the 2012 Citra, FL application was made to larger plants, roughly 20cm. This demonstrates the critical timing of contact herbicide application to control Palmer amaranth. Applications made to smaller weeds provided sufficient control at any carrier volume tested, while applications made to larger weeds were least effective at 94 L ha^{-1}. Growers must be judicious in treating these weeds in early growth stages to achieve acceptable control.

EFFICACY OF PRE- AND POST-EMERGENCE APPLICATIONS OF DICAMBA ON GLYPHOSATE-RESISTANT PALMER AMARANTH. B. Edwards*[1], T. W. Eubank[2], D. R. Shaw[3], L. E. Steckel[4]; [1]Mississippi State University, Starkville,MS, MS, [2]Mississippi State University, Stoneville, MS, [3]Mississippi State University, Mississippi State, MS, [4]University of Tennessee, Jackson, TN (120)

ABSTRACT

Since the introduction of glyphosate-resistant (GR) crops, producers have almost exclusively used glyphosate-only herbicide programs, placing tremendous selection pressure on the evolution of GR weed biotypes. Now, GR Palmer amaranth (*Amaranthus palmeri* S. Wats.) is widespread across the U.S. Dicamba-tolerant soybean could potentially offer effective control of Palmer amaranth and other broadleaf weeds. This technology will allow producers the option of applying dicamba, as an additional mechanism-of-action (MOA), in-season and prior to planting. As commercialization of this technology nears, dicamba pre-emergence (PRE) and post-emergence (POST) efficacy on GR Palmer amaranth must be evaluated. The objective of this study was to evaluate the most efficacious dicamba rates and timings for PRE and POST control of Palmer amaranth. Research was conducted in 2011 and 2012 on fields containing natural populations of GR Palmer amaranth. Dicamba was applied PRE and POST at 0, 0.28, 0.56, and 1.1 kg ae/ha. POST treatments of dicamba were applied to 5, 10 and 15 cm weeds with and without the addition of glyphosate at 0.86 kg ae/ha. There was no benefit adding glyphosate to dicamba at the 5 and 10 cm timings; however, as weed size increased to 15 cm and dicamba rate decreased to 0.28 kg/ha the addition of glyphosate to dicamba improved control of Palmer amaranth. Glyphosate alone provided 30, 18, and 10% control of 5, 10, and 15 cm Palmer amaranth 28 DAT, respectively. Dicamba alone at 0.56 kg/ha provided 90, 75, 68% control of 5, 10, and 15 cm weeds 28 DAT, respectively. Weed density and biomass was reduced with all rates of dicamba both with and without the addition of glyphosate, when compared to glyphosate alone. The PRE applications of dicamba were applied 30, 15, and 0 days prior to planting (DPP). Flumioxazin at 0.07 kg ae/ha was also applied as a comparison treatment for residual control of Palmer amaranth. At 30 DPP, each rate of dicamba at 0, 0.28, 0.56, and 1.1 kg/ha resulted in increased control but none were comparable to flumioxazin, which provided 95% control. At 15 DPP, results indicate no difference among dicamba at 0.56 and 1.1 kg/ha and flumioxazin for the 28 DAT rating by providing 78, 84, and 87% control, respectively. This is likely due to the environmental conditions which were conducive to residual control with dicamba but hindered control with flumioxazin. At 0 DPP, dicamba at 0.56 and 1.1 kg/ha provided comparable levels of control at 70 and 63%, respectively, but was less than flumioxazin at 90%. Results for this research demonstrate the importance of timing when targeting GR Palmer amaranth with dicamba. The most efficacious rates and timings were achieved with all rates of dicamba applied to 5 cm Palmer amaranth, which provided greater than 80% control. Dicamba applied PRE at 1.1 kg/ha provided 77, 84, and 73% control of Palmer amaranth when applied at 30, 15, and 0 DPP, respectively.

IMPACT OF HEMP SESBANIA AND INDIAN JOINTVETCH IN CLEARFIELD RICE. N. D. Fickett*, E. P. Webster, B. M. McKnight, J. C. Fish; LSU AgCenter, Baton Rouge, LA (121)

ABSTRACT

Studies were established in 2012 at the Louisiana State University Agricultural Center Rice Research Station (RRS) near Crowley, Louisiana, at the Northeast Research Station (NERS) near St. Joseph, Louisiana, and at the Macon Ridge Research Station (MRRS) near Winnsboro, Louisiana to evaluate the influence on rice (*Oryza sativa* L.) of hemp sesbania [*Sesbania exaltata* (Raf.) Cory], and Indian jointvetch (*Aeschynomene indica* L.). Two studies evaluated the influence of hemp sesbania, and Indian jointvetch on rice. In both studies, uniform applications of fenoxaprop at 120 g ai ha^{-1}, and imazamox at 43 g ai ha^{-1} were used as needed for grass and sedge control, respectively. Broadleaf weeds were hand weeded. An area of influence study was conducted separately for hemp sesbania and Indian jointvetch at RRS to assess the area influenced by a single weed. The study followed a randomized complete block design (RCB) with four replications, treated, weed present, and nontreated, no weed present, and four subplots. Subplots were row distances from the center of the plot, or, in the treated plots, from the weed. These were rows 8, 28, 48, and 68 cm from the center and twice as long as their distance from the center. Data were analyzed using an analysis of variances (ANOVA) with treatment and distance as fixed effects, and repetitions as a random effect. Within the treated plot, an ANOVA with distance as a fixed effect, and repetitions as a random effect followed by LSD test at α=0.05 was used to determine the presence of mean differences between the distances. Also, a Gompertz growth model was used to regress yield, as a percent of the nontreated, on distance. A density study was conducted at RRS and NERS for hemp sesbania, and NERS and MRRS for Indian jointvetch to assess the effect of their density on rough rice yield. The study layout followed a RCB with 4 repetitions, and 6 treatments and a nontreated. The treatments were hand-seeded with weed seed amounts for germination of 2.5, 5, 10, 15, 20, and 25 plants m^{-2}. Data were analyzed with non-linear regression following an exponential model to regress yield loss, as a percentage of reduction from the nontreated yield, on weed density. In the area of influence study, yield reduction was found for both hemp sesbania and Indian jointvetch. There was a difference in yield between treated and nontreated plots for both weeds. However, only Indian jointvetch showed a difference between the row distances from the plot center. Further analysis showed the nearest row (8 cm from center) had lower yield then the other rows. Fitting a Gompertz growth model suggested yield reduction of 10% or more occurs within 19 and 18 cm of hemp sesbania and Indian jointvetch, respectively. At 68 cm from the plant, 7 and 0% yield reduction occurred with hemp sesbania and Indian jointvetch, respectively. In the density study, the exponential model fit the percent yield loss well. For hemp sesbania, percent yield loss varied by location. At RRS, hemp sesbania caused 10 and 25% yield loss at 0.5 and 1.25 plants m^{-2}, respectively, with a maximum yield loss of 90% at a density of 18 plants m^{-2}. At NRS, hemp sesbania caused 10 and 25% yield loss at 1.5 and 4.5 plants m^{-2}, respectively, with a maximum yield loss of 66% at a density of 32 plants m^{-2}. Locations were similar for Indian jointvetch; it caused 10 and 25% yield loss at 1.25 and 4.5 plants m^{-2}, respectively, with a maximum yield loss of 35% at a density of 17 plants m^{-2}. These studies showed that both hemp sesbania and Indian jointvetch are competitive in Clearfield® rice with hemp sesbania being the more competitive. The majority of yield loss occurs within 20 cm of the weeds. Weed densities as low as 0.5 and 1.25 plants m^{-2} for hemp sesbania and Indian jointvetch, respectively, may cause significant yield loss. Given that imazethapyr and imazamox have little activity on these weeds, other herbicides need to be incorporated in an herbicide program where these weeds are present.

PALMER AMARANTH AND IVYLEAF MORNINGGLORY CONTROL IN GLYPHOSATE-DICAMBA-GLUFOSINATE-TOLERANT COTTON. J. L. Spradley*[1], W. Keeling[2], P. A. Dotray[2], J. D. Reed[2]; [1]Texas A&M AgriLife Research, Lubbock, TX, [2]Texas AgriLife Research, Lubbock, TX (122)

ABSTRACT

Glyphosate/dicamba/glufosinate tolerant (DGT) cotton could improve control of many problem annual and perennial weeds on the Texas High Plains such as Palmer amaranth (*Amaranthus palmeri*), and devil's-claw (*Proboscidea louisanica*). Other weed species including Horseweed (Conyza canadensis), ivyleaf morningglory (*Ipomoea hederacea*), Russian thistle (*Salsola iberica*), kochia (*Kochia scoparia*), field bindweed (*Convolvulus arvensis*), woollyleaf bursage (*Ambrosia grayi*), and Texas blueweed (*Helianthus ciliaris*) are not always effectively controlled with glyphosate alone, but dicamba or glufosinate combined with glyphosate may improve control. This technology may also improve control of recently identified glyphosate- resistant Palmer amaranth populations. The objectives of this study were 1) to evaluate dicamba (Clarity) applied early-postemergence and mid-postemergence alone or in combination with glufosinate (Liberty) or glyphosate (Roundup PowerMax) for Palmer amaranth and devil's-claw control in DGT cotton; 2) to compare Palmer amaranth and ivyleaf morningglory control with dicamba-based treatments in DGT cotton to standard weed management programs; and 3) determine crop response and lint yields in DGT cotton. Field trials conducted near Lubbock and Lorenzo, TX in 2012 compared trifluralin applied preplant incorporated (PPI), and dicamba applied early-postemergence (EPOST) alone or in combination with glufosinate, acetochlor (Warrant), or glyphosate. These treatments were followed by (fb) glufosinate, glyphosate+dicamba, or glyphosate at mid-postemergence (MPOST). Treatments were applied using a CO_2-pressurized backpack sprayer calibrated to deliver 15 gallons per acre. A DGT cotton variety was planted on May 9 in 2012 on 40-inch rows. Plots, 4 rows by 30 feet in length, were replicated four times. Weed control was estimated visually based on a standard scale of 0 to 100%, where 0 = no weed control and 100 = complete weed control, and verified with weed density counts. At Lubbock, glyphosate and glyphosate+dicamba EPOST improved Palmer amaranth control compared to trifluralin alone. Glyphosate, glyphosate+dicamba, and glufosinate+dicamba improved devil's-claw control compared to trifluralin alone. All treatments applied MPOST controlled Palmer amaranth 99 to 100%. At Lorenzo, glyphosate, glyphosate+dicamba, and glufosinate+dicamba controlled Palmer amaranth more effectively than glufosinate alone. All treatments, with the exception of glufosinate and glufosinate fb glyphosate, controlled Palmer amaranth 99 to 100% 14 days after MPOST applications. Glyphosate+dicamba (100%), and glufosinate+dicamba (89%) controlled ivyleaf morningglory more effectively than glyphosate (53%) or glufosinate (68%) alone. Ivyleaf morningglory was controlled 94 to 100% with glyphosate+dicamba applied MPOST. Glufosinate fb glufosinate (74%), glyphosate fb glyphosate (81%), and glufosinate fb glyphosate (66%) controlled morningglory less effectively compared to dicamba-based treatments 14 days after MPOST applications. Little to no crop injury and no adverse yield response was observed following any herbicide treatment in crop tolerance trials.

EVALUATION OF SOYBEAN HERBICIDES FOR MANAGEMENT OF A RECENTLY INTRODUCED PALMER AMARANTH (*AMRANTHUS PALMERI*) POPULATION. K. M. Vollmer*, H. P. Wilson, T. E. Hines; Virginia Tech, Painter, VA (123)

ABSTRACT

Palmer amaranth (*Amaranthus palmeri*) is a serious problem throughout the Southern United States. However, this species has only recently been reported on the Eastern Shore of Virginia and Maryland since 2010. Over 90% of soybeans produced on the Eastern Shore are planted no-till and 90-95% are glyphosate-resistant. Glyphosate-resistant Palmer amaranth has since been confirmed on mainland Virginia and resistant populations are suspected in Maryland and Delaware. Resistance to ALS-inhibiting herbicides has been suspected as well. In 2012, a field study was conducted near Hebron, MD to evaluate different herbicide modes of action alone or in tank mix combinations for PRE control, and to determine if there were resistance issues associated with a glyphosate-STS tolerant soybean system. The study was conducted as a randomized complete block design with 3 replications. Herbicides evaluated in the field study consisted of the following PRE treatments: flumioxazin (0.07), flumioxazin (0.08) + chlorimuron (0.03), chlorimuron (0.04), chlorimuron (0.01) + thifensulfuron (0.004), sulfentrazone (0.29) + imazethapyr (0.01), pendimethalin (1.6), *s*-metolachor (1.4), metribuzin (0.042), sulfentrazone (0.2) + metribuzin (0.3), linuron (0.7), fomesafen (0.42), and *s*-metolachor (1.2) + fomesafen (0.3) kg ai ha^{-1}. Glyphosate (1.1 kg ai ha^{-1}) + ammonium sulfate (AMS) (2.1 kg ha^{-1}) was applied 12 and 26 days after initial treatment (DAIT) to all PRE plots regardless of the presence of Palmer. A single POST treatment of imazamox (0.044 kg ai ha^{-1}) + non-ionic surfactant (25% v/v) + urea ammonium nitrate (1.25% v/v) was applied 12 DAIT to plots not receiving a PRE application. Plots were visually evaluated for percent control 12, 26, and 40 DAIT on a scale of 0-100 with 0 being no control and 100 being complete control of Palmer amaranth. The study was terminated with the application of chlorimuron (0.01) + thifensulfuron (0.004) kg ai ha^{-1} 42 DAIT to prevent any remaining Palmer from going to seed. Data were analyzed using ANOVA and means separated using Fisher's LSD (α=0.05). The majority of the PRE treatments provided 95% control or greater 40 DAIT, with little to no Palmer present at the time of glyphosate applications. *S*-metolachor provided only 60% control 40 DAIT, when applied in conjunction with glyphosate and AMS. Flumioxazin and pendimethalin provided no control 40 DAIT when applied in conjunction with glyphosate and AMS and averaged 3-4 plants m^{-2} in each plot. Weed emergence prior to application of flumioxazin, *s*-metolachor, and pendimethalin could have been a factor in the poor control provided by these herbicides. In order to categorize the level of resistance a preliminary dose-response study was performed on 11 cm Palmer amaranth propagated from seed collected from the field site. The study was conducted as a randomized complete block design with 17 replications per treatment with each individual plant representing a single replication. Glyphosate was applied at 0.27, 0.53, 1.1, 2.1, 4.2, 8.5, and 17.0 kg ai ha^{-1} in combination with 2.2 kg ha^{-1} AMS. Plants were visually rated for % injury 14, 21, and 28 days after treatment (DAT) on a scale from 0-100 with 0 being no injury and 100 being complete plant death. Data were analyzed using the SAS PROC NLIN procedure and I_{50} values calculated using log-logistic regression. This resulted in an I_{50} value of 1.58 kg ai ha^{-1} 28 DAT, which is only slightly higher than the recommended rate of 1.1 kg ai ha^{-1}. However, field observations suggest higher levels of resistance. These studies show that while the majority of herbicides tested are still an option for controlling this particular population of Palmer. Weed emergence prior to application of flumioxazin, *s*-metolachor, and pendimethalin could have been a factor in the poor control provided by these herbicides. In addition, glyphosate may no longer be the best option for control. Comparisons of I_{50} values between glyphosate-resistant and glyphosate-susceptible populations need to be performed in order to develop a comprehensive management strategy for Palmer amaranth on the Eastern Shore.

GLUFOSINATE RATE AND TIMING FOR CONTROL OF JOHNSONGRASS (*SORGHUM HALEPENSE*) IN GLUFOSINATE-RESISTANT SOYBEAN (*GLYCINE MAX*). R. L. Landry*, D. Stephenson, B. C. Woolam; LSU AgCenter, Alexandria, LA (124)

ABSTRACT

Experiments were conducted at the LSU AgCenter Dean Lee Research and Extension Center near Alexandria, LA in 2011 and 2012. These experiments assessed glufosinate rate and timing for control of johnsongrass in glufosinate-resistant soybean. Experiments were a 3x2x2 factorial arranged in a randomized complete block with four replications. Factors consist of: (1) 0.5, 0.6, or 0.7 kg ha^{-1} of glufosinate applied to 46-cm johnsongrass (first application); (2) sequential application of 0.5 or 0.6 kg ha^{-1} of glufosinate; (3) sequential application timings of 3 or 4 wk after the first application. Johnsongrass control and heights (converted to percent of nontreated), and soybean yield were collected. Glufosinate applied to 0.6 and 0.7 kg ha^{-1} as the first application controlled johnsongrass 83 and 85%, respectively, 21 d after the first application and both rates provided greater control than 0.5 kg ha^{-1} (79%). However, only glufosinate at 0.7 kg ha^{-1} (85%) gave greater johnsongrass control than 0.5 kg ha^{-1} (75%) at harvest. Johnsongrass control was 78 and 87% for the 3 and 4 wk sequential glufosinate application timing, respectively, 28 d after the sequential application. Similarly, johnsongrass control at harvest was increased 13% by delaying the sequential application from 3 wk (73%) to 4 wk (86%) after the first glufosinate application. As glufosinate rate at first application increased, johnsongrass heights as a percent of nontreated decreased with 0.5, 0.6, and 0.7 kg ha^{-1} reducing heights to 45, 32, and 26% of the nontreated, respectively, 28 d after sequential application. At harvest, sequential application timing of 3 wk decreased johnsongrass heights to 76% of the nontreated; however, delaying the sequential application until 4 wk reduced heights to 57% of the nontreated. Soybean treated with 0.5, 0.6, and 0.7 kg ha^{-1} of glufosinate at the first application yielded 2560, 2760, and 2830 kg ha^{-1}, respectively; however, yield differences were only observed between the 0.5 and 0.7 kg ha^{-1} glufosinate rates. Johnsongrass control was maximized when glufosinate was applied at 0.7 kg ha^{-1} as the first application to 46-cm johnsongrass followed by a sequential glufosinate application 4 wk after the first application. Soybean yields were increased when 0.7 kg ha^{-1} of glufosinate was applied as the first application. These data indicate that glufosinate applications are a viable tool for management of johnsongrass in glufosinate-resistant soybean. Research will be repeated in 2013 to substantiate these results.

CROSS RESISTANCE TO ALS INHIBITORS IN *EUPHORBIA HETEROPHYLLA* (L.) WITH MULTIPLE HERBICIDE RESISTANCE. A. C. Roso*[1], R. A. Vidal[2], M. Trezzi[3], N. R. Burgos[1]; [1]University of Arkansas, Fayetteville, AR, [2]Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil, [3]Universidade Tecnologica Federal do Parana, Pato Branco, Brazil (125)

ABSTRACT

Euphorbia heterophylla (L.) (wild poinsettia) is a broadleaf weed commonly occurring in several countries worldwide. Its center of origin lies between Brazil and Paraguay. In Brazil this weed infests several crops of economic importance. Soybean yield losses of up to 50% were observed when competing with 52 plants/m^2 for 115 days. The major concern about wild poinsettia is the evolution of resistance to soybean herbicides. Ecotypes resistant to ALS inhibitors and those with multiple resistance to ALS and PPO inhibitors make weed management very difficult as resistance eliminates many major herbicides. Little is known about the mechanisms of resistance in wild poinsettia or the pattern of cross resistance. This study aimed to evaluate the occurrence of cross resistance to five chemical groups of ALS inhibitors in wild poinsettia resistant to ALS (R ALS) and an ecotype with multiple resistance (R ALS/PPO). Dose-response bioassays were conducted to characterize the level of resistance to imazethapyr (Vezir 106 SC, Milenia Agrociências), nicosulfuron (Sanson 40 SC, FMC Química do Brasil, Ltda), bispyribac-sodium (Nominee 400 SC, Ihara), cloransulam-methyl (Pacto 840 WG, Dow Agrosciences) and flucarbazone-sodium (Everest 70 WDG, Arysta Lifescience). Nine herbicide doses were used for the S ecotype ranging from 0 to 1X the recommended dose and nine doses were used for the R ecotypes ranging from 0 to 40X. The assays were conducted twice. Visual injury estimates (I) were recorded 7, 14, 21 and 28 days after treatment (DAT). Plants were harvested at 28 DAT and the dry weights recorded. Cloransulam and flucarbazone were not effective on the susceptible standard (SS) because the control achieved with 1x dose were only 69 and 65%, respectively. Imazethapyr, nicosulfuron, and bispyribac controlled the SS 100, 99 and 92%, respectively, at the 1x dose. The resistant ecotypes were cross-resistant to imidazolinone, sulfonylurea, and pyrimidinylthiobenzoate chemical groups of ALS inhibitors. Resistance factors were high, ranging from 45 to >63. The pattern of cross resistance and the high level of resistance suggest target site mutation.

IMPACT OF PLANT POPULATION, ROW SPACING AND HERBICIDE ON WEED MANAGEMENT IN SORGHUM. T. E. Besancon*, R. Riar, R. Heiniger, R. Weisz, W. J. Everman; North Carolina State University, Raleigh, NC (126)

NO ABSTRACT SUBMITTED

WEED COMPETITION AND CONTROL IN SOLANACEOUS CROPS. D. M. Dayton*[1], S. Chaudhari[2], K. M. Jennings[3], D. W. Monks[2]; [1]NC State University, Raleigh, NC, [2]North carolina state university, Raleigh, NC, [3]NCSU, Raleigh, NC (127)

NO ABSTRACT SUBMITTED

EFFICACY OF DAS 402, DAS 534 AND DAS 896 COMPARED TO TRICLOPYR ON SELECTED WOODY PLANTS USING RAPID SCREENING METHODS. W. L. Stanley*[1], S. M. Zedaker[1], J. R. Seiler[1], P. L. Burch[2]; [1]Virginia Tech, Blacksburg, VA, [2]Dow AgroSciences, Christianburg, VA (128)

ABSTRACT

The purpose of this study was to compare biological data from three experimental herbicides from Dow AgroSciences to an industry standard, triclopyr, while testing a greenhouse rapid screening approach for woody plants. Field trials that are the mainstay of woody plant herbicide development require significant time commitment (15 months or greater) and can be expensive to implement. The need to recoup the investment required for product registration creates a barrier to entry into smaller markets, such as woody vegetation management. Developing a screening system to provide early detection of efficacy and selectivity of newly discovered herbicide products would allow for more efficient development programs leading up to field trials. By reducing costs of preliminary testing for new herbicides, such a system could result in more entries into the woody vegetation management market. Experimental herbicides that were part of this study are members of a new area of chemistry, 4-amino-6-phenylpicolinic acids, and are related to labeled herbicides including picloram and aminopyralid. Greenhouse and laboratory based methods for rapid woody plant herbicide screening were assayed with the goal of reducing resources and time required to conduct preliminary screenings for new products. Screenings on three age groups of greenhouse seedlings, germinal (6 week old), 1-0 (1 year old), and 2-0 (2 year old), were conducted in facilities at the Reynolds Homestead Forest Resources Research Center in Critz, VA and Virginia Tech's Blacksburg Campus. The experimental design was a randomized complete block replicated three times with treatments applied to 10 seedling subsamples of each of the following species: black locust, loblolly pine, red maple, sweetgum, and water oak. Herbicide treatments were applied in a spray booth (De Vries Mfg. - Model #: SB8) fitted with an 8001E-HSS TeeJet spray tip mounted 30.5 cm above the seedling canopy and calibrated to deliver a volume of 187 L ha^{-1}. Experimental herbicides were applied at 35, 70, 140, and 280 g ae ha^{-1} in addition to the control standard, triclopyr, at 140, 280, and 560 g ae ha^{-1}. Agri-dex surfactant at 1.25% v/v was included in all treatments. Rapid seed screening was carried out in growth chambers located on Virginia Tech's Blacksburg Campus. Following cold-moist stratification, seeds were counted into Petri dishes in groups of 20 and soaked for 24 hours in 10 mLs of herbicide solution. Herbicide concentrate was mixed with deionized water at rates equivalent to the percentage of herbicide concentrate in the total spray volume used in the greenhouse screening. Petri dishes were then drained and placed in a growth chamber at 25°C and 80% RH with 16 photoperiods. Germination and length of tissue emerging from seeds were observed over a 14 day period. Data from each experiment was subjected to analysis of variance and Tukey's HSD at p=0.05 was used to separate treatment means. Herbicide treatments yielded mixed control of woody species. Statistical differences between treatment means occurred due to herbicide main effect much more frequently than due to rate. DAS 534 was the most effective herbicide in both seedling groups while DAS 896 was consistently the weakest. In 1-0 seedlings, DAS 534 provided significantly higher control than triclopyr. Experimental herbicides were effective on 1-0 loblolly pine and black locust seedlings at very low rates of active ingredient per hectare, relative to standard field applications. The same rates were applied to 1-0 and 2-0 seedlings and, as expected, provided less control of 2-0 seedlings. DAS 402 and DAS 534 were the most effective herbicides on 1-0 seedlings, but DAS 534 was significantly more effective than DAS 402 on the older seedling group. Pooling species data for 2-0 seedlings showed that DAS 534 gave the best control, but control was not statistically higher than triclopyr. No herbicide was better than triclopyr for control of red maple, but even that was not very effective at the rates applied (all treatments <15% mortality). Germinal data showed no statistical differences between experimental herbicides and triclopyr. In seed screening, DAS 402 provided statistically greater control of tissue length than triclopyr, but no difference in germination rate due to herbicide was observed. Findings suggest that these new compounds will be effective on some species tested at low rates of active ingredient per hectare, but field trials will be needed to confirm the results.

RAGWEED PARTHENIUM (*PARTHENIUM HYSTEROPHORUS*) CONTROL IN NONCROP AREAS IN THE EVERGLADES AGRICULTURAL AREA. J. V. Fernandez*[1], D. C. Odero[2], G. E. MacDonald[1], J. Ferrell[1]; [1]University of Florida, Gainesville, FL, [2]University of Florida, Belle Glade, FL (129)

ABSTRACT

Ragweed parthenium is a troublesome annual weed commonly found along field edges, canals, ditch banks, roadsides, and disturbed sites in the Everglades Agricultural Area (EAA) that is encroaching into adjoining sugarcane and vegetable fields. Glyphosate has traditionally been used to manage this weed species, but has recently become ineffective and resistance is suspected. Therefore, field studies were conducted near Belle Glade, FL, in 2012 to evaluate the efficacy and residual control of ragweed parthenium using 15 herbicides applied postemergence at 1/2x and 1x rates. Aminocyclopyrachlor + chlorsulfuron (116, 232 g ai/ha), 2,4-D amine (1120, 2240 g ai/ha), aminopyralid (70, 123 g ai/ha), clopyralid (105, 210 g ai/ha), flumioxazin (53.6, 107 g ai/ha), fomesafen (210, 420 g ai/ha), oxyfluorfen (224, 450 g ai/ha), saflufenacil + dimethenamid-P (390, 880 g ai/ha), imazapic (2.8, 5.6 g ai/ha), imazethapyr (35, 70 g ai/ha), mesotrione (52.5, 105 g ai/ha), glyphosate (420, 840 g ai/ha), glufosinate (127, 254 g ai/ha), paraquat (420, 840 g ai/ha), and hexazinone (560, 1120 g ai/ha) were applied to flowering ragweed parthenium. Plants were 90 cm in height at the time of treatment and visual estimates of ragweed parthenium control (0 = no control; 100 = complete plant death) were taken 3 and 9 weeks after treatment (WAT). Aminopyralid, aminocyclopyrachlor + chlorsulfuron, saflufenacil + dimethenamid-P, and hexazinone at the full and the half label rate provided 100% control of ragweed parthenium 9 WAT. Clopyralid, 2,4-D amine, and glufosinate at the full label rate provided 98, 96 and 89% control of ragweed parthenium, respectively at 9 WAT. Control of ragweed parthenium at 9 WAT was less than 75% with all other herbicides irrespective of use rate. Hexazinone and saflufenacil + dimethenamid-P provided rapid control of ragweed parthenium compared to other herbicides with 100% control at 3 WAT. These results demonstrate that aminopyralid, aminocyclopyrachlor + chlorsulfuron, saflufenacil + dimethenamid-P, hexazinone, clopyralid, 2,4-D amine, and glufosinate could be used to provide effective control of flowering ragweed parthenium in noncrop areas in the EAA.

EFFECT OF WEEDS IN SEEPAGE IRRIGATION FURROWS ON WEED SEEDBANK IN POTATO (*SOLANUM TUBEROSUM)*. C. E. Rouse*, P. J. Dittmar; University of Florida, Gainesville, FL (130)

ABSTRACT

Florida potato producers utilize seepage irrigation to supply water to the crop. Seepage irrigation furrows run the length of the field and provide an environment for weeds to grow, set seed, and contribute to the seedbank. The objective of this study was to quantify weed populations and movement from the irrigation furrows and the start of the row into the crop row. In 2012, four commercial potato fields (identified as sites A-D) in Flagler County, Florida, were included for this study. A bed of sixteen rows constituted a replication with three replications per field. Sampling sites were in two directions- from the end of the crop row and into the field (every 15.2 m for 91.4 m) and across the beds (every 1.1 m from irrigation furrow for 9.12 m) from the irrigation furrow. Sixty- three sample sites in each bed were used. Weeds were counted in field (30 cm x 30 cm quadrant) during the crop season and soil cores were taken at each of the sample sites. Soil cores (11.5 cm wide x 18 cm deep) were collected, bagged, refrigerated (4°C), and grown in a greenhouse during the summer and winter. Weeds in the field and from the soil cores were counted and analyzed with Duncan's multiple range test and lack of fit to quantify weed movement. Due to significant location interactions, locations were analyzed separately for both in field and greenhouse counts. The three most common weeds in the field were yellow nutsedge (*Cyperus esculentus* L.), broadleaf dock (*Rumex obtusifolius*), and bermudagrass (*Cynodon dactylon* [L.] Pers.). Old world diamond- flower (*Oldenlandia corymbosa* L.), low falsepimpernel (*Lindernia dubia* [L.] Pennell), and winged waterprimrose (*Ludwigia decurrens* Walt.) were the highest in the greenhouse. Field weed counts for distance from irrigation furrow showed higher populations of weeds in the furrow and the eight distances into the field being significantly lower with less then one weed. At sites A and C, 0 m from the start of the row contained the highest weed density of greater than 4.5 weeds, all other sample sites within the row being significantly less. Lack of fit analysis fit a linear and quadratic model for field weed counts with increasing distance from the furrow (a= 0.05). Sites A and C fit a linear and quadratic model for distance from the start of the row while the other two fields fit neither. Greenhouse weed counts were lower in the crop row compared to the furrow at site B. At sites B and C, distance from the start of the row at 0 m. contained the highest weed population (70- 98 weeds). For site D, the farthest distance (91.4 m) had the greatest number of weeds (>272 weed). All fields fit a linear model and all but site D fit a quadratic model relating weed density to the start of the crop row (a= 0.05). Site A and C did not fit a linear or quadratic model for distance from the furrow because of the even distribution of weeds throughout the field. Irrigation furrows and the end of crop rows are among the heavier populated areas of the fields with the crop rows having gradually lower densities. Differences in the three most dominate weed species between the field and greenhouse studies indicate the problems in determining weed populations from seedbank analysis.

CORN POLLINATION AND YIELD AS INFLUENCED BY WEED DENSITY AND CORN POPULATION. M. K. Williams*[1], R. Heiniger[2], D. L. Jordan[2], W. J. Everman[2]; [1]North Carolina State Univesity, Sanford, NC, [2]North Carolina State University, Raleigh, NC (131)

ABSTRACT

Weeds and their management continue to be important in optimizing corn yield. Cultural practices such as planting date, cultivar selection, and row pattern/plant population can affect weed interference with corn. Twin row plantings (18-cm spacing on 91-cm centers) could reduce weed interference by closing the canopy more quickly than single rows. The interaction of row pattern has not been thoroughly evaluated in LibertyLink® and Roundup Ready® systems. The role of weed population, as influenced by herbicide program, on silking and quality characteristics associated with corn ears also has not been evaluated. Therefore, research was conducted to determine weed control and corn response to interactions of appropriate herbicide programs when grown in single and twin row planting patterns on the coastal plain of North Carolina. The experiment was conducted at Peanut Belt Research Station during 2012 on a Norfolk fine sandy loam soil typical of the Coastal Plain of North Carolina under sprinkler irrigation. Corn was planted in conventionally-prepared raised beds spaced 36 inches apart. A Glufosinate-resistant (LibertyLink®) and glyphosate-resistant (Roundup Ready®) hybrid was planted in single rows or twin rows (18-cm spacing on 91-cm centers) in mid April. Within each trial and planting pattern combination, Dual Magnum was applied preemergence (PRE), followed by postemergence (POST) herbicide programs including:1) no POST; 2) dicamba POST; 3) glufosinate or glyphosate POST in the appropriate hybrid; 4) atrazine POST; 5) atrazine plus dicamba POST; and 6) atrazine plus dicamba plus glufosinate or glyphosate POST. Corn was 10 to 14 inches in height when herbicides were applied. Visible estimates of percent common ragweed control were determined 3 wks after POST application. Density of common ragweed was also determined 3 and 6 weeks after POST herbicides were applied. In addition to corn yield per unit area, yield components and number of days from planting to silk emergence were determined. Data for common ragweed density and visible control, corn grain yield, corn height, corn ear type, and days from planting to silk emergence were subjected to ANOVA appropriate for the factorial treatment structure and means were separated using Fisher's Protected LSD test at $p \leq 0.05$. Pearson Correlation Coefficients were determined for weed population and visible control vs. corn parameters at $p \leq .05$. The interaction of trial, planting pattern, and herbicide program was significant for common ragweed visible control but not for Texas panicum visible control, density or common ragweed density or any corn growth parameters. The interaction of planting pattern, and herbicide program was not significant for any weed management or corn growth parameters. The interaction of trial, and herbicide program was significant for common ragweed visible control, Texas panicum visible control, and Texas panicum density. The interaction of trial, and planting pattern was significant for yield but no other parameters. Herbicide program was significant for several parameters, including common ragweed visible control, common ragweed density, Texas panicum visible control, Texas panicum density, days to first silk emergence, duration of silk emergence and yield. These data suggest that under the conditions of this experiment and with common ragweed and Texas panicum, twin rows sometimes offer an advantage to single rows when the total corn population per unit area is the same. The data also suggests that the addition of a POST applied herbicide is more effective than an herbicide program with *S*-metolachlor only, and that glyphosate and glufosinate offer an advantage over dicamba in common ragweed visible control, Texas panicum visible control and densities of both. The addition of a POST may decrease the days from planting to silk emergence, as well as decrease the duration of silk emergence. Corn grain yield is also significantly affected with the addition of a POST herbicide, and is sometimes significantly affected when using twin rows.

CROP TOLERANCE AND PALMER AMARANTH CONTROL BY ZIDUA, WARRANT, AND DUAL MAGNUM IN COTTON. C. W. Cahoon*, A. C. York, D. L. Jordan, W. J. Everman; North Carolina State University, Raleigh, NC (132)

ABSTRACT

Pyroxasulfone (Zidua) is a new herbicide currently registered in corn. Similar to the chloroacetamides s-metolachlor (Dual Magnum) and encapsulated acetochlor (Warrant), Zidua is a seedling shoot inhibitor providing preemergence (PRE) control of both annual grasses and some broadleaf weeds. With the prevalence of glyphosate-resistant Palmer amaranth (*Amaranthus palmeri*), residual postemergence (POST) herbicides such as Dual Magnum and Warrant have become widely used in cotton weed management systems. Furthermore, interest in applying Warrant PRE has grown in the last year. Therefore, the objective of this research was to evaluate the efficacy and crop tolerance of Zidua and Warrant applied PRE and Zidua applied POST in cotton. Field experiments were conducted at three sites in North Carolina during the 2011 and 2012 season. Zidua was applied PRE 59.5, 89.3, and 119 g ai/ha (1, 1.5, and 2 oz./acre of formulated product) immediately after planting. Zidua at 1, 1.5, and 2 oz/acre, Dual Magnum at 1067 g ai/ha (1 pt./acre), and Warrant at 1260 g ai/ha (3 pt./acre) were applied POST to 2-leaf cotton. Additional treatments included Zidua at 1 oz/acre and Warrant at 3 pt/acre applied to 2-leaf and 6-leaf cotton. In 2012, Warrant applied at 3 pt./acre PRE was added to evaluate cotton tolerance to this herbicide. All treatments, except a non-treated check, received the potassium salt of glyphosate (Roundup PowerMAX) at 22 fl oz./acre 866 g ae/ha (22 fl oz./acre) at the 2-, 6-, 12-leaf stages of cotton. Two-, 6-, and 12-leaf stages of cotton occurred 18 to 19, 33, and 46 (days after planting), respectively. Data for cotton stand, cotton height, cotton necrosis, Palmer amaranth control, and cotton lint yield were subjected to ANOVA. Data for the non-treated check were not included in the ANOVA. The interaction of trial by treatment was not significant for cotton stand, cotton height, cotton necrosis, Palmer amaranth control, and seed cotton yield. However, the main effect of treatment was significant for all parameters. Pooled treatments were separated using Fisher's Protected LSD at $p \leq 0.05$. Zidua applied PRE at 1, 1.5, and 2 oz./acre reduced cotton stand approximately 9, 14, and 20%, respectively, 26 DAP (days after planting). However, Zidua applied PRE had no effect on cotton height at 45 DAP. Zidua applied once POST reduced cotton height 17 to 22% 45 DAP. Comparatively, Dual Magnum and Warrant applied POST reduced cotton height 0 to 7% 45 DAP. Necrosis 7 days after 2-leaf treatment, ranged from 26 to 34% and 0% with Zidua applied POST and PRE, respectively. Necrosis with Warrant and Dual Magnum applied POST was less than Zidua POST, ranging from 12 to 13%. Necrosis was greatest with Zidua applied twice POST, injuring cotton 26% 7 days after applications at the 6-leaf stage, whereas Zidua applied once injured cotton 6 to 7%. Necrosis was less with Warrant applied twice POST and single applications of Warrant and Dual Magnum, ranging 2 to 5%. In 2012, Warrant applied PRE had no effect on cotton stand or plant height. Furthermore, no necrosis of cotton was observed when Warrant was applied at-planting. Control of Palmer amaranth by Roundup PowerMAX was 71% in late August. Similarly, Zidua, Warrant and Dual Magnum applied POST once controlled Palmer amaranth 65 to 71%, 70%, and 67%, respectively. Late-season control was not improved with additional applications of Zidua or Warrant at the 6-leaf stage. Zidua applications PRE were more effective late-season, providing greater than 82% control of Palmer amaranth. In 2012, however, PRE applications of Warrant and Zidua (2 oz./acre) provide 76% control of Palmer amaranth. Zidua applied PRE at the lower rates were less effective controlling the weed (65 to 70%). Cotton lint yield was greatest when herbicides were applied PRE. Averaged over both years, lint yields ranged 1420 to 1454 lbs./acre when Zidua was applied PRE. Plots treated with Roundup PowerMAX alone or combined with a POST residual yielded approximately 1080 to 1310 lbs./acre. In 2012, lint yield was greatest when Warrant was applied PRE (1795 lbs./acre). A yield loss of 88 to 122 and 510 lbs./acre were observed in plots treated by Zidua PRE and Roundup PowerMAX alone POST, respectively. Performance during the 2011 and 2012 season in North Carolina, suggests Zidua PRE would be preferred over Zidua POST for Palmer amaranth control and cotton tolerance. However, Zidua PRE reduced cotton stand and stunted growth. Therefore, Zidua may not have a fit in cotton PRE or POST. However, further evaluation is needed before ruling out the use of Zidua early preplant or POST-Directed lay-by. Cotton tolerance to Warrant applied PRE was excellent. Additionally, Palmer amaranth control and cotton lint yield was greatest in plots treated with Warrant PRE in 2012. Therefore, Warrant PRE may provide growers another at-planting residual option for Palmer amaranth control with little crop injury.

HERBICIDE PROGRAMS FOR CONTROLLING GLYPHOSATE-RESISTANT JOHNSONGRASS IN LIBERTY LINK SOYBEAN.
D. B. Johnson*[1], J. K. Norsworthy[1], H. D. Bell[1], B. W. Schrage[1], D. S. Riar[1], B. Scott[2]; [1]University of Arkansas, Fayetteville, AR, [2]University of Arkansas, Lonoke, AR (133)

ABSTRACT

Before glyphosate-resistant soybean was commercialized in 1996, johnsongrass (*Sorghum halepense*) was one of the most troublesome grass weeds of soybean. The use of glyphosate in glyphosate-resistant soybean quickly alleviated much of the weed management difficulties that growers were accustomed to prior to the mid-1990s. However, in the fall of 2007, a population of glyphosate-resistant johnsongrass was found in a field located near West Memphis, AR. An experiment was conducted in 2010 and 2012 in the same production field in which the population was initially found, with an objective to develop herbicide programs for management of glyphosate-resistant johnsongrass in Liberty Link soybean. The treatments in this study consisted of glufosinate (Liberty) at 0.40 lb ai/A applied alone in sequential applications or in tank-mixture with other postemergence herbicides. The herbicides that were evaluated in combination with glufosinate were imazamox (Raptor) at 0.05 lb ai/A, imazethapyr (Pursuit) at 0.063 lb ai/A, and clethodim (Select Max) at 0.061 and 0.121 lb ai/A. Clethodim was applied at either the V3 or V6 soybean stage and both stages, while the other herbicides were applied in combination with glufosinate at either the V3 or V6 stage. Johnsongrass was 6 to 10 inches tall when the V3 application was made and 12 to 18 inches tall at the V6 application. Visible weed control ratings were taken weekly throughout the growing season, and grain yield was determined at crop maturity. The treatment by year interaction was not significant for johnsongrass control at 3 and 5 weeks after the final application (WAFT); therefore, data were pooled over both years. Sequential glufosinate applications controlled johnsongrass 78% at 3 WAFT and control was 76% at 5 WAFT. Glufosinate + clethodim followed by glufosinate + imazamox or glufosinate + imazethapyr were the most consistent treatments, both providing >95% control at 5 WAFT. Johnsongrass control with sequential applications of glufosinate + clethodim was 92% at 5 WAFT. Crop yield was not significantly different between years, and all treatments yielded more than the nontreated check. This research shows that sequential applications of glufosinate at the rates evaluated will not provide effective johnsongrass control; however, glufosinate applied in combination with multiple herbicide modes of action can effectively control johnsongrass and would reduce the risks of johnsongrass evolving resistance to glufosinate in glufosinate-resistant soybean.

INFLUENCE OF APPLICATION TIME OF DAY ON WEED CONTROL IN ENLIST COTTON. R. M. Merchant*[1], A. S. Culpepper[1], J. S. Richburg[2], P. M. Eure[1]; [1]University of Georgia, Tifton, GA, [2]Dow AgroSciences, Dothan, AL (134)

ABSTRACT

Weed management systems in Enlist™ cotton have the potential to improve Palmer amaranth control. However, off-target movement of 2,4-D, especially drift, is of concern to specialty crop producers. Drift potential may be reduced if herbicide applications are made at night or early mornings. Therefore an experiment was conducted to determine the impact of time of day on efficacy of herbicides that could be used in Enlist™ cotton systems. The RCBD experiment with four replications included a factorial arrangement of four sequential herbicide treatments (glyphosate + 2,4-D choline, glufosinate + 2,4-D choline, 2,4-D choline, or glufosinate) and four time of day applications (1:00 AM, 7:00 AM, 1:00 PM, or 7:00 PM). Glyphosate + 2,4-D choline premix (2185 g ae ha^{-1}), 2, 4-D choline (1065 g ae ha^{-1}) and glufosinate (542 g ae ha^{-1}) were applied at 140 L ha^{-1} with DG 11002VS nozzles. Sequential applications of the same treatment at the same time of day were made 18 days after initial POST applications. Use of at-plant herbicides were avoided to ensure uniform weed infestations, but diuron (280 g ai ha^{-1}) plus MSMA (410 g ai ha^{-1}) was applied at layby. Research was conducted in Macon County and near Attapulgus (Decatur Co), Georgia during 2011 and 2012. Palmer amaranth (*Amaranthus palmeri*) was present at all locations. Smallflower morningglory (*Jacquemontia tamnifolia*), carpetweed (*Mollugo verticillata*) and Florida beggarweed (*Desmodium tortuosum*) were also present at Attapulgus. Initial POST applications were made when Palmer amaranth reached 9-15 cm and cotton reached 20 cm in height, other weeds ranged from 5-6 cm. Visual estimates of weed control, cotton heights, Palmer amaranth density, and seed cotton yield were measured. Weed control and yield are reported. In Macon County (dryland), glyphosate-resistant Palmer amaranth control at harvest ranged from 25 to 57% when treatments were applied at 1:00 AM. Delaying application to 7:00 AM improved control with glufosinate + 2,4-D (93%), but did not influence control with 2,4-D, 2,4-D + glyphosate, or glufosinate (37-39%). Applications at 1:00 or 7:00 PM provided 76-78% with 2,4-D, 89-93% with glyphosate + 2,4-D, and 95-99% with glufosinate or glufosinate + 2,4-D. Herbicide treatments that controlled Palmer amaranth > 95% produced the highest cotton yields. At Attapulgus (irrigated), glyphosate-sensitive Palmer amaranth control at layby was 99% with glyphosate or glufosiante + 2,4-D when applied at 7:00 AM, 1:00 PM, and 7:00 PM and 90-96% when applied at 1:00 AM. Control with 2,4-D alone was 87% with 1:00 or 7:00 AM applications and 99% with 1:00 or 7:00 PM applications while glufosinate provided 53% control applied at 1:00 AM, 71% control when applied at 7:00 AM, and 97 to 98% control applied at 1:00 or 7:00 PM, respectively. After the layby application, control was at least 98% with all herbicide applications except with glufosinate applied at 1:00 or 7:00 AM (47-54%). Layby herbicide coverage of Palmer amaranth was increased when POST options included 2,4-D as Palmer amaranth was more prostrate. Glufosinate, glyphosate + 2,4-D, and glufosinate + 2,4-D controlled carpetweed and beggarweed 89 to 95% and 95 to 99%, respectively, regardless of application time of day. Control of these weeds with 2,4-D ranged from 72 to 84% and was also not influenced by application time of day. After layby application, these weeds were controlled 99% with all treatments. Smallflower morningglory was controlled completely after each herbicide application. Cotton yields were similar across all treatments except where lower yields were noted with glufosinate applied at 1:00 or 7:00 AM.

NITROGEN CONTENT IN CORN AND WEEDS AT VARIOUS GROWTH STAGES DUE TO VARYING NITROGEN SOURCES AND RATES. A. M. Knight*, W. J. Everman, D. L. Jordan, R. Heiniger, T. J. Smyth; North Carolina State University, Raleigh, NC (135)

ABSTRACT

Two of the greatest factors, following genetics, impacting production and yield in agronomic crops are fertility and weed management. The uptake efficiency of nitrogen is dependent upon many factors including tillage system, soil type, crop, weeds, and the amount and type of nitrogen fertilizer applied. The relationship and interaction between crops and weeds is important, and determining how North Carolina corn production may be impacted by different fertilizers could improve nitrogen use efficiency and overall corn yields. The objectives of this study were to determine how nitrogen source and rate impact nitrogen content in weeds and investigate how early season weed competition impacts yield. Field studies were conducted in 2011 and 2012 at the Upper Coastal Plains Research Station near Rocky Mount, NC and at the Central Crops Research Station in Clayton, NC. Treatment factors included N source, N rate, and weed removal time with a factorial treatment arrangement. The N sources included urea ammonium nitrate (UAN), chicken litter (CCL) and sulfur coated urea (SCU) with rates of 0 kg N/A, 67 kg N/ha, 135 kg N/ha, and 202 kg N/ha. Weed removal times were at 0 (weed free), 8, and 16 cm heights. When weeds were allowed to remain in the field with corn, the weeds were able to compete with the corn for nitrogen over a greater time period therefore reducing corn yield potential which showed the importance of the critical period of weed removal. ÂžIt was also observed that the highest rate of nitrogen fertilizer led to the greatest nitrogen content in *Amaranthus palmeri* and *Digitaria sanguinalis*. ÂžUrea ammonium nitrate showed a significantly greater nitrogen content in weeds with sulfur coated urea behind it and chicken litter with the least nitrogen content. ÂžYield data also demonstrated that any early season weed competition impacts yield with the weed-free plots having the greatest yield. Significance was also observed for nitrogen source in corn yield. Significance based on source could also have been predicted due to the different sources being used with an organic source, and two synthetic sources one of which was a time release fertilizer.

SOYBEAN RESPONSE AND WEED CONTROL WITH PYROXASULFONE. J. Hardwick*[1], J. L. Griffin[1], D. Stephenson[2], M. J. Bauerle[1]; [1]LSU AgCenter, Baton Rouge, LA, [2]LSU AgCenter, Alexandria, LA (136)

ABSTRACT

Pyroxasulfone was developed by K-I Chemical Company and is currently being marketed as Zidua (BASF), Fierce (Valent), and Anthem (FMC). Pyroxasulfone is classified by WSSA as a Group 15 herbicide with mitosis inhibition as the mode of action. In 2012, research was conducted to evaluate soybean tolerance and weed control with pyroxasulfone. In the soybean tolerance study, Zidua was applied preemergence (PRE) and postemergence (POST) at rates of 1, 2, 3, 4, and 5 oz/A. In the weed control study, programs utilizing Zidua PRE and POST were compared with commercial standards. For both studies, experiments were conducted in Baton Rouge and Alexandria, LA using a Randomized complete block design with four replications. Soybeans were planted on May 2 in Alexandria and May 16 in Baton Rouge and PRE herbicides were applied the day of planting. Postemergence herbicides were applied when soybeans were at V3 on June 15 in Baton Rouge and May 24 in Alexandria. For the soybean tolerance study, data were analyzed using Proc Mixed where locations were considered as a random effect. For the weed control study because of differences in weed spectrum between locations, data were analyzed separately for each location. For both studies where significant differences were detected by ANOVA means were separated using LSD. For the soybean tolerance study with Zidua applied PRE, soybean injury 14 days after treatment (DAT) averaged 10% for 4 oz/A and 12% for 5 oz/A; for other rates of Zidua and the other rating intervals, injury was no more than 8%. For Zidua applied POST at rates of 1, 2, 3, 4, and 5 oz/A, soybean injury was 18 to 23% 3 DAT and 15 to 21% 10 DAT; injury for all rates of Zidua 14 and 28 DAT was no more than 9%. Soybean plant height and yield were not reduced with Zidua applied PRE or POST. For the weed control study, Zidua applied at 2.5 oz/A PRE followed by Roundup WeatherMax at 22 oz/A at Alexandria controlled browntop millet, Palmer amaranth, ivyleaf morningglory, hemp sesbania, hophornbeam copperleaf, and sicklepod 89 to 99%. At Baton Rouge, Zidua PRE followed by Roundup WeatherMax controlled barnyardgrass 85 to 97% and entireleaf morningglory 86 to 94%. At both locations where Zidua was applied PRE and followed by Roundup WeatherMax, weed control was equivalent to the commercial standards of Anthem, Authority MTZ, Prefix, and Valor applied PRE and followed by Roundup WeatherMax. Soybean yield at Alexandria for Zidua plus Valor PRE followed by Roundup WeatherMax and for Zidua PRE followed by Prefix plus Roundup WeatherMax was 53.6 bu/A. Soybean yield was 48.5 bu/A for Zidua followed by Zidua at 1 oz/A plus Roundup WeatherMax. At Baton Rouge, yield where Zidua was applied PRE followed by Roundup WeatherMax was 50.6 to 52.5 bu/A. For Zidua PRE followed by Zidua plus Roundup WeatherMax at Baton Rouge, soybean yield was 49.0 bu/A.

WEED MANAGEMENT IN CLEARFIELD RICE. J. C. Fish*[1], E. P. Webster[1], N. D. Fickett[1], B. M. McKnight[1], J. A. Bond[2]; [1]LSU AgCenter, Baton Rouge, LA, [2]Mississippi State University, Stoneville, MS (137)

ABSTRACT

Producers commonly apply two or more herbicides in a single application to improve the spectrum of weed control, reduce production costs, and/or prevent the development of herbicide resistance in weed populations (Zhang et al. 1995). The objective of this study is to evaluate the interaction between imazethapyr and propanil plus thiobencarb on the control of red rice (*Oryza sativa* L.) and barnyardgrass [*Echinochloa crus-galli* (L.) P. Beauv]. Two studies were established in 2011 and 2012 at the Louisiana State University AgCenter Rice Research Station near Crowley, LA, the LSU AgCenter Northeast Research Station near St. Joseph, LA, the LSU AgCenter Macon Ridge Research Station near Winnsboro, LA, and on two sites at the Mississippi State University Delta Research and Extension Center near Stoneville, MS. These studies were established to evaluate the interactions between a pre-packaged mix of thiobencarb plus propanil and its components thiobencarb and propanil mixed with imazethapyr. The experimental design was a randomized complete block with four replications in a two-factor factorial arrangement of treatments. Factor A consisted of imazethapyr at 0 and 70 g ai/ha. Factor B consisted of no mixture herbicide, the pre-mix of propanil plus thiobencarb at 1680 and 3360 g ai/ha, propanil at 840 and 1680 g ai/ha, and thiobencarb at 840 and 1680 g ai/ha. The rates of propanil and thiobencarb are equivalent to the rates found in the pre-packaged mixture of propanil plus thiobencarb. All treatments were applied early postemergence. Data collected was dependent upon location and included percent weed control, rice plant height at harvest, rough rice yield, and harvested rice seed moisture. All treatments received a late postemergence application of imazethapyr at 70 oz/A. Treatments were analyzed using Blouin's modified Colby's to evaluate the mixtures for synergism or antagonism (Blouin et al. 2010). Red rice control at 14 days after treatment (DAT) resulted in a synergistic response when imazethapyr was mixed with propanil plus thiobencarb at both rates evaluated and propanil at 1680 g/ha. An additive response was observed for red rice control when imazethapyr was mixed with propanil at 840 g/ha and both rates of thiobencarb. At 21 DAT, imazethapyr mixed with both rates of the pre-mix of propanil plus thiobencarb resulted in a synergistic response for red rice control, while all other mixtures evaluated resulted in an additive response. At 35 DAT, imazethapyr mixed with the pre-mix of propanil plus thiobencarb at 3360 g/ha increased control of red rice and resulted in a synergistic response. All other mixtures displayed an additive response. In general, yield increased as herbicide rates increased. Synergistic responses were observed with imazethapyr mixed with the pre-mix of propanil plus thiobencarb at both rates evaluated; however, no difference occurred for rice yield for all mixtures evaluated and a single application of imazethapyr; however, rice treated with imazethapyr mixtures had higher yields than the nontreated. In conclusion, imazethapyr with the pre-mix of propanil plus thiobencarb was shown to be synergistic for control of red rice for all evaluations and barnyardgrass at 21 and 35 DAT. At no point was antagonism found with the weed species evaluated. A mix of imazethapyr plus the pre-mix of propanil plus thiobencarb provides a multiple mode of action herbicide program which is part of a best management practice to help prevent or delay the development of herbicide resistant weeds.

YELLOW NUTSEDGE CONTROL WITH TRIBUTE TOTAL. K. Venner*[1], M. Cox[2], S. D. Askew[1], J. Hope[3]; [1]Virginia Tech, Blacksburg, VA, [2]Virginia Tech, Blaksburg, VA, [3]BayerCropScience, Raleigh, NC (138)

ABSTRACT

Yellow nutsedge (*Cyperus esculentus*) is a troublesome weed in warm season turfgrass and can be difficult to control due to its persistent nature. Typically, yellow nutsedge is controlled with several different compounds, such as halosulfuron (Sedgehammer®), trifloxysulfuron (Monument®) and others. Tribute Total™ is a three-way combination product manufactured by Bayer, which contains a combination of thiencarbazone-methyl, foramsulfuron, and halosulfuron, for weed control in bermudagrass (*Cynodon dactylon*). This combination of herbicides is effective at higher soil temperatures, and is safe for use on bermudagrass during periods of optimal growth. Two studies were initiated on August 18, 2012 to evaluate Tribute Total™ for yellow nutsedge control. The first location was at the Glade Road Research Facility in Blacksburg, VA, on 'Yukon' bermudagrass maintained at lawn height (8 cm). The second location was at the Virginia Tech Golf Course in Blacksburg, VA, on perennial ryegrass maintained at fairway height (1.3 cm). The 'Yukon' bermudagrass site was selected to quantify bermudagrass phytotoxicity as a result of Tribute Total™ applications, and evaluations at the Virginia Tech Golf course functioned to evaluate yellow nutsedge control. Yellow nutsedge was at the 3-leaf stage or larger at trial initiation. Experimental design was a randomized complete block with 4 replications. Treatments included Tribute Total™ at 136 g ai/ha alone, Tribute Total™ at 136 g ai/ha plus ammonium sulfate (AMS), Tribute Total™ at 84 g ai/ha alone and Tribute Total™ at 84 g ai/ha plus AMS. An untreated check and halosulfuron (Sedgehammer®) at 70 g ai/ha were included for comparison. All herbicide treatments included a non-ionic surfactant. All treatments received an initial application on August 18. Tribute Total™ at 136 g ai/ha with and without AMS and halosulfuron received a second application at 3 weeks after the initial treatment (WAIT). Tribute Total™ at 84 g ai/ha with and without AMS received sequential applications at 7 WAIT and 9 WAIT, respectively. Tribute Total™ injured bermudagrass 9 to 11% at 1 WAIT. By 2 WAIT, bermudagrass had recovered. At 4 WAIT, only higher rates of Tribute Total™ with and without AMS injured bermudagrass 18 and 17%, respectively. No other applications of Tribute Total™ injured bermudagrass. At 2 WAIT, all herbicide treatments controlled yellow nutsedge 97 to 98%. By 4 WAIT, higher rates of Tribute Total™ with and without AMS, plus Tribute Total™ alone at 84 g ai/ha controlled yellow nutsedge 99 to 100%. Tribute Total™ at 84 g ai/ha with AMS and halosulfuron controlled yellow nutsedge 98%.

DETERMINATION OF METHIOZOLIN ABSORPTION AND TRANSLOCATION IN ANNUAL BLUEGRASS (*POA ANNUA*). M. L. Flessner*[1], G. R. Wehtje[2], J. S. McElroy[2]; [1]Auburn University, Auburn University, AL, [2]Auburn University, Auburn, AL (139)

ABSTRACT

Annual bluegrass (*Poa annua*) is a troublesome turfgrass weed, especially in golf course putting greens. Methiozolin has been reported to selectively control annual bluegrass in desirable turfgrasses including putting greens. Little is known regarding absorption and translocation of methiozolin. This information is imperative for proper field application and maximum efficacy. Previous research using selective placement techniques indicate that methiozolin is likely absorbed by the foliage and roots. Also, the octanol-water partitioning of methiozolin is indicative of foliar and root absorption. Studies were conducted to evaluate methiozolin foliar and root absorption and translocation using radio-labeled methiozolin in annual bluegrass. Annual bluegrass plants were grown in individual containers in native soil to approximately the 3-tiller growth stage. Experiments simulated a 2.24 kg ha^{-1} methiozolin rate. Foliar absorption treatments were applied as a ~5µL leaf spotting placed on the adaxial surface of a fully mature leaf. For root absorption studies, plants were washed free of soil and placed in a spiked hydroponic solution containing 5 ppm methiozolin. Individual plants were partitioned 24, 48, and 72 hours after treatment into various parts. For foliar-absorption experiments the treated area was washed then the plant was partitioned into target area, treated leaf above target area, treated leaf below target area, remainder of foliage on treated tiller, foliage of adjacent tillers, crown, and roots. For root-absorption experiments, roots were washed and partitioned into roots, crown, and foliage for subsequent analysis. All samples were then dried, oxidized, and radioactivity was determined through liquid scintillation spectrometry. Data were transformed into methiozolin concentration in each sample. All studies were conducted in the greenhouse with four single plant replicates for each of the three harvest times and the experiment was repeated in time. All data were subjected to ANOVA using SAS; LSmeans and adjusted 95% confidence intervals were used to detect significant differences between treatments; this method allows for multiple comparisons by providing family-wise error rate protection. Foliar absorption and translocation was complete 24 hours after treatment as no differences were detected between harvest times. 45% of applied methiozolin was detected in the leaf wash, indicating only 55% of foliar applied methiozolin was absorbed. 37% of applied methiozolin was detected in the target area of the treated leaf. 10% of applied methiozolin was detected in the treated leaf above the target area and 1.4% was detected in the treated leaf below the target area. Negligible amounts (<1% of applied methiozolin) were detected in other samples. Root absorption and translocation was complete 48 hours after treatment (48 and 72 hours after treatment timings were similar according to contrasts). Roots had the highest methiozolin concentration with >145 µg g^{-1} tissue, across harvest times. Translocation to the crown was 20 to 30 µg methiozolin g^{-1} tissue, across harvest times. Translocation to the foliage was less than to the crown; methiozolin concentration was 4 to 8 µg g^{-1} tissue, across harvest times. Absorption and translocation data indicate that methiozolin is absorbed by both foliage and roots and moderately translocates upward in the plant toward the leaf tip, presumably through the xylem, with little to no basipetal translocation. Based on these results, successful field application of methiozolin likely requires exposure of annual bluegrass roots and foliage.

PREEMERGENCE HERBICIDES AFFECT HYBRID BERMUDAGRASS NUTRIENT CONTENT.
P. A. Jones*, J. Brosnan, D. A. Kopsell, G. K. Breeden; University of Tennessee, Knoxville, TN (140)

ABSTRACT

Preemergence herbicides that inhibit mitotis (MTI) or cellulose biosynthesis (CBI) have been reported to negatively impact turfgrass root development. These reductions in root growth or morphology could negatively affect nutrient uptake resulting in the development of foliar deficiency symptoms. However, data describing the effects of MTI and CBI herbicide applications on turfgrass nutrient content are limited. Research was conducted in 2012 in a greenhouse at the University of Tennessee to determine the effects of indaziflam (35 and 52.5 g ha^{-1}), prodiamine (0.84 kg ha^{-1}), and isoxaben (1.12 kg ha^{-1}) applications on hybrid bermudagrass [*C. dactylon* (L.) Pers. x *C. transvaalensis* Burtt-Davey] foliar tissue nutrient content. Treatments were compared to non-treated control as well as the protoporphyrinogen oxidase inhibitor oxadiazon (3.36 kg ha^{-1}), as it has been reported to have minimal effects on turfgrass roots. Treatments were arranged in a randomized complete block design with five replications and the experiment was repeated in time. Ten hybrid bermudagrass plugs were transplanted from washed sod into aerated polyethylene containers filled with 10 L of Hoagland's nutrient solution. Plants were allowed to acclimate for three weeks prior to herbicide treatment. Visual foliar injury was assessed weekly using a 0 (i.e., no injury) to 100% (i.e., complete plant death) scale relative to the non-treated control. Similarly, root mass and root color were assessed weekly using a 1 (i.e, lowest) to 5 (i.e., highest) scale.. Foliar and root biomass were also harvested at the conclusion of the study, dried, and weighed. Foliar biomass samples were analyzed for macro- and micronutrient content. Significant foliar injury was observed in plants treated with CBI herbicides. Injury symptoms included curling of new growth, reddening of leaf tissue and eventual necrosis. Symptoms were more severe in indaziflam treated plants (67 to 78% injury) than isoxaben (49% injury) by 6 WAT. Prodiamine, indaziflam, and isoxaben also reduced visual root mass and root color compared to the non-treated control. Consequently, these herbicides reduced P, S, and K content in foliar tissue. Treatment with indaziflam reduced Mg and Mn content in foliar tissue compared to non-treated plants. This response was not observed with prodiamine and could explain the significant foliar injury (>70%) observed with both rates of indaziflam in this research. Data in the current study illustrate that preemergence herbicide applications affect hybrid bermudagrass nutrient content.

PREEMERGENT HERBICIDE COMBINATIONS FOR GOOSEGRASS CONTROL IN BERMUDAGRASS FAIRWAYSÂ . M. Cox*[1], A. Smith[2], S. D. Askew[2], J. Corbett[3]; [1]Virginia Tech, Blaksburg, VA, [2]Virginia Tech, Blacksburg, VA, [3]Qualipro, Clayton, NC (141)

ABSTRACT

With the removal of monosodium methanearsenate (MSMA) from the turfgrass market and very few effective postemergence herbicides available, control options for goosegrass are limited in athletic fields and golf course fairways; therefore, preemergence herbicide programs are key components for inhibiting goosegrass outbreaks in turf. Oxadiazon (Ronstar®) is a preemergence herbicide commonly used to control goosegrass in golf course fairways due to its safety on sprigged bermudagrass. Other preemergence herbicides such as prodiamine, dithiopyr, and oryzalin have also shown activity on goosegrass. The objective of this study was to determine the most effective preemergence herbicide program for goosegrass control in bermudagrass due to lack of control with oxadiazon in the southeastern region of Virginia. A study was conducted as a randomized complete block design at Independence Club in Richmond, VA during the summer of 2012. Three replications were implemented each on a separate fairway within the golf course. All treatments were applied at 407 L ha^{-1} using Teejet turbo twin injection 11004 nozzles at 262 kPa on March 15, 2012 initially and again on May 30, 2012. Treatments included the following herbicides marketed by Quali-Pro: one application of oxadiazon applied at 3360 g ai ha^{-1}, prodiamine L at 1120 g ai ha^{-1}, prodiamine 65WG at 1120 g ai ha^{-1}, dithiopyr at 560 g ai ha^{-1}, oryzalin at 2240 g ai ha^{-1}; sequential applications of oxadiazon fb prodiamine L, oxadiazon fb dithiopyr, prodiamine L fb prodiamine L, prodiamine L fb dithiopyr, and oryzalin fb dithiopyr 10 weeks after initial treatment (WAIT). Turfgrass on the fairways at Independence Club was 'Midlawn' bermudagrass. Generally speaking, goosegrass pressure is higher on this course closer to the green, year after year, according to the golf course superintendent. This pressure gradient may have attributed to the high variance of goosegrass occurrence between plots and across treatments. Fairways were sprayed with diclofop in July by golf course personnel; however, all dithiopyr and indaziflam applications had already been made. This accidental, broadcast treatment to the trial site controlled all goosegrass seedlings present in plots and injured most mature plants, but it did not prevent accurate goosegrass cover ratings based on the preemergence herbicide treatments. Goosegrass occurred more often in areas of turf infected with spring dead spot than non-infected areas of the fairways. This is likely due to a lack of competition with actively growing bermudagrass. Goosegrass cover was 6% or less for all treatments 27 WAIT, but no treatments were significantly different from each other or the untreated check. Oxadiazon treatments injured the bermudagrass up to 70% 9 days after initial treatment (DAIT), but injury was not evident 24 DAIT; in fact, a rebound effect was observed in these plots as bermudagrass green cover was significantly greater in these plots than all other treatments 24 DAIT. No other treatments caused significant injury to the bermudagrass at any timing during this study. From this site, data suggest that none of the treatments controlled goosegrass when compared to the untreated check. 'Midlawn' bermudagrass is recognized as a slow growing and minimally-competitive cultivar in the transition zone and could have increased goosegrass survival, leading to poor treatment performance. More research should be conducted to determine if more aggressive bermudagrass cultivars, higher fertility, and more consistent goosegrass pressure across the study site would elucidate clearer distinctions between treatment programs.

TOLERANCE OF FIVE WARM-SEASON TURFGRASSES TO FLUMIOXAZIN. T. Reed*, P. McCullough; University of Georgia, Griffin, GA (142)

ABSTRACT

Field experiments were conducted to evaluate tolerance of bermudagrass, centipedegrass, St. Augustinegrass, seashore paspalum, and zoysiagrass to spring applications of flumioxazin. Treatments were applied in February, mid-March, or late April at 0, 0.21, 0.42, or 0.84 kg ai/ha. Bermudagrass, seashore paspalum, and zoysiagrass had acceptable injury (<20%) from February applications during dormancy but centipedegrass and St. Augustinegrass injury was unacceptable. March and April applications caused unacceptable injury to all grasses but bermudagrass, seashore paspalum, and zoysiagrass recovered from application rates tested. Centipedegrass and St. Augutinegrass injury was unacceptable at these timings and resulted thinning and stand loss, especially at 0.42 or 0.84 kg/ha.

MICROSTEGIUM MANAGEMENT: INFLUENCING FOREST COMMUNITY STRUCTURE. A. R. Post*[1], D. Tekiela[2], J. N. Barney[1], S. D. Askew[1]; [1]Virginia Tech, Blacksburg, VA, [2]Virginia Tech, Blacksbrug, VA (143)

ABSTRACT

Japanese stiltgrass (*Microstegium vimineum*), a C4 annual grass, is one of the worst invaders of the Eastern United States. Unmanaged populations of Japanese stiltgrass decrease understory biodiversity, alter nutrient cycling and successional patterns in hardwood forest ecosystems. Current management strategies include prescribed fire, mechanical removal and hand-pulling, which are not practical solutions for large populations occurring in Eastern US hardwood forests. Single herbicide applications are commonly used to control larger populations, however, Japanese stiltgrass persists in the seedbank for at least three years. Therefore, single herbicide applications are unlikely to provide long-term control and certainly not eradication. More feasible and cost-effective management strategies are needed to eradicate Japanese stiltgrass in understory forest ecosystems. The objectives of this study are to compare the effectiveness of the standard single season herbicide applications against an eradication-focused “as-needed” treatment for Japanese stiltgrass control, while minimizing negative impacts on the surrounding plant community. This long-term study has an end-goal of Japanese stiltgrass eradication with minimal impact to the surrounding desirable plant community. The trial was initiated in August 2011 in Newport, VA in an established oak/hickory hardwood stand heavily infested with Japanese stiltgrass. The study is a split block design with four replications. Six treatments programs were initiated were imposed including full-rate glyphosate (2.77 kg ai/ha), low-rate glyphosate (0.114 kg ai/ha), pendimethalin (2.24 kg ai/ha), sethoxydim (0.772 kg ai/ha), a mechanical treatment applied with a string trimmer, and a nontreated control. Blocks were split in half with one half treated once per season and one half treated as needed to prevent Japanese stiltgrass seed production. Point intercept community data were collected prior to treatment and at the end of the season prior to Japanese stiltgrass seed set. To date, we have observed no differences between single season and as needed treatments, thus data are pooled. All treatments except mechanical removal controlled Japanese stiltgrass greater than 95% in both years but negative impacts on the surrounding plant community differed among treatments. All treatments significantly increased bare ground compared to the nontreated; however, full-rate glyphosate decreased percent cover of other species and increased bare ground to 70% compared to 15% bare ground in the nontreated and 29-49% in other treatments. Sethoxydim effectively controlled Japanese stiltgrass while leaving the surrounding plant community intact. A total of 99 unique species were encountered in year and 106 were encountered in year 2. Species richness did not change in year one; however, in year two species richness was significantly lower in full-rate glyphosate plots compared to all other treatments and nontreated plots had significantly higher species richness compared to all treatments. After two years of treatments, Shannon diversity indices have not changed from the initial community, though Japanese stiltgrass was almost completely controlled in several treatments. The Shannon diversity index is a measure of species richness and evenness. Thus, even though Japanese stiltgrass was entirely removed from many treatments, it is likely that other species are still dominating the community thereby skewing evenness and preventing a change in this measure of diversity. In the case of full rate glyphosate, through nonselective removal of most species richness decreases but evenness may improve leaving no net change in Shannon index. Results to date indicate Japanese stiltgrass can be effectively managed with single season herbicide applications applied over multiple years and in some cases without negatively impacting the surrounding plant community. To date, sethoxydim is the best single treatment over multiple seasons for control of Japanese stiltgrass with minimum negative impacts to the community. However, depletion of the seedbank will be required to achieve eradication. This study will continue at least three additional seasons. Seedbank information collected over the course of this study will serve as an additional tool to evaluate the effectiveness of treatments applied over time and indicate whether these treatments effectively deplete seedbank stores of Japanese stiltgrass.

EVALUATION OF CUTLESS G (FLURPRIMIDOL) ON ORNAMENTAL SHRUBS IN RELATION TO PRUNING TIME AND METHOD OF APPLICATION. H. C. Smith*; University of Florida, Gainesville, FL (144)

ABSTRACT

The plant growth regulator flurprimidol (Cutless G) is registered for use on ornamental plants to reduce internode elongation and delay trimming frequency. However, the results of the application can be inconsistent. It has been hypothesized that timing of the trimming event can be related to the efficacy of the flurprimidol treatment. Cutless G was applied to well establish plants at a standard rate of 15lbs (2,247g ai)/1000ft^2 on April 23rd, 2012. Plants (*Viburnum odoratissimum and V. suspensum)* were trimmed at different times to investigate flurprimidol efficacy by measuring plant regrowth. The five trimming applications occurred at 7 days before treatment (DBT), 0 DBT, 7 days after treatment (DAT), 14 DAT, and 21 DAT. Plant regrowth was measured and compared against an untreated control trimmed at the same time. No significant difference was observed in trimming application times for *V. odoratissimum*. In *V. suspensum*, plants trimmed 21 DAT had significantly less shoot regrowth compared to the other treatments but there was no significant difference in biomass produced. Although plants trimmed 21 DAT had significantly less regrowth, by visual assessment plants trimmed 7 and 14 DAT displayed the most substantial overall growth regulation.

PHYSIOLOGICAL EFFECTS OF TEMPERATURE ON TURFGRASS INJURY TO AMICARBAZONE. J. Yu*, P. McCullough; University of Georgia, Griffin, GA (145)

ABSTRACT

Amicarbazone effectively controls annual bluegrass (*Poa annua* L.) in cool-season grasses with spring applications but summer applications are too injurious for selective control. Experiments were conducted to evaluate uptake, translocation, and metabolism of ^{14}C-amicarbzone in hybrid bermudagrass (*Cynodon dactylon* x *C. transvaalensis*), tall fescue (*Festuca arundinacea*), and annual bluegrass. Grasses were grown in growth chambers set for 25/20 C (day/night) or 40/35 C. At the cool temperature, annual bluegrass absorbed more foliar applied amicarbazone than tall fescue and bermudagrass after 72 hours. Foliar absorption increased at 40/35 in all species, compared to 25/20, and tall fescue had similar absorption to annual bluegrass at the high temperature. Bermudagrass had less foliar absorption than annual bluegrass at both temperatures and less absorption than tall fescue at the high temperature only. Annual bluegrass and tall fescue had approximately twofold greater root absorption of ^{14}C-amicarbazone than bermudagrass after 72 hours. Annual bluegrass had less metabolism of amicarbazone than tall fescue at 25/20 but both species recovered similar levels of parent herbicide at the high temperature. Bermudagrass had more metabolism of amicarbazone than annual bluegrass and tall fescue at the high temperature but metabolism was similar to annual bluegrass at the low temperature. Results suggest bermudagrass tolerance to amicarbazone is attributed to less absorption than cool-season grasses while increased sensitivity of tall fescue to amicarbazone at high temperatures results from greater foliar and root absorption.

EVALUATION OF NEW HERBICIDES, MOWING, AND APPLICATION TIMING ON COGONGRASS (*IMPERATA CYLINDRICA*) STAND REDUCTION AND CONTROL. L. C. Beckworth*, J. D. Byrd, J. M. Taylor, N. Barksdale, M. L. Zaccaro; Mississippi State University, Mississippi State, MS (146)

ABSTRACT

Cogongrass (*Imperata cylindrical* (L.) Beauv.) is a highly invasive grass species that continues to infest forests, pasture, and rights-of-way throughout the southeastern United States. Currently, there are only two herbicides, glyphosate and imazapyr, that provide satisfactory control of cogongrass. Recently, granular formulations of imazapyr, as well as, herbicide combinations with aminocyclopyrachlor, have both been suggested to help control this species. Field trials were established in Forrest County, Mississippi in 2011 to evaluate the effectiveness of these treatments for cogongrass control. A split-plot study was designed to evaluate these treatments on both mown and unmown plots with both summer and fall application timings. Plot size was 3.1 by 6.1 meters, with subplots measuring 3.1 by 3.1 m. Two weeks prior to the applications, the mown subplots were trimmed to 12.7 cm in height. Summer applications were made in June, and fall applications were made in late September. A backpack sprayer was used to apply the liquid treatments and a 0.5 liter shaker, with calibration blanks to aid in even distribution, was used to distribute granular formulations. Treatments applied were 120 + 40 g ai/ha soluble granule (SG) aminocyclopyrachlor + (SG) metsulfuron methyl with 1% v/v MSO, 87 + 35 g ai/ha (SG) aminocyclopyrachlor + (SG) chlorsulfuron and 1% v/v MSO, 101 + 73 + 26 g ai/ha (SG) imazapyr + (SG) aminocyclopyrachlor +(SG) metsulfuron methyl and 1% v/v MSO, 315 g ai/ha liquid (L) aminocyclopyrachlorand 1% v/v MSO, 315 g ai/ha (SG) aminocyclopyrachlor and 1% v/v MSO, 140 + 1064 g ai or ae/ha (SG) aminocyclopyrachlor + 2,4-D amine and 1% v/v MSO, 140 + 280 g ai or ae/ha (SG) aminocyclopyrachlor + triclopyr ester and 1% v/v MSO, 840 g ai/ha (L) imazapyr and 1% v/v MSO, 1120 g ae/ha potassium salt of glyphosate and 840 g ai/ha granular (G) imazapyr. Visual evaluation of the plots began 1 month after treatment (MAT) and was continued until 15 MAT. Shoot height was measured at application, 12 MAT, and 15 MAT. Culm density was measured using a 930 cm^2 quadrat. Density measurements were taken at application, 1 MAT, and 15 MAT. Rhizome biomass samples were also collected dried and weighed. In all subplots that were mown, significant reductions in shoot heights were present at 12 MAT. Fall applications of (L) imazapyr, glyphosate,(G) imazapyr, and (SG) aminocyclopyrachlor +(SG) imazapyr + (SG) metsulfuron greatest level of visual control for both mown and unmown plot, as well as providing the greatest reduction in culm densities. Rhizome biomass data was inconclusive.

EFFECTS OF AMINOCYCLOPYRACHLOR PLUS METSULFURON ON TALL FESCUE GROWTH AND FORAGE QUALITY. T. D. Israel*[1], N. Rhodes[2], T. C. Mueller[2], G. E. Bates[2], J. C. Waller[2]; [1]University of Tennessee Knoxville, Knoxville, TN, [2]University of Tennessee, Knoxville, TN (147)

ABSTRACT

Tall fescue (*Lolium arundinaceum*) is the major grass species found in pastures in the mid-South. It occupies 35 million acres and supports over 8.5 million beef cows in the United States. Most tall fescue is infected with a fungal endophyte, *Neotyphodium coenophialum*, which imparts certain advantages to the plant such as drought tolerance, insect feeding deterrence, and enhanced mineral uptake. However, ergot alkaloids produced by the endophyte are detrimental to livestock and contribute to fescue toxicosis. Increased body temperature, rough hair coats, and reduced average daily gain (ADG) are all symptoms of fescue toxicosis. Since the alkaloids are highly concentrated in seeds and stems, a potential way to reduce the harmful effects is by suppressing seed heads with herbicides. Metsulfuron is well documented to limit seed head formation, but also damages tall fescue. Aminocyclopyrachlor, hereafter abbreviated MAT28, a new synthetic auxin herbicide, has been registered for use in non-cropland and right-of-way applications; registration in pastures is expected 4Q 2013. The first MAT28 pasture herbicide product to be registered will also contain metsulfuron. Research was conducted in 2012 using metsulfuron applied alone and in combination with other herbicides to determine the growth response of tall fescue, effects on forage quality, and potential to reduce the impact of fescue toxicosis by reducing ergot alkaloid concentration. Trials were conducted on endophyte-infected tall fescue pastures in Alcoa and Crossville, Tennessee. Experimental design was a randomized complete block with four replications and all herbicide treatments included non-ionic surfactant at 0.25%. In addition to the anticipated use rates of MAT28 plus metsulfuron, other treatments were metsulfuron alone, aminopyralid plus metsulfuron, and MAT28 plus 2,4-D. Clipping at early boot stage was also included to compare effects of herbicide applications versus mechanical removal. Visual ratings were performed monthly to evaluate fescue discoloration and stunting on a 0-99% scale and were combined over location. Plots were harvested in May and July to determine yield, seed head density, stem/leaf ratio, and tiller density. Forage quality measurements were determined using NIRS and were combined over harvest and location. Alkaloid concentrations were determined by ELISA. MAT28 plus metsulfuron (78 + 12 g ai/ha), metsulfuron alone (12 g ai/ha), and aminopyralid plus metsulfuron (65 + 12 g ai/ha) stunted tall fescue more than 50% at one month after treatment. Clipping or metsulfuron applied alone or in combination with MAT28 or aminopyralid reduced seed head density by 50% or more compared to the untreated control. Stem/leaf ratios from the clipping treatment and treatments containing metsulfuron were also less than the untreated control at first harvest. May yields ranged from 37 to 46% of untreated for all treatments containing metsulfuron. At two months after treatment, metsulfuron at 12 g ai/ha had the highest injury ratings with 23% discoloration and 29% stunting. Metsulfuron alone or in combination with MAT28 or aminopyralid reduced tiller density 27 to 54% at Alcoa two months after treatment. Metsulfuron alone or in combination with MAT28 or aminopyralid improved forage quality as evidenced by increased crude protein and total digestible nutrients (TDN) and decreased acid detergent fiber (ADF). Metsulfuron alone or in combination with MAT28 or aminopyralid decreased total ergot alkaloid concentration. In the May Alcoa harvest, total ergot alkaloid concentration in untreated forage was 2194 ppm while treatments containing 12 g ai/ha metsulfuron ranged from 1356 to 1702 ppm. When applied alone or in combination with MAT28 or aminopyralid, metsulfuron injured tall fescue and reduced yield, but also reduced seed heads and stems in harvested forage. Forage quality was also improved in all treatments containing metsulfuron. Clipping reduced seed heads and stems, but did not improve forage quality. Metsulfuron applied alone or in combination with MAT28 or aminopyralid can potentially reduce the severity of fescue toxicosis as evidenced by the reduction in total ergot alkaloid concentration. Follow-up ratings and measurements will be performed in spring 2013 and the study will be repeated. Future research also includes determining effects of application timing on tall fescue growth and yield.

EVALUATION OF AMINOCYCLOPYRACHLOR-METHYL ALONE AND IN MIXTURES FOR WEED MANAGEMENT IN ABANDONED PASTURES. J. J. Vargas*[1], J. Brosnan[1], D. A. Kopsell[1], G. R. Armel[2], T. C. Mueller[1], W. Klingeman[1]; [1]University of Tennessee, Knoxville, TN, [2]BASF, Raleigh, NC (148)

ABSTRACT

Japanese honeysuckle (Lonicera japonica Thunb.) is the most abundant and widespread invasive weed in the state Tennessee. This aggressive vine forms mats along forest edges, abandoned fields, pastures, and non-cropland areas that can compromise ecological habitats. Research was established at two adjacent sites in an abandoned pasture setting in Walland, TN (lat. 35.7281° N, long. 83.8132° W) evaluating the efficacy of aminocyclopyrachlor-methyl alone and in mixtures with other herbicides for control of Japanese honeysuckle. Field studies were conducted in 2008 and 2009 evaluating the efficacy of aminocyclopyrachlor-methyl, aminopyralid, and 2, 4-D applied alone and in mixtures with metsulfuron-methyl and diflufenzopyr for POST control of Japanese honeysuckle. The experimental design was a randomized complete block with three replications. Treatments included aminocyclopyrachlor-methyl (35, 70, 140 and 280 g ai/ha), aminopyralid (70 and 140 g ai/ha), 2,4-D (1080 g ai/ha), metsulfuron-methyl (42 g ai/ha), diflufenzopyr (70 g ai/ha), aminocyclopyrachlor-methyl + metsulfuron-methyl (70 + 42 g ai/ha), aminopyralid + metsulfuron-methyl (70 + 42 g ai/ha), aminocyclopyrachlor-methyl + 2,4-D (70 + 1080 g ai/ha), aminopyralid + 2,4-D (70 + 1080 g ai/ha), aminocyclopyrachlor-methyl + diflufenzopyr (70 + 70 g ai/ha), and aminopyralid + diflufenzopyr (70 + 70 g ai/ha). All treatments contained a methylated seed oil surfactant at 1% v/v and were applied using a CO2 powered sprayer calibrated to deliver 215 L/ha at 310 kPa. Japanese honeysuckle control was visually assessed two, four, eight, fifty two weeks after treatment (WAT), using a 0 (i.e, lowest) to 100 (i.e., highest) scale relative to the non-treated check. Japanese honeysuckle plant counts and biomass measurements were also made 52 WAT. Aminocyclopyrachlor-methyl at 280 g ai ha-1 provided 84% control of JHS by 4 WAT. Aminocyclopyrachlor-methyl at 70 g ai/ha plus 2,4-D controlled JHS 92 to 94%, greater than either herbicide applied alone. Aminocyclopyrachlor-methyl plus diflufenzopyr controlled JHS 68-80% by 4 WAT. Comparatively aminocyclopyrachlor-methyl alone controlled JHS 57-63%, while diflufenzopyr only provided 7-10% control. Mixtures of aminocyclopyrachlor-methyl plus 2,4-D provided 83-92 % control by 52 WAT. This mixture proved to be more effective than aminocyclopyrachlor-methyl applied alone at rates <70 g ai ha-1. Long term JHS control could be achieved with mixtures of multiple auxin herbicides or the incorporation of an auxin transport inhibitor.

THE EFFECT OF GROWING DEGREE-DAY-BASED APPLICATION TIMINGS ON DALLISGRASS (*PASPALUM DILATATUM*) CONTROL IN TALL FESCUE. M. Elmore*, J. Brosnan, T. C. Mueller, D. A. Kopsell, G. K. Breeden; University of Tennessee, Knoxville, TN (149)

ABSTRACT

Dallisgrass (*Paspalum dilatatum*) is a perennial warm-season graminaceous weed found throughout the southern United States. Selective control of dallisgrass in tall fescue (*Festuca arundinacea*) is difficult. The ACCase-inhibiting herbicide fluazifop-*p*-butyl (fluazifop) is labeled for use in tall fescue. Previous reports indicate dallisgrass control with fluazifop varies with seasonal application timing, but more investigation is warranted. Additionally, the HPPD-inhibiting herbicides mesotrione, topramezone and tembotrione are being researched for use in turfgrass and may have dallisgrass activity. In 2010 and 2011 field experiments evaluated fluazifop (105 g ha^{-1}) alone or in combination with mesotrione (280 g ha^{-1}), topramezone (37 g ha^{-1}) and tembotrione (92 g ha^{-1}) applied at different growing degree day- (GDD) or cooling degree day- (CDD) based application timings. GDD's were calculated using a 10 °C base beginning January 1. CDD's were calculated by subtracting the average daily temperature from a 22 °C base beginning July 1. The influence of fall or spring tall fescue interseeding was also evaluated. Herbicide treatments were applied through flat-fan nozzles with NIS at 0.25% v/v and 280 L ha^{-1} of water using a standard CO_2-powered backpack sprayer. Interseeding treatments were applied using a slit-seeder at 353 kg pure live tall fescue seed per hectare. The irrigated experiment site contained a natural dallisgrass infestation and was maintained as a home lawn with respect to irrigation and mowing. Plots were arranged in a split-split plot randomized complete block design with three replications. Dallisgrass control and tall fescue injury were evaluated 2, 4, 8, 18, and 52 weeks after treatment (WAT). Grid counts were conducted 52 WAT to quantitatively assess dallisgrass control. Fluazifop applied at 175 GDD and 5 CDD provided the greatest control 52 WAT in 2010; application at 5 CDD provided greater dallisgrass control than treatments applied at 75, 375 and 775 GDD at 8 and 18 WAT in 2011 as well. Combining HPPD-inhibitors with fluazifop did not improve control compared to fluazifop alone in either year. Application of mesotrione alone provided < 20% dallisgrass control regardless of application timing or evaluation date. Tembotrione and topramezone controlled dallisgrass < 65% regardless of application timing or evaluation date. Fall interseeding improved dallisgass control 52 WAT from herbicide treatments applied at 175, 375 and 775 GDD in 2010 and at 75, 175, 375 and 775 GDD in 2011. Spring interseeding did not improve dallisgrass control. Data suggest fluazifop applications at 175 GDD and 5 CDD and fall interseeding will provide the greatest dallisgrass control in tall fescue. Future research should investigate GDD and CDD-based herbicide application timings in other locations in order to further refine programs for selective dallisgrass control. More CDD-based application timings should be investigated to determine how fluazifop efficacy changes as CDD's accumulate in fall.

TOLERANCE OF PERENNIAL RYEGRASS OVERSEEDING TO RESIDUAL ACTIVITY OF TRIBUTE TOTAL. C. M. Straw*[1], G. M. Henry[1], T. Cooper[2], L. Beck[2]; [1]University of Georgia, Athens, GA, [2]Texas Tech University, Lubbock, TX (150)

ABSTRACT

Research was conducted from August to December 2011 on a common bermudagrass [*Cynodon dactylon* (L.) Pers.] fairway at Reese Golf Course (Lubbock, TX) and a 'Tifway 419' hybrid bermudagrass (*Cynodon dactylon* x. *C. transvaalensis* Burtt-Davy) fairway at the Rawls Golf Course (Lubbock, TX). Plots were arranged in a 2 x 4 factorial within a randomized complete block design with four replications. The main factor was herbicide rate and the sub-factor was application timing [weeks before overseeding (WBO)]. Treatments included thiencarbazone + foramsulfuron + halosulfuron (Tribute Total) at 136 and 271 g ai ha^{-1} + MSO at 0.5% v/v applied on August 15, 2011 (8 WBO), August 29, 2011 (6 WBO), September 12, 2011 (4 WBO), and September 26, 2011 (2 WBO). Treatments were applied to 1.5 x 1.5 m plots with a CO_2 powered boom sprayer equipped with XR8004VS nozzle tips calibrated to deliver 375 L ha^{-1} at 221 kPa. The entire experimental area was overseeded with perennial ryegrass (*Lolium perenne* L.) at 392 kg ha^{-1} on October 10, 2011. The research area was verticut in two directions to a depth of 0.6 cm to open the canopy for overseeding without disturbing the soil profile. Perennial ryegrass seed was broadcast in two directions using a shaker jar. Perennial ryegrass cover was evaluated bi-monthly through December 2011 using digital image analysis. As Tribute Total rate increased and applications were made closer to overseeding, perennial ryegrass establishment decreased. Untreated check plots exhibited 80% perennial ryegrass cover on December 14, 2011. Similar ryegrass cover (75% to 76%) was observed on December 14, 2011 in plots sprayed with Tribute Total at 136 g ai ha^{-1} applied 6 and 8 WBO, respectively. Ryegrass cover in response to Tribute Total at 136 g ai ha^{-1} applied 4 and 2 WBO was 45 and 36%, respectively. No Tribute Total treatment at the 271 g ai ha^{-1} rate exhibited similar ryegrass cover to the untreated check, regardless of application timing. Ryegrass cover in response to Tribute Total at 271 g ai ha^{-1} applied 8, 6, 4, and 2 WBO was 54%, 40%, 43%, and 16%, respectively. Applications of Tribute Total may be limited to rates of 136 g ai ha^{-1} made 6 WBO when utilized in overseeded bermudagrass turf in order to avoid reductions in perennial ryegrass establishment.

IMPACT OF NOZZLE SELECTION ON ENGENIA PERFORMANCE.
L. Newsom*[1], W. E. Thomas[2], J. Frihauf[3], S. J. Bowe[4], G. Kruger[5]; [1]BASF Corporation, Tifton, GA, [2]BASF Corporation, Research Triangle Park, NC, [3]BASF Corporation, Raleigh, NC, [4]BASF, Research Triangle Park, NC, [5]University of Nebraska-Lincoln, North Platte, NE (151)

ABSTRACT

New weed control options are needed to help manage an evolving weed resistance problem. Dicamba-tolerant soybean and cotton will enable the use of dicamba to manage these problematic broadleaf weeds with an additional herbicide mechanism-of-action. These dicamba tolerant cropping systems will allow for application of dicamba as a preplant burndown without a planting interval and postemergence over the top of the crop. Engenia herbicide, currently under evaluation by the US EPA, is an advanced formulation based on the novel BAPMA (N, N-Bis-(aminopropyl) methylamine) form of dicamba that reduces potential secondary loss more than Clarity® herbicide, which in itself was an improvement over other formulations. In addition to addressing secondary loss through formulation innovation, a comprehensive stewardship strategy will be implemented to focus on weed management and effective control, weed resistance management, and maximizing on-target application. In order to maximize on-target deposition, many parameters related to equipment setup and environmental conditions should be considered. Proper nozzle selection offers the opportunity to dramatically reduce the potential for spray drift. Research shows that venturi-type nozzle technology can greatly reduce drift potential compared to standard hydraulic flat-fan nozzles. Other application parameters that should be considered include wind speed and direction, temperature inversions, travel speed, boom height, application volume, use of a deposition aid, and proximity to sensitive crops. BASF has initiated the 'On Target Spray Academy' training series to educate applicators on best application practices to optimize herbicide performance and limit off-target movement. The combination of Engenia herbicide and dicamba-tolerant crops plus a stewardship strategy will provide growers with an effective system to control herbicide-resistant and difficult to control broadleaf weeds. Pending regulatory approvals, commercialization of Engenia herbicide is anticipated to coincide with the launch of dicamba tolerant soybean in 2014.

EFFECT OF SPRAY TIP SELECTION ON PALMER AMARANTH CONTROL.

T. H. Dixon*[1], D. M. Dodds[1], D. Z. Reynolds[1], C. A. Samples[1], A. Mills[2]; [1]Mississippi State University, Mississippi State, MS, [2]Monsanto, Collierville, TN (152)

ABSTRACT

Experiments were conducted in 2012 at Dundee, MS and Robinsonville, MS to determine the effect of spray tip selection and herbicide program on glyphosate-resistant Palmer amaranth control. Experiments were initiated in grower fields with heavy natural infestations of glyphosate-resistant Palmer amaranth. Applications were initiated when Palmer amaranth plants were 10 to 15 cm in height. Applications were made with a CO_2 backpack sprayer at a pressure of 324 kPa and an application volume of 140 L/ha. Treatments utilized in these experiments included: dicamba at 0.6 kg ai/ha; glufosinate at 0.6 kg ai/ha; dicamba + glufosinate at 0.6 kg ai/ha each; dicamba + glufosinate at 0.3 kg ai/ha each; and glyphosate + dicamba at 0.75 kg ae/ha and 0.6 kg ai/ha, respectively. All herbicide treatments were applied using each of the following spray tips: Extended Range Flat Fan, Greenleaf Asymmetric Dual Fan, Extended Range Air Induction, and Turbo Teejet Induction. All tips utilized in these studies delivered 0.06 liters per minute (0.015 GPM) at 276 kPa. Visual estimates of weed control, the number of Palmer amaranth plants per square meter, and height of Palmer amaranth plants per square meter were collected weekly following herbicide application. In addition, above ground plant biomass from each square meter was collected four weeks after application and dried in a forced air dryer for one week. Experiments were conducted using a factorial arrangement of treatments in a randomized complete block design with four replications. Visual estimates of weed control, number of plants per square meter, plant height, and plant biomass were subjected to analysis of variance and means were separated using Fisher's Protected LSD at p = 0.05. Two weeks after application, dicamba + glufosinate at 0.6 kg ai/ha provided greater than 80% reduction in total plants compared to the untreated check. Glufosinate alone, glyphosate + glufosinate, dicamba + glufosinate at 0.3 kg ai/ha, and dicamba alone provided 66, 55, 40, and 23% reduction in the total number of plants per square meter, respectively, two weeks after treatment. No difference in plant height was observed two weeks after treatment. All plant heights were reduced 15 to 38%. Visual estimates of control indicated that dicamba + glufosinate at 0.6 kg ai/ha provided significantly greater control (90%) compared to all other treatments two weeks after application. Similar control was observed following application of glufosinate alone of glyphosate + dicamba two weeks after treatment. Four weeks after treatment, dicamba + glufosinate at 0.6 kg ai/ha reduced the total number of plants and plant height approximately 70% compared to the untreated check. In addition, glyphosate + dicamba reduced the total number of plants by 60% and height plant height by 80%. Visual estimates of weed control and reduction in above ground biomass were similar in that dicamba + glufosinate and glyphosate + dicamba each provided greater than 75 to 80% reductions compared to the untreated check. Spray tip selection did not impact efficacy of the herbicides tested on Palmer amaranth. The most consistent treatments were dicamba + glufosinate at 0.6 kg ai/ha and glyphosate + dicamba. However, no single treatment provided adequate control four weeks after treatment. A combination of herbicide applications and timings is recommended for season long control of glyphosate resistant Palmer amaranth.

EVALUATION OF SEQUESTRATION OF AUXIN HERBICIDES IN SPRAYER HOSES. G. T. Cundiff*[1], D. B. Reynolds[2]; [1]Mississippi State University, Starkville, MS, [2]Mississippi State University, Mississippi State, MS (153)

ABSTRACT

The introduction of new herbicide tolerant crops may provide many benefits for producers such as alternative control options for resistant weed species, decreased costs, and different modes of action. Along with these benefits, the use of auxin containing herbicides may also increase concern for issues such as herbicide drift, volatilization, and tank contamination. The adjuvant and solvent system utilized in several commercial herbicides often result in the release of herbicides which have been sequestered within the spray system thus resulting in injury to sensitive crops. Roundup WeatherMax (glyphosate) is one such product that has been observed to have this effect. Preliminary experiments were conducted to develop a method for assessing auxin herbicide persistence in sprayer hoses. This study focused on determining if Clarity (diglycolamine salt of dicamba) persistence would differ among various hose types and cleanout procedures and to determine if soybean could be used as a bio-indicator to assess cleanout efficiency. Five different types of agricultural spray hoses were evaluated. Each hose measured 3 m and had an inside diameter of 1.2 cm, which is enough carrying capacity to deliver sufficient volume to treat the two center rows of a four row plot with a length of 12 m. All spray lines were filled with dicamba at 0.56 kg ae/ha and left to incubate for 48 hours. The dicamba spray solution was then flushed out of the lines and cleaned with either water or ammonia and then left to incubate in their designated cleaning solution for 24 hours. After their final flush, all lines were left empty for 48 hours. The spray lines were then filled with Roundup WeatherMax (glyphosate) at 1.1 kg ae/ha and incubated for 48 hours to aid in the release of any sequestered auxin herbicides before spraying to a sensitive crop. The glyphosate solution was applied to emerged Roundup Ready soybean with a two row spray boom using TeeJet XR 80015 spray tips delivering 141 liters per hectare. Weekly visual ratings were taken at 7 and 14 days after treatment (DAT). Initial results showed significant differences among hose types and visual injury percentages at both 7 and 14 DAT. Hose cleanout procedures significantly differed seven days after treatment but did not differ 14 days after treatment. These preliminary data indicate that this methodology may be an effective way to compare various cleanout procedures as well as to compare various hose types. Future research will utilize this technique to assess dicamba and 2,4-D sprayer cleanout efficiency by utilizing soybean and cotton as bio-indicator species, respectively.

SUCCESSFUL TANK-MIXING AND SPRAY APPLICATION OF GRAMOXONE SL 2.0. M. Ledson*, M. Hopkinson, C. Ouzts, C. Miln, L. Glasgow; Syngenta, Greensboro, NC (154)

ABSTRACT

Laboratory tank-mix compatibility tests were conducted to investigate mixtures of Gramoxone SL 2.0 with typical tank-mix partners and adjuvants. The purpose of the testing was to investigate the root cause of tank-mix compatibility issues that have been seen in the field. Initially, a jar test method based on the ASTM Standard Method E1518-05 was used to investigate a number of product use rates, spray volumes and water qualities. These initial tests were followed by a more in-depth high throughput study using a robot to conduct the tests, generating photographic images as data. The results of the jar and robot tests are presented as well as the root-causes of the issues that were seen. In addition, recommendations for best practice to avoid tank-mix compatibility issues in the field in the future are provided.

ADVANCEMENTS IN DEVELOPING ROUNDUP® XTEND™ GLYPHOSATE/ DICAMBA PREMIX FORMULATIONS. J. Sandbrink*[1], A. MacInnes[2], D. R. Wright[3], J. A. Kendig[1], D. Findley[1], J. N. Travers[4], E. Urbanczyk-Wochniak[5]; [1]Monsanto, St. Louis, MO, [2]Monsanto Company, St Louis, MO, [3]Monsanto Ag Products, St. Louis, MO, [4]Monsanto Co., St. Louis, MO, [5]Monsanto, St Louis, MO (155)

NO ABSTRACT SUBMITTED

TOLERANCE OF DGT COTTON TO GLUFOSINATE AND DICAMBA. D. Z. Reynolds*[1], D. M. Dodds[1], T. H. Dixon[1], C. A. Samples[1], L. Barber[2], C. Main[3], A. Mills[4]; [1]Mississippi State University, Mississippi State, MS, [2]University of Arkansas, Little Rock, AR, [3]University of Tennessee, Jackson, TN, [4]Monsanto, Collierville, TN (156)

ABSTRACT

Experiments were conducted in 2012 to evaluate tolerance of cotton containing Roundup Ready® Xtend technology to dicamba and glufosinate. Experiments were conducted at the Black Belt Branch Experiment Station near Brooksville, MS; the West Tennessee Research and Education Center in Jackson, TN; and at the Lon Mann Cotton Research Center in Marianna, AR. Six experimental varieties provided by Monsanto Company were planted during the third week of May at each location. All agronomic and pest management practices were conducted according to University recommendations in each respective state. All plots were maintained weed free using preemergence herbicides, postemergence-directed herbicides, and hand weeding. The following herbicide programs were utilized to evaluate crop tolerance: 1) dicamba at 2.2 kg ai/ha PRE followed by (FB) dicamba at 1.1 kg ai/ha to four-leaf cotton FB dicamba at 1.1 kg ai/ha to 12-leaf cotton; 2) dicamba at 2.2 kg ai/ha PRE FB glyphosate (1.7 kg ae/ha) + dicamba (1.1 kg ai/ha) to four-leaf cotton FB glyphosate (1.7 kg ae/ha) + dicamba (1.1 kg ai/ha) to 12-leaf cotton; 3) glufosinate at 1.1 kg ai/ha applied to four-, eight-, and 12-leaf cotton, and 4) untreated check. All applications were made with a CO_2-powered backpack sprayer equipped with Turbo Teejet Induction spray tips utilizing 324kPa pressure. Visual evaluations of cotton injury as well as cotton height, total nodes, nodes above cracked boll, and seed cotton yield were collected. Visual injury following application of glyphosate + dicamba to four-leaf cotton was approximately 13% one week after treatment whereas injury following application of glufosinate and dicamba was 10% and 7%, respectively. Visual injury following the eight-leaf application was significantly greater from glyphosate + dicamba (~8%) than from dicamba alone (~6%). One week after glyphosate + dicamba was applied to 12-leaf cotton, 13% visual injury was observed; however, by four weeks after application injury was less than 5%. Plant height of each variety at the end of the season was not negatively affected following herbicide application. In addition, no differences in nodes above cracked boll for any variety were observed due to herbicide application. Similarly, seed cotton yields were not affected by herbicide application; however, significant differences due to variety were observed. Seed cotton yields ranged from 2975 to 3900 kilograms of seed cotton per hectare. These results indicate that while visual injury may appear after application of glyphosate + dicamba, this injury is transient in nature and has no impact on final plant height, maturity, or seed cotton yield.

WEED MANAGEMENT WITH ENGENIA™ HERBICIDE IN DICAMBA TOLERANT CROPS. C. D. Youmans*[1], J. Frihauf[2], W. E. Thomas[1], S. J. Bowe[3], L. L. Bozeman[4]; [1]BASF Corporation, Research Triangle Park, NC, [2]BASF Corporation, Raleigh, NC, [3]BASF, Research Triangle Park, NC, [4]BASF, Raleigh, NC (157)

ABSTRACT

Dicamba has been a highly effective weed management tool for nearly 50 years. Engenia™ herbicide is a new experimental formulation (pending regulatory approval, commercialization anticipated in 2014) based on the BAPMA (N, N-Bis-(aminopropyl) methylamine) form of dicamba. Engenia herbicide reduces the volatilization potential of dicamba beyond the improvement achieved with Clarity® herbicide over Banvel® herbicide. Engenia herbicide has been shown in research trials to effectively control many problematic weed species such as ragweed (*Ambrosia* spp.), common cocklebur (*Xanthium strumarium*), common lambsquarters (*Chenopodium album*), morningglory (*Ipomoea* spp.), pigweed (*Amaranthus* spp.), and horseweed (*Conyza canadensis*). The auxin agonist mechanism of action of Engenia herbicide will provide growers the opportunity to effectively control broadleaf weeds resistant to EPSPS, triazine, ALS, and PPO herbicides. Weed management programs should be designed to take advantage of dicamba's postemergence and moderate residual activity. Combining dicamba with preemergence herbicides preplant will provide burndown with critical broad spectrum early season residual control. Postemergence use of dicamba with glyphosate and other effective herbicides following a PRE or preplant residual herbicide often provides the most consistent and effective control. Optimum postemergence control has been shown when Engenia herbicide is applied to small weeds no larger than four inches. Integration of weed management strategies that combine herbicide, cultural and mechanical control techniques such as alternative herbicide mechanisms of action, crop rotation, and sanitation are critical to effectively manage herbicide resistant weeds and protect the utility of dicamba-tolerant cropping systems.

DICAMBA CONTRIBUTES RESIDUAL CONTROL OF PALMER AMARANTH IN ROUNDUP READYÂ® XTEND CROP SYSTEMS. A. Mills*[1], S. Seifert-Higgins[2], S. Bollman[2], J. A. Bond[3], D. M. Dodds[4], E. Blinka[5], C. Corkern[6], S. Crawley[7], D. Pitts[8], D. Singh[9], S. Stanislav[10], A. Winslow[11]; [1]Monsanto, Collierville, TN, [2]Monsanto Company, St. Louis, MO, [3]Mississippi State University, Stoneville, MS, [4]Mississippi State University, Mississippi State, MS, [5]Monsanto, Dyersburg, TN, [6]Monsanto, Alapaha, GA, [7]Monsanto, Florence, SC, [8]Monsanto, Lexington, SC, [9]Monsanto, Garner, NC, [10]Monsanto, Cape Girardeau, MO, [11]Monsanto, Smithfield, NC (158)

ABSTRACT

Small plot replicated field experiments were conducted across several locations in the Southern U.S. to evaluate dicamba residual control of Palmer amaranth *(Amaranthus palmeri)* alone, and in combination with Valor® (flumioxazin), Warrant® Herbicide (encapsulated acetochlor), Authority® MTZ (sulfentrazone + metribuzin), Reflex® (fomesafen), Cotoran® (fluometuron), Caparol® (prometryn) or diuron. Dicamba provided residual control of palmer amaranth. The level of control was dependent on rate and rainfall after application. Low amounts of rainfall after application tended to favor dicamba residual activity on Palmer amaranth. Dicamba provides residual Palmer amaranth control to the Roundup Ready Xtend Crop System. Dicamba does not replace the need for traditional soil residual herbicides but does increase consistency of residual Palmer amaranth control when applied in tank-mixes across different environments.

DICAMBA CROPPING SYSTEMS: IT'S A PROGRAM APPROACH. J. A. Kendig*[1], D. Findley[1], J. N. Travers[2], G. Griffith[1], R. Godara[1]; [1]Monsanto, St. Louis, MO, [2]Monsanto Co., St. Louis, MO (159)

NO ABSTRACT SUBMITTED

GLYPHOSATE-RESISTANT PALMER AMARANTH *(AMARANTHUS PALMERI)* CONTROL IN COTTON (*GOSSYPIUM HIRSUTUM) W*ITH THE ENLIST WEED CONTROL SYSTEM. R. J. Edwards*[1], D. B. Reynolds[2], J. A. Bond[3], D. M. Dodds[2], L. C. Walton[4]; [1]Mississippi State University, Starkville, MS, [2]Mississippi State University, Mississippi State, MS, [3]Mississippi State University, Stoneville, MS, [4]Dow AgroSciences, Tupelo, MS (160)

ABSTRACT

Dow AgroSciences is developing Enlist Duo™, a new herbicide product featuring Colex-D™ Technology combining a new 2,4-D choline product, the latest formulation science and a proprietary manufacturing process developed to deliver ultra-low volatility, minimized potential for physical drift and lower odor. Enlist Duo 3.33 SL is a premix of glyphosate (1.71 lb ae/gal) and 2,4-D choline (1.62 lb ae/gal). A study was performed in 2012 at three sites (Batesville, Dundee, and Stoneville) across Mississippi to assess the control of glyphosate-resistant Palmer amaranth (*Amaranthus palmeri*) in Enlist cotton (*Gossypium hirsutum*) with the Enlist Duo herbicide (GF-2726). All sites were chosen based upon known heavy infestations of previously detected glyphosate-resistant Palmer amaranth. Each study consisted of 16 treatments (15 herbicide applications and an untreated check). Herbicides were applied at three different timings; preemergence (PRE), an early postemergence (EPOST) to 2 to 4 inch Palmer amaranth and a late postemergance (LPOST) applied 14 to 21 days after the EPOST. With the exception of the untreated check, all treatments received a PRE application of Cotoran 4L (fluometuron) at 1.26 kg ai/HA. The EPOST treatments consisted of sequential applications of Enlist Duo applied alone at 1.64 and 2.19 kg ae/HA. Additional EPOST treatments included Enlist Duo + Liberty 2.34 SL (glufosinate) at 2.19 kg ae/HA + 0.54 kg ai/HA, Enlist Duo + Dual II Magnum 7.62 EC (S-metolachlor) at 2.19 kg ae/HA + 1.09 kg ai/HA, Enlist Duo + Warrant 3 SC (acetochlor) at 2.19 kg ae/HA + 1.26 kg ai/HA, Enlist Duo + StapleLX 3.2 SL (pyrithiobac) at 2.19 kg ae/HA + 0.08 kg ai/HA, 2,4-D choline salt 3.8 SL + Liberty at 1.07 kg ae/HA + 0.54 kg ai/HA, Roundup WeatherMax 4.5 SL (glyphosate) at 1.12 kg ae/HA, Liberty at 0.54 kg ai/HA, and Liberty + Warrant at 0.54 + 1.26 kg ai/HA. The EPOST treatments were followed by LPOST applications of Liberty at 0.54 kg ai/HA, Enlist Duo + Liberty at 2.19 kg ae/HA + 0.54 kg ai/HA, 2,4-D choline salt + Liberty at 1.07 kg ae/HA + 0.54 kg ai/HA, or Roundup WeatherMax at 1.12 kg ae/HA. Visual estimates of Palmer amaranth control were taken 7, 14 and 21 days after treatment (DAT) for each timing. Data for the 14 DAT following the LPOST application were averaged across sites and subjected to an analysis of variance with means separated using LSD (α=0.05) to test for differences in Palmer amaranth control. There were no significant differences among treatments containing Enlist Duo with all applications averaging greater than 90% control. Significant differences were only detected between singular applications of Roundup Weathermax applied at both timings (62% control) and a PRE application of Cotoran (33% control) between all other applications. With individual plants producing approximately 600,000 seeds during a growing season, complete control of Palmer amaranth is desirable. Enlist Duo may be used as a component of a comprehensive weed management program to control Palmer amaranth while also utilizing an additional mode of action to manage the development of resistance.

WEED CONTROL OPTIONS FOR ENLIST$_{TM}$ SOYBEANS. R. B. Lassiter*[1], B. Braxton[2], A. T. Ellis[3], R. A. Haygood[4], J. S. Richburg[5], D. M. Simpson[6], L. C. Walton[7]; [1]Dow AgroSciences, Little Rock, AR, [2]Dow AgroSciences, Travelers Rest, SC, [3]Dow AgroSciences, Greenville, MS, [4]Dow AgroSciences, Germantown, TN, [5]Dow AgroSciences, Dothan, AL, [6]Dow AgroSciences, Indianapolis, IN, [7]Dow AgroSciences, Tupelo, MS (161)

ABSTRACT

The Enlist™ Weed Control System currently in development at Dow AgroSciences, includes Enlist™ herbicide tolerant traits and an associated herbicide (2,4-D choline + glyphosate DMA). Components of the Enlist™ system are under review for regulatory approval. Weed control programs that utilize preemergence herbicide treatments followed by postemergence applications of mixed modes of action provide consistent, highly effective weed control and help prevent the onset of herbicide-resistant weeds. A total of 30 studies were conducted in 2011 and 2012 within the U.S. to evaluate the weed control delivered by a systems approach composed of preemergence followed by postemergence herbicide applications. Preemergence treatments consisted of cloransulam + sulfentrazone, flumioxazin, flumioxazin + chlorimuron ethyl or *S*-metolachlor + fomesafen. Postemergence treatments of Enlist Duo™ herbicide (2,4-D choline + glyphosate DMA) were applied at 1092, 1640, and 2185 g ae/ha at approximately 30 days after planting. Separate experiments were conducted in the U.S. at 5 locations in 2011, and 20 locations in 2012 to evaluate a total postemergence weed control program consisting of Enlist Duo™ alone or in combination with micro-encapsulated acetochlor, fomesafen, or *S*-metolachlor + fomesafen. Treatments were applied at the V3 soybean growth stage or V3 growth stage followed by a second application 17 to 21 days later. The Enlist™ Weed Control System, which includes Enlist Duo™ herbicide, used in combination with an appropriate soil residual herbicide, provided greater than 95% control of several key broadleaf weed species (AMAPA, AMATA, AMBEL, AMBTR, SIDSP, IPOSS, and ABUTH) that are difficult to control or may be resistant to glyphosate.

2,4-D AND DICAMBA RESISTANT SOYBEAN FOR MANAGEMENT OF GLYPHOSATE RESISTANT COMMON RAGWEED. A. Smith*, S. Hagood; Virginia Tech, Blacksburg, VA (162)

ABSTRACT

Reduced response to glyphosate in common ragweed (*Ambrosia artemisiifolia*) was observed near Richmond, Virginia in 2009. Field and greenhouse trials conducted in 2011 confirmed resistance to glyphosate. In field trials, glyphosate applied POST at 0.86, 1.72, and 3.44 kg ae ha^{-1} resulted in 21, 31, and 56% control, respectively, at 68 DAT. Field trials were conducted at this location in 2011 and 2012 to evaluate alternative control options, including those control options which might be afforded through the use of 2,4-D or dicamba in soybean with resistance to these herbicides. In 2011, PRE and POST herbicide treatments were applied to glyphosate-resistant soybean. Results indicated that PRE tank mixtures containing flumioxazin + chlorimuron-ethyl, sulfentrazone + chlorimuron-ethyl, or sulfentrazone + cloransulam-methyl provided excellent control of glyphosate-resistant common ragweed. The addition of fomesafen or cloransulam-methyl to glyphosate provided excellent control of this species in POST applications. In 2012, two additional trials were conducted at this site in which dicamba-resistant soybean was planted. Lack of rainfall early in the 2012 growing season caused delayed germination of common ragweed, such that few plants were emerged at the time of PRE treatment. For this reason, PRE treatments with longer soil residual or POST treatments provided best ragweed control. In the first trial, PRE applications of 2,4-D, glyphosate + dicamba, 2,4-D + flumioxazin + chlorimuron-ethyl, glyphosate + dicamba + metribuzin, and glyphosate+ dicamba + acetochlor provided 48-73% control in final evaluations taken 59 DAT. PRE treatments of glyphosate + dicamba in combination with flumioxazin + chlorimuron-ethyl, sulfentrazone + cloransulam-methyl, sulfentrazone + chlorimuron-ethyl, or metribuzin + chlorimuron-ethyl provided 91-100% common ragweed control at 59 DAT. All treatments which included glyphosate + dicamba POST provided 100% control of glyphosate-resistant common ragweed in final evaluations. In the second trial, PRE treatments of pyroxasulfone or BAS-18322H, followed by POST applications of glyphosate or glyphosate + dimethenamid did not provide acceptable control of common ragweed. All treatments, however, that included BAS-18322H as a component of the POST treatment afforded 100% common ragweed control at 59 DAT. PRE treatments of flumioxazin + 2,4-D followed by POST treatments of acetochlor also provided complete common ragweed control. No herbicide treatment in either 2011 or 2012 resulted in significant soybean vigor reduction.

THE EFFECT OF AUXIN HERBICIDE CONCENTRATION ON SOYBEAN GROWTH AND YIELD. A. R. Blaine*[1], D. B. Reynolds[2], C. Smith[2]; [1]Mississippi State University, Starkville, MS, [2]Mississippi State University, Mississippi State, MS (163)

ABSTRACT

With the development of crops containing the new auxin-resistant traits, producers will have additional options for weed control. While these traits offer many benefits to producers they will require additional precautions to ensure they do not injure many susceptible crop and non-crop species. Trace amounts of dicamba or 2,4-D onto sensitive species can result in severe injury or death to the plant. Sensitive plants could be subjected to these trace concentrations from spray particle drift, use of contaminated spray equipment, and volatility from applications applied to other crops. The objective of this research was to determine how reduced concentrations of dicamba and 2,4-D would effect soybean growth and yield. The diglycolamine form of dicamba (Clarity 4L) and dimethylamine form of 2,4-D (DM4) were used in these experiments. Separate experiments for each herbicide were conducted at two locations. Each experiment was conducted in a randomized complete design with a factorial arrangement of treatments. Factor A was application timing and Factor B consisted of the rates of application. For Factor A, each rate was applied to soybeans at two stages of growth. One was applied at the vegetative stage (V3) and one was applied at the reproductive stage (R1). For Factor B, an X rate for each herbicide was set as 0.56 kg ae/ha. Each herbicide was applied at a 1X, 1/4X, 1/16X, 1/64X, 1/256X, and 0X rate. Each experiment contained four replicates and experimental units consisted of 4 rows 97 m wide by 12.1 m in length. The center two rows of each experimental unit were treated and evaluated visually and harvested for yield determinations. Treatments were applied in a total delivery volume of 15 GPA. Visual injury estimates, plant heights, and yield data were collected. At 28 days after application, significant visual injury occurred from all dicamba (27-93%) and 2,4-D (12-37%) treatments, with the exception of 2,4-D applied to vegetative stages at the 1/16 X, 1/64 X, and 1/256 X rates. Overall, visual injury was greater in the dicamba trials than the 2,4-D trials, with plant height reductions following the same trend. Yield reductions with 2,4-D did not exhibit an interaction and the only significant factor was rate of application. When 2,4-D was applied at the 1 X rate of 0.56 kg ae/ha, there was a 46% yield loss. Yield reductions with dicamba did not exhibit an interaction; however, both rate of application and application timing were significant. Dicamba applied at the 1X rate of 0.56 kg ae/ha resulted in a 98% yield reduction when averaged over both application timings. In addition, a 1/256 X rate of dicamba resulted in a 22% yield loss. When averaged over all rates of application, the R1 application timing resulted in an average of 53% yield loss as compared to the 44% from applications at the V3 growth stage.

INFLUENCE OF 2,4-D APPLICATION ON CORN GROWTH AND YIELD. J. T. Copes*[1], D. Stephenson[2], J. A. Bond[3], R. L. Landry[2], B. C. Woolam[2], J. L. Griffin[1]; [1]LSU AgCenter, Baton Rouge, LA, [2]LSU AgCenter, Alexandria, LA, [3]Mississippi State University, Stoneville, MS (164)

ABSTRACT

Research was conducted at Stoneville, MS and at St. Joseph and Alexandria, LA during the 2012 growing season to evaluate corn response to 2,4-D rate and application timing. Corn was treated with 2,4-D at 0.5 and 1.0 lb ae/A preemergence and at spiking, cotyledon, and the vegetative growth stages 1, 2, 3, and 4. Because of variability in response and differences in weather conditions among the locations, data were analyzed by location. Where significant differences were detected by ANOVA means were separated using LSD. For Stoneville and St. Joseph, 2,4-D rate and application timing effects were significant 7 days after treatment (DAT). Averaged across application timings, injury was greater for 2,4-D applied at 1.0 lb/A compared with 0.5 lb/A (3 vs. 6% at Stoneville and 10 vs. 21% at St. Joseph). Averaged across 2,4-D rates, significant injury was observed at St. Joseph 7 DAT for 2,4-D applied at spiking (24%), V2 (30%), and V3 (28%). Injury was no more than 7% for other timing treatments at St. Joseph or for any of the timing treatments at Stoneville. At 21 DAT, injury at Stoneville and St. Joseph was no more than 6% for any of the 2,4-D rate and application timing treatments, indicating that corn was able to recover rapidly from 2,4-D injury observed 7 DAT. Corn yield at Stoneville and St. Joseph was not negatively affect by 2,4-D rate or application timing and yields for the non-treated were 193 bu/A at Stoneville and 215 bu/A at St. Joseph. At Alexandria, corn injury 7 DAT averaged across 2,4-D rates was 53% for application at V2, 13% at V3, and 24% at V4. No more than 4% injury was observed for the other application timings. At 21 DAT at Alexandria, 2,4-D applied at 0.5 lb/A injured corn 34% at V3 and 33% at V4. For application of 2,4-D at 1.0 lb/A, corn was injured 84% at V3 and 8% at V4. Injury was no more than 1% for other 2,4-D rate and application timing treatments. At Alexandria, corn injury consisting of severe leaning of plants was attributed to wind speeds as high as 37 MPH that occurred two and seven days before rating were made for the V3 and V4 application timing. Injury observed for the V3 and V4 application timings was reflected in reduced corn yield. Averaged across 2,4-D rates, corn yield was reduced 9% for application at V3 and 8% for application at V4 when compared with the non-treated yield of 167 bu/A. Averaged across timing treatments, a difference in corn yield between 2,4-D rates was not observed.

THE EFFECT OF COTTON GROWTH STAGE ON COTTON'S SENSITIVITY TO AUXIN HERBICIDES.
J. L. Cobb*[1], A. R. Blaine[1], C. Smith[2], D. B. Reynolds[2]; [1]Mississippi State University, Starkville, MS, [2]Mississippi State University, Mississippi State, MS (165)

ABSTRACT

New herbicide tolerant crops technologies may provide many benefits for producers such as alternative control options with resistant weed species and decreased weed control cost. However, their introduction may also increase concern for issues such as herbicide drift and volatilization. Research has been conducted with application of low concentrations of various herbicides to a variety of crop species to assess their effect on growth and yield. Some of these herbicides have exhibited differences in injury potential as a function of crop growth stage at the time of deposition. An experiment was conducted to assess the effect of application timing on the injury potential of dicamba and 2,4-D to cotton growth and yield. For both herbicides, the X rate was considered to be 0.56 kgs ae/ha. Based upon the injury potential found with other research projects, a 1/64X rate (8.8 g ae/ha) of dicamba and 2,4-D amine was evaluated. In respective experiments, 2-4,D and dicamba were applied from one to fourteen weeks after cotton emergence. Crop growth stage and height were recorded at each application along with environmental data. The experiment was conducted at two locations (Starkville & Brooksville, MS). in a randomized complete block design with four replications. Plots were 4 (97 cm) rows wide by 12.1 m long. The center rows of each plot received the herbicide treatments and yields were taken on the center two rows of each plot. Visual injury was assessed for each plot 7, 14, 21, and 28 days after treatment (DAT). Plant heights were taken prior to harvest. Just prior to defoliation, the nodes above cracked bole (NABC) were recorded for each plot as this measurement is often a good indicator for assessing delayed crop maturity. Results showed cotton treated with 2,4-D and Dicamba at a 1/64X rate exhibited the greatest visual injury 2 and 3 weeks after emergence (WAE) at the 5-7 node growth stage. In general, cotton yields were decreased with both herbicides regardless of when it was applied. Cotton yields were reduced the greatest amount (44-58%) with 2,4-D when applications occurred 2 - 5 WAE. For dicamba, yield losses were the greatest (14-21%) when applied at 2, 3, and 10 WAE. These preliminary data indicate that cotton stage of growth is an important factor in its susceptibility to low dose concentrations of 2,4-D and dicamba. Additional research is needed to better understand which growth stages are most critical and to determine the impact of off-target concentrations of these herbicides on fruiting patterns and yield.

EFFECTIVENESS OF GLUFOSINATE WITH AND WITHOUT CLETHODIM AS INFLUENCED BY JOHNSONGRASS (*SORGHUM HALEPENSE*) HEIGHT IN GLUFOSINATE-RESISTANT COTTON (*GOSSYPIUM HIRSUTUM*). D. Stephenson*[1], J. K. Norsworthy[2], R. L. Landry[1], B. C. Woolam[1], D. B. Johnson[2]; [1]LSU AgCenter, Alexandria, LA, [2]University of Arkansas, Fayetteville, AR (166)

ABSTRACT

Experiments were conducted at the LSU AgCenter Dean Lee Research and Extension Center near Alexandria, LA and in a producers field near Marion, AR in 2012. These experiments assessed the effectiveness of glufosinate with and without clethodim on johnsongrass as influenced by johnsongrass size at initial herbicide application. Experiments were a 2x2x2+1 factorial arranged in a randomized complete block design with four replications. Factors consisted of: (1) 15- or 46-cm johnsongrass at initial application; (2) single (initial) or sequential applications; (3) glufosinate with or without clethodim and a nontreated control. Glufosinate at 730 and 590 g ha^{-1} was applied at the initial and sequential applications, respectively. Clethodim was applied at 140 g ha^{-1} at both application timings. Glufosinate plus clethodim controlled 15-cm johnsongrass greater than glufosinate alone (74 vs. 51%); however, control was not increased by the addition of clethodim when applied to 46-cm johnsongrass (82-88%). Johnsongrass control 3 wk after the sequential application and 2 wk following the typical cotton layby application timing was 7-13% greater when treatments were applied to 46-cm compared to 15-cm johnsongrass. In addition, sequential applications provided 23-24% greater johnsongrass control than the single initial application at both rating dates. Cotton lint yield in Louisiana was increased by a sequential application as compared to the single initial application. If applying only a single application, cotton lint yield was 350 and 870 kg ha^{-1} when applied to 15- and 46-cm johnsongrass, respectively. Research will be repeated in 2013.

WEED MANAGEMENT OPTIONS FOR GLYTOL/LIBERTY LINK HERBICIDE TOLERANT COTTON. G. Schwarzlose*[1], N. Hummel[2], G. Light[1], G. Henniger[1], D. Unland[2], J. W. Mullins[3]; [1]Bayer CropScience, Lubbock, TX, [2]Bayer CropScience, Raleigh, NC, [3]Bayer CropScience, Collierville, TN (167)

ABSTRACT

This presentation will discuss best management practices for Liberty use focusing on recommended spray nozzles, spray volume, timing (weed size and time of day) of application and other variables that we have observed to be critical to the performance of Liberty across the cotton production regions of the US.

PALMER AMARANTH CONTROL SIGNIFICANTLY INFLUENCED BY THE TIME OF DAY IN WHICH LIBERTY IS APPLIED. A. S. Culpepper*[1], A. C. York[2], L. E. Steckel[3], J. A. Bond[4], D. Stephenson[5]; [1]University of Georgia, Tifton, GA, [2]North Carolina State University, Raleigh, NC, [3]University of Tennessee, Jackson, TN, [4]Mississippi State University, Stoneville, MS, [5]LSU AgCenter, Alexandria, LA (168)

ABSTRACT

Liberty-based weed management programs have been adopted throughout the Southeast and MidSouth to combat glyphosate-resistant Palmer amaranth. Numerous growers have voiced concern that early morning Liberty applications were not controlling Palmer amaranth. Thus two experiments were conducted in five states (GA, LA, MS, NC, TN) to determine the impact that application time of day has on Palmer amaranth response to Liberty. The morning experiment included Liberty applied at 1 and ½ hr before sunrise (-1 and -½ hr after sunrise), at sunrise, and ½, 1, 2, 4, and 6 hr after sunrise. For the evening experiment, Liberty was applied at 6, 4, 2, 1, and ½ hr before sunset, at sunset, and ½ and 1 hr after sunset. Liberty applications were triggered when Palmer amaranth reached 5- to 8-inches in height. A sequential Liberty application was made 15 d after the first application at the exact same time of day as previously described followed 15 to 18 days later by a lay-by application of diuron + MSMA. Late-season Palmer amaranth control was combined over all locations for the morning experiment. The Liberty system was more effective when application was delayed until at least 2 hours after sunrise. Liberty applied -1, -½, 0, ½, 1, 2, 4, and 6 hr after sunrise controlled Palmer amaranth 34, 39, 48, 66, 82, 90, 93, and 93%, respectively. In LA and MS, GlyTol LibertyLink cotton was planted and no cotton injury was observed. PHY 499 WRF or PHY 375 WRF cotton was planted in GA, NC, and TN with Liberty applied topically to 1- to 2- and 5- to 7-leaf cotton. The greatest level of injury was noted at each location between 4 to 7 d after the second Liberty application. At this time, cotton injury ranged from 4 to 8% with applications made at sunrise or earlier, 12 to 16% injury with applications made at ½ or 1 hr after sunrise, and 23 to 27% injury with applications made at 2 to 6 hr after sunrise. No cotton injury was detectable visually at 2 wk after a Liberty application. Cotton yield was not obtained in MS and no yield differences were noted in LA due to light Palmer populations. Combined over GA, NC, and TN, seed cotton yields of 2725 to 2844 lb/A were noted when Liberty was applied at 1 to 6 hr after sunrise; lower yields were noted with Liberty applications applied earlier in the morning. Fewer differences were noted with evening applications. In TN and LA, Palmer amaranth control was complete regardless of Liberty application timing. In GA and NC, Palmer amaranth was controlled at least 97% by Liberty systems applied from 6 hr before sunset through ½ hr before sunset. The weed was controlled 91% by Liberty applied at sunset and less than 70% by Liberty applied at ½ or 1 hr after sunset. In MS, Palmer amaranth control ranged from 79 to 83% with Liberty applied between 6 hr before sunset and 1 hr before sunset but control was less than 54% with applications made at ½ hr before sunset through 1 hr after sunset. PHY 375 WRF or PHY 499 WRF cotton was injured at most 24 to 26% by Liberty applied from 6 hr before sunset through 1 hr before sunset, but injury less than 15% was observed at ½ hr before sunset or later in the evening. No differences in yield were noted in TN or LA; pooling over GA and NC results, cotton yields were maximized when Liberty was applied at sunset or earlier in the afternoon. Presence of dew, herbicide spray drip from leaves, leaf orientation, cloudiness, humidity, soil and air temperatures, and moon stage were documented at each location. Dew present during morning applications prior to 2 hr after sunrise likely played a role in the results observed; however, dew was not present with any evening application suggesting that there may also be a physiological process, impacted by sunlight, occurring within the Palmer amaranth plant allowing the plant more tolerance to Liberty when applied during early mornings or late in the evening. Therefore, Liberty should be applied in the Southeast and Midsouth from 2 hr after sunrise through 1 hr before sunset for the control of Palmer amaranth.

DOES LIGHT INTENSITY INFLUENCE COTTON'S TOLERANCE TO GLUFOSINATE? B. W. Schrage*, J. K. Norsworthy, H. D. Bell, Z. T. Hill; University of Arkansas, Fayetteville, AR (169)

ABSTRACT

Glufosinate has become an important postemergence alternative to glyphosate in cotton, especially in fields having dense populations of glyphosate-resistant Palmer amaranth. Our objective was to determine if degree of injury to Phytogen (Widestrike) and Liberty Link cotton is influenced by cotton growth stage and light quantity prior to application. The reduction in light quantity that was simulated in this trial was intended to be reflective of prolonged periods of cloudy conditions prior to applying glufosinate. An experiment having a split-split-split plot design was conducted in Fayetteville, Arkansas in 2012. The main plot consisted of cotton variety (PHY 375 WRF, PHY 499 WRF, and Stoneville 4145 LLB2). The sub-plot factor was degree of shading: shaded cotton (50% shading) and non-shaded cotton. The sub-sub plot factor was application timing (1-, 4-, and 6-leaf stage). The sub-sub-sub plot included two rates of glufosinate (0.79 and 1.58 lb ai/A) and a nontreated check. Plots were shaded 3 d prior to application and irrigated 0.25 in 1 d prior to their respective applications. Glufosinate was applied using a $C0_2$-pressurized backpack sprayer calibrated to deliver 15 GPA. Injury was visually assessed at 2 and 4 to 5 weeks after treatment (WAT), and seedcotton was harvested. Cotton tolerance to glufosinate differed by variety at 2 WAT, but injury was observed on all varieties, including Liberty Link cotton. In general, cotton plants that were shaded prior to applying glufosinate were injured to a greater extent than non-shaded plants. Injury at 2 WAT following the 1-leaf application was generally greater for 375 WRF and 499 WRF compared to 4145 LLB2. At 4 to 5 WAT, all varieties showed similar potential for recovery. Seedcotton yield was reduced when glufosinate was applied at the 1X rate to 1-leaf cotton or at the 1X and 2X rates to 4-leaf cotton when plants were shaded for 3 d prior to glufosinate application. Our results indicate that in general, shading (cloudcover) 3 d prior to glufosinate application at 1X and/or 2X rates increased injury, irrespective of variety, and decreased seedcotton yield.

EFFECT OF GLUFOSINATE APPLICATION ON YIELD OF LIBERTY LINK COTTON. D. M. Dodds*[1], L. Barber[2], C. Main[3], T. H. Dixon[1], D. Z. Reynolds[1], C. A. Samples[1]; [1]Mississippi State University, Mississippi State, MS, [2]University of Arkansas, Little Rock, AR, [3]University of Tennessee, Jackson, TN (170)

ABSTRACT

Liberty Link cotton was introduced in 2004; however, grower acceptance since that time has been minimal. Several reasons exist for this including variety performance, herbicide cost, and effectiveness of the Roundup Ready Flex® cropping system. However, with the development of glyphosate-resistant Palmer amaranth in 2005 and its spread throughout the Southeast and Mid-Southern United States, grower interest in Liberty Link cotton is increasing. In addition, performance of newly released Liberty Link varieties has increased over previously available varieties. Extensive previous research exists on the effect of glufosinate application on glyphosate-resistant Palmer amaranth control. However, no data exists on the effect of glufosinate application of growth, development, and yield of cotton in the absence of weeds. Data from previous research on variety tolerance indicated that Liberty Link® cotton yield may be increased following glufosinate application. Therefore, this study was conducted to determine the effect of glufosinate application on cotton growth, development, and yield in a weed free environment. Studies were conducted in Arkansas, Georgia, Mississippi, South Carolina, and Tennessee in 2011 and 2012. Standard agronomic practices were followed for each trial based on Extension recommendations within each state. All plots were maintained weed free through the use of PRE herbicides, postemergence herbicides, postemergence-directed herbicides, and hand weeding. Plots consisted of four – 38" rows that were 30 or 40 feet in length. Glufosinate was applied at 0.6 kg ai/ha to cotton at the following growth stages: two to four leaf; two to four leaf followed by six to eight leaf, and two to four leaf followed by six to eight leaf followed by an application at first bloom. All glufosinate applications were made with a CO_2-powered backpack sprayer or a tractor-mounted compressed air sprayer. Cotton varieties included: FM 1773 LLB2; FM 1944GLB2; and ST 4145 LLB2. A factorial arrangement of treatments within a randomized complete block design with four replications was utilized for this experiment. All data were subjected to analysis of variance using the PROC Mixed procedure in SAS v. 9.2. Means were separated using Fisher's Protected LSD at p = 0.05. No differences in any variable were observed due to glufosinate application. Minor differences in plant height and total nodes at bloom, which averaged 71 cm and 15, respectively, were observed due to variety. No differences in nodes above white flower were observed. Final plant height averaged 107 cm with no differences observed due to variety. In addition, no differences in total nodes at the end of the season were observed due to variety. No differences in lint yield were observed between varieties. Yield averaged 1560 kg/ha over all varieties and number of glufosinate applications. Minor differences in fiber quality were observed due to variety. Fiber length, micronaire, strength, and uniformity of ST 4145 LLB2 were all reduced compared to other varieties. Glufosinate application had no positive or negative effect on growth, development, and yield of cotton varieties tested.

EFFECT OF PALMER AMARANTH SIZE ON THE ACTIVITY OF FLEXSTAR®. V. K. Shivrain*[1], C. L. Dunne[1], R. Jain[2], L. Glasgow[3], D. J. Porter[4]; [1]Syngenta Crop Protection, LLC, Vero Beach, FL, [2]Syngenta Crop Protection, Vero Beach, FL, [3]Syngenta, Greensboro, NC, [4]Syngenta Crop Protection, LLC, Greensboro, NC (171)

ABSTRACT

Protoporphyrinogen oxidase (PPGO) inhibitor herbicides are being used for effective weed management in various crops. However, post-emergence weed control from PPGO herbicides is highly dependent on weed size at the time of herbicide application. In this study, we investigated the intraspecific variability in the control of Palmer amaranth (*Amaranthus palmeri* or AMAPA) accessions with fomesafen applied as Flexstar® at the 3 and 6 inch height of plants. Eleven AMAPA accessions collected from Arkansas (3), Georgia (3), Kansas (2), North Carolina (2), and Mississippi (1) between 2009 and 2010 were evaluated for their response to fomesafen. Three and six inch tall AMAPA accessions were treated with 0, 2, 4, 8.2, 16.4, 32.8, 65.7, 131.5, 263 g ai ha^{-1} of fomesafen along with AMS (2.5% v/v) and MSO (1% v/v). Data were collected on percent control and biomass of plants 21 days after treatment. Significant differences in control and biomass were observed between these accessions treated at the same rate of fomesafen. As expected, the control for all accessions in all treatments decreased significantly from the application made to plants 6 inches in height versus 3 inch plants. The variability in control at the same rate of herbicide indicates that there are inherent differences in the sensitivity of AMAPA populations to PPGO herbicides with respect to both origin and height. These data clearly suggest that fomesafen provides most effective and consistent control of smaller AMAPA plants

EVALUATION OF DIURON AND DIQUAT COMBINATIONS FOR PALMER AMARANTH CONTROL ON DITCHBANKS. Z. T. Hill*, J. K. Norsworthy, H. D. Bell, B. W. Schrage; University of Arkansas, Fayetteville, AR (172)

ABSTRACT

Over the past decade glyphosate-resistant Palmer amaranth (*Amaranthus palmeri*) has rapidly infested most of Arkansas' crop and non-crop acres. Glyphosate-resistant Palmer amaranth has become the most common weed along roadsides and ditchbanks and is extremely troublesome due to its similar extended emergence period seen in crops. With the absence of interspecific crop interference on ditchbanks, Palmer amaranth has a greater opportunity of sufficient growth and producing higher numbers of seed. Controlling glyphosate-resistant Palmer amaranth is of high importance because of additions to the soil seedbank and ability of this weed to successfully grow under many environmental conditions. The use of herbicide combinations are a successful method of controlling weeds. A bareground experiment was conducted to evaluate the combinations of diquat and diuron for synergy on Palmer amaranth. The experiment consisted of two rates of diquat, 0.28 and 0.56 kg ai/ha; four rates of diuron from 1.12 to 9.0 kg ai/ha; and the combinations of both rates of diquat with the four rates of diuron. The treatments in this experiment were applied at two separate timings; 30 to 45 cm tall Palmer amaranth and 60 to 90 cm tall Palmer amaranth. No combination of diquat and diuron provided synergistic control of Palmer amaranth at either application timing. At 8 days after treatment on 60 to 90 cm Palmer amaranth an additive effect generally occurred for the combinations. Most combinations at both application timings resulted in an antagonistic effect on Palmer amaranth control, except for combinations at 8 days after treatment on 60 to 90 cm Palmer amaranth. Although both diquat and diuron are labeled for weed control on ditchbanks, based on a single year of research there does not appear to be a benefit from applying these herbicides together. Continued research is needed under varying circumstances to determine if the combination of these herbicides provide improved Palmer amaranth control.

EVALUATION OF PRE AND POST WEED CONTROL PROGRAMS FOR PALMER AMARANTH CONTROL. C. A. Samples*[1], D. M. Dodds[1], D. Z. Reynolds[1], T. H. Dixon[1], J. A. Bond[2], D. B. Reynolds[1], A. Mills[3]; [1]Mississippi State University, Mississippi State, MS, [2]Mississippi State University, Stoneville, MS, [3]Monsanto, Collierville, TN (173)

ABSTRACT

An experiment evaluating the control of glyphosate-resistant Palmer amaranth using preemergence and postemergence herbicides was conducted in Robinsonville, MS in 2012. Plots were established within a producer's field that had historically high populations of glyphosate-resistant Palmer amaranth. Cotton containing Xtend® technology was planted on May 21, 2012. Pre-plant applications were made ten days prior to cotton planting and included fomesafen at 0.14 kg ai/ha; fomesafen at 0.14 kg ai/ha + dicamba at 1.12 kg ae/ha; and fomesafen at 0.14 kg ai/ha + dicamba at 0.6 kg ae/ha. Preemergence herbicide applications included the following: fluometuron at 1.1 kg ai/ha; acetochlor at 1.3 kg ai/ha; and prometryn at 1.1 kg ai/ha. In addition, each of these herbicides was tank mixed with dicamba at 0.6 kg ae/ha and dicamba at 1.1 kg ae/ha. Dicamba was also applied alone at 0.6 and 1.1 kg ai/ha. 2,4-D at 0.7 kg ai/ha was also applied preemergence. Postemergence applications included the following: glufosinate at 0.6 kg ai/ha; glufosinate at 0.6 kg ai/ha + dicamba at 0.6 kg ai/ha; glufosinate at 0.6 kg ai/ha + acetochlor at 1.3 kg ai/ha; glufosinate at 0.6 kg ai/ha + dicamba at 0.6 kg ai/ha + acetochlor at 1.3 kg ai/ha; glufosinate at 0.6 kg ai/ha + glyphosate at 1.1 kg ae/ha; glyphosate at 1.1 kg ae/ha + dicamba at 0.6 kg ai/ha; and glyphosate at 1.1 kg ae/ha + dicamba at 0.6 kg ai/ha + acetochlor at 1.3 kg ai/ha. Postemergence applications were made to 10 cm and 25 cm tall Palmer amaranth. All herbicide applications were made with a CO_2-powered backpack sprayer with an application volume of 140 L/ha at 324 kPa. Visual estimates of weed control efficacy, the number of Palmer amaranth plants per square meter, and height of Palmer amaranth plants in each plot were collected at weekly intervals following the early pre-plant, preemergence, and postemergence applications. This trial was conducted using a randomized complete block with four replications. Data were subjected to analysis of variance and means were separated using Fisher's Protected LSD at p = 0.05. Early pre-plant applications of fomesafen + dicamba resulted in greater than 96% control of Palmer amaranth five weeks after treatment. In addition, one plant per square meter was observed in plots receiving early pre-plant applications compared to 13 plants per square meter in untreated areas. Also, cotton growth and development was unaffected be pre-plant applications. All preemergence applications containing dicamba resulted in 90 to 99% Palmer amaranth control. However, fluometuron, acetochlor, or prometryn alone resulted in less than 75% control of Palmer amaranth five weeks after treatment. Palmer amaranth counts per square meter following applications containing the proprietary premix of glyphosate + dicamba were less than two plants per square meter compared to 13 per square meter in untreated areas. Cotton growth and development was unaffected by preemergence applications five weeks after treatment. Reduced residual activity of fluometuron, acetochlor, and prometryn was likely due to very low rainfall totals at the experimental location. Postemergence applications of glufosinate + dicamba, glyphosate + dicamba, and glyphosate + dicamba + acetochlor to 10 cm glyphosate-resistant Palmer amaranth resulted in significantly greater control (81 – 83%) than all other treatments four weeks after application. In addition, these treatments resulted in the shortest Palmer amaranth plants four weeks after treatment. Control of 25 cm glyphosate-resistant Palmer amaranth was maximized four weeks after treatment following application of glufosinate + dicamba; glufosinate + dicamba + acetochlor; glyphosate + dicamba; and glyphosate + dicamba + acetochlor. The greatest reduction in Palmer amaranth height was also observed following application of these herbicides. Cotton growth and development was unaffected by postemergence herbicide application.

GLYPHOSATE RESISTANT WEED MANAGEMENT IN TEXAS COTTON. J. A. McGinty*[1], P. A. Baumann[2], G. D. Morgan[1], M. E. Matocha[1], L. M. Etheredge[3]; [1]Texas A&M AgriLife Extension, College Station, TX, [2]Texas AgriLife Extension, College Station, TX, [3]Monsanto, Llano, TX (174)

ABSTRACT

The development of herbicide resistance in weed species has rapidly become a large concern in agriculture. The ability to accurately identify herbicide resistant weeds and the need to employ effective management strategies for specific resistance problems has become increasingly important. Seeds of nineteen common waterhemp (*Amaranthus rudis* Sauer) accessions from Brazos, Burleson, Fort Bend, Milam, Robertson, and Wharton Counties, TX, that exhibited signs of glyphosate resistance were collected and grown in a greenhouse in 2012. Rates of 0.47 lb a.i./A (0.5X), 0.95 lb a.i./A (1X), 1.89 lb a.i./A (2X), and 3.78 lb a.i./A (4X) glyphosate were then applied to these plants to identify those with resistance. Of those nineteen accessions, seventeen exhibited greater than 50% survival 28 days after receiving the 1X rate and eight exhibited greater than 50% survival following the 4X rate. Also in 2012, a field research trial was established at the Texas A&M Agrilife Research Farm in College Station, TX, to evaluate the efficacy of twelve different herbicide regimes for control of Palmer amaranth (*Amaranthus palmeri* S. Wats.), with particular emphasis on the value of preplant incorporated and preemergence treatments. This trial was conducted in cotton possessing glyphosate, glufosinate, and dicamba tolerant technologies. Preplant and preemergence treatments included fomesafen, pendimethalin, prometryn, pyrithiobac, s-metolachlor, and trifluralin. These treatments were then followed by a variety of early- and mid-postemergence treatments including acetochlor, dicamba, glufosinate, glyphosate, pyrithiobac, and trifloxysulfuron. All preplant and preemergence treatments resulted in 81 to 99% control of Palmer amaranth with the exception of pyrithiobac, which provided 29% control. All treatments resulted in excellent late-season control of Palmer amaranth following early and mid-postemergence treatments (99 to 100%).

FULL-SEASON WEED CONTROL SYSTEMS IN ARKANSAS COTTON. R. C. Doherty*[1], B. Scott[2], K. L. Smith[3], J. R. Meier[1]; [1]University of Arkansas, Monticello, AR, [2]University of Arkansas, Lonoke, AR, [3]University of Arkansas-Extension, Monticello, AR (175)

ABSTRACT

One trial was established in Rohwer, AR, on the Southeast Research and Extension Center in a Hebert silt loam soil in 2010, 2011, and 2012 to evaluate Palmer amaranth, Ipomoea spp., and barnyardgrass control in cotton. The trial was arranged in a randomized complete block design with four replications. Parameters evaluated were visual control ratings of Palmer amaranth, Ipomoea spp., barnyardgrass, and cotton yield. The Objective was to determine herbicide systems that provide full-season weed control in Arkansas cotton. Eight herbicide systems were evaluated at one or more of the three layby timings (8, 10, or12 lf cotton). At 64 days after the 12 leaf layby application in 2010 all herbicide programs applied at all three timings provided 100% control of Palmer amaranth, *Ipomoea* spp., and barnyardgrass. All cotton yields were statistically equal to each other and higher than the untreated check. At 80 days after the 12 leaf application in 2011 Cotoran at 1 lb ai/A PRE fb (followed by) Roundup PowerMax at 0.77 lb ae/A plus Dual Magnum at 0.95 lb ai/A applied at 2 leaf cotton fb Roundup PowerMax at 0.77 lb ae/A plus Dual Magnum at 0.95 lb ai/A applied at 6 leaf cotton fb MSMA at 2 lb ai/A plus Valor at 0.064lb ai/A applied at 12 leaf cotton provided 100% control of Palmer amaranth, Ipomoea spp., and barnyardgrass. All other herbicide systems applied at 10 and 12 leaf layby timings provided 93-100% control of Palmer amaranth, 78-100% control of Ipomoea spp., and 93-100% control of barnyardgrass. Cotoran at 1 lb ai/A PRE fb Roundup PowerMax at 0.77 lb ae/A plus Dual Magnum at 0.95 lb ai/A applied at 2 leaf cotton fb Roundup PowerMax at 0.77 lb ae/A plus Dual Magnum at 0.95 lb ai/A applied at 6 leaf cotton fb MSMA at 2 lb ai/A plus Valor at 0.096 lb ai/A applied at 8 leaf cotton provided the highest cotton yield numerically with 3320 lb/A of seed cotton. All other herbicide systems applied at 10 and 12 leaf layby timings provided statistically equal cotton yields. Herbicide systems that contained a 12 leaf layby did provide numerically higher weed control than the same system with the layby applied at 8 or 10 leaf cotton. At 81 days after the 12 leaf layby application in 2012 all herbicide programs applied at all three timings provided 95 to 100 % control of Palmer amaranth and 100% control of Ipomoea spp. and barnyardgrass. Cotoran at 1 lb ai/A PRE fb Roundup PowerMax at 0.77 lb ae/A plus Dual Magnum at 0.95 lb ai/A applied at 2 leaf cotton fb MSMA at 2 lb ai/A plus Valor at 0.064 lb ai/A applied at 8 leaf cotton yielded higher than the untreated check but lower than all other systems. Cotoran at 1 lb ai/A PRE fb Roundup PowerMax at 0.77 lb ae/A plus Dual Magnum at 0.95 lb ai/A applied at 2 leaf cotton fb Roundup PowerMax at 0.77 lb ae/A plus Dual Magnum at 0.95 lb ai/A applied at 6 leaf cotton fb MSMA at 2 lb ai/A plus Reflex at 0.375 lb ai/A applied at 10 leaf cotton provided the highest cotton yield numerically with 3574 lb/A of seed cotton.

INFLUENCE OF SOYBEAN POPULATION AND RESIDUAL HERBICIDE ON PALMER AMARANTH EMERGENCE. H. D. Bell*, J. K. Norsworthy, D. B. Johnson, B. W. Schrage, S. S. Rana, Z. T. Hill; University of Arkansas, Fayetteville, AR (177)

ABSTRACT

Palmer amaranth is the most troublesome weed in Arkansas row crops, causing producers to rely heavily on residual herbicides to successfully produce a profitable crop. In 2012, a field experiment was conducted at the University of Arkansas Research and Extension Center in Fayetteville, AR, to determine the effect of drill-seeded soybean population density on Palmer amaranth emergence. This experiment was arranged in a split-plot design replicated four times. The main plot factor was soybean seeding rate. The subplot factor was no preemergence-applied residual herbicide or a premergence application of Fierce (flumioxazin + pyroxasulfone) at 3.5 oz/A. Palmer amaranth emergence was counted weekly in two half meter quadrants in each plot and Palmer amaranth seedlings were removed after counting. Plots that had no residual herbicide applied were sprayed weekly with Liberty at 29 oz/A. Additionally, soybean groundcover was monitored throughout the season, and daily soil temperature (maximum and minimum) was measured in selected treatments. The application of Fierce helped maintain season-long Palmer amaranth control, irrespective of soybean population density. In plots that did not receive Fierce, greater Palmer amaranth emergence was observed under low soybean densities and vice versa, suggesting the value of crop canopy in preventing Palmer amaranth emergence in the absence of residual herbicides or when residual herbicides are not activated. Although the residual herbicide was sufficient to achieve effective weed control, exploitation of crop canopy effects can help reduce the selection pressure exerted by residual herbicides. Thus, manipulation of plant densities could be a valuable tool in integrated weed/resistance management.

WEED CONTROL PROGRAMS IN ROUNDUP READY® 2 XTEND SOYBEANS. M. J. Bauerle*, J. L. Griffin, J. Hardwick; LSU AgCenter, Baton Rouge, LA (178)

ABSTRACT

Research was conducted to evaluate weed control programs with dicamba applied preemergence (PRE) and postemergence (POST). In the first study, Roundup Ready® 2 Xtend (dicamba- and glyphosate-tolerant) soybeans were planted June 13, 2011, and May 16, 2012. Twenty eight days after dicamba was applied PRE at 1 lb ae/A (Clarity in 2011and MON 100111 in 2012), barnyardgrass was controlled 77%, pigweed 85%, and prickly sida 83% when averaged across two years; in 2011, hemp sesbania was controlled 61% and in 2012 entireleaf morningglory was controlled 62%. In the same experiments when Valor was applied PRE at 2 oz/A, barnyardgrass was controlled 89%, entireleaf morningglory 76%, hemp sesbania 48%, and pigweed and prickly sida 97%. Following dicamba and Valor PRE, Roundup Weathermax at 0.77 lb ae/A plus Clarity at 0.5 lb ae/A (2011) or MON 76754 (glyphosate + dicamba) at 1.5 lb ae/A (2012) were applied alone and in combination with Warrant Herbicide at 1.13 lb/A and Flexstar at 0.3 lb/A. Fourteen days after POST application, control of barnyardgrass, hemp sesbania, pigweed, prickly sida, and entireleaf morningglory was at least 93% when Clarity/MON 100111 was applied PRE and followed by Clarity plus Roundup/MON 76754, Clarity plus Roundup/MON 76754 plus Warrant Herbicide, or Clarity plus Roundup/MON 76754 plus Warrant Herbicide plus Flexstar. Late-season weed re-infestation, particularly grasses, occurred for treatments that did not include Warrant Herbicide and Flexstar. Soybean injury 7 days after treatment was not observed for dicamba. Injury noted for Warrant Herbicide and Flexstar was transient. In the second study conducted in a non-crop area, PRE herbicide treatments were applied June 14, 2011, and May 18, 2012, and included: Clarity at 16 and 32 oz/A, Valor SX at 2 oz/A, Valor XLT at 3 oz/A, Prefix at 2 pt/A, Dual Magnum at 1 pt/A, Warrant Herbicide at 3 pt/A, Warrant Herbicide plus Valor SX at 3 pt/A + 2 oz/A, Authority MTZ at 11 oz/A, Fierce at 3 oz/A, Metribuzin at 10.7 oz/A, Zidua at 2.3 oz/A, and Canopy DF at 6 oz/A. Averaged across two years and at 28 days after PRE application, Clarity at 16 oz/A controlled barnyardgrass 62%, prickly sida 48%, and entireleaf morningglory 33%. In 2011, hemp sesbania and pigweed were controlled 55% and 50%, respectively. When the Clarity rate was increased to 32 oz/A, control of only hemp sesbania was increased (55 to 70%). Valor XLT, Warrant Herbicide plus Valor SX, and Fierce provided greater control (at least 15 percentage points) of barnyardgrass, hemp sesbania, pigweed, and prickly sida 28 days after PRE application when compared with Clarity at 16 oz/A. Valor SX, Prefix, Dual Magnum, Warrant Herbicide, Authority MTZ, and Zidua provided greater control (at least 15 percentage points) of barnyardgrass, pigweed, and prickly sida compared with Clarity at 16 oz/A. Control of hemp sesbania, pigweed, and prickly sida was greater for Metribuzin than for Clarity at 16 oz/A, and control of pigweed and prickly sida was greater for Canopy DF than for Clarity at 16 oz/A. Weed control was also evaluated for Valor SX, Valor XLT, Prefix, Dual Magnum, Warrant Herbicide, Warrant Herbicide plus Valor SX, Authority MTZ, Fierce, Metribuzin, Zidua, and Canopy DF applied alone and with Clarity at 32 oz/A. When averaged over two years, barnyardgrass control 28 days after application was not increased when Clarity was applied with any of the herbicide treatments. Prickly sida control, however, was increased (at least 15 percentage points) when Clarity was applied with Prefix (72 to 91%), Warrant Herbicide (70 to 86%), Zidua (70 to 93%), and Canopy DF (74 to 89%). In 2011, hemp sesbania control was increased when Clarity was applied with Valor SX (66 to 86%), Prefix (47 to 75%), Dual Magnum (50 to 78%), Warrant Herbicide (33 to 76%), Authority MTZ (52 to 82%), Zidua (33 to 73%), and Canopy DF (60 to 88%). Pigweed control in 2011 was increased only when Clarity was applied with Zidua (83 to 100%).

COMPARISON OF ACETOCHLOR, S-METOLACHLOR, AND PYROXASULFONE APPLIED PRE AND POST IN GLUFOSINATE-RESISTANT SOYBEAN. J. R. Meier*[1], K. L. Smith[2], B. Scott[3], R. C. Doherty[1], J. A. Bullington[1]; [1]University of Arkansas, Monticello, AR, [2]University of Arkansas-Extension, Monticello, AR, [3]University of Arkansas, Lonoke, AR (179)

ABSTRACT

Several preemergence soil residual herbicides are available for use in soybean. The use of soil applied residual herbicides has become a standard program for producers to assist with control of glyphosate-resistant Palmer amaranth in glufosinate-resistant soybean and reduce the over-dependency on glufosinate. Acetochlor, s-metolachlor, and pyroxasulfone all have a similar mode of action and are all classified as group 15 herbicides. Trials were conducted in 2012 at the Southeast Research and Extension Center, near Rohwer, AR, to examine weed control with acetochlor, s-metolachlor, and pyroxasulfone applied preemergence at 0.5X, 0.75X, 1X, and 2X use rates in glufosinate-resistant soybean. Acetochlor at 1.125 lb ai/a (1X), s-metolachlor at 0.95 lb ai/a (1X), and pyroxasulfone at 0.10 lb ai/a (1X), provided similar control of barnyardgrass and Palmer amaranth 15 days after application (DAA). Control of morningglory spp. at this time with pyroxasulfone was greater compared to acetoclor. By 26 DAA, morningglory control was no different between acetochlor and pyroxasulfone, but was greater with s-metolachlor compared to acetochlor. Glufosinate at 0.53 lb ai/a was applied to all treatments at the V-5 soybean growth stage. Ten days after glufosinate was applied, barnyardgrass control was similar among treatments, but control of Palmer amaranth and morningglory was greater with pyroxasulfone compared to acetochlor and s-metolachlor due to less selection pressure. There were no differences in weed control from these herbicides at 2X use rates at all evaluation intervals, and no injury to soybean was observed from treatments at all use rates in this trial. Control of Palmer amaranth with pyroxasulfone was similar to acetochlor and s-metolachlor 15 and 26 DAA, but was greater later in the season due to reduced Palmer amaranth and morningglory pressure prior to a glufosinate application.

PALMER AMARANTH WEED CONTROL PROGRAMS FOR ROUNDUP READYÂ® 2 XTEND SOYBEANS IN THE MID-SOUTH. L. E. Steckel*[1], T. W. Eubank[2], R. Montgomery[3], B. Scott[4], R. Smeda[5], E. Blinka[6], A. Mills[7], S. Stanislav[8], S. Seifert-Higgins[9], F. Zabala[10]; [1]University of Tennessee, Jackson, TN, [2]Mississippi State University, Stoneville, MS, [3]Monsanto, Union City, TN, [4]University of Arkansas, Lonoke, AR, [5]University of Missouri, Columbia, MO, [6]Monsanto, Dyersburg, TN, [7]Monsanto, Collierville, TN, [8]Monsanto, Cape Girardeau, MO, [9]Monsanto Company, St. Louis, MO, [10]Monsanto, St. Louis, MO (180)

ABSTRACT

With the development of glyphosate-resistant (GR) weed species, new weed management technology is clearly needed. Monsanto is developing a new herbicide technology trait that will provide soybean the tolerance to both dicamba and glyphosate herbicides. Research was conducted in Germantown, TN, Stoneville, MS, Tunica, MS, New Port, AR, Pine Bluff, AR and Portageville, MO in 2012 examining how the addition of dicamba tolerance to soybean could be used in a system to manage GR Palmer amaranth. The specific objective of this research was to (1) determine if dicamba can increase Palmer amaranth control over current weed management options and (2) evaluate different dicamba-based weed management systems in soybean. The herbicide treatments were applied with a CO_2 pressurized backpack sprayer equipped with 11002 AIXR nozzles calibrated to apply 15 GPA at a pressure of 40 psi. Treatments consisted of either dicamba or Valor SX applied pre-emergence. The rate of dicamba was 16 oz/A while the Valor SX was applied at 2 oz/A. Post treatments consisted of either Roundup PowerMax® (32 oz/A) + dicamba (16 oz/A), Roundup PowerMax® (32 oz/A) + dicamba (16 oz/A) + Warrant Herbicide (48 oz/A), or Roundup PowerMax (32 oz/A) + Prefix (32 oz/A), applied to 3 to 4” Palmer amaranth. Sequential application of Roundup PowerMax and dicamba was also utilized on selected treatments. Each study location was conducted as a randomized complete block design. Palmer amaranth control was evaluated at 7, 14, 21, 27 and 40 days after application (DAA). Data was subjected to ANOVA in a mixed model with location and rating time treated as random variables in the model. The 16 oz/A rate of dicamba provided better residual control than Valor at 2 oz/A in the locations that did not receive precipitation after application. This resulted in the system where Valor SX was applied pre followed by Roundup PowerMax + dicamba applied post emergence to 4” weeds providing only 85% control compared to 97% control for dicamba pre followed by Roundup PowerMax + dicamba applied post emergence to 4” weeds. Warrant Herbicide tankmixed with dicamba and Roundup PowerMax and applied post emergence did not statistically improve Palmer control. However, from a resistance management perspective, adding another mode of action that is effective on Palmer amaranth should be encouraged. All the systems that contained dicamba provided better Palmer amaranth control than the current standard used by farmers of Valor pre followed by Roundup PowerMax + Prefix applied to 4” weeds. This study would suggest that dicamba can be a very effective tool in controlling Palmer amaranth in Mid-South soybean production when it is used in a weed management system. This system should include several herbicide modes of action applied pre emergence followed by post emergence applications to 4” or less Palmer amaranth. Moreover, it showed that particularly under dry conditions dicamba can provide residual control of Palmer amaranth.

NEW TOOLS FOR WEED RESISTANCE MANAGEMENT. J. K. Soteres*[1], D. Sammons[2], S. Reiser[1], G. Heck[1]; [1]Monsanto Company, St. Louis, MO, [2]Monsanto, St. Louis, MO (181)

ABSTRACT

It is well established that stewardship of all our weed management tools, including herbicides, is dependent upon farmer implementation of diversified weed practices that include overlapping activity of mechanical, cultural and/or herbicide methods of weed management. Additionally, there is an increasing appreciation that the current herbicide resources are exhaustible with no new herbicide modes of action in commercial development programs. This is leading to an increased emphasis by the public and private sectors to find additional and novel approaches. New weed management approaches have been developed through use of ag biotechnology and the re-freshed use of cultural and mechanical methods. There has also been increased emphasis to find novel chemistries through natural product discovery efforts, discovery of effective biologicals, and, most recently, new approaches using genomic derived technologies such as RNA interference. A new versatile technology platform within the ag biologicals arena with the potential to increase weed management options is in development. For weed scientists, this new topically-applied technology, still in early phases of development, has the potential to bring a step change in weed control, targeting resistant weeds resulting in better herbicide performance. BioDirect™ technology from Monsanto utilizes a plant's naturally occurring process to target specific biochemical processes in weeds, including mechanisms responsible for weed resistant to glyphosate. BioDirect leverages Monsanto's core capability in genomics, using genomic information to identify precise and effective tools for effective weed control. BioDirect™ technology is a non-transgenic approach and will provide additional weed management options. While still in early development, testing to date indicates that BioDirect™ technology can be used in combination with glyphosate to reverse existing glyphosate resistance in Palmer amaranth and other species.

A NEW MESOTRIONE, GLUFOSINATE AND ISOXAFLUTOLE TOLERANT TRAIT FOR SOYBEAN WEED MANAGEMENT. B. Miller*[1], R. Jain[2], B. Erdahl[3], A. Silverstone[4], G. Vail[5], J. Allen[6], J. Fischer[7], S. Van Wert[8]; [1]Syngenta, Minnetonka, MN, [2]Syngenta Crop Protection, Vero Beach, FL, [3]Syngenta, Clinton, IL, [4]Syngenta, Research Triangle Park, NC, [5]Syngenta, Greensboro, NC, [6]Bayer CropScience, Research Triangle Park, NC, [7]Bayer CropScience, Middleton, WI, [8]Bayer CropScience, Monheim, Germany (182)

ABSTRACT

Syngenta and Bayer CropScience are developing new herbicide tolerant technology for soybeans consisting of a molecular stack of a gene conferring tolerance to HPPD-inhibiting herbicides as well as a gene for glufosinate tolerance. This multiple mode-of-action herbicide tolerant trait will enable the use of herbicides such as mesotrione and isoxaflutole pre- and post-emergence in soybean in addition to glufosinate-ammonium post-emergence. This new trait technology will provide growers with a valuable tool to improve weed management options in soybeans. HPPD-inhibitors are a leading, selective class of herbicide chemistry and provide unprecedented broadleaf and grass weed control with proven residual and application flexibility. Glufosinate-ammonium has a unique mode of action and provides control of a broad-spectrum of weeds. This technology will therefore enable herbicide programs with more options for multiple modes-of-action and superior residual control for sustainable weed management including ALS-, triazine-, PPO-, and glyphosate resistant biotypes. The technology has shown consistent efficacy and agronomic performance for seven field seasons in North and South America. During 2012, it demonstrated excellent yield and agronomic performance as well as tolerance to mesotrione, isoxaflutole and glufosinate across numerous elite genetic backgrounds and many environments. Regulatory dossiers have been submitted for cultivation and import approval in key countries and further studies to support approvals and commercialization are on-going with a target for commercial launch after the middle of the decade. brett.miller@syngenta.com

WEED MANAGEMENT PROGRAMS UTILIZING MESOTRIONE IN HERBICIDE TOLERANT SOYBEANS.
J. C. Holloway*[1], R. Lins[2], D. Bruns[3], T. Beckett[4], G. Vail[4]; [1]Syngenta, Jackson, TN, [2]Syngenta, Bryon, MN, [3]Syngenta, Marysville, OH, [4]Syngenta, Greensboro, NC (183)

ABSTRACT

Field trials were conducted in 2011 and 2012 to assess potential weed control programs for mesotrione use in HPPD-tolerant soybeans. Several programs provided near complete control of important weed species, including targeted glyphosate resistant populations. The most successful programs included preemergence residual weed control with multiple, overlapping mode of actions. The use of these chemically diverse and novel programs offers effective, safe and sustainable weed management options for soybean growers.

UNIVERSITY EVALUATION OF ISOXAFLUTOLE WEED MANAGEMENT PROGRAMS IN HPPD-TOLERANT SOYBEAN SYSTEM. J. Allen*[1], S. Garris[2], M. Weber[3]; [1]Bayer CropScience, Research Triangle Park, NC, [2]Bayer CropScience, Yazoo City, MS, [3]Bayer CropScience, Indianola, IA (184)

ABSTRACT

MS Technologies and Bayer CropScience are codeveloping a soybean event tolerant to glyphosate and p-hydroxyphenyl pyruvate dioxyegenase (HPPD) inhibiting herbicides. Tolerance to glyphosate is equal to commercially available soybean lines. There is differential tolerance to HPPD inhibiting herbicides in this new event. This event is tolerant to preemergence applications of isoxaflutole and mesotrione. There are varying levels of tolerance to postemergence applied HPPD inhibitors. This event exhibits the best postemergence tolerance to isoxaflutole. There is reduced tolerance to mesotrione, topramezone and tembotrione in this soybean event.

PALMER AMARANTH MANAGEMENT AND CROP RESPONSEÂ IN HPPD TOLERANT SOYBEANS. W. J. Everman*[1], M. Rosemond[2], J. Allen[3]; [1]North Carolina State University, Raleigh, NC, [2]Bayer CropScience, Raleigh, NC, [3]Bayer CropScience, Research Triangle Park, NC (185)

ABSTRACT

Glyphosate-resistant Palmer amaranth is the greatest weed management issue for Southeastern soybean producers. Farmers in North Carolina often design their production plans with Palmer amaranth management in mind. Bayer CropScience is developing soybean tolerant to HPPD-inhibiting herbicides in order to provide alternative control options. Research was conducted in North Carolina in 2012 to investigate crop tolerance and efficacy in HPPD tolerant soybeans. Two studies were conducted in Clayton, NC to investigate tolerance of HPPD tolerant soybeans to PRE and POST applied HPPD inhibitors and to determine efficacy of weed management programs based on these herbicides. In the first trial, fifteen treatments consisting of PRE fb POST herbicide applications were compared, and in the second trial seventeen PRE fb POST or POST only treatments were evaluated. In both studies excellent crop tolerance was observed. Palmer amaranth control was greater than 95% for all sequential treatments, with residual HPPD-inhibiting herbicides providing an excellent foundation for subsequent POST applications. Results affirm the need for residual herbicides in a comprehensive weed management program for Palmer amaranth.

U.S. UNIVERSITY HERBICIDE EFFICACY STUDIES ANALYSIS: CORN AND SORGHUM YIELDS WITH ATRAZINE VERSUS ALTERNATIVES: 2006-2010. R. S. Fawcett*; Fawcett Consulting, Huxley, IA (186)

ABSTRACT

Previously, 20 years of corn herbicide efficacy studies conducted by university weed scientists and published in the North Central Weed Science Society Research Report were analyzed to compare corn yields with treatments containing atrazine to treatments lacking atrazine but containing atrazine alternatives. All treatments had to control both broadleaf and grass species, be applied at label rates, and registered for use at the time of the analysis. For the 236 studies analyzed for the period, 1986-2005, corn yielded an average 5.7 bushels/acre higher or 5.1% higher with atrazine than with alternatives. The North Central Weed Science Society discontinued publishing the Research Report after 2005. Therefore, to investigate the potential yield benefits of atrazine for years after that date, herbicide efficacy studies were obtained directly from universities or from a Syngenta Crop Protection database summarizing studies conducted by universities. Unlike the 1986-2005 analysis, which involved only Corn Belt states, the new analysis covered 22 states in all major corn-growing regions of the U.S. A total of 449 qualifying studies containing 5,991 qualifying treatments were analyzed for the years 2006-2010. Corn yielded an average 4.9 bushels per acre or 3.3% higher with atrazine than with atrazine alternatives. The yield benefit with atrazine was greatest with no-till systems, with a yield increase of 8.1 bushels per acre or 6.7%, compared to 4.6 bushels per acre (3.1%), and 4.4 bushels per acre (2.7%) for conventional and reduced tillage, respectively. Thus, atrazine continues to provide a yield benefit similar to that provided over the previous 20 years, despite the introduction of new herbicide actives and technologies such as herbicide-resistant corn. In addition to analyzing corn studies, sorghum yield studies were also analyzed. A total of 12 qualifying studies containing 131 qualifying treatments were analyzed for the years 2006-2010. Sorghum yielded an average 5.7 bushels per acre or 6.4% higher with atrazine than with atrazine alternatives.

A SURVEY OF WEED MANAGEMENT PRACTICES IN MIDSOUTH SOYBEAN. D. S. Riar*[1], J. K. Norsworthy[1], L. E. Steckel[2], D. Stephenson[3], T. W. Eubank[4], B. Scott[5]; [1]University of Arkansas, Fayetteville, AR, [2]University of Tennessee, Jackson, TN, [3]LSU AgCenter, Alexandria, LA, [4]Mississippi State University, Stoneville, MS, [5]University of Arkansas, Lonoke, AR (187)

ABSTRACT

The knowledge of crop production practices, troublesome weeds, desired weed management research by growers, and perceived obstacles in the adoption of new herbicide-resistant soybean technologies can help weed scientists to develop more efficient weed management programs for the Midsouth soybean growers. Consultants have the first-hand information about common constraints to soybean production and management of troublesome weeds. Therefore, soybean consultants from Arkansas, Louisiana, Mississippi, and Tennessee were surveyed through direct mail and on-farm visits in fall 2011. These consultants represented 15, 21, 5, and 10% of total soybean planted in Arkansas, Louisiana, Mississippi, and Tennessee, respectively, in 2011. Collectively, 93% of the total scouted area in these four states was planted with glyphosate-resistant (RR) soybean. The adoption of glufosinate-resistant (LL) soybean was greatest in Arkansas (12%), followed by Tennessee (4%), Mississippi (2%), and Louisiana (<1%). Only 17% of the RR soybean was treated solely with glyphosate compared to 37% of LL soybean treated solely with glufosinate. Across four states, average cost of herbicides in RR and LL soybean systems was 78 and 91 US\$ ha^{-1}, respectively. Collectively across states, total scouted area under conventional tillage was 42%, stale seedbed 37%, and no-tillage 21%. Palmer amaranth and morningglories were the most problematic weeds in all four states. Additionally, barnyardgrass and horseweed were the third most problematic weeds of Arkansas and Tennessee, respectively, and Italian ryegrass was the third most problematic weed in Louisiana and Mississippi. Glyphosate-resistant Palmer amaranth infested fewer fields in Louisiana (16% of fields) than the remaining three states (54% collectively). Average Palmer amaranth hand-weeding cost in the Midsouth was 59 US\$ ha^{-1}. Three-fourths of the Midsouth consultants stipulated the need for continued research and education focused on management of glyphosate-resistant and -tolerant weed species.

FIELD EVALUATION OF CURRENT GEORGIA SOYBEAN CULTIVARS TO METRIBUZIN. B. H. Blanchett*[1], T. L. Grey[1], T. M. Webster[2], E. P. Prostko[1], W. K. Vencill[3]; [1]University of Georgia, Tifton, GA, [2]USDA-ARS, Tifton, GA, [3]University of Georgia, Athens, GA (188)

ABSTRACT

Glyphosate-resistant weeds have become one of the most common and troublesome issues in soybeans in the southeastern US. Glyphosate is still used as a control for weeds; however farmers also use residual herbicides to maintain season long weed control. Metribuzin could potentially be used to provide residual weed control of herbicide resistant weeds in soybeans. Metribuzin has been shown to provide some control of glyphosate resistant Palmer amaranth and other weeds in the southeast. However, metribuzin has been shown to cause injury to certain soybean cultivars of the past. Therefore it is necessary to evaluate current soybean cultivars to metribuzin. Experiments were conducted in 2011 and 2012 in different fields at Plains, Ga UGA agricultural experiment station involving three general soybean groups. Conventional, Roundup Ready, and Liberty Link soybean cultivars of more recent release were evaluated for injury, stand density, height, and yield, after field treatments of metribuzin at rates of 420 or 840 g ai/ha and a non-treated control for each cultivar. There were no significant negative effects with conventional and Roundup Ready soybeans for any metribuzin treatments. Liberty Link cultivars were significantly affected for stand density in 2011 with 840 g/ha. Liberty Link cultivars were significantly injured after emergence with metribuzin at 840 g/ha, only in 2011, but injury was transient. With reduced stand count, Liberty Link cultivars were outperformed in yield by the conventional and Roundup Ready cultivars in 2011. The Liberty Link cultivars, AGS5911LL, LL595N, and LLSS511N, exhibited greater metribuzin susceptibility in 2011. With the correct choice of soybean cultivar and weed management program, metribuzin could play an important part of controlling current herbicide resistant weeds and preventing similar future weed pest problems.

DOES AT-PLANT FLURIDONE APPLICATIONS REDUCE POSTEMERGENCE HERBICIDE NEEDS IN GLYPHOSATE- AND GLUFOSINATE-TOLERANT COTTON? M. W. Marshall*[1], A. C. York[2], A. S. Culpepper[3]; [1]Clemson University, Blackville, SC, [2]North Carolina State University, Raleigh, NC, [3]University of Georgia, Tifton, GA (189)

ABSTRACT

Cotton tolerance to fluridone was established during its early development as a herbicide during its early development. In susceptible plants, fluridone inhibits the carteniod biosynthesis pathway. During its initial development, fluridone efficacy long-term on several broadleaf weeds including *Amaranthus* spp. was observed. Field studies were initiated and conducted across the southeast to determine the efficacy of various combinations of at-plant preemergence residual herbicides, the effect of eliminating in-season postemergence herbicides, and quantify the effects of selected herbicide treatments on seed cotton yield. Field experiments were conducted across the southeast at the Clemson University Edisto Research and Education Center (EREC) near Blackville, SC; a grower field near Mt. Olive, NC, and a grower field in Macon County, GA in 2012. Experimental design consisted of a randomized complete block design with 4 replications. At EREC and Mt. Olive sites, preplant burndown treatment of glyphosate at 0.75 lb ae/A plus 2,4-D was applied about 21 days before planting. The Macon County site was conventional tillage. Preemergence (PRE) herbicide treatments included fluridone at 0.25 and 0.38 lb ai/A, fomesafen at 0.25 lb ai/A, and diuron at 0.5 lb ai/A. Postemergence (POST) included glyphosate at 0.75 lb ae/A, glufosinate, and acetochlor at 1.125 lb ai/A. All treatments, except the untreated control, were followed by MSMA at 2.0 lb ai/A plus diuron at 0.75 lb ai/A at layby. Palmer amaranth control rating were collected at the layby application timing at EREC, 2 weeks after POST2 treatment at Mt. Olive, and 12 days after layby application at the Macon County site. Palmer amaranth control data and seed cotton yield were analyzed using ANOVA and means separated at the $P = 0.05$ level. At the EREC and Mt. Olive sites, adequate rainfall occurred shortly after PRE application. In the glyphosate-based programs at EREC, fluridone PRE at 0.25 and 0.38 followed by glyphosate plus acetchlor provided greater than 96 to 98% control of Palmer amaranth. However, removal of the first and/or second postemergence treatment greatly reduced Palmer amaranth control later in the season in the glyphosate-based system (43-49%). In the glufosinate based system, fluridone at either 0.25 or 0.38 lb ai/A followed by glufosinate plus acetochlor provided 96% or better control of Palmer amaranth. Seed cotton yield in the glyphosate-based systems were 1 or more of the postemergence programs were eliminated were significantly reduced yield; however, in the glufosinate-based system, yields were higher in all treatment except where no postemergence glufosinate was sprayed. At the Mt. Olive site, fluridone PRE at 0.25 and 0.38 followed by glyphosate plus acetchlor provided greater than 93% or better control of Palmer amaranth in the glyphosate-based programs. However, Palmer amaranth control was significantly less in the treatments were all postemergence treatments were removed (<55%). Similarly, the glufosinate-based system, removal of 1 or more of the postemergence treatment reduced Palmer amaranth control later in the season in the glyphosate-based system (less than 65%). Seed cotton yields in the glyphosate-based systems, where both of the postemergence programs were eliminated, were significantly reduced with the exception of the fluridone PRE at the 0.38 lb ai/A rate. In the glufosinate-based system, yields were similar across all treatments receiving at least one glufosinate postemergence treatment. At the Macon County site, rainfall was limiting after PRE treatments. The fomesafen plus diuron PRE treatments provided a consistent and higher level of Palmer amaranth control compared to the fluridon PRE treatments in both glyphosate and glufosinate systems. The fomesafen plus diuron followed by two application of glyphosate plus acetochlor provided the greatest seed cotton yield (2579 lb/A) compared to the fluridone at 0.38 lb ai/A followed by two applications of glyphosate plus acetochlor (1696 lb/A). Seed cotton yields were significantly higher in the glufosinate based systems where PRE treatments followed two applications of glufosinate. In conclusion, fluridone needed about 0.5 in rainfall within 7 days of application to activate. Under dry conditions, Palmer amaranth control from fluridone PRE was less than fomesafen plus diuron. In contrast, Palmer amaranth control was similar between fomesafen plus diuron and fluridone during normal precipitation. Benefit from postemergence plus residuals was evident compared to programs where in-season postemergence treatments were eliminated. Fluridone did not seem reduce or eliminate the need for in-season postemergence herbicides.

THE EFFECT OF REMOVAL TIME AND DENSITY OF VOLUNTEER CORN POPULATIONS ON COTTON GROWTH AND YIELD. A. N. Eytcheson*, D. B. Reynolds, R. C. Storey; Mississippi State University, Mississippi State, MS (190)

ABSTRACT

The introduction of herbicide-resistant cropping technologies coupled with decreased use of many residual herbicides has resulted in an increase of herbicide-resistant volunteer plants from the previous growing season. Volunteer plants can potentially cause yield reductions and may impact harvest efficiency. In 2012, 73% and 80% of corn and cotton acres planted were herbicide-resistant. Glyphosate resistant volunteer corn has been reported to cause cotton height and yield reductions from season long interference, in a glyphosate based herbicide system. Three experiments were conducted in Mississippi in 2011 and 2012 to determine when volunteer corn should be removed to prevent cotton yield loss at a low (4 plants/12.2 m row), intermediate (20 plants/12.2 m row) and high (40 plants/12.2 row) corn density. Corn was hand planted into the center two rows of a four row cotton plot. Corn was removed by hand at 0, 1, 2, 6, 8, 10 and 12 weeks after emergence or remained for season long interference. Cotton height decreased as the density of corn increased and as the time of removal was delayed. Seed cotton yield decreased from 2,850 kg/ha at the low corn density to 2,120 kg/ha at the high corn density. There was no seed cotton yield reduction at the low corn density; however, at the intermediate and high corn densities, seed cotton yield was reduced up to 31 and 46% when the removal of the volunteer corn was delayed beyond 6 and 4 weeks, respectively. Corn density and removal time affected cotton height and yield. Seed cotton yield was reduced when the removal of the volunteer corn was delayed beyond 4 to 6 weeks at the higher volunteer corn densities. However, because the corn was hand removed, the results of the experiment do not account for the lag time of plant death following a herbicide application, nor does the yield account for picker efficiency with season long volunteer corn interference. These data indicate that moderate to high populations of volunteer corn should be removed prior to four weeks of interference in order to prevent yield loss.

WEED MANAGEMENT SYSTEMS WITH MULTIPLE MODE OF ACTION PRODUCTS IN GLYPHOSATE TOLERANT SOYBEANS. J. Whitehead*[1], D. Feist[2], G. Wiley[3], K. Miller[4], D. Downing[5], B. Ahrens[6]; [1]MANA, Oxford, MS, [2]MANA, Ft. Collins, CO, [3]Wiley Ag Consulting, Columbus, IN, [4]MANA, Troy, IL, [5]MANA, Raleigh, NC, [6]MANA, Coralville, IA (191)

NO ABSTRACT SUBMITTED

GLYPHOSATE-RESISTANT JOHNSONGRASS CONTROL OPTIONS IN ROUNDUP READY SOYBEAN. D. B. Johnson*[1], J. K. Norsworthy[1], H. D. Bell[1], B. W. Schrage[1], S. S. Rana[1], B. Scott[2]; [1]University of Arkansas, Fayetteville, AR, [2]University of Arkansas, Lonoke, AR (192)

ABSTRACT

Johnsongrass (*Sorghum halapense*) was once considered among the most problematic weed species in soybean. However, due to wide-spread adoption of glyphosate-resistant crop technology and the effectiveness of glyphosate on this weed, it has not been a problem in recent years. In the fall of 2008, a population of glyphosate-resistant johnsongrass was found in a field located near West Memphis, AR. An experiment was conducted in 2009, 2010, and 2012 in the same production field in which the population was initially found, with an objective to develop herbicide programs for management of glyphosate-resistant johnsongrass in Roundup Ready soybean. The treatments in this study consisted of glyphosate (Roundup Powermax) at 0.75 lb ae/A applied alone in sequential applications or in tank-mixture with other postemergence herbicides. The herbicides that were evaluated in combination with glufosinate were imazamox (Raptor) at 0.05 lb ai/A, fomesafen (Flexstar) at 0.35 lb ai/A, and clethodim (Select Max) at 0.061 and 0.121 lb ai/A. Clethodim was applied at either the V3 or V6 soybean growth stage and both stages, while the other herbicides were applied in combination with glyphosate at either the V3 or V6 stage. Johnsongrass was 6 to 10 inches tall when the V3 application was made and 12 to 18 inches tall at the V6 application. Visible weed control ratings were taken weekly throughout the growing season, and grain yield was determined at crop maturity. The treatment by year interaction was significant for yield and johnsongrass control at 3 weeks after the final application (WAFT); therefore, data were not pooled over years. Sequential glyphosate applications controlled johnsongrass ≤28% in all three years. However, glyphosate + clethodim followed by glyphosate + imazamox or sequential applications of glyphosate + clethodim were the most consistent treatments, both providing >95% control in all three years of the study. In 2010 and 2012, programs containing glyphosate + clethodim followed by glyphosate + imazamox or sequential applications of glyphosate + clethodim resulted in the highest yields. This research shows that sequential applications of glyphosate is no longer an effective control option for this population of johnsongrass; however, glyphosate applied in combination with multiple herbicide modes of action can effectively control this biotype of johnsongrass in Roundup Ready soybean.

ISOXAFLUTOLE AND TEMBOTRIONE BASED HERBICIDE PROGRAMS FOR PALMER AMARANTH, PITTED MORNINGGLORY, AND GOOSEGRASS CONTROL IN FIELD CORN. M. W. Marshall*; Clemson University, Blackville, SC (193)

ABSTRACT

In South Carolina, corn weed management program centers on atrazine which is an excellent herbicide choice for most broadleaf weeds. However, atrazine is highly mobile in coarse textured soils which can compromise weed control later in the season. Several new herbicides, including isoxaflutole and tembotrione, have been introduced the Southern Corn Belt in recent years. In the interests of rotating herbicide mode of action with atrazine, field experiments were initiated to evaluate isoxaflutole and tembotrione efficacy on selected broadleaf and grass weeds. Field experiments were conducted at the Clemson University Edisto Research and Education Center (EREC) located near Blackville, SC in 2011 and 2012. Herbicide treatments included preemergence and postemergence combinations of isoxaflutole at 3.0, 5.6, and 6.0 oz/A, atrazine at 1 pt/A and 1 qt/A, tembotrione at 2.0 and 3.0 oz/A, glyphosate at 22 oz/A, and glufosinate at 22 oz/A. Palmer amaranth, pitted morningglory, and goosegrass control data and corn yield data were analyzed using ANOVA and means separated at the P = 0.05 level. Isoxaflutole PRE alone or followed by tembotrione provided 95% or better control of Palmer amaranth and pitted morningglory. Combinations of isoxaflutole followed by glyphosate or glufosinate also provided excellent Palmer amaranth and pitted morningglory control. Two pass programs of isoxaflutole and tembotrione provided the greatest consistency amoung studies when compared across years. In conclusion, isoxaflutole and tembrotrione based programs provided an excellent broad spectrum control package for corn with greater residual efficacy compared to atrazine alone. In addition, these herbicide programs provide an additional mode of action for rotation with atrazine in corn, especially where corn is planted on a continuous basis.

EVALUATION OF FIERCE HERBICIDE FOR WEED CONTROL IN COTTON AND PEANUTS. F. Carey*[1], J. Cranmer[2], J. Etheridge[3], M. Griffin[3], B. Odle[4], J. Smith[5], J. Pawlak[6]; [1]Valent USA, Olive Branch, MS, [2]Valent USA, Raleigh, NC, [3]Valent USA, Greenville, MS, [4]Valent USA, Dallas, TX, [5]Valent USA, Atlanta, GA, [6]Valent USA, Grand Rapids, MI (194)

ABSTRACT

Fierce Herbicide is a new herbicide developed by Valent USA recently labeled in corn with a soybean label pending. Fierce is a premix of flumioxazin (sold as Valor Herbicide by Valent USA) and pyroxasulfon, a new herbicide developed by Kumiai Ihara of Japan. Valent USA was interested in expanding the Fierce label to include cotton and potentially peanuts. Therefore, studies were designed to evaluate the potential fit of Fierce Herbicide as a pre-plant and a lay-by herbicide in cotton and as a pre-emerge herbicide in peanuts. Studies were conducted by numerous universities across the southern United States as well as in-house studies conducted at Valent's Mid South Ag Research Center in Leland, MS. Pre-plant cotton uses in Georgia and along the east coast included evaluation in the strip tillage system which has been developed for Palmer amaranth control. Fierce herbicide had an excellent fit in the strip tillage system in Georgia, but control of Palmer amaranth decreased when this system was utilized in North Carolina. In the mid south, Fierce was evaluated as a cotton pre-plant application 21 days prior to planting. Fierce provided excellent Palmer amaranth and annual grass control in this system. Cotton was not injured in any of these pre-plant systems. Lay-by applications were evaluated as well. In the lay-by systems evaluated, Fierce was always applied as a tank mix with diruron for increased resistance management for Palmer amaranth. Cotton was not injured by any lay-by application. Palmer amaranth control was excellent out to 60+ days after application. Fierce was applied pre-emergence to peanuts at rates of 3, 3.75 and 4.5 oz of product per acre. Peanut injury was less than 10% at all rates and was comparable to Valor at 3 oz per acre. Palmer amaranth control at 40 DAT was >95% with all Fierce rates and was slightly greater than the control provided by Valor. Annual grass control at 40 DAT increased as the rate of Fierce increased and ranged from85 to93%. Control of Bristly starbur, smallflower morningglory and Devil's claw was excellent with Fierce at all rates as well and was slightly greater than that provided by Valor. In summary, when Fierce herbicide was compared to Valor Herbicide in these systems, Fierce provided slightly greater control of Palmer amaranth and much greater control of annual grasses. As has been seen in other crops, Fierce herbicide is also more consistent in weed control than Valor and is more active in drier weather. These factors demonstrate that Fierce herbicide has a valid fit in cotton and peanut production and brings value compared to other herbicides currently used today. The Fierce cotton label has been submitted to EPA and is expected in late 2013. Residue work for Fierce in peanuts is planned for 2013 with anticipated sales opportunities in 2016.

EFFICACY OF F9310 (ANTHEM) AND F9312 IN COTTON WEED MANAGEMENT PROGRAMS--2012. S. Akin*[1], S. Wilson[2], R. Mitchell[3], D. Johnson[4]; [1]FMC, Monticello, AR, [2]FMC, Cary, NC, [3]FMC, Louisville, MS, [4]FMC, Madison, MS (195)

ABSTRACT

Field trials were conducted in 2012 to evaluate preemergence efficacy of Anthem herbicide against weeds such as Palmer amaranth, velvetleaf, and annual grasses. Anthem herbicide, containing pyroxasulfone and fluthiacet-methyl, was applied PRE to upland cotton at 9 locations in TX, AR, LA, TN, GA, and NC. Weed control (%) and phytotoxicity (%) was evaluated for various rates of Anthem (75, 100, and 125 g/ha pyroxasulfone), Dual II Magnum (2 pt/A), and Prowl H20 (2 pt/A). At multiple locations, Anthem was comparable with Dual II Magnum (96-99%) and better than Prowl H2O (88%) with respect to Palmer amaranth control at 29 DAT. All rates of Anthem provided better velvetleaf control (68-83%) than Dual II Magnum (50%) and Prowl H2O (33%) at 29 DAT at the only location that had sufficient velvetleaf pressure and ample rainfall for PRE activation. Medium and high rates of Anthem were also comparable with Dual II Magnum and Prowl H2O with respect to Texas panicum control (90-92%) at 29 DAT. Anthem caused 0% crop injury at 4 locations with medium- to fine-textured soils across all rating timings. This information is for technical and research purposes only. Anthem is not a registered product in cotton and is not available for sale or use in this crop. Anthem is a trademark of FMC Corporation. Dual II Magnum is a trademark of Syngenta Group Company. Prowl H20 is a trademark of BASF Company.

EVALUATION OF VERDICT IN SOYBEAN ON SANDY LOAM SOILS. J. Tredaway Ducar*[1], C. Burmester[2], B. Meyer[3], J. W. Keeling[4]; [1]Auburn University, Crossville, AL, [2]Auburn University, Belle Mina, AL, [3]Alabama Farmers Cooperative, Decatur, AL, [4]Texas A&M AgriLife Research, Lubbock, TX (232)

ABSTRACT

Soybeans are one of the major crops grown in the Sand Mountain area of Northeast Alabama. Several problem weeds that are encountered in soybean production could be controlled using the product Verdict however the label states that it should not be used on a sandy loam soil type because possible injury may occur. Field studies were conducted at the Sand Mountain Research and Extension Center in Crossville, AL in the summer of 2012 to determine the effect that Verdict would have on yields if applied to a sandy loam soil. The soil type is a Hartsells sandy loam with 62.5% sand, 20% silt, and 17.5% clay. Plots measured 10 feet x 50 feet and were arranged in a randomized complete block with a split-plot treatment arrangement. The split-plots were planting date with five planting dates used and herbicide treatment. Treatments were applied using a CO2 self-propelled sprayer equipped with 8002VS nozzle tips and calibrated to deliver 15 GPA at 40 psi. Treatments were applied on May 17, 2012 and consisted of Roundup Powermax at 29 fluid ounces per acre + Dual II Magnum at 1 pint/acre, Roundup Powermax at 29 fluid ounces per acre + Verdict at 5 fluid ounces per acre, Roundup Powermax at 29 fluid ounces per acre + Verdict at 7.5 fluid ounces per acre, and Roundup Powermax at 29 fluid ounces per acre + Verdict at 10 fluid ounces per acre. Planting dates were 0, 7, 14, and 21 DAT (days after treatment) which were May 18, May 25, May 30, and June 8, 2012, respectively. Data were subjected to analysis of variance (ANOVA) and means were separated using Fisher's Protected LSD at the 0.05 significance level. There was no planting date and herbicide treatment interaction. Less than 10% soybean injury was reported at 7 DAT (data not shown) and no injury was observed at 14 DAT. Roundup Powermax plus Dual II Magnum, Roundup Powermax plus Verdict at 5 fluid oz/acre at 7 DAP (days after planting), and Roundup Powermax plus Verdict at 7.5 fluid oz/acre at 0 DAP produced the highest yields (>69 bu/acre). All 21 day treatments regardless of rate produced lower yields (62 bushels/acre or less). Planting date was the most critical factor with the last date producing the lowest yields. Herbicide treatment had little to no effect on yields.

POSTEMERGENCE HERBICIDE VONTROL OF RHIZOME-ESTABLISHED *MISCANTHUS GIGANTEUS*. X. Li*[1], T. L. Grey[2], W. K. Vencill[1], D. Lee[2]; [1]University of Georgia, Athens, GA, [2]University of Georgia, Tifton, GA (233)

ABSTRACT

Miscanthus giganteus has been evaluated as a potential bioenergy crop in the US for over a decade. However, effective and economical methods to control this species have not been established. An experiment was conducted in greenhouses at Athens, GA with the objective of identifying optimum methods to control *M. giganteus* using POST herbicides. Glyphosate POST alone at 1.64 kg ae/ha did not provide significant shoot height and weight reductions or visual injury compared to the NTC. Glyphosate did not prevent *M. giganteus* shoot regrowth from rhizomes at 3 weeks after treatment (WAT) and it did not reduce underground rhizome production and root weight up to 6 WAT. Compared to glyphosate, one application of glyphosate plus imazapyr, fluazifop, pyrithiobac or sulfometuron resulted in significantly greater visual injury, lower shoot heights and dry weights 3 WAT. These treatments also prevented shoot regrowth and produced significantly lower rhizome and root dry weights compared to the NTC and glyphosate alone, which indicates *M. giganteus* could be effectively controlled with glyphosate-herbicide combinations. *M. giganteus* control increased when glyphosate was applied as a sequential 3 weeks after the initial application; significantly greater visual injury, lower shoot and rhizome dry weights were observed as compared to a single application. The four combination treatments applied as two sequential applications provided greatest *M. giganteus* control among all treatments.

HERBICIDE OPTIONS FOR SUPPRESSING BERMUDAGRASS IN SUGARCANE. C. D. Dalley*; USDA-ARS, Houma, LA (234)

ABSTRACT

Bermudagrass (*Cynodon dactylon*) is a problematic weed in Louisiana sugarcane. The most effective herbicide options are limited to the fallow period prior to planting. Frequently, efforts to eliminate bermudagrass from fields during the fallow season are unsuccessful. This subjects newly planted sugarcane to competition at a time when it is becoming established and is most vulnerable. Trials were conducted to evaluate herbicide options and application timing for bermudagrass control to determine their impact on sugarcane yields. In 2008, three trials were conducted comparing metribuzin (1.5, 2.25, and 3 lb ai/ac), clomazone plus diuron (1.25 plus 2 lb ai/ac), terbacil (1.8 lb ai/ac), and diuron plus hexazinone (1.4 plus 0.4 and 1.87 plus 0.53 lb ai/ac). Treatments were applied on February 11 and 12, 2012 to sugarcane planted in the fall of 2011. Treatments were broadcast applied either to undisturbed soil, or after row sides had been cultivated twice to break up stolons, with and without a broadcast application of pendimethalin (2 lb ai/ac). Experiments that were cultivated prior to application were lightly cultivated a third time to incorporate herbicides. At the time of application, bermudagrass had just begun to green up and sugarcane was 3 inches in height to the uppermost leaf collar. In 2009 and 2011, similar trials were conducted comparing the same herbicide treatments, except that no cultivation or pendimethalin were included. In 2009, treatments were applied on three dates four weeks apart (February 9, March 9, and April 8) to determine if application timing affected bermudagrass control, sugarcane injury, or yield. On the February application date, both bermudagrass and sugarcane were dormant. On the March application date, bermudagrass had greened up and stolons averaged 5 inches in length and sugarcane averaged 1 inch to the uppermost leaf collar. On the April application date, bermudagrass stolons averaged 10 inches in length and sugarcane measured 4 inches. In 2011, the same herbicide treatments were applied on February 15 to dormant bermudagrass and sugarcane. At 4 WAT, clomazone plus diuron provided the best bermudagrass control (85%) followed by 3 lb/ac of metribuzin (72%) and diuron plus hexazinone at 1.87 plus 0.53 lb/ac (69%). Bermudagrass control was least with metribuzin at 1.25 lb/ac (44%). In the 2008 trial, cultivation only slightly improved control compared to no cultivation, and the application of pendimethalin did not improve control. All treatments increased yield compared to the non-treated control. No differences in yield occurred due to cultivation or pendimethalin treatments. Application of clomazone plus diuron increased sugar yield (11,150 lb/ac) by 41% compared to the non-treated control (7,910 lbs/ac). Increasing metribuzin from 1.5 to 2.25 lb/ac increased sugar yield (10,060 to 10,780 lb/ac), but no further improvement occurred when 3 lb/ac were applied (10,520 lb/ac). When application timing was evaluated in 2009, average control ratings decreased from 67 to 54 to 41%, respectively, for February, March, and April application dates. In this study, sugar yield was greatest following February or March herbicide applications compared to the April application date. This was especially true for the clomazone plus diuron treatments where sugar yield decreased from 11,600 to 10,100 to 9,200 lb/ac, respectively, for February, March, and April application dates. This loss in yield was due to a combination of increased sugarcane injury and reduced bermudagrass control. In all studies it was apparent that even while excellent control of bermudagrass was not achieved, tremendous gains in sugar yield could be attained through suppression of bermudagrass in sugarcane.

WEED MANAGEMENT AND WHEAT TOLERANCE TO PYROXASULFONE IN NORTH CAROLINA. L. A. Grier*[1], W. J. Everman[1], S. Tan[2], T. E. McKemie[2]; [1]North Carolina State University, Raleigh, NC, [2]BASF Corporation, Research Triangle Park, NC (235)

ABSTRACT

Pyroxasulfone, an active ingredient in Zidua (85% pyroxasulfone) and Fierce (42% pyroxasulfone + 34% flumioxazin), is active on a wide range of weeds species including annual grasses and many broadleaf weeds. Two field studies were conducted in the fall/winter of 2011 in NC to evaluate weed control efficacy of and crop tolerance to pyroxasulfone in winter wheat (*Triticum aestivum*). Study 1 was conducted in Salisbury, NC in a no-till field with a clay loam soil type. Preplant (PPL) treatments included Fierce at 161 g a.i. ha^{-1} and Zidua+Sharpen at 74+ 50 g a.i. ha^{-1}, respectively. Preemergence (PRE) treatments included Fierce at 161 g a.i. ha^{-1} and Zidua+Sharpen at 74+50 g a.i. ha^{-1}, respectively, and Prowl H_2O at 1064 g a.i. ha^{-1}. Treatments at wheat spike included Fierce at 161 g a.i. ha^{-1} and Zidua+Sharpen at 74+50 g a.i. ha^{-1}, respectively, Prowl H_2O at 1064 g a.i. ha^{-1} and Axiom at 381 1064 g a.i. ha^{-1}. Crop injury, henbit (*Lamiaceae amplexicaule*) and field speedwell (*Veronica agrestis*) control were rated at 5 and 15 weeks after wheat spike. Treatments resulted in no crop injury or yield reduction. At wheat spike stage, all PPL and PRE treatments (except Prowl) showed 95-100% control of henbit and speedwell. Study 2 was conducted in Plymouth, NC in a conventional tillage field with loam soil and in Salisbury, NC in a no-till field with a clay loam soil. Treatments included Zidua at 60 and 74 g a.i. ha^{-1} PPL and 89 g a.i. ha^{-1} PRE, Zidua+Sharpen PRE at 60+50 g a.i. ha^{-1}, respectively, Zidua at 60 g a.i. ha^{-1} PRE + 30 g a.i. ha^{-1} POST, Zidua at 60 PRE + 60 g a.i. ha^{-1} POST, Axiom at 381 g a.i. ha^{-1} at wheat spike, Prowl H_2O+Axial XL POST at 1064+60 g a.i. ha^{-1}, respectively, and Osprey+Harmony POST at 15+21 g a.i. ha^{-1}, respectively. Crop injury, annual bluegrass (*Poa annua*) control and henbit control were rated at 14 days after wheat spike and 12 weeks after POST. Treatments resulted in no crop injury at either location and no yield differences in Plymouth. Henbit and annual bluegrass control responded to increasing rates of Zidua applied PRE. Osprey+Harmoney provide the greatest overall control and Zidua provided similar control of henbit and annual bluegrass as Axiom.

SORGHUM WEED MANAGEMENT AS AFFECTED BY ROW SPACING, PLANT POPULATION, AND HERBICIDE PROGRAM. T. E. Besancon*, R. Riar, W. J. Everman, R. Weisz, R. Heiniger; North Carolina State University, Raleigh, NC (236)

ABSTRACT

Weed control remains a major challenge for economically viable sorghum production in North Carolina because sorghum is highly sensitive to weed competition during early growth stages. Moreover, herbicides able to suppress grasses are extremely limited due to sorghum sensitivity. Besides grass weeds, Palmer amaranth (*Amaranthus palmeri*) is one of the broadleaf weeds that may be the most problematic in sorghum production. As previously demonstrated by different studies, a potential response to improve weed control in sorghum production would be to narrow the spacing between rows and to increase the density at which sorghum is planted. Three separate field studies have been conducted in 2012 at the Upper Coastal Plain Research Station near Rocky Mount, NC, at the Caswell Research Farm near Kinston, NC, and at Clarkton, NC, to determine which row spacings and which plant populations would increase crop competitiveness sufficiently to allow the reduction of POST herbicide applications. The experiment has been conducted in a factorial arrangement of treatments in a randomized complete block design with row spacing (19, 38, and 76 cm), plant population (40,000, 80,000, 120,000, 160,000 plants, and 300,000 plants per acre), and herbicides (non-treated, PRE application of S-metolachlor at 1412 g ai.ha^{-1} + atrazine at 1824 g ai.ha$^{\text{â€}1}$, and PRE application of S-metolachlor at 1076 g ai.ha^{-1} + atrazine at 1390 g ai.ha^{-1} followed by POST application of 2,4-D amine at 333 g ai.ha^{-1}) as main factors. Sorghum was rated for the percentage of Palmer amaranth, sicklepod (*Senna obtusifolia*), and large crabgrass (*Digitaria sanguinalis*) control 4 weeks after PRE, and 1, 3 and 7 weeks after POST. Weed density and biomass were evaluated before harvest as well as yield at the harvest. Palmer amaranth control averaged 98% for both herbicide strategies at Clarkton and Rocky Mount. At Kinston, sicklepod control averaged 42% for PRE herbicide alone and 66% for PRE herbicide followed by POST herbicide whereas heterogeneity of large crabgrass infestation prevented to draw conclusions about the efficacy of the two herbicide strategies. Overall, Palmer amaranth density increased with wider row spacings. For 19 cm rows, its density decreased from 8 plants.m^{-2} to 2 plants.m^{-2} when sorghum population increased from 80,000 to 300,000 plants per acre. Its biomass has been primarily affected by plant population and reached a maximum dry weight of 1420 g.m^{-2} for 76 cm rows and 40,000 plants per acre, and a minimum of 400 g.m^{-2} for 19 cm rows and 300,000 plants per acre. Sicklepod control tended to increase with plant population for both the 19 and 38 cm row spacings. For 76 cm row spacing, percentage of control at a given date remained similar between the different plant populations. Sorghum yields were shown to present significant differences at Clarkton and Rocky Mount. The highest yields were associated with the combination of narrow rows (19 cm) and high plant densities (120,000 to 160,000 plants per acre). For both the 38 and 76 cm row spacings, 80,000 plants per acre produced optimal yields.

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WEED MANAGEMENT OPTIONS IN SORGHUM-BASED CROPPING SYSTEMS IN NC. R. Riar*, W. J. Everman; North Carolina State University, Raleigh, NC (237)

ABSTRACT

North Carolina growers produced Sorghum on 70,000 acres in year 2012. This acreage is expected to increase in 2013 due to assured market, grower enthusiasm, low production cost, drought tolerance and lower risk compared to corn, especially on sandy soils. Since sorghum is an old crop with renewed interest, this is the first time it has been grown on a large scale. This crop may be a good fit in the overall cropping system of the state. However, limited research based production and management information is available in the state. Weed control is an important aspect of profitable crop production which has a bearing on the success of a new crop, and in determining its fit in a cropping system. So to address the issues of successful weed management under the given environment and cropping system, three studies were conducted to evaluate the impact of different herbicides and weed management strategies on sorghum growth and yield. The first study was conducted to evaluate the response of sorghum to three rates of 2, 4-D amine and one rate of Dicamba applied post beyond the recommended growth stage (6-8" tall), at 10, 14, 18, 22, 26, and 29 inch height, at two locations. Significant reduction in yield was observed with later applications of both 2, 4-D and dicamba compared to earlier applications. The second study evaluated effect of two rates of Huskie tank mixed with Atrazine, Banvel, 2, 4-D, and AMS on weed control and yield, at two locations. At one location, there were no differences within treatments, but at the second location, lower rate of Huskie tank mixed with Atrazine and Banvel or 2, 4-D yielded higher than higher rate of Huskie mixed with Atrazine and AMS. The third study tested the impact of Huskie mixed with different adjuvants on crop injury and yield. All treatment combinations caused significant visible injury on sorghum leaves. However the crop grew out of it and grain yield was similar for all treatments.

NEW HERBICIDE OPTIONS FOR RICE PRODUCTION. B. M. McKnight*, E. P. Webster, J. C. Fish, N. D. Fickett; LSU AgCenter, Baton Rouge, LA (238)

ABSTRACT

Benzobicyclon is a carotenoid biosynthesis inhibiting herbicide discovered and currently used in Japan rice production systems. Field and greenhouse studies were initiated in 2012 to evaluate benzobicyclon activity on weed species encountered in Mid-South rice cropping systems. The field study was conducted at the Louisiana State University Rice Research Station near Crowley, Louisiana. A burndown application of glyphosate at a rate of 1.12 g/ha was applied to establish a clean seedbed. Seven days later, 91-cm diameter rings were installed in individual plots for treatment containment. A 5-cm seeding flood was established and pre-germinated 'CL 161' rice was water-seeded into the rings. The seeding flood was removed 24-h later to allow for seedling establishment. When rice was at the 1-leaf growth stage, a permanent flood was established and maintained in a pin-point fashion. GWN-9796 in an SC formulation was applied at PP, two- to three-leaf rice and four-to five-leaf rice. Rates for all applications were 600 g ai/ha and the POST treatments were applied with 1% v/v COC. Weed control ratings of four species, ducksalad [*Heteranthera limosa* (Sw.) Willd.], yellow nutsedge (*Cyperus esculentus* L.), hemp sesbania [*Sesbania exaltata* (P. Mill.) McVaugh], and barnyardgrass [*Echinichloa crus-galli* (L.) Beauv.] was recorded at 28, 35 and 42 days after the initial PP application timing. At 42 DAT, control from the PP application was 98, 96, 50 and 98% for ducksalad, yellow nutsedge, hemp sesbania, and barnyardgrass, respectively. Barnyardgrass and yellow nutsedge receiving the two- to three-leaf application was controlled 75 and 83%, respectively. This was less than was observed for these two species receiving the PP application. Across all treatment timings, symptoms were very slow to develop in hemp sesbania and the highest observed control was 53%. In the greenhouse study conducted at the Louisiana State University campus in Baton Rouge, Louisiana, seedling weeds were transplanted into 38 liter containers designed to hold a flood depth of 0, 5, 10 and 15-cm. Weed size at the time of transplanting was two- to three-leaf for yellow nutsedge, three- to four-leaf for hemp sesbania, two- to three-leaf for barnyardgrass and three-to four-leaf for Indian jointvetch (*Aeschynomene indica* L.). A shallow flood was introduced 7 days after transplanting and treatments were applied 24 h later. Two hours after treatment, the targeted flood depths were established. Herbicide treatments consisted of two formulations of GWN-9796, an SC and G, and both were applied at a rate of 600 g/ha. The SC formulation was applied with 1% v/v COC. Weed control was evaluated 7 and 14 days after application. Indian jointvetch control in the 5-cm flood was 35 and 48% when treated with the G and SC formulations, respectively; compared with 20 and 73%, respectively, with the 10-cm flood. Control of Indian jointvetch improved to 68 and 98% in the 15-cm flood when treated with the G and SC, respectively. Barnyardgrass control in the 15-cm flood was 63 and 98% when treated with the G and SC formulations, respectively. As flood depth decreased, control also decreased. Barnyardgrass treated with the SC formulation was controlled 85 and 80% with a 10- and 5-cm flood, respectively. Yellow nutsedge control was 98% treated with both the G and SC formulation in a 15-cm flood; however, the G formulation controlled yellow nutsedge 68% in the 10-cm flood compared with 98% control with the SC. Data indicates weed control increased when GWN-9796 is applied in the SC formulation with deeper flood water.

IMPACT OF RICE SEEDING RATE AND HERBICIDE PROGRAM ON BARNYARDGRASS CONTROL IN CLEARFIELD RICE. S. S. Rana*, J. K. Norsworthy, D. B. Johnson, D. S. Riar, H. D. Bell, B. W. Schrage, Z. T. Hill, M. T. Bararpour; University of Arkansas, Fayetteville, AR (239)

ABSTRACT

Barnyardgrass is the most important weed in Arkansas rice. A high percentage of rice fields in Arkansas contain propanil- and quinclorac-resistant barnyardgrass. Recommended seeding rates for hybrid rice (6 seed/ft of row) are one-fourth those for conventional rice (24 seed/ft of row); hence, the ability to establish a dense and uniform crop canopy to reduce the weed emergence and growth may differ between conventional and hybrid rice. Clomazone (PRE) and imazethapyr fb imazamox (POST) can be effective means for controlling propanil- and quinclorac-resistant barnyardgrass in rice. Therefore, a field trial was conducted at Stuttgart (silt loam soil), AR, in 2012 to evaluate the impact of rice seeding rate and herbicide program on barnyardgrass control in clearfield rice. Clearfield 152, the conventional variety, and Clearfield XL 745, a hybrid, were planted at 1/8 to 4 times (X) their respective recommended seeding rates. Herbicide programs used were PRE fb POST and POST-only applications. Clomazone was applied PRE at 0.3 lb ai/A; imazethapyr was applied EPOST and PREFLD at 0.063 lb/A; and imazamox was applied POSTFLD at 0.04 lb/A. All the POST applications included adjuvants. Environmental conditions were conducive for rice emergence and rice populations were representative of the seeding rate at 2 WAP. At 2 WAP, PRE-applied clomazone reduced the barnyardgrass count 6 folds; thereby, decreased the selection pressure on following postemergence herbicide applications. At 6 WAP, percent groundcover for rice seeding rates ≤1/2X was higher for conventional than hybrid rice (planted $1/4^{th}$ the seeding rate of conventional rice). However for rice seeding rates ≥1X, the percent groundcover did not vary between rice cultivars indicating the profuse tillering ability of hybrid rice. At harvest, PRE fb POST and POST-only herbicide programs resulted in lesser barnyardgrass panicle count than the non-treated check. In addition, POST-only applications resulted in escapes of barnyardgrass in conventional rice but not in hybrid rice indicating the efficacy of hybrid rice cultivar to reduce the selection pressure on herbicide applications the following year. Based on the results of this study, only the herbicide program, not the rice variety and seeding rate, influenced barnyardgrass density. However, the use of competitive rice cultivars and seeding rates will reduce panicle formation in barnyardgrass and in turn should lower the subsequent seedbank, reducing selection pressure on herbicide applications subsequent years.

EVALUATION OF SHARPEN IN CLEARFIELD RICE WEED CONTROL PROGRAM. G. B. Montgomery*, J. A. Bond, H. M. Edwards, S. A. Shinkle, T. W. Eubank; Mississippi State University, Stoneville, MS (240)

ABSTRACT

Sharpen (saflufenacil) is a PPO-ase inhibiting herbicide that was first labeled for use in 2009. Sharpen exhibits postemergence and residual activity. It is currently labeled for burndown in corn, cotton, soybeans, and a variety of other crops. Sharpen labeling was updated to include burndown in rice in 2011, but applications are restricted to 15 d prior to planting. Broadleaf weeds are difficult to control in Clearfield rice because Newpath (imazethapyr) control a limited number of broadleaf weeds. Even though Sharpen is labeled for application prior to rice planting, it is not labeled for in-season use. The objective of this study was to compare the efficacy of Sharpen to other broadleaf herbicides applied in mixtures with Newpath at two application timings in Clearfield rice. The study was conducted in 2012 at the Mississippi State University Delta Research and Extension Center in Stoneville, MS. The soil texture was a Sharkey clay with a pH of 8.2. Individual plots were 5.33 feet wide and 15 feet long. CL 151 was drill-seeded at 65 lb/A. Treatments were arranged as a two-factor factorial within a randomized complete block design with four replications. The first factor was herbicide timing and consisted of early-postemergence (EPOST) timing to one- to two- leaf rice, and late-postemergence (LPOST) that was applied to four- to five- leaf rice. The second factor was broadleaf herbicide and included Sharpen at 0.045 lb ai/A, Aim (carfentrazone) at 0.031 lb ai/A, Permit Plus (halosulfuron plus thifensulfuron) at 0.035 lb ai/A, RiceBeaux (propanil plus thiobencarb) at 4.5 lb ai/A, and no broadleaf herbicide. Each plot received two applications of Newpath at 0.063 lb ai/A EPOST and LPOST. Broadleaf herbicides were applied in mixture with Newpath at the specified timings. Weed control and injury were visually estimated 7, 14, and 28 DAT, and rough rice yield was determined. Data were subjected to ANOVA with means separated using Fisher's protected LSD at p=0.05. Sharpen injured rice more than other broadleaf herbicides following EPOST application. No rice injury was observed 14 days after LPOST with any treatment. Sharpen controlled hemp sesbania $\geq$96% with applications at both timings. Sharpen controlled more hemp sesbania than Permit Plus and RiceBeaux following EPOST applications but not LPOST applications. Sharpen provided similar Palmer amaranth control following EPOST and LPOST applications. Palmer amaranth control with Aim and Permit Plus was less than that with Sharpen and RiceBeaux, regardless of timing. The addition of Sharpen increased barnyardgrass control compared with Newpath alone following EPOST but not LPOST applications. Rice yield was optimized following RiceBeaux LPOST or Sharpen EPOST. Rice yield was greater when Sharpen or Aim were applied EPOST compared with LPOST. However, rice yield following Permit Plus or RiceBeaux was greater when application were delayed to LPOST. Sharpen controlled hemp sesbania and Palmer amaranth when applied in mixtures with Newpath. Sharpen improved barnyardgrass control when mixed with Newpath at the EPOST application. Sharpen provided broadleaf weed control that was greater than or equal to currently-labeled herbicides. Sharpen should be included with the first application of Newpath to avoid yield loss.

INFLUENCE OF RATE AND APPLICATION TIMING ON RICE TOLERANCE TO WARRANT. M. T. Bararpour*[1], J. K. Norsworthy[1], D. B. Johnson[1], B. Scott[2]; [1]University of Arkansas, Fayetteville, AR, [2]University of Arkansas, Lonoke, AR (241)

ABSTRACT

About 3 billion people, nearly half the world's population, depend on rice for survival. Arkansas has been the nation's leading rice-producing state since 1973. Field studies were conducted at Keiser and Stuttgart, Arkansas, in 2011 and 2012 to evaluate the influence of rate and application timing of Warrant (acetochlor) on rice tolerance. The experiment was designed as a three (application timings) by three (Warrant rates) factorial in a randomized complete block design. Warrant was applied at 1, 2, and 3 pt/A at spiking, 2-leaf, and 4-leaf stages of rice. A nontreated check was included. All weeds were controlled throughout the test area. On a clay soil at Keiser, five weeks after emergence, there was no rice injury when Warrant was applied at 2-leaf stage of rice, regardless of rate. Rice injury was only 4 and 3% following Warrant at 3 pt/A at spiking and 4-leaf rice stage, respectively. On a silt loam soil at Stuttgart, rice injury was 28, 43, and 62% at spiking; 4, 16, and 18% at 2-leaf rice; and 1, 3, and 3% at 4-leaf stages of rice from the application of Warrant at 1, 2, and 3 pt/A, respectively. At both locations, plots that received Warrant at 1and 2 pt/A provided comparable yield to the nontreated check (averaged over years and timings). However, rice yield was reduced 7% from the highest rate (3 pt/A) of Warrant. In conclusion, rice exhibited tolerance to Warrant applied at 2 pt/A at the 2- to 4-leaf stage of rice without yield loss.

INFLUENCE OF ITALIAN RYEGRASS CONTROL PROGRAMS ON CORN AND COTTON. J. A. Bond*, T. W. Eubank, H. M. Edwards, S. A. Shinkle, G. B. Montgomery; Mississippi State University, Stoneville, MS (242)

ABSTRACT

Glyphosate-resistant (GR) Italian ryegrass (*Lolium perenne* ssp. *multiflorum*) was first documented in the United States in Oregon in 2003. Regionally, two populations of GR Italian ryegrass exhibiting a three-fold resistance were identified in field crops in Washington County, Mississippi, in 2005. Glyphosate-resistant Italian ryegrass is now present in 31 counties in Mississippi. Research to address management of GR Italian ryegrass was initiated at the Delta Research and Extension Center in Stoneville, Mississippi, in 2005. This research has shown that a minimum of two herbicide applications are required for >90% control of GR Italian ryegrass. However, herbicide programs that provide nearly complete GR Italian ryegrass control are costly and growers are sometimes hesitant to invest the required money during burndown. Therefore, research is needed to demonstrate the yield loss associated with GR Italian ryegrass that is not controlled during burndown. Two studies were conducted in 2011-12 at an on-farm site near Elizabeth, Mississippi, to determine the impact on cotton and corn yield of GR Italian ryegrass that survives burndown herbicide programs. The two studies were identical until planting in spring 2012. Treatments were arranged as a three-factor factorial in a randomized complete block design with four replications. Factor A was fall application and included no fall treatment, tillage, or application of a mixture of *S*-metolachlor (1.27 lb ai/A) plus paraquat (0.75 lb ai/A). Fall applications were made November 7, 2011. Factor B was winter application and included no winter treatment or clethodim (0.094 lb ai/A) applied February 2, 2012. Factor C was spring application and included no spring treatment or paraquat (1 lb ai/A) applied February 27, 2012. In the first study, corn was planted February 27, 2012, and cotton was planted in the second study on April 20, 2012. Data collected included visual estimates of GR Italian ryegrass control after the last herbicide application as well as crop height, density, and yield at appropriate intervals during the growing season. Data were subjected to ANOVA with means separated by Fisher's protected LSD at p=0.05. Two herbicide applications were required for >90% control of GR Italian ryegrass in both studies. Glyphosate-resistant Italian ryegrass control was reduced in programs that did not include a fall treatment. Cotton yield and economic returns were reduced 85% in plots receiving no herbicide for control of GR Italian ryegrass compared with the highest yielding plots. Corn yield and economic returns were reduced 65% in plots receiving no herbicide for control of GR Italian ryegrass compared with the highest yielding plots. Although two herbicide applications were required to completely control GR Italian ryegrass, data indicates that complete control was not necessary to optimize cotton yield and economic returns. Cotton yield and economic returns were optimized following programs that contained *S*-metolachlor in the fall or clethodim in winter. Corn yield and economic returns were optimized following programs that contained S-metolachlor in the fall or when fall tillage was followed by clethodim in winter and paraquat in spring.

SIMULATING THE SIMULTANEOUS EVOLUTION OF BARNYARDGRASS RESISTANCE TO ALS- AND ACCASE-INHIBITING HERBICIDES IN MIDSOUTH RICE. M. V. Bagavathiannan*[1], J. K. Norsworthy[1], K. L. Smith[2], P. Neve[3]; [1]University of Arkansas, Fayetteville, AR, [2]University of Arkansas-Extension, Monticello, AR, [3]University of Warwick, Warwick, England (243)

ABSTRACT

Herbicide resistance in barnyardgrass is an important challenge to sustainable rice production in the Midsouth region. Resistance has been confirmed for some of the major rice herbicides, including propanil, quinclorac, clomazone, and lately to imazethapyr (and cross resistance to other acetolactate synthase (ALS)-inhibiting herbicides). Barnyardgrass resistance to ALS-inhibiting herbicides is particularly a growing concern in the Clearfield™ rice production system, which has been widely adopted in the Misouth. Most rice growers heavily rely on some of the acetyl-COA carboxylase (ACCase)-inhibiting herbicides such as fenoxaprop and cyhalofop to control barnyardgrass resistant to other herbicides, ultimately leading to selection pressure on the latter herbicides. If barnyardgrass evolves resistance to the ACCase-inhibiting herbicides, control of this species will be challenging because few herbicide options are left to achieve season-long barnyardgrass control in rice. The prime barnyardgrass management goals in Clearfield™ rice are a) prevent further spread of ALS-inhibitor-resistant barnyardgrass, and b) prevent simultaneous evolution of resistance to ALS- and ACCase-inhibiting herbicides (i.e., multiple resistance) in barnyardgrass. A simulation model was developed to address these goals, using the STELLA visual programming language. Barnyardgrass emergence was predicted across the important rice growing region in eastern Arkansas using historical weather data. For each weed management scenario, 1000 model runs were performed over a 30-year period. A population was considered to have evolved resistance when at least 20% of the seedbank consisted of resistant individuals. Under a sole application of ALS-inhibiting herbicides (four applications annually) in continuous Clearfield™ rice, resistance is predicted within only four years of adopting this program, with about 40% risk by year 10. Model predictions largely corroborate field observations in the Midsouth rice production. Cyhalofop applied 14 d POSTFLD helped reduce the risk of ALS-inhibitor resistance to about 27% by year 10. Analysis of the seedbank population, however, showed that the number of individuals with multiple resistance to ALS- and ACCase-inhibiting herbicides steadily increased under this program, although not reaching the 20% seedbank threshold. When fenoxaprop was applied PREFLD, risk of ALS-inhibitor resistance was further reduced to about 14% by year 10; however, there is a risk of selecting for multiple resistance (about 5% risk by year 20). In situations where both fenoxaprop (PREFLD) and cyhalofop (14d POSTFLD) were applied, the risk of multiple resistance increased even further (about 12% risk by year 10). Results suggest that there is a high risk for evolution of multiple resistance in barnyardgrass to both ALS- and ACCase-inhibiting herbicides in Clearfield™ rice, particularly in fields where ACCase-inhibiting herbicides are heavily relied upon, further suggesting the need for more diversified barnyardgrass management programs that incorporate all herbicide and non-chemical strategies available at one's disposal. Research is underway to devise more diversified barnyardgrass management programs using the model.

EVALUATION OF FALL-APPLIED HERBICIDES FOR HENBIT (*LAMIUM AMPLEXICAULE*) MANAGEMENT. B. C. Woolam*, D. Stephenson, R. L. Landry; LSU AgCenter, Alexandria, LA (244)

ABSTRACT

Experiments were conducted at the LSU AgCenter Dean Lee Research and Extension Center Alexandria, LA in 2011-2012. This experiment evaluated date of application and residual herbicides for the control of the winter annual henbit. Experiments were a 5 by 7 factorial arranged in an randomized complete block with four replications. Factors consisted of: (1) residual herbicide application date (November 15, December 1, December 15, January 1 or January 15); (2) paraquat at 840.47 g ha^{-1} plus no residual herbicide, paraquat plus oxyfluorfen at 280 g ha^{-1}, paraquat plus flumioxazin at 72 g ha^{-1}, paraquat plus *S*-metolachlor at 1420 g ha^{-1}, paraquat plus pyroxsulfone at 150 g ha^{-1}, paraquat plus chlorimuron/metribuzin at 17/100 g ha^{-1}, paraquat plus diuron at 840 g ha^{-1}. Flumioxazin, oxyflurofen, and *S*-metolachlor applied on November 15th controlled henbit 80% or greater 21 d after application (DAA). However, only flumioxazin and oxyflurofen controlled henbit greater than 80% when applied on December 1st 21 DAA. All residual herbicides controlled henbit at least 80%, except pyroxasulfone, 21 DAA when applied on December 15th. Oxyflurofen is the only herbicide applied on November 15 to provide greater than 80% henbit control 35 DAA. The premix of chlorimuron/metribuzin, oxyflurofen, and flumioxazin provided greater than 80% henbit control 35 DAA when applied on December 1st. All residual herbicides provided at least 90% control of henbit when applied December 15th 35 DAA. Henbit control was greater than 80% 50 DAA following oxyflurofen applied November 15th, chlorimuron/metribuzin, diuron, oxyflurofen, and flumioxazin applied December 1st, and following all residual herbicide treatments applied December 15th, except *S*-metolachlor which provided 73% control. Preliminary data indicates that oxyflurofen provides the greatest henbit control that is independent of application date; however, most residual herbicides evaluated provided at least 90% henbit control when application was delayed until December 15th. Research will be repeated in 2012/2013 to substantiate results.

EFFICACY OF FALL- AND SPRING-APPLIED HERBICIDES FOR THE CONTROL OF HENBIT (*LAMIUM AMPLEXICAULE*). T. W. Eubank*[1], D. Stephenson[2], J. A. Bond[1], B. Edwards[3], R. L. Landry[2], B. C. Woolam[2]; [1]Mississippi State University, Stoneville, MS, [2]LSU AgCenter, Alexandria, LA, [3]Mississippi State University, Starkville,MS, MS (245)

ABSTRACT

Producers typically apply non-selective herbicides for the removal of weeds prior to planting to soybean (*Glycine max*). These applications can be confounded by environmental extremes making timely removal of winter weeds difficult. Henbit (*Lamium amplexicaule* L.) is a major winter weed in the Mississippi Delta which has recently become increasingly difficult to control with spring-applied burndown options. Henbit can emerge throughout most of the growing season with emergence occurring in fall and spring in the southern U.S. Furthermore, henbit has also been to shown to be an alternate host for several insect species as well as soybean cyst nematode. Previous research has shown that fall-applied residual herbicides can be effective in preventing the emergence of winter weeds until planting. The objective of this study was to compare the efficacy of fall- vs. spring-applied soybean herbicides for the control of henbit. Studies were conducted in 2011-2012 at two locations in Mississippi and one location in Louisiana. Investigations were made to evaluate the efficacy of several fall-applied residual herbicides including: 0.39 lb ai/A Authority MTZ, 0.22 lb ai/A Authority XL, 1.63 lb ai/A Boundary, 0.19 lb ai/A Canopy, 0.031 lb ai/A Canopy EX, 1.3 lb ai/A Dual Magnum, 0.09 lb ai/A Envive, 0.143 lb ai/A Fierce, 0.31 lb ai/A LeadOff, 0.016 lb ai/A Resolve, 0.064 lb ai/A Valor, 0.088 lb ai/A Valor XLT and 0.106 lb ai/A Zidua. All treatments including the treated check included 0.56 lb ai/A paraquat to control existing vegetation. Treatments were applied in November at all three locations. Visual ratings were taken at 14, 28, 56 and 90 DAT. All data was analyzed in ANOVA using the PROCMIXED procedure at the 0.05 level of significance in SAS. Results indicate that all fall-applied treatments, with the exception of Zidua (82%), were comparable and provided at least 92% control of henbit 90 DAT. Additional weeds of cutleaf evening primrose (*Oenothera laciniata*) and curly dock (*Rumex crispus*) were observed at one location. The treatments of Dual Magnum, LeadOff and Resolve provided <60% control of cutleaf evening primrose. Zidua and Valor were comparable at 80 and 89% control, respectively. Valor was not significantly different than other treatments providing at least 94% control. Resolve provided only 47% control of curly dock 90 DAT. All other treatments were comparable providing at least 80% control. A survey of trials conducted at The Delta Research Extension Center in Stoneville, Miss. from 2003-2012 were gleaned for henbit control data with various spring-applied postemergence (POST) herbicides. When averaged across years 0.75 lb ai/A glyphosate provided 87% control of henbit 28 DAT. The addition of 1 lb ae/A 2,4-D or 0.25 lb ae/A dicamba to glyphosate did not significantly improve control at 92% and 90%, respectively. The combination of glyphosate plus 0.031 lb/A Canopy EX provided 99% control of henbit across years. The addition of 0.34 lb ai/A metribuzin or 0.3 lb ai/A Canopy to 0.75 lb ai/A paraquat provided at least 97% control of henbit and significantly improved control over paraquat alone at 80%. These results suggest that all fall-applied residual herbicides evaluated provided acceptable control of henbit into spring. Henbit control with spring-applied POST herbicides is variable with glyphosate or paraquat alone and the addition of residual herbicides to these treatments improved control.

DISSIPATION OF OIL- AND WATER-BASED PENDIMETHALIN FORMULATIONS IN HIGH ORGANIC MATTER SOIL . D. C. Odero*[1], D. L. Shaner[2]; [1]University of Florida, Belle Glade, FL, [2]USDA, Fort Collins, CO (246)

ABSTRACT

Approximately 80% of sugarcane acreage in Florida is in the Everglades Agricultural Area (EAA). The EAA is dominated by organic or muck soils. Currently, there is no data available on bioavailability and persistence of pendimethalin applied PRE for weed control in sugarcane on organic soils of the EAA. Therefore, field studies were conducted in 2011 and 2012 near Belle Glade, FL to evaluate dissipation of pendimethalin on organic soils of the EAA. Treatments consisted of water- and oil-based pendimethalin formulations applied PRE at 2, 4, and 8 kg/ha following sugarcane planting. The initial amount of pendimethalin in the soil was higher with the water-based formulation compared to the oil-based formulation. This was probably due to lower volatility of the water-based formulation. However, the rate of dissipation of the water- and oil-based formulations were very similar. The time to 50% dissipation (DT_{50}) was between 10 to 20 d and 12 to 14 d in 2011 and 2012, respectively for the water-based formulation. The DT_{50} was 10 to 32 d and 8 to 12 d in 2011 and 2012, respectively for the oil-based formulation.

IS THE GRASS REALLY GREENER? A SURVEY OF FORMER EXTENSION WEED SCIENTISTS. J. A. Kendig*[1], S. Kelly[2]; [1]Monsanto, St. Louis, MO, [2]The Scotts Company, Apopka, FL (247)

ABSTRACT

Over the past 10 years, upwards of 12 individuals left extension positions within the SWSS region, and approximately ½ of these individuals were extension weed specialists. Industry versus academia and extension is routinely discussed, and there are often some common themes as the attributes of each are discussed. A survey of 33 questions was given to seven individuals who recently left extension. Most of the questions (27) were statements which asked for a one to five response of 1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree. Additionally, respondents were asked to compare their salary. Five narrative questions asked for the best and worst aspects of Extension and Industry, and for "Anything else that the respondents wished to convey". The numerical-response questions focused on Job satisfaction, Administration, Funding, Competition, Clientele, and the changes between Industry and Extension. Survey results were difficult to interpret statistically. With a typical response, there was some consensus, usually also an outlier response. Also, no response differed statistically from neutral. There may have been some bias: many questions, while based on typical discussions, were somewhat negative in tone. The results of numerical questions are listed below in Table 1. The statement generating the maximum agreement was that "County level extension is largely obsolete due to agronomic services supplied by consultants, sales reps and dealership agronomists." When this subject is discussed in extension, it is often stated that county councils are where the primary political support exists for extension, and that these councils are generally unsupportive of doing away with positions in their counties. In a similar vein, the question generating the highest level of disagreement was "I believe that agronomic extension has a bright future with respect to funding and staffing. Statements regarding administration were not among the highest 8 in consensus. Persons moving from Extension to Industry averaged a 39% increase in pay. In many instances this difference is not necessarily reflected in the salary as much as an annual bonus program. With narrative questions, respondents often cited "helping growers" and "freedom" as the best aspects of extension and "unclear objectives", "publication pressure", and "Red Tape" as negative aspects. In industry, "the ability to work with cutting edge technology", "pay and benefits", "strong funding and infrastructure", and a "clear logical objective" were positives; while "less freedom and legal constraints", and "separation from growers" were cited as negative aspect. The open question of "what else would you like to convey" generated broad responses, including some major frustrations; however, there was a strong tendency to praise the mission of extension and the work being conducted by specialists as very important.

Survey results are on the following page.

Table 1. Survey of former extension specialists.

No.	Question	Responses 1 = Strongly Agree 5 = Strongly Disagree Avg	SD	Min	Max
1	I would encourage interested young persons to pursue my old extension position, but primarily for short term employment.	2.9	1.1	1	4
2	I would encourage interested persons to pursue my old extension position for long term employment.	3.7	1.4	2	5
3	I was pleased with the direction given by Extension administration.	3.4	1.1	1	4
4	I believe that my administration was doing the best it could with the situation it was dealt.	3.1	1.6	1	5
5	Frustration with administration was a primary reason I moved to industry	2.7	1.4	1	4
6	My performance was ranked more by my production of scholarly publications than the quality and quantity of my extension efforts.	2.3	1.1	1	4
7	I was pleased with overall extension funding and staffing at the state-specialist level.	3.9	0.7	3	5
8	I was pleased with the overall extension funding and staffing at the county*-specialist level (*or regional level if you do not have true “county agents”).	3.6	1.1	2	5
9	I believe that agronomic extension has a bright future with respect to funding and staffing.	4.0	1.2	2	5
10	Weed Science Extension has a strong advantage over other extension due to industry funding	2.1	1.2	1	4
11	An imbalance between workload versus staffing and funding was a rapidly increasing problem.	1.9	0.9	1	3
12	My role in extension was mostly to be the actual speaker/expert at grower meetings.	2.6	1.1	1	4
13	My role in extension was mostly to generate educational materials and PowerPoint shows for the county agent to use.	3.7	1.0	2	5
14	County-level extension is largely obsolete due to agronomic services supplied by consultants, sales reps, and dealership agronomists.	1.7	0.5	1	2
15	State level extension is largely obsolete due to agronomic services supplied by consultants, sales reps, and dealership agronomists.	3.4	1.1	2	5
16	The internet had a positive effect on county-level extension programming.	3.3	1.3	1	5
17	The internet had a positive effect on state-level extension programming.	2.4	1.0	1	4
18	The NRCS was a major competitor to extension.	2.9	1.3	1	4
19	The NRCS generally provided growers with sound advice.	3.3	1.0	2	4
20	Growers/Clientele appreciated the efforts of our agronomic extension programs.	2.3	1.3	1	4
21	Growers/Clientele, while verbally supportive, had little genuine effect on administration and overall funding.	2.7	1.6	1	5
22	Our grower meetings were attended mostly by active farmers, wanting new information.	3.6	1.0	2	5
23	Our grower meetings were usually dominated by older, retired growers.	2.1	1.3	1	4
24	Pay was a primary reason I moved to industry	3.1	1.2	2	5
25	What's is the percent difference in pay in your new vs old role?	38.9	27.6	20	100
26	The desire to do something more meaningful was a primary reason I moved to industry.	2.3	1.4	1	5
27	I am aware of less job security in my new role.	2.3	1.6	1	5
28	My transition from extension to industry was difficult and required a very different mindset.	3.9	1.5	1	5

EFFECT OF HERBICIDE STRIP WIDTH AND LATE SEASON WEED COMPETITION ON WINE GRAPE GROWTH AND YIELD. W. E. Mitchem*[1], K. M. Jennings[2], D. W. Monks[3], S. Spayd[4], S. L. Meyers[5], H. Lisa[4], B. Smith[4]; [1]North Carolina State University, Mills River, NC, [2]NCSU, Raleigh, NC, [3]North carolina state university, Raleigh, NC, [4]NC State University, Raleigh, NC, [5]Mississippi State University, Pontotoc, NC (196)

ABSTRACT

A field study was initiated in fall 2010 at RayLen Vineyards and Winery in Yadkin Valley, NC to determine effect of herbicide strip width and mid-summer weed competition on vine vigor, yield and juice quality of ‘Cabernet Franc’ wine grapes planted April 2001. In row strip widths included 0, 30, 60, 120, and 240 cm. The experimental design was a randomized complete block with subplots and four replications. All main plots were maintained weed-free until July each year and then they were split such that subplots had either late emerging weeds through harvest, or were controlled till harvest. Natural weed infestation included large crabgrass, goosegrass, and white clover. No differences were observed in cluster number, cluster weight, or total yield in 2011. However, as strip width decreased, brix level increased. Increased competition from late germinating weeds also increased brix. Titratable acidity and pruning weight increased as strip width increased from 0 to 240 cm. In 2012, 240 cm weed-free herbicide strip produced larger clusters than 0 or 30 cm weed-free herbicide strips. Treatments did not affect brix, pH, or titratable acidity of grape juice.

INFLUENCE OF VEGETATION-FREE STRIP WIDTH ON NEWLY PLANTED NAVAHO BLACKBERRY GROWTH, YIELD, AND FRUIT QUALITY. S. L. Meyers*[1], K. M. Jennings[2], D. W. Monks[3], W. E. Mitchem[4]; [1]Mississippi State University, Pontotoc, NC, [2]NCSU, Raleigh, NC, [3]North carolina state university, Raleigh, NC, [4]North Carolina State University, Mills River, NC (197)

ABSTRACT

Field studies were conducted in 2011 and 2012 at the Sandhills Research Station near Jackson Springs, NC to determine the influence of vegetation-free strip width (VFSW) on newly planted ‘Navaho’ blackberry growth, yield, and fruit quality. Treatments consisted of 0, 0.3, 0.6, 1.2, 1.8, and 2.4 m VFSW. Blackberry yield displayed a positive quadratic response to VFSW. Predicted blackberry yield increased from 711 to 1,030 kg ha^{-1} at VFSW of 0 to 1.8 m and decreased from 1,030 to 960 kg ha^{-1} at VFSW of 1.8 to 2.4 m. Predicted post-harvest floricane weight per plant displayed a positive quadratic response to VFSW at one of two locations and increased from 0.19 to 0.30 kg at VFSW of 0 to 1.5 m and decreased from 0.30 to 0.26 kg at VFSW of 1.5 to 2.4 m. Predicted individual blackberry fruit weight displayed a positive linear response to VFSW and increased from 3.1 to 3.6 g per fruit at VFSW of 0 to 2.4 m. Soluble solids content (SSC) of dull black blackberry fruit decreased from 15.0 to 14.4 °Brix at VFSW of 0 to 1.4 m and increased from 14.4 to 14.7 °Brix at VFSW of 1.4 to 2.4 m. VFSW did not influence shiny black blackberry fruit SSC, nor titratable acidity, sugar-to-acid ratio, or pH of shiny or dull black blackberry fruit or primocane number, length, and stem caliper.

NEWLY ESTABLISHED PECAN TREE RESPONSE TO INDAZIFLAM. T. L. Grey*[1], K. S. Rucker[2]; [1]University of Georgia, Tifton, GA, [2]Syngenta, Tifton, GA (198)

ABSTRACT

Weed competition can reduce growth in new pecan (*Carya illinoinensis*) orchards by more than 50% and has the capability of competing with trees for sunlight, moisture, and nutrients. Weeds also serve as inoculum for diseases and alternate host for insects. Establishing herbicide strips surrounding newly planted trees increases survival and growth. Thus reducing the time for pecan trees to begin bearing nuts and producing the first commercially viable yield. Indaziflam can be applied to trees that have been established in field for at least 3 years. If newly planted trees in the first year of establishment could be treated with indaziflam to promote season long weed free paths, then irrigation and soil nutrients could be more efficiently utilized and establishment of nut producing trees could be quickened. Newly planted pecan trees were established in winter of Jan 2011 and Jan 2012 in Georgia followed by applications of indaziflam at 75 or 150 g AI/ha in March followed by sequential application of the same rates in April. A weed free-nontreated control was included for comparison. Trees were monitored for visual injury, monthly caliper measures of at least 3 tree trunks at 15 cm above the soil in each replication (4 total), and tree height measure. For all treatments, there was no visible injury to newly developed leaves during either growing seasons. Linear regression analysis of 2011 and 2012 data indicated no differences for the parameter estimates as compared to the nontreated controls. Average pecan tree trunk growth rate was 0.093, 0.137, and 0.127 mm per day for indaziflam at 150 and 300 g/ha, and nontreated control during the 2011 growing season. In 2012, average pecan tree trunk growth rate was 0.04, 0.047, 0.060 mm per day for indaziflam at 150 and 300 g/ha and nontreated control. Overall there were no differences in pecan tree growth for indaziflam and the nontreated control for the first year of establishment in newly planted orchards.

CROP CIRCLES AND ORGANIC WEED CONTROL. A. J. Price*, T. S. Korneckie; USDA-ARS, Auburn, AL (199)

ABSTRACT

Organic vegetable production relies on integrated weed control measures to attain satisfactory weed control. An experiment was established in autumn 2010 and 2011 at the North Alabama Horticulture Experiment Station, Cullman, AL. Plot size at both locations was 2.5 by 6 m containing a single row of tomatoes with 0.5 m spacing between plants. The three winter cover crops cereal rye [(*Secale cereale* L.) cv Elbon], crimson clover [(*Trifolium incarnatum* L.) cv AU Robin] and turnip (*Brassica rapa* L. subsp. *rapa* cv Civastro)] were compared to black polythene mulch for their weed suppressive potential and effect on yield and grade of fresh market tomatoes. In addition, organic weed control treatments consisting on corn gluten applied PRE alone, flaming, hand weeding, or corn gluten applied PRE followed by flaming were compared. A standard herbicide regime consisting of a PRE application of *S*-metolachlor (1.87 kg a.i./ha) followed by an EPOST metribuzin (0.56 kg a.i./ha) application, followed by a LPOST application of clethodim (0.28 kg a.i./ha) was also included for comparison. Results indicate that early smooth pigweed, crabgrass, and yellow nutsedge were adequately control in clover, plastic and rye systems when corn gluten followed by hand weeding was utilized compared to the herbicide standard. Marketable organic yield was lowest in systems that utilized flaming and all organic systems yielded less compared to the conventional herbicide treatment in each system likely due to mid-season weed interference.

EVALUATION OF WEED CONTROL AND SWEET POTATO TOLERANCE TO ALTERNATIVE HERBICIDES. D. K. Miller*[1], T. P. Smith[2], M. M. Mathews[1]; [1]LSU AgCenter, St. Joseph, LA, [2]LSU AgCenter, Chase, LA (200)

ABSTRACT

Field studies were conducted in 2012 at the Sweet Potato Research Station near Chase, La to evaluate weed control and crop tolerance with alternative herbicides applied in sweet potato. Treatments in study one included Zidua at 2 oz/A, Balance Pro at 2 oz/A, Fierce at 3 oz/A, Prefix at 2 pt/A, Valor at 2 oz/A, and Corvus at 3 oz/A, all applied PRE-transplant. Study two evaluated the same treatments with the exception being Fierce and Valor were excluded and replaced with Dual Magnum and Reflex each applied at the rate of 1 pt/A. Treatment application timing was immediately POST-transplant. In the third study, treatments were the same as in study two but applied 15 d POST-transplant following Valor at 1 oz Pre-transplant and Command at 1 pt/A immediately POST-transplant. In all three studies, Valor at 2 oz PRE-transplant followed by Command at 2 pt A immediately POST-transplant was included as a standard comparison. Variety 07-146 was planted on July 18. Soil type was a silt loam with pH 5.8. Parameters measured included visual crop injury estimates 14 and 42 d after treatment (DAT) in studies one and two and 28 and 42 DAT in study three, visual weed control estimates at 42 d after planting (DAT) in all studies, and yield. Visual injury was not observed at either evaluation interval in study one. Equivalent control of barnyardgrass (88 to 100%), yellow nutsedge (88 to 93%), carpetweed (100%), entireleaf morningglory (100%), spiny amaranth (67 to 97%), and goosegrass (92 to 100% was observed 42 DAT for all treatments evaluated. Zidua, Corvus, and Balance Pro resulted in no greater than 58% control of cutleaf groundcherry, while other treatments controlled the weed at least 85%. Yield of U.S. no. 1 and total yield (U.S. no. 1, canner, and jumbo) for the Valor/Command standard was 159 and 302 bu/A, respectively, which was equal to that for Fierce (169 and 294 bu/A) and Valor (146 and 264 bu/A), and greater than all other treatments (48 to 75 and 113 to 163 bu/A). In study two, Balance Pro and Corvus resulted in 72 and 82% visual injury, respectively, 14 DAT. All other treatments, with the exception of the standard (0% injury), injured the crop 15 to 40%. At 42 DAT, injury was still 73 and 85% for Balance Pro and Corvus, respectively. Zidua resulted in 30% injury while all other treatments resulted in injury no greater than 8% and equal to that observed for the standard. All treatments resulted in equivalent control of barnyardgras (85 to 100%), spiny amaranth (77 to 95%), yellow nutsedge (85 to 92%), cutleaf groundcherry (22 to 78%), carpetweed (97 to 100%), common purslane (95 to 100%), entireleaf morningglory (100%), and goosegrass (95 to 100%) 42 DAT. The Valor/Command standard treatment resulted in a 150 and 296 bu/A yield of U.S. no. 1and total yield, respectively, which was equal to that observed for Dual Magnum (111 and 231 bu/A), and greater than all other treatments (0 to 58 and 7 to 140 bu/A). In the third study, application of Corvus 15 d POST-transplant resulted in 83% visual injury, greater than all other treatments. Reflex injured the crop 8%, which was greater than all other treatments (0% injury) 28 DAT. At 42 DAT, injury was 65% for the Corvus treatment and the only one to result in injury. All treatments resulted in equal control of spiny amaranth (83 to 97%), cutleaf groundcherry (55 to 92%), carpetweed (100%), entireleaf morningglory (100%), and goosegrass (87 to 100%). Control of barnyardgrass with the Valor/Command standard was complete, which was equal to that for Zidua (100%), Dual Magnum (93%), and Prefix (95%), and greater than other treatments (77 to 85%). Yellow nutsedge was completely controlled by Zidua, Dual Magnum, and Reflex, and control was equivalent to that for Balance Pro (95%) and Prefix (98%), and greater than other treatments (82 and 83%). The Corvus treatment resulted in no yield when applied 15 d after POST-transplant. All other treatments resulted in equal yield ranging from 132 to 247 for U.S. no. 1 and 263 to 373 for total.

WEED MANAGEMENT IN SWEETPOTATO WITH FLUMIOXAZIN AND PYROXASULFONE. M. W. Shankle*[1], T. F. Garrett[1], I. A. Abukari[2]; [1]Mississippi State University, Pontotoc, MS, [2]Mississippi State University, Starkville, MS (201)

ABSTRACT

A weed control and herbicide tolerance study was conducted in 2010 and 2011 to evaluate the potential use of flumioxazin (Valor), pyroxasulfone (Zidua), and flumioxazin plus pyroxasulfone (Fierce) in sweetpotato production. In both years, the experimental design was a RCB with 4 replications. Plots were 10 x 30 ft containing three 40-inch rows. Beauregard B-14 sweetpotato slips were transplanted and treatments were applied on June 16, 2010 and June 24, 2011. Treatments in included Zidua at 1.5, 2.0, 2.5, and 3.0 oz/A applied pre-transplant (PRE) & post-transplant (POST); Fierce at 3.0, 3.75, and 4.5 oz/A applied PRE; Command 2.66 pt/A POST + Valor SX 2.5 oz/A PRE; Command 2.66 pt/A POST + Zidua 2.5 oz/A POST; Command 2.66 pt/A POST + Fierce 3.75 oz/A PRE; and a Weedy and Weed-free Check. Each year ratings were made throughout the growing season for broadleaf signalgrass (BRAPP) and redroot pigweed (AMARE) control. Crop tolerance (injury) was rated in 2011. Sweetpotatoes were harvested on October 21, 2010 and October 6, 2011 at 127 and 104 days after transplant (DAT), respectively. Sweetpotatoes were graded to determine US No.1, Canner, Cull, and Jumbo yield grades. Total marketable yield was recorded as the sum of US No.1, Canners, and Jumbo grade yields. Analysis of variance was conducted using Fisher's protected LSD (α=0.05). In 2010, at 35 DAT all treatments of Zidua applied alone PRE controlled BRAPP at least 65%, while all POST treatments of Zidua alone controlled BRAPP at least 80%. Fierce treatments controlled BRAPP at least 70% at 35 DAT in 2010. The addition of Command to Fierce and Zidua treatments improved BRAPP control. In 2011, BRAPP control was at least 83% for all treatments and 100% for treatments that included Command at 35 DAT. AMARE control for 2010 and 2011 combined was at least 93% for all treatments at 14 DAT. At 35 DAT, all treatments of Zidua applied alone PRE controlled AMARE at least 72%, while all POST treatments of Zidua applied alone controlled AMARE at least 91%. At this same time, all Fierce treatments controlled AMARE at least 81%. In 2011, sweetpotato injury was 9 and 5% or less for all treatments at 14 and 21 DAT, respectively. US No.1 grade yield combined for 2010 and 2011 ranged from 155 to 372 boxes/A for the untreated check and Zidua 3.0 oz/A PRE, respectively. Yield of US No. 1 grade was greater than 250 boxes/A for all treatments except Zidua1.5 oz/A PRE, Zidua 2.0 oz/A Post, Fierce at 3.0 and 3.75, and the untreated check. Total marketable yield average for 2010 and 2011 ranged from 245 to 617 boxes/A for the untreated check and Zidua 3.0 oz/A PRE, respectively. Total marketable yield was greater than 500 boxes/A for all treatments except Zidua1.5 and 2.5 oz/A PRE, Zidua 2.0 oz/A Post, Fierce at 3.0 and 3.75, and the untreated check. Sweetpotato tolerance to Zidua PRE or POST transplant and Fierce was less than 10% at any time after application. Any reduction in sweetpotato yield was not related to herbicide injury, but was associated with herbicide performance relative to lack of week control. BRAPP and AMARE control was improved with the addition of Command to all weed control systems. It appears a tank-mix of Zidua 2.5 oz/A + Command 2.66 pt/A applied POST-transplant would be a good fit for Mississippi sweetpotato producers and provide good weed control with acceptable crop tolerance.

WEED CONTROL AND SWEET POTATO TOLERANCE TO LINURON AND FOMESAFEN. D. K. Miller*[1], M. M. Mathews[1], T. P. Smith[2]; [1]LSU AgCenter, St. Joseph, LA, [2]LSU AgCenter, Chase, LA (202)

ABSTRACT

A field study was conducted in 2012 at the Sweet Potato Research Station near Chase, La to evaluate weed control and crop tolerance with linuron and fomesafen herbicides applied in sweet potato. Study design was a randomized complete block with four replications. Treatments included Valor @ 2 oz/a Pre transplant followed by (fb) Dual Magnum @ 1.33 pt/a Post transplant; Linex @ 1.5 pt/a Pre transplant fb Dual Magnum @ 0.75 pt/A Post transplant; Valor @ 2 oz/a Pre transplant fb Linex @ 1.5 pt/A Post transplant; Reflex @ 1.5 pt/a Pre transplant fb Dual Magnum @ 0.75 pt/a Post transplant; Valor @ 2 oz/a Pre transplant fb Reflex @ 1.5 pt/a Post transplant; Linex @ 1.5 pt/a Pre transplant fb Command @ 2 pt/A Post transplant; Reflex @ 1.5 pt/a Pre transplant fb Command @ 2 pt/a Post transplant; Linex @ 1.5 pt/a Post transplant fb Dual Magnum @ 1.33 pt/A 15 d Post transplant; and Reflex @ 1.5 pt/a Post transplant fb Dual Magnum @ 1.33 pt/a 15 d Post transplant. Variety 07-146 was planted on July 11. Soil type was a silt loam with pH 5.8. Parameters measured included visual crop injury and weed control estimates 13, 28, and 42 d after transplanting (DAP), and yield. At 13 DAP, control of cutleaf groundcherry (82 to 100%), barnyardgrass (98 to 100%), entireleaf morningglory (100%), and carpetweed (99 to 100%) was equivalent for all treatments. Injury from programs including Reflex applied Post transplant was 89%. Valor Pre transplant fb Dual Magnum or Linex Post transplant resulted in 11% visual injury while Linex Post transplant fb Dual Magnum 15 d Post transplant resulted in 8%. No other treatment resulted in greater than 5% injury. At 28 DAP, control of barnyardgrass (97 to 100%), goosegrass (99 to 100%), broadleaf signalgrass (100%), entireleaf morningglory (97 to 100%), spiny amaranth (88 to 100%), yellow nutsedge (40 to 79%), and cutleaf groundcherry (92 to 100%) was equivalent among all treatments. Reflex applied Pre transplant fb Command Post transplant resulted in 73% control of carpetweed while all other treatments controlled this weed 89 to 100%. Injury following application of Reflex Post transplant was 76 and 72% while injury was not observed with any other treatment. At 42 DAP, control of goosegrass (98 to 100%), entireleaf morningglory (99 to 100%), and spiny amaranth (94 to 100%) was equal for all treatments. Reflex Post transplant programs resulted in 89 and 91% barnyardgrass control compared to greater than 96% control for all other treatments. Broadleaf signalgrass was controlled 98 to 100%. Programs with Reflex applied Pre transplant resulted in 88 and 80% control of yellow nutsedge compared to no greater than 71% control for all other programs. Valor applied Pre transplant fb Dual Magnum or Linex Post transplant, Linex applied Pre transplant fb Dual Magnum @ 0.75 pt/a Post transplant, and Linex applied Post transplant fb Dual Magnum applied 15 d Post transplant controlled cutleaf groundcherry 91 to 100% while other programs resulted in only 63 to 81% control. With the exception of Reflex applied Pre transplant fb Command Post transplant (73%), all programs controlled carpetweed at least 90%. Linex applied Post transplant fb Dual Magnum 15 d Post transplant resulted in no. 1 and total yield of 483 and 741 bu/a, respectively. All other programs, with the exception of those including Reflex or Command applied Post transplant, resulted in equivalent yield to this treatment.

WEED CONTROL PROGRAMS FOR SEASON-LONG YELLOW NUTSEDGE CONTROL IN POTATO (*SOLANUM TUBEROSUM*). C. E. Rouse*, P. J. Dittmar; University of Florida, Gainesville, FL (203)

ABSTRACT

Florida potato producers currently have few registered herbicides for postemergence nutsedge control during the cropping season. Two studies were conducted in 2012 in Flagler County, Florida, to evaluate potato tolerance and yellow nutsedge (*Cyperus esculentus*) control in a season long herbicide program. Potato tolerance to the herbicide treatments were evaluated on the research station at the Florida Partnership for Water, Agriculture, and Community Sustainability at Hastings and yellow nutsedge control was measured on farm in Elkton, FL. Ten herbicide treatments, at varying rates, and a weedy control were used in the study: fomesafen applied PRE at 0.28 and 0.561 kg ha^{-1}, S- metolachlor PRE at 1.068 and1.602 kg ha^{-1}, imazosulfuron applied POST at 0.263 and 0.315 kg ha^{-1}, fomesafen 0.28 and 0.561 kg ha^{-1} or S-metolachlor at 1.068 and 1.602 kg ha^{-1} followed by (fb.) imazosulfuron POST at 0.263 kg ha^{-1}. The POST herbicides were sprayed 28 days after PRE treatments (DAT) on station and 35 DAT on farm. Potato tolerance (0%= no injury; 100%= complete plant death) was visually estimated weekly for 56 DAT and potatoes were harvested and analyzed by weight and grade. Yellow nutsedge control (0%= no control; 100% = complete control) was visually estimated weekly following preemergence application for 63 days. Data were analyzed using a general linearized model and orthogonal contrasts, means were separated using Duncan's new multiple range test. Potato injury 7 DAT was not significant among treatments. Minor injury (3%) for fomesafen treatments was observed at 7 DAT however the injury was not seen at 14 DAT. Injury at 35 DAT was found to be not significant following the POST applications. Yield by weight and grade were not different among herbicides. Yellow nutsedge control 6 DAT was highest in plots treated with fomesafen at 0.561 kg ha^{-1} (58%). At 42 DAT yellow nutsedge control was greatest with the higher rate of fomesafen at 0.561 kg ha^{-1} fb. imazosulfuron at about 9% control. At 62 DAT, fomesafen aat 0.28 kg ha^{-1} fb. imazosulfuron had the greatest control (80%). Treatments containing the POST application, excluding the higher imazosulfuron rate (0.315 kg ai ha^{-1}), had >50% control. Treatments containing S-metolachlor fb. imazosulfuron had similar results to the other PRE herbicides fb. imazosulfuron but were significantly less at about 50 to 54% control. Treatments with only preemergence herbicides and the nontreated control had less yellow nutsedge control than the previously mentioned treatments at 62 DAT (0% control). Fomesafen fb. POST application of imazosulfuron had the greater season long control then the other treatments.

EFFECT OF THIFENSULFURON PRE OR POST ON WEED CONTROL AND TOMATO AND PEPPER TOLERANCE. P. J. Dittmar*; University of Florida, Gainesville, FL (204)

ABSTRACT

The phase-out of methyl bromide has required tomato and pepper farmers to use herbicides for weed control. Limited herbicides are registered in tomato and pepper; the continuous use of a group of herbicides causes a shift in problematic weeds. Common purslane (*Portulaca oleracea*) is an emerging problematic weed in these two crops. The study's objective was to establish crop safety and purslane control of thifensulfuron PRE and POST in plasticulture tomato and pepper. Thifensulfuron at 0.005, 0.009, 0.014, 0.019 lb./ha. was applied PRE under the polyethylene mulch or POST-directed to the lower 4 in. of the plant. Tomato and pepper were transplanted on March 19, 2012; PRE treatments were applied Feb. 21 and POST were applied April 18. Thifensulfuron POST had greater visual estimate control of common purslane than thifensulfuron PRE. In tomato, thifensulfuron PRE did not cause crop injury during the crop season. At 14 and 28 days after treatment, thifensulfuron POST at 0.014 and 0.019 lb./ha. had $\leq$9%. All thifensulfuron application timings and rate had greater yield than the weedy control. No difference in total marketable fruit count and fruit weight was between thifensulfuron rates. In bell pepper, thifensulfuron POST had greater crop injury ($\leq$21) and shorter plants (12 cm.) than thifensulfuron PRE (0% and 15 cm., respectively). Among thifensulfuron PRE rates, no difference in marketable fruit count and weight were measured. Thifensulfuron at 0.014 and 0.019 lb./ha. had lower marketable fruit count and weight than the untreated check. Thifensulfuron PRE does not provide adequate control of common purslane, however, thifensulfuron POST provides excellent control of common purslane. Thifensulfuron POST-directed at 0.005 and 0.009 has excellent pepper and tomato tolerance.

CRITICAL WEED-FREE PERIOD IN FRESH MARKET PLASTICULTURE GRAFTED TOMATO. S. Chaudhari*[1], K. M. Jennings[2], D. W. Monks[1], F. J. Louws[1]; [1]North carolina state university, Raleigh, NC, [2]NCSU, Raleigh, NC (205)

ABSTRACT

A field study was conducted to determine the effect of timing of weed establishment on yield of grafted tomato grown on polyethylene-mulched beds. A study was conducted at the Horticultural Crops Research Station, Clinton, NC in summer 2012. ‘Amelia’, a commercially acceptable hybrid planted by NC growers was used as the scion and grafted onto ‘Maxifort’ tomato rootstock. A mixture of common tomato weeds including yellow nutsedge, common purslane and large crabgrass were transplanted (two seedling of each weed) into each crop hole along with a tomato plant. Each plot consisted of seven tomato plants. Weed transplants were grown in the greenhouse for 10 d in 98-cell plug trays using potting media. Weeds were established at 0 (weed-free check), 1, 2, 3, 4, 5, 6, and 12 (weedy check) wk after tomato transplanting (WAT) and remained until final tomato harvest. The experimental design was a randomized complete block with four replications. Tomato were harvested weekly for six wk and graded mechanically into S, M, L, XL and J grades. Above-ground portion of weeds and tomato plants were harvested separately from two holes per plot and dried at 55 °C to measure dry weight. Total yield (includes all the grades) expressed as percentage of the weed-free and weed biomass reduction were response variables for statistical analysis. Weed establishment one wk or later did not affect aboveground tomato biomass (dry weight). All treatments including the weed-free check had significantly higher aboveground tomato biomass than the weedy check. Based on results from this study, the establishment of yellow nutsedge, common purslane and large crabgrass must be delayed at least two WAT in order to obtain 50% reduction in weed biomass ($R^2 = 0.89$) and to avoid more than 10% yield loss ($R^2 = 0.95$) in grafted tomato produced in a plasticulture system.

EFFECT OF S-METOLACHLOR OR FOMESAFEN PRE FOLLOWED BY IMAZOSULFURON POST FOR SEASON-LONG NUTSEDGE (*CYPERUS* SPP.) CONTROL IN BELL PEPPER (*CAPSICUM ANNUUM L.*). M. R. Miller*[1], P. J. Dittmar[2]; [1]Univeristy of Florida, Gainesville, FL, [2]University of Florida, Gainesville, FL (206)

ABSTRACT

In the fall of 2012, a field trail was conducted to determine the efficacy of S-metolachlor and fomesafen applied preemergence (PRE) under the polyethylene mulch, followed by a postemergence directed (Post-Dir) application of imazosulfuron to achieve season-long control of nutsedge (*Cyperus spp.* L*)* in bell pepper (*Capsicum annuum* L.). PRE treatments included S-metolachlor at 0.71 and 1.07 kg/ha and fomesafen at 0.28 and 0.42 kg/ha applied to preformed beds prior to laying polyethylene mulch. Post-Dir treatments included imazosulfuron at 0.21 and 0.34 kg/ha applied to the base of the pepper plants 35 days after planting (DAP). PRE followed by (f.b.) Post-Dir treatments included S-metolachlor at 0.71 or 1.07 kg/ha f.b. imazosulfuron at 0.21 kg/ha and fomesafen 0.28 or 0.42 kg/ha f.b. imazosulfuron at 0.21 kg/ha. Weed-free and weedy control treatments were also included. Experimental design was a randomized complete block with 4 replications. On August 22, 2012, bell pepper 'Tomcat' (*Capsicum annuum* L. 'Tomcat') were transplanted the same day as PRE treatments at the Plant Science Research and Education Unit in Citra, FL. Visual weed control and crop injury ratings were performed 7, 14,21,28,42,49,56 and 63 DAP. Plant heights were measured 14,28,49 and 63 DAP. Bell peppers were harvested and graded on October 30, 2012 (69 DAP). Data were analyzed with analysis of variance and means were separated with Duncan's multiple range test and orthogonal contrasts. Nutsedge control at 28 DAP was greatest with S-metolachlor at 0.71 and 1.07 kg/ha (59% and 60% respectively) and fomesafen at 0.42 kg/ha (48%). Nutsedge control at 56 DAP was similar among the weed-free, S-metolachlor at 0.71 kg/ha f.b. imazosulfuron at 0.21 or fomesafen at 0.42 kg/ha f.b. imazosulfuron at 0.21 kg/ha (76% and 79% respectively). S-metolachlor alone and imazosulfuron alone resulted in lower fruit count and weight. Orthogonal contrasts showed S-metolachlor f.b. imazosulfuron resulted in higher marketable fruit count and weight. Applications of fomesafen or S-metolachlor PRE f.b. imazosulfuron provides season long control of nutsedge and the reduced competition improves yield.

HERBICIDE DRIFT: PAST, PRESENT, FUTURE. E. P. Webster*; LSU AgCenter, Baton Rouge, LA (207)

ABSTRACT

The development of 2,4-D began with the discovery of plant growth hormones in the 1920. In the late 1930s and early 1940s researchers in Great Britain and the United States were working with growth regulators similar to 2,4 D and by 1941 the synthesis of this compound had been reported. The herbicide was originally evaluated for use during World War II; however, the war came to an end before 2,4-D could be used in the active theater. In 1945, researchers around the United States began to evaluate the product for weed control in crops, and it was also available commercially for use by producers. Almost immediately, 2,4-D was observed to move off-site to non-target plants in the form of drift. Soon it was determined the reason for a drift was due to the volatility of the ester formulations that made up for most of the available commercial formulations. Research continued to evaluate other formulations, and the acid and amine formulations were found to be up to 90% less volatile than the ester formulations. Researchers and extension faculty soon identified management practices and helped implement restrictions that could be used to help reduce or prevent drift. The drift issues have constantly been a problem with 2,4-D. In 2007, the state of Arkansas further restricted the application of 2,4-D in certain parts of the state. The new restrictions occurred after approximately 200,000 to 250,000 acres of cotton were injured by drift in 2006. The numbers of complaints have dropped significantly since the new regulations were enacted. Other states have also implemented restrictions for 2,4-D use. With the development of 2,4-D and dicamba resistant cotton and soybean there will be an effort to roll-back some of these restrictions. State researchers, extension faculty, applicators, consultants, and producers should all work together before restrictions are relaxed. History tells us that anytime restrictions are relaxed, drift complaints increase.

A FIELD SCALE COMPARISON OF AI AND TTI NOZZLES TO MITIGATE OFF-TARGET MOVEMENT OF CICAMBA. J. L. Cobb[1], D. B. Reynolds*[2], J. Irby[2], J. K. Norsworthy[3], L. E. Steckel[4], A. Mills[5], R. Montgomery[6], J. Sandbrink[7], K. M. Remund[8]; [1]Mississippi State University, Starkville, MS, [2]Mississippi State University, Mississippi State, MS, [3]University of Arkansas, Fayetteville, AR, [4]University of Tennessee, Jackson, TN, [5]Monsanto, Collierville, TN, [6]Monsanto, Union City, TN, [7]Monsanto, St. Louis, MO, [8]Monsanto Ag Products, St. Louis, MO (208)

ABSTRACT

Monsanto is currently developing transgenic cotton and soybean varieties capable of withstanding postemergence applications of dicamba. This technology facilitates effective control of many troublesome weed species, including many that have exhibited resistance to glyphosate. The ability to control glyphosate-resistant weeds like Palmer Amaranth will likely result in rapid adoption of this new technology. As adoption increases, incidences of off-target deposition will likely increase as well. The potential for increased off-target deposition of dicamba coupled with the fact that soybean are very sensitive to low concentrations of dicamba has resulted in many concerns relative to its use as an in season weed control option. Monsanto will require the use of spray tips that produce very coarse to ultra coarse spray droplets in an effort to mitigate spray particle drift. Two such spray tips available from Spraying Systems is an air induction (AI) and turbo teejet induction (TTI). In 2012, an experiment was designed to evaluate the potential for off-target deposition of dicamba when applied with these tips under wind speeds of 5 to 10 miles per hour (MPH). The experiment was conducted in Brooksville, MS, Jackson, TN, Keiser, AR, and Scott, MS. The two treatments consisted of a comparison of off-target movement of a premix candidate when applied at 1.5 lbs ae/A with 11004 AI and 11004 TTI nozzles calibrated to deliver 15 gallons per acre (GPA). The premix candidate was composed of 2.67 lbs ae glyphosate with 1.33 lbs ae dicamba per gallon of product. Each treatment was replicated three times. Non-transgenic soybeans were utilized as a bio-indicator because of their sensitivity to dicamba. Treatments were applied to soybean at the V5-V6 stage of growth. In general, wind direction was perpendicular to each area sprayed and speeds averaged 6.2, 4.2, 5.0, and 5.4 MPH at Brooksville, Jackson, Keiser, and Scott, respectively. Plots were 100 feet long at all locations and width was dependent upon sprayer type and ranged from 28 to 60 feet. A 100 ft nontreated buffer was left between each sprayed plot. Data were collected in upwind and downwind transects segmented into 4 row wide plots that were 25 ft long. Plots were contiguous throughout the transects and were adjacent to both the treated and nontreated buffer areas. This approach was utilized to capture the effect of non-right angle movement of driftable particles. Visual estimates of injury and plant heights were collected from each downwind and upwind experimental unit 14 and 28 days after treatment. Malformation data were fitted as a function of log(distance) using linear regression. At 28 DAT, the distance beyond which malformation was less than 5% with the AI tip was 187, 85, 248, and 141 ft while with the TTI tip it was 225, 85, 248, and 161 ft at Brooksville, Jackson, Keiser, and Scott, respectively. AT 28 DAT, the distance beyond which malformation was less than 15% with the AI tip was 59, 18, 179, and 11 ft while with the TTI tip it was 80, 31, 109, and 19 ft at Brooksville, Jackson, Keiser, and Scott, respectively. Plant heights were fitted with a segmented regression technique to determine the hinge point at which the data reaches a plateau of no effect. Plant heights were reduced with drift out to a distance of 71, 36, and 45 ft with the AI tip and 71, 19, and 46 ft with the TTI tip at Brooksville, Jackson, and Keiser, respectively. Plant heights at the Scott location did not result in the detection of a hinge point when fitted to this model. When yield data were subjected to the hinge point model to determine the distance to which yield reductions occurred only two were detectable. The AI tip at Keiser and the TTI tip at Scott resulted in drift that caused yield losses out to 40 and 36 ft, respectively. When subjected to an analysis of variance yield reductions could be determined to approximately 25, 12, 12, and 24 feet with the TTI tip at Brooksville, AI tip at Keiser, AI tip at Scott, and the TTI tip at Scott. These data indicate that malformation can be observed a considerable distance downwind from an application of dicamba. They also show that plant height may be reduced at moderate distances from the treated area. However, even where visual estimates of injury and plant heights were reduced, yields were not reduced beyond 40 ft from the treated area. Additional data are needed to allow the development of buffer restriction relative to applications around sensitive species.

VOLATILITY AND OFF-TARGET MOVEMENT OF FORMULATIONS CONTAINING COLEX-D™ TECHNOLOGY. J. K. Norsworthy*[1], B. Scott[2], D. Stephenson[3], D. B. Reynolds[4], M. Peterson[5], G. Kruger[6]; [1]University of Arkansas, Fayetteville, AR, [2]University of Arkansas, Lonoke, AR, [3]LSU AgCenter, Alexandria, LA, [4]Mississippi State University, Mississippi State, MS, [5]Dow AgroSciences, Indianapolis, IN, [6]University of Nebraska-Lincoln, North Platte, NE (209)

ABSTRACT

Herbicide-resistant weeds continue to evolve at an alarming rate that far exceeds the discovery of new effective herbicides. It is anticipated that in the near future, Dow AgroSciences will commercially launch soybean and cotton cultivars that possess resistance to 2,4-D (Enlist™ Weed Control System), which should aid weed management in both crops by providing an additional over-the-top mode of action for control of many broadleaf weeds, especially those-resistant to other herbicide mechanisms of action. In conjunction with this launch, Dow AgroSciences has developed and anticipates registration of a new 2,4-D formulation that has reduced volatility and lower potential for off-target movement relative to current commercially available 2,4-D formulations. Laboratory and field experiments have been conducted to validate and demonstrate the reduced volatility and drift potential of the new 2,4-D formulation (Colex-D™ Technology) relative to other formulations and observations from these trials and demonstrations are herein reported. The 2,4-D formulation that contains Colex-D Technology, a combination of 2,4-D choline for reduced volatility and other proprietary formulation components to diminish physical drift, will be marketed as a premix with glyphosate, with an anticipated tradename of Enlist Duo™. Using laser spectrometer analysis, it was determined that Enlist Duo produced 63% fewer driftable fines than did 2,4-D amine (DMA6™) tank-mixed with glyphosate (Durango™ DMA) when applied at 10 GPA. In a wind tunnel, airborne spray at 6.6 ft downwind from a nozzle was assessed for Durango + Weedar and Enlist Duo applied through XR, AIXR, and TTI nozzles at 40 PSI and 15 GPA into a 7 mph wind. It was concluded that nozzle type has a bigger impact than the formulations tested on droplet size and drift potential; albeit, formulation can impact drift potential for a given nozzle type. Minimal differences, if any, were observed between AIXR and TTI nozzles, regardless of formulation, and both nozzles generally reduced airborne spray at 6.6 ft downwind by at least 3-fold compared to the XR nozzle. In 2011, the drift potential of Enlist Duo was compared to Durango + Weedar across three nozzle types (XR, AIXR, and TTAI) in McCook, NE where triplicate downwind collectors were used to sample tracer dye and 2,4-D analytical when both mixtures were applied through a commercial sprayer at wind speeds of 3 to 11 mph. At 100 ft downwind for the XR and AIXR nozzles, deposition was reduced approximately 2-fold by the Enlist Duo formulation alone. The AIXR and TTAI nozzles in combination with Enlist Duo resulted in the same level of deposition, which was more than a 10-fold reduction relative to Durango + Weedar applied through XR nozzles. To further build on earlier findings, large-plot field demonstrations were conducted across seven locations in 2012 with the objective of comparing downwind movement of Enlist Duo and a tankmix of Durango + Weedar 64 (2,4-D dimethyl amine) when applied through XR nozzles, and secondly demonstrate reduced drift with Enlist Duo and AIXR nozzles. Cotton was the indicator crop at a single location in GA, MS, LA, and two sites in AR. Soybean was used as an indicator crop in NE and IN. All spray applications were made at 15 GPA, and plots were nonreplicated consisting of a 200 ft by 120 to 150 ft wide plot with 75 ft between treated plots. There was generally three to four passes per plot in order to achieve the desired spray swath. Assessments were taken upwind and downwind following treatment and at predeteremined locations perpendicular to the sprayed plots (parallel to the prevailing wind). Deposition data were collected at five of the seven sites, and visual estimates of crop injury assessed at all sites. Wind speeds ranged from 1 to 8 mph at all sites, except Keiser, AR where wind speeds ranged from 3 to 19 mph during application. The deposition data across sites aligned well with the crop response data with AIXR nozzles having the lowest drift. In these studies, no differences were observed between formulations with the XR nozzles. Some results from 2012 differed from earlier lab research and field deposition trials conducted in 2011. Reasons for these differences between years and experiments are not well understood at this time; however, it is well known that off-target movement and impact on sensitive crops is determined by a complex set of variables and mitigation recommendations cannot rely on any one technology or factor but must employ a combination of new technologies, proven techniques, and common sense. In regards to volatility, relative volatility as measured by cotton and soybean as indicator crops was measured by treating flats of moistened soil with 2,4-D ester, 2,4 amine, and 2,4-D choline, and placing these treated flats between rows of both crops covered with a plastic film to ensure high temperatures and relative humidity. Flats of treated soil were removed from the field along with the covered domes at 48 hours after treatment. At 21 days after treatment, the percentage of cotton plants under the dome showing malformation from 2,4-D ester, 2,4-D-amine, 2,4-D choline, and the DGA salt of dicamba (Clarity) was

100, 52, 16, and 0, respectively. For soybean, no injury was observed from any of the 2,4-D formulations whereas 98% of the soybean plants under the dome showed malformation from Clarity. Based on this and other trials conducted over the past few years, it is apparent that the potential for off-target movement of Cholex-D technology is greatly reduced compared to other current commercial formulations.

INFLUENCE OF NOZZLE SELECTION AND AUXIN HERBICIDES ON EFFICACY. L. E. Steckel*[1], A. S. Culpepper[2], J. K. Norsworthy[3], A. C. York[4], B. Braxton[5], R. A. Haygood[6], R. Montgomery[7], C. D. Youmans[8]; [1]University of Tennessee, Jackson, TN, [2]University of Georgia, Tifton, GA, [3]University of Arkansas, Fayetteville, AR, [4]North Carolina State University, Raleigh, NC, [5]Dow AgroSciences, Travelers Rest, SC, [6]Dow AgroSciences, Germantown, TN, [7]Monsanto, Union City, TN, [8]BASF Corporation, Research Triangle Park, NC (210)

NO ABSTRACT SUBMITTED

AUXINIC HERBICIDES: PHYSICAL PARTICLE SIZE AND WHAT IT MEANS FOR DRIFT POTENTIAL. G. Kruger*[1], A. Hewitt[2]; [1]University of Nebraska-Lincoln, North Platte, NE, [2]Lincoln Ventures, Lincoln, New Zealand (211)

ABSTRACT

With the advent of auxinic herbicide traits for in-season broadleaf weed control in corn, soybean and cotton, there is much concern about the potential off-target movement of these herbicides into sensitive areas. Particle drift of auxinic herbicides is much like all atomized sprays in that the quantity of the off-target movement is a function of the environmental conditions in which the spray is released (especially wind speed), the height of the release, and the atomization profile (size range of the droplets). Applicators must use sound judgment when making applications so that they do not spray under temperature inversions or when wind speeds are great in order to mitigate physical particle drift. Also, keep a uniform boom height and keeping the boom height as close to the target as possible are critical to mitigate drift. Managing particle size is also critical to mitigating physical particle drift. Particle drift is the movement of spray particles during or shortly after the spray application into an unintended area. By managing droplet size, pesticide applicators have a significant ability to manage pesticide drift. It has been well established that the smaller the droplet size the greater the drift potential. Applications that are made in which the fines are mitigated will have lower potential for drift. For application of auxinic herbicides the droplet size is going to determine the potential for physical particle drift similar to any other pesticide. Tactics which mitigate the fines should be implemented as often and as judiciously as possible up to the point where pesticide efficacy is compromised. We know that practices such as using operating pressure on hydraulic nozzles will reduce the number of fines in the droplet size distributions. Additionally, applicators can utilize large orifice nozzles and nozzle designs which give larger spray droplets. Additionally, the spray solution can have a tremendous influence on spray droplet size for aerial applications. Care should be taken though in terms of making sure that the right spray solution is used with the appropriate spray nozzles for an application. Interactions exist between nozzle design and spray solution which can sometime cause unexpected results. For example, some drift reducing adjuvants will cause more drift when applied with specific nozzles while most nozzles are completely appropriate to use with the adjuvant for drift management. With the new auxinic herbicide formulations, it is not appropriate to assume that what has worked with other formulations will work for the new formulations. The Enlist Duo formulation produces a coarser spray droplet size distribution than many of the glyphosate, glyphosate + 2,4-D and 2,4-D products than what most applicators generally experience. However, because of how the product is formulated, some nozzles are not appropriate to use with this formulation. The twin turbo jet nozzles (TTJ60) produce an unacceptable number of fines compared to many of the nozzles on the market and nozzles such as the turbo teejet (TT), air induction turbo twin jet (AITTJ60) and turbo teejet induction (TTI) are not going to provide the performance that other nozzles on the market will in terms of mitigating the fines while maintaining the droplet size distributions in a range that will maximize efficacy of the product. Alternatively, with Engenia the least fines are observed with the use of the TTI nozzles and from a drift reduction management standpoint, this nozzle will provide the greatest performance. The efficacy, especially over multiple years of selection pressure, should be investigated as the TTI nozzles will produce ultra-coarse spray qualities in most situations. The use of other adjuvants for drift management with both Engenia and Enlist Duo should be investigated further before recommendations are made. However, the data suggests that we can greatly eliminate the fines which will be prone to drift under application conditions (nozzle selection, spray solution components, operating pressure, etc.) which are the most conducive to mitigating fines.

EFFECT OF FORMULATION AND APPLICATION TIME OF DAY ON DICAMBA VOLATILITY UNDER FIELD CONDITIONS. T. C. Mueller*[1], D. R. Wright[2], K. M. Remund[2]; [1]University of Tennessee, Knoxville, TN, [2]Monsanto Ag Products, St. Louis, MO (212)

ABSTRACT

The development of dicamba-tolerant and other auxin-tolerant crops will enable the use of these effective herbicides in crops such as soy and cotton at application timings such as at planting or over-the-top that are not currently possible. This research examined the effect of various factors on post-application amounts of dicamba in the air under field conditions by coupling a sample collection system with advanced chemical analysis of those samples. The levels of dicamba measured in air in the field from an application of the dimethylamine salt of dicamba were significantly higher (greater than 2X) than the diglycolamine salt of dicamba based on three 2009 field trials. The measured levels of dicamba in air were significantly lower for evening applications of diglycolamine dicamba salt as compared to mid-day and morning applications based on three 2010 field trials. The 0-12 hour time period after application appears to be most important for detecting dicamba in the air. Regardless of application timing differences, the greatest concentrations of dicamba in air measured were during this time with lower amounts detected in time periods greater than twelve hours after treatment. This was particularly noted in morning applications where the highest detected amounts were measured in the afternoon. Average ambient air temperature (and other weather variables) significantly correlated with higher detection levels of dicamba in the air in the field.

STATE CONCERNS WITH USE OF AUXIN HERBICIDES IN COTTON AND SOYBEAN. R. Rivera*; Texas Department of Agriculture, Austin, TX (213)

ABSTRACT

A brief overview of existing herbicide regulations in Texas in be presented. I will also provide input on potential changes to herbicide regulations in the anticipated future production of auxin-resistant crops, specifically cotton and soybean. Auxins are a family of herbicides which in Texas, by regulation, are listed as state-limited-use herbicides and include such herbicides as 2,4-D and dicamba. In Texas, these herbicides are considered regulated (and require a certification to use) because of their potential to cause adverse effects to non-targeted vegetation; specifically, crops such as cotton and other auxin-sensitive crops and vegetation.

USE AND MANAGEMENT OF ENGENIATM IN DICAMBA TOLERANT CROPPING SYSTEMS, WITH A FOCUS ON MANAGING OFF TARGET APPLICATION RISK. L. L. Bozeman*[1], S. J. Bowe[2], J. Frihauf[3], W. E. Thomas[4], D. Pepitone[4]; [1]BASF, Raleigh, NC, [2]BASF, Research Triangle Park, NC, [3]BASF Corporation, Raleigh, NC, [4]BASF Corporation, Research Triangle Park, NC (214)

ABSTRACT

Dicamba has been a highly effective weed management tool for nearly 50 years and provides control of over 190 broadleaf weeds. Engenia™ herbicide, currently in development, is an advanced formulation of dicamba and is optimized to further improve on target application through reduced secondary loss potential of dicamba. Growers require a number of herbicide options to build effective weed control programs for their specific cropping system. The use of herbicides representing disparate and effective sites of action is an important strategy for managing weed resistance. Engenia herbicide will provide another effective site of action for the control of many glyphosate, triazine and ALS resistance weed biotypes. As with all herbicides, the goal of the application is to place the spray solution on target, such as the foliar surface of the emerged weed or in some cases the soil surface. Reduced efficacy may result from an herbicide spray that does not reach the intended target. Also spray moving off target may cause injury to sensitive plants that are contacted. Effective stewardship of Engenia will encompass three distinct areas. Use of the correct formulation, use of proper application methods and applicator education will be discussed.

HERBICIDE APPLICATION BEST MANAGEMENT PRACTICES FOR ROUNDUP READY 2 XTEND TECHNOLOGY. R. Montgomery*[1], A. Mills[2], J. Sandbrink[3], J. N. Travers[4]; [1]Monsanto, Union City, TN, [2]Monsanto, Collierville, TN, [3]Monsanto, St. Louis, MO, [4]Monsanto Co., St. Louis, MO (215)

ABSTRACT

The dicamba application requirements for Roundup Ready® Xtend Crop (RRXC) systems focuses on critical factors that keep the spray on-target and reduces the risk of movement to sensitive crops. The requirements also include recommendation for obtaining effective and sustainable weed control. Label use recommendations are pending regulatory approval. Wind speed and spray droplet size are the key factors that determine spray drift. The expected requirements for this technology will not permit applications when wind speeds exceeding 10 miles per hour (MPH) when a sensitive crop is downwind of the field being treated and are not permitted when wind speeds exceed 15 MPH in any direction. The use of air-induction nozzles that produce very coarse to ultra coarse droplets will be required to minimize small droplets that are prone to drift. To further safeguard susceptible crops that are down wind spray buffer areas will be required and will be specified on the dicamba label. Applications must only be made when there is evidence that there is not a temperature inversion present. The potential for an inversion is high when wind speeds are less than 3 MPH. To further ensure on-target applications, the spray boom must be close to the crop canopy as recommended for the nozzle type (e.g. 20 inches above the canopy), sprayer ground speeds must not exceed 15 MPH and water volumes must be at least 10 gallons per acre. Dimethylamine salts and acid forms of dicamba will not be allowed in RRXC because of their volatility potential. Diglycolamine and other dicamba formulations that reduce potential herbicide volatility are being evaluated as candidates for use in-crop. Spray equipment should be triple-rinsed to avoid herbicide cross contamination between applications and will be a recommendation for use within the system. The RRXC weed control system will offer effective and flexible weed control, even on herbicide resistant and tough weeds, through the use of multiple modes of action (including soil residual products) and the combination of pre-emergence (PRE) and post-emergence (POST) application timings. Effective weed control is achieved through the use of multiple modes of action and proper application timing for dicamba (when weeds are less than 4-inches tall). The use of pre soil residual products contributes to flexibility to the window of application for in-crop POST herbicides.

BEST MANAGEMENT PRACTICES UNDER THE ENLIST™ AHEAD STEWARDSHIP PROGRAM. M. Peterson*; Dow AgroSciences, Indianapolis, IN (216)

ABSTRACT

Dow AgroSciences is committed to stewardship of the Enlist™ Weed Control System. Innovative research resulted in the development of Colex-D™ Technology which provides reduced 2,4-D volatility and reduced potential for physical drift. Formulation improvement alone will not prevent off-target movement. The applicator's decisions on nozzle selection, equipment setup, weather conditions and buffer requirements will directly impact any potential for physical drift. Dow AgroSciences' recommended weed resistance management practices requires the use of Enlist Duo™ herbicide(2,4-D choline salt + glyphosate DMA salt) in a weed control system that includes a residual herbicide such as SureStart™ (acetochlor + clopyralid + flumetsulam) , Keystone™ (acetochlor + atrazine) or Keystone LA™ (acetochlor + atrazine). Enlist Ahead™ is a stewardship program developed for the Enlist Weed Control System. Enlist Ahead consists of three foundational pillars : 1) technology advancements in herbicide product, 2) management recommendations and resources, and 3) education, training and outreach. Enlist Ahead will provide growers and applicators with training and information for proper selection of application equipment, environmental conditions and setbacks to ensure responsible herbicide application. Enlist Ahead is a benefits-based management resource designed to help growers and applicators succeed while promoting responsible use of the technology.

™Trademark of Dow AgroSciences LLC. Components of the Enlist Weed Control System have not yet received regulatory approvals; approvals are pending. The information presented here is not an offer for sale. Enlist Duo herbicide is not yet registered for sale or use as a component of the Enlist Weed Control System. Always read and follow label directions.

AMICARBAZONE FOR ANNUAL BLUEGRASS CONTROL IN COOL-SEASON TURFGRASS. F. Yelverton*[1], T. Gannon[2], L. Warren[2], M. Jeffries[1]; [1]NCSU, Raleigh, NC, [2]North Carolina State University, Raleigh, NC (217)

ABSTRACT

In 2012, amicarbazone (Xonerate) received a U. S. registration for turf use. Use sites include golf courses, sod farms, parks and recreational areas, academic grounds, and commercial / residential properties. All warm-season turf species are tolerant as well as cool-season turfgrasses such as tall and fine fescue, perennial ryegrass, Kentucky bluegrass, and creeping bentgrass. Research was conducted to evaluate treatment regimens of amicarbazone and paclobutrazol for annual bluegrass control in creeping bentgrass putting greens and overseeded perennial ryegrass. Trials were also established to determine the effect of post-application irrigation timing on creeping bentgrass tolerance. Annual bluegrass control in creeping bentgrass trials were initiated early March in 2010-11 at Occoneechee Golf Club, Prestonwood Country Club, and Sandhills Research Station. Amicarbazone was applied at 49, 65, or 92 g/ha and included NIS at 0.25% vol/vol. Paclobutrazol was applied at 70, 140, and 280 g/ha. These treatments were applied separately and in tankmix combinations weekly, biweekly, or monthly timings. Treatment regimens that included amicarbazone at 49 or 92 g/ha caused unacceptable turfgrass injury. Treatment regimens that provided 70 to 100% control, $\geq$ 6 turf quality, $\leq$10% turf injury, and $\geq$ 90% turf cover included three monthly amicarbazone applications at 65 g/ha: 1) followed by six bi-weekly paclobutrazol applications at 140 g/ha, 2) followed by three monthly paclobutrazol applications at 280 g/ha, or 3) tankmixed with paclobutrazol at 280 g/ha. Annual bluegrass control in overseeded perennial ryegrass was evaluated in 2011 at Lake Wheeler Turf Field Lab. Amicarbazone was applied Feb 23 in a two- or three-week sequential regimen at 140 and 280 g/ha and included NIS at 0.25% v/v. 140 g/ha amicarbazone provided unacceptable control (54 to 75%) regardless of timing. 280 g/ha amicarbazone provided excellent (100%) control regardless of timing. Post-application irrigation trials were established in 2011-12 at Sandhills Research Station and Lake Wheeler Turf Field Lab. Amicarbazone was applied in October at 140, 280 or 420 g/ha. Irrigation timings included: 1) none, 2) immediate, 3) 1 hr, or 4) 24 hr after treatment. Irrigation timing had no effect on amicarbazone applied at 140 g/ha. At one of three sites, amicarbazone applied at 280 or 420 g/ha was less injurious to creeping bentgrass at 16 DAT when irrigated immediately after application. At two of three sites, amicarbazone applied at 420 g/ha increased creeping bentgrass injury 23 DAT when irrigated immediately after application. Irrigation timing does not produce a major negative effect on creeping bentgrass tolerance to amicarbazone.

EVALUATION OF FLAZASULFURON PLUS AMICARBAZONE COMBINATIONS FOR ANNUAL BLUEGRASS CONTROL IN BERMUDAGRASS AND SEASHORE PASPALUM. C. Johnston*[1], P. McCullough[2]; [1]University of Georgia, Athens, GA, [2]University of Georgia, Griffin, GA (218)

ABSTRACT

Annual bluegrass (*Poa annua*) is a problematic winter annual weed and seashore paspalum (*Paspalum vaginatum*) is injured by most postemergence herbicides that are effective for control. However, seashore paspalum has shown acceptable tolerance levels to flazasulfuron during active growth and treatments may have potential for postemergence annual bluegrass control in spring. The objective of this research was to evaluate application timing of single and sequential flazasulfuron applications alone or with amicarbazone in seashore paspalum and bermudagrass (*Cynodon dactylon*) fairways. Treatments were applied at dormancy or during initial greenup and sequential treatments were made at three week intervals. Sequential flazasulfuron at 26 g ai/ha were required for >80% control at both timings and were similar to single applications of 52 g ai/ha. Single applications of flazasulfuron at 26 g ai/ha provided poor (<70%) annual bluegrass control at both timings after six weeks but the addition of amicarbazone improved control at the later application timing. Although several treatments were effective for annual bluegrass control, seashore paspalum had unacceptable injury (>20%) from all flazasulfuron treatments and application timings. Seashore paspalum injury was acceptable (<20%) from exclusive amicarbazone applications suggesting further research is needed to evaluate potential for annual bluegrass control in spring.

SOIL TYPE AND ROOTING DEPTH EFFECTS ON AMICARBAZONE AND METHIOZOLIN APPLICATIONS FOR WEED CONTROL IN CREEPING BENTGRASS. J. Brosnan*[1], G. K. Breeden[1], S. Calvache[1], G. M. Henry[2], T. Cooper[3], T. J. Serensits[4], J. C. Sorochan[1]; [1]University of Tennessee, Knoxville, TN, [2]University of Georgia, Athens, GA, [3]Texas Tech University, Lubbock, TX, [4]Penn State University, University Park, PA (219)

ABSTRACT

Amicarbazone and methiozolin are herbicides with efficacy for annual bluegrass (*Poa annua* L.) control in creeping bentgrass (*Agrostis stolonifera* L.). Greenhouse research was conducted at the University of Tennessee (Knoxville, TN) to determine the effects of rooting depth and soil type on creeping bentgrass injury with amicarbazone and methiozolin. Field studies conducted on golf greens in Knoxville, TN and Lubbock, TX evaluated effects of soil texture on annual bluegrass control efficacy with methiozolin. In the greenhouse, 'Penncross' creeping bentgrass was established in sand- or soil-based rootzones using mini-rhizotrons. Plants were treated with amicarbazone (49, 98, 196 g ha^{-1}) or methiozolin (500, 1000, 2000 g ha^{-1}) once root growth reached depths of 5, 10, and 15 cm. Amicarbazone was more injurious than methiozolin in both rootzones. Creeping bentgrass injury with amicarbazone measured 62% in soil compared to only 38% in sand. This injury was accompanied by 54 to 69% reductions in root length density in the sand-based rootzone and 42 to 81% reductions in soil. Methiozolin resulted in ≤ 12% creeping bentgrass injury, regardless of rootzone type or application rate, and reduced root length density ≤ 25%. Plants rooted to 15 cm were more tolerant of amicarbazone than those rooted to 5 and 10 cm depths. Responses indicate that methiozolin is less injurious to creeping bentgrass than amicarbazone and that rooting depth and soil type affect creeping bentgrass injury with amicarbazone. Field experiments evaluated annual bluegrass control efficacy with methiozolin using two application rates (500 and 1000 g ha^{-1}) and six application regimes [October, November, December, October followed by (fb) November, November fb December, and October fb November fb December] on sand- and soil-based putting greens. Annual bluegrass control with methiozolin at 1000 g ha^{-1} on sand-based greens ranged from 70 to 72% compared to 87 to 89% on soil-based greens. Treatment at 500 g ha^{-1} controlled annual bluegrass 57 to 64% on sand-based greens compared to 72 to 80% on soil-based greens. On sand-based greens, sequential application programs controlled annual bluegrass 70 to 79% compared to 85 to 92% on soil-based greens. Responses indicate that soil type and rooting depth affect they activity of amicarbazone and methiozolin applications for weed control on creeping bentgrass putting greens.

ANNUAL BLUEGRASS CONTROL IN CREEPING BENTGRASS PUTTING GREENS. R. B. Cross*, L. B. McCarty, A. G. Estes; Clemson University, Clemson, SC (220)

ABSTRACT

Annual bluegrass (*Poa annua* L.) is the most problematic winter annual weed for golf courses worldwide as it disrupts the aesthetic quality and playability of turf stands. Annual bluegrass commonly infests creeping bentgrass putting greens in the turfgrass “transition zone” of South Carolina. Moist conditions from handwatering/syringing, above ground fans, and high fertilizer and fungicide inputs increase its occurrence in creeping bentgrass putting greens. Susceptibility of creeping bentgrass to herbicides and the pace of annual bluegrass removal which leaves voids in playing surfaces provide challenges for acceptable control. The objective of this study was to evaluate herbicide and plant growth regulator treatments at various rates, timings, and combinations for annual bluegrass control in creeping bentgrass putting greens. The study was conducted from 2010 to 2012 at the Walker Golf Course in Clemson, SC on ‘Crenshaw’ creeping bentgrass putting greens. Plots were treated for 2 years and annual bluegrass infestations were greater than 50% at study initiation, consisting of both annual and perennial biotypes. Normal transition zone putting green maintenance was performed by the maintenance staff. The study was conducted in a randomized complete block design with 1.5 by 8 m plots and four replications. Treatments were applied using a CO_2-pressurized backpack sprayer calibrated to deliver 20 gal/acre through 8003 flat fan nozzles (60 gal/acre for treatments containing methiozolin). Visual ratings were taken at numerous dates throughout the study and included annual bluegrass control and seedhead suppression from 0-100%, where 0% was no control or seedhead suppression and 100% was complete control or seedhead suppression. Additionally, turf quality was visually evaluated from 0-9 (9=best). Fall and spring treatments were initiated in mid-October and mid-February, respectively, in each year. After one year of treatments, annual bluegrass control in early May was >70% for methiozolin applied 6 times (3 fall, 3 spring; 1 wk intervals) at 0.5 lb ai/acre and 3 times (3 fall; 4 wk intervals) at 1 lb ai/acre. Paclobutrazol (8 applications at 16 oz/acre; 3 wk intervals) provided 60 % control. All other treatments provided <50% annual bluegrass control after one year. After two years of treatments, annual bluegrass control in early May was >95% for methiozolin applied 6 times (3 spring; 1 wk intervals) at 0.5 lb ai/acre and 3 times (3 fall; 1 wk intervals) at 1 lb ai/acre and 53% for paclobutrazol. All other treatments provided <35% annual bluegrass control. Seedhead suppression at both locations was >80% for paclobutrazol (8 applications at 16 oz/acre; 3 week interavls), paclobutrazol + amicarbazone (8 paclobutrazol applications at 16 oz/acre + 4 spring amicarbazone applications at 0.5 oz/acre; 1 week intervals), and all methiozolin treatments evaluated. After two years, turf quality was >7 for all treatments except amicarbazone applied 4 times in the spring at 1 oz/acre at 1 week intervals. The best option currently labeled for annual bluegrass control in creeping bentgrass putting greens in the SC transition zone is paclobutrazol, applied multiple times throughout the fall and spring at 16 oz/acre. Methiozolin is not currently labeled for use in the United States, but upon registration, should be applied 6-8 times at low rates (≤0.5 lb ai/acre) throughout the fall and spring for best annual bluegrass control. Future research will complete this study at a second site and continue evaluation of herbicides and plant growth regulators at various rates, timings, and combinations for annual bluegrass control in creeping bentgrass in the SC transition zone.

ANNUAL BLUEGRASS CONTROL IN NON-OVERSEEDED FAIRWAYS. N. J. Gambrell*, A. G. Estes, L. B. McCarty; Clemson University, Clemson, SC (221)

ABSTRACT

The purpose of this study was to determine the efficacy of various herbicides and combinations for postemergece control of annual bluegrass in non-overseeded bermudagrass turf. Annual Bluegrass is native to Europe, but now found on every continent. Due to its prolific seed production, competitive growth habit, poor heat and disease tolerance, annual bluegrass disrupts the appearance and uniformity of a turf stand. For these and other reasons, annual bluegrass is a very troublesome bunch type grassy weed, in most turf situations. A study with seventeen treatments was initiated February 17, 2012, with rating dates on February 25, March 10, March 22, and April 7 which corresponded to 8, 22, 34, and 50 days after treatment (DAT), respectively. Treatments included: Reward 2L @ 0.5 lb ai/a; Roundup Pro 4L @ 0.625 lb ai/a; Quick Pro 76WG @ 1 lb ai/a; Finale 1.0SC @ 1.5 lb ai/a; Tranxit 25DF @ 0.03 lb ai/a; Certainty 75DG @ 0.06 lb ai/a; Monument 75DG @ 0.03 lb ai/a; Katana 25DG @ 0.047 lb ai/a; Revolver 0.19SC @ 0.025 lb ai/a; Princep 4L @ 1 or 2 lb ai/a; Kerb 50 WP @ 1.5 lb ai/a; SureGuard 51 WDG @ 0.38 lb ai/a; Xonerate 70WDG @ 0.022 lb ai/a; Roundup Pro 4L + Simazine 4L @ 0.3125 and 1 lb ai/a; Roundup Pro 4L + Ronstar 3.2L @ 0.625 and 3 lb ai/a; and Celsius 63WDG @ 0.1628 lb ai/a. A follow-up study, containing four additional treatments, was initiated March 6, 2012, with rating dates on March 10, March 22, and April 7 at 4, 16, and 32 days after treatment, respectively. Treatments included: Celsius 63WDG @ 0.198 lb ai/a; Tribute Total 60.51WG @ 0.038 lb ai/a; Tribute Total 60.51WG @ 0.076 lb ai/a; and Tribute Total 60.51WG @ 0.24 lb ai/a. All treatments were applied only once in both studies. The studies were conducted near Clemson University in a 'Tifway' bermudagrass field, irrigated and maintained under fairway conditions, and heavily infested with annual bluegrass. Applications were made using a COâ,, powered sprayer calibrated at 20 GPA. Three treatment replications were applied on 2x2 meter plots, using a randomized complete block design. Visual ratings evaluated percentage control of annual bluegrass. Ratings were based on a 0-100% scale. 0% indicating no control and 100% indicating complete control. ANOVA was evaluated with alpha at 0.05. On the April 7, 2012 rating date, ten treatments provided greater than 95% control: Roundup Pro 4L @ 0.625 lb ai/a at 99%; Finale 1.0SC @ 1.5 lb ai/a at 98%; Tranxit 25DF @ 0.03 lb ai/a 96%; Revolver 0.19SC @ 0.025 lb ai/a at 99%; Princep 4L @ 2 lb ai/a at 100%; Kerb 50 WP @ 1.5 lb ai/a at 98 %; Roundup Pro 4L plus Ronstar 3.2L @ 0.625 and 3 lb ai/a at 99%, at 50 DAT respectively. Tribute Total 60.51WG @ 0.038 lb ai/a; Tribute Total 60.51WG @ 0.076 lb ai/a; and, Tribute Total 60.51WG @ 0.24 lb ai/a all provided ≥ 99% control at 32 DAT (April 7, 2012). Roundup treated plots had some early temporary turfgrass damage but fully recovered by the last rating date. Repeat applications and screening of additional products will be continued in the future for timing and control of annual bluegrass in non-overseeded bermudagrass.

EVALUATION OF SUREGUARD FOR WINTER WEED CONTROL AND PREEMERGENCE CRABGRASS CONTROL. A. G. Estes*, L. B. McCarty; Clemson University, Clemson, SC (222)

ABSTRACT

SureGuard (flumioxazin 51WDG) is being developed for postemergence winter annual weed control in dormant bermudagrass. However, treated areas also have provided a certain level of preemergence crabgrass control. Therefore, in the winter of 2011-2012 a study was conducted in upstate South Carolina to investigate the efficacy of SureGuard for winter broadleaf weed control and preemergence control of smooth crabgrass (*Digitaria ischaemum*) in bermudagrass turf. Treatments were applied with a CO_2 backpack sprayer calibrated at 40 GPA, using 8004 flat fan spray nozzles. Treatments were replicated three times. Data was analyzed using ANOVA with means separated by LSD (α=0.05). Treatments included: SureGuard at 6 oz/A (0.19 lb.ai/A), SureGuard at 6 oz/A + Manor at 0.33 oz/A (0.012 lb ai/A) and SureGuard at 10 oz/A (0.32 lb ai/A) applied Nov 14, 2011 and Dec 15, 2011 and Jan1 6, Feb 20, and Mar 13 2012. A Monument treatment at 0.45 oz/A (0.021 la ai/A) was applied Dec 15, 2011. All treatments included a non-ionic surfactant at 0.25 % V/V. Visual ratings were taken throughout the study. Percent broadleaf weed control of the various species and smooth crabgrass were rated on a 0 - 100% scale with 0% representing no control and 100% representing complete control 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. NovemberSureGuard applications burned pre-dormant bermudagrass and did not delay green-up the following spring. In addition no SureGuard treatment delayed bermudagrass green-up the following spring. SureGuard applications alone and with metsulfuron provided good efficacy overall on annual broadleaf and grassy weeds. Perennial winter broadleaf efficacy was increased with metsulfuron at the February and March application timings. Smooth Crabgrass control was greater than 80% on June 7, 2012 following the February and March application timings. Future research will continue screening new and experimental herbicides for preemergence crabgrass activity. Research with herbicides used in these studies will continue to evaluate additional combinations and timings.

CONTROL OF COOL-SEASON BROADLEAF WEEDS, ANNUAL BLUEGRASS AND SMOOTH CRABGRASS USING FLUMIOXAZIN IN DORMANT COMMON BERMUDAGRASS TURF. L. Warren*[1], F. Yelverton[2], T. Gannon[1]; [1]North Carolina State University, Raleigh, NC, [2]NCSU, Raleigh, NC (223)

ABSTRACT

Dormant common bermudagrass (*cynodon dactylon*) turf stands are routinely infested with various winter broadleaf weeds and annual bluegrass (*poa annua*). When these weeds die out in late spring, smooth crabgrass (*digitaria ischaemum*) quickly invades the thin bermudagrass stands during summer months. Research was conducted to evaluate the efficacy of a single application of flumioxazin applied at timings ranging from November through March on germinated winter broadleaf weeds and annual bluegrass, and nongerminated smooth crabgrass. Trials were conducted at Pine Burr Golf Course in 2011-12, Lake Wheeler Turf Field Lab in 2010-12 and Thorndale Country Club in 2012. A Pine Burr and Lake Wheeler trial consisted of flumioxazin applied at 6 oz/A alone or at 10 oz/A tankmixed with 0.33 oz/A metsulfuron, and trifloxysulfuron applied at 0.45 oz/A. Induce was applied to all treatments at 0.25% v/v. Applications were made monthly from November through March. Smooth crabgrass was present in both locations during the spring and summer. Annual bluegrass was present at the Pine Burr location during applications. A separate Lake Wheeler trial evaluated annual bluegrass treated with November through March applications of flumioxazin at 6 and 12 oz/A as well as trifloxysulfuron at 0.45 oz/A. Induce was added to all treatments at 0.25% v/v. Another Lake Wheeler trial tested 10 oz/A flumioxazin and 0.33 oz/A metsulfuron, each with 0.25% v/v Induce, and 2.5 pt/A 2,4-D amine + fluroxypyr + dicamba on mouseear chickweed (*cerastium vulgatum*) and corn speedwell (*veronica arvensis*), along with greenup effects on 'Princess' bermudagrass. A trial at Thorndale was established to evaluate 6 and 12 oz/A flumioxazin plus 0.25% v/v Induce and 1.5 pt/A prodiamine. Weeds present at application included parsley-piert (*alchemilla arvensis*) and mouseear chickweed. Smooth crabgrass was the dominant summer weed. Trials were RCB designed with treatments replicated 4 times. Plots were sprayed on 40" centers with lengths ranging from 4 to 8 ft. Treatments were applied at 32.5 gpa and 28 psi with a 4-nozzle, 10 in spacing boom containing XR 80002VS nozzles. Data presented are visual weed control observations on a 0-100 scale with 0 being no control and 100 being complete control, and percent bermudagrass green plot coverage where 0 = no green coverage and 100 = total green plot coverage. At Pine Burr and Lake Wheeler locations, 6 oz/A flumioxazin provided similar annual bluegrass control as 0.45 oz/A trifloxysulfuron (84-99%) from November through January timings. 12 oz/A flumioxazin provided similar control as 0.45 oz/A trifloxysulfuron (89-100%) from November through February timings. The Pine Burr site was a nonirrigated sandy loam area. 6 and 10 oz/A flumioxazin controlled smooth crabgrass 70 to 94% through early August when applied in early March. Lake Wheeler soil is a heavy clay loam under irrigation. At this site, smooth crabgrass control was only 54 to 59% through an August evaluation. At Thorndale, a nonirrigated sandy clay loam site, 6 oz/A flumioxazin controlled smooth crabgrass 56% through early September when applied in early March. 12 oz/A flumioxazin provided better control (85%) which was similar to prodiamine (88%). A March application of flumioxazin at 6 oz/A controlled parsley-piert, mouseear chickweed and corn speedwell 95 to 100%. 0.33 oz/A metsulfuron provided 99% mouseear chickweed control but only 46% corn speedwell control. 2,4-D amine + fluroxypyr + dicamba controlled mouseear chickweed 88% but did not control corn speedwell at all. Four weeks after treatment, green coverage of 'Princess' bermudagrass was reduced 32% compared to the nontreated check when treated with 10 oz/A flumioxazin during spring transition (40% greenup at application). In conclusion, when applied in February or early March before spring transition, one application of flumioxazin at 10 to 12 oz/A provided excellent control of parsley-piert, mouseear chickweed and corn speedwell, as well as annual bluegrass, without injuring common bermudagrass. Flumioxazin only provided fair to good smooth crabgrass control (similar to prodiamine), probably due to summer rainfall or irrigation totals and high temperatures.

ANNUAL BLUEGRASS RESISTANT TO ALS-INHIBITING HERBICIDES. J. S. McElroy*[1], M. L. Flessner[2], R. H. Walker[1], S. Chen[1]; [1]Auburn University, Auburn, AL, [2]Auburn University, Auburn University, AL (224)

ABSTRACT

Annual bluegrass (*Poa annua*) is a low-growing grass species common in turfgrass throughout the world. Annual bluegrass is adapted to diverse climates and adapts rapidly to herbicide management practices. Annual bluegrass is an allotetraploid with *Poa infirma* and *Poa supina* as its diploid progenitors and it is suspected that polyploidy aids its adaptability. Annual bluegrass management with herbicides has become more problematic due to resistance development to almost all modes of action used. ALS-inhibiting herbicides are a popular choice for annual bluegrass control in both warm and cool-season turfgrass species. Annual bluegrass plants left uncontrolled by ALS-inhibiting herbicides were collected from Grand National Golf Course in Opelika, AL (GN population) for comparison in greenhouse experiments with a susceptible population (AU population). Treatments included foramsulfuron at 25 and 50 g ai/ha, trifloxysulfuron at 16 and 32 g ai/ha, bispyribac at 150 and 300 g ai/ha, and imazaquin at 490 and 980 g ai/ha. These herbicides were selected to encompass three ALS-inhibiting herbicide families, sulfonylurea, pyrimidinyl benzoates, and imidazolinone, and because they are registered for annual bluegrass control in turfgrass. Testing confirmed resistance of the GN population to these herbicides when compared to a susceptible population collected locally at Auburn University (AU population). Further research was conducted to determine the molecular basis of resistance. Sequencing of the GN population ALS gene revealed a point mutation resulting in an amino acid substitution of Trp_{574} to Leu_{574}. No such point mutation was observed for the AU population. Cloning of the GN population ALS gene surrounding the Trp_{574} region yielded two distinct ALS gene sequences – one encoding Trp_{574} and one producing Leu_{574}. Trp_{574} to Leu_{574} has been previously correlated with resistance to ALS-inhibiting herbicides. Diploid progenitors *Poa supina* (paternal parent) and *Poa infirma* (maternal parent) were sequenced to compare to annual bluegrass. By comparing nucleic acid sequences it was determined that the resistant allele arose from the *Poa infirma* maternal genome. Thus, the GN annual bluegrass can be said to be homozygous for the resistant allele within the maternal *Poa infirma* ancestral genome and produce both resistant and susceptible homeologous alleles from its progenitor parent genomes.

CRABGRASS AND GOOSEGRASS CONTROL WITH DITHIOPYR AND INDAZIFLAM. M. Cox*[1], K. Venner[2], S. D. Askew[2]; [1]Virginia Tech, Blaksburg, VA, [2]Virginia Tech, Blacksburg, VA (225)

ABSTRACT

Dimension® 2EW is a newer formulation of dithiopyr from Dow AgroSciences that is a widely used pre-emergence herbicide for crabgrass in the transition zone and Northern U.S. Specticle® (indaziflam) is a new herbicide from Bayer CropScience, utilizing low application rates and a new mode of action (cellulose biosynthesis inhibitor), that has shown excellent results when used as a PRE for crabgrass and goosegrass in warm-season turfgrasses. The objective of this study was to determine how the two herbicides compare to each other for pre-emergent smooth crabgrass and goosegrass control given various rates and repeat treatment programs, while comparing their results to the commonly used standard Barricade® (prodiamine). Two studies were conducted as randomized complete block designs and initiated on March 15, 2012 at Independence Club in Richmond, VA and March 29, 2012 at the Turfgrass Research Center (TRC) of Virginia Tech in Blacksburg, VA. The study site at Independence Club was infested with goosegrass and the site at the TRC was infested with smooth crabgrass. Treatments included: dithiopy at 426 g ai ha^{-1} applied twice, dithiopyr at 560 g ai ha^{-1} fb 426 g ai ha^{-1}, dithiopyr at 280 g ai ha^{-1} fb 560 g ai ha^{-1}, dithiopyr at 426 g ai ha^{-1} fb 560 g ai ha^{-1}, all at six-week intervals; dithiopyr at 560 g ai ha^{-1} applied twice at a three-week interval, indaziflam at 35 g ai ha^{-1} applied once, indaziflam at 35 g ai ha^{-1} applied twice at a six-week interval, indaziflam at 62 g ai ha^{-1} applied twice at a three-week interval, and prodiamine at 840 g ai ha^{-1} applied once on April 2, 2012. Turfgrass was 'Midlawn' bermudagrass at Independence Club and goosegrass pressure was inconsistent and seemed to follow a gradient. Turfgrass at the TRC was 'Tifway' bermudagrass and smooth crabgrass late-season pressure was consistently above 30% across the study site. No treatment in either location injured bermudagrass or delayed greenup at any timing. Smooth crabgrass cover was 3.5% or below, 27 weeks after initial treatment (WAIT), and was not significantly different between treatments. Smooth crabgrass cover in the untreated check was 34%, indicating a minimum of 90% reduction in crabgrass cover by all herbicide treatments 27 WAIT. One application of indaziflam at the 35 or 62 g ai ha^{-1} rate or two applications at a six-week interval with the 35 g ai ha^{-1} rate and a three-week interval with the 62 g ai ha^{-1} rate controlled goosegrass completely 13 WAIT. These treatments, however, were not significantly different from the following: prodiamine once (840 g ai ha^{-1}), dithiopyr once (560 g ai ha^{-1}), dithiopyr twice (426 fb 560 g ai ha^{-1}), and the untreated check. Dithiopyr applied twice (426 fb 560 g ai ha^{-1}) at a six-week interval was also not significantly different from sequential applications at a six-week interval of dithiopyr (426 g ai ha^{-1} applied twice), dithiopyr (560 fb 426 g ai ha^{-1}), dithiopyr (560 g ai ha^{-1} applied twice), and one application of dithiopyr (560 g ai ha^{-1}). Single applications of indaziflam controlled goosegrass better than single applications of dithiopyr at 13WAIT; however, there were no significant differences 27 WAIT possibly due to overspray of diclofop mid-season by golf course staff. These data suggests that Dimension® 2EW controls smooth crabgrass in bermudagrass equivalent to Specticle® 20WSP and Barricade® 4L at all rates and timings tested. It also shows that delayed applications of Dimension® 2EW are not as effective on smooth crabgrass as early timing applications. Geographical regions with short growing seasons like the transition zone of the U. S. and north may not need sequential applications of these herbicides to obtain season-long control of annual grassy weeds.

EVALUATION OF VARIOUS PGRS FOR USE ON BERMUDGRASS ROUGHS. M. D. Carlton*[1], L. B. McCarty[2], J. S. McElroy[3], F. W. Totten[4]; [1]University of Tennessee at Martin, Martin, TN, [2]Clemson University, Clemson, SC, [3]Auburn University, Auburn, AL, [4]University of Tennessee at Martin, Athens, AL (226)

ABSTRACT

Research objectives were comparing and contrasting growth suppression efficacy of various plant growth regulators on 'Tifway' bermudagrass rough, and their effects on turf quality, injury, percent seedhead, and weed count. Experimental design was randomized complete block with four replications. Plots were mowed prior to application, remained unmowed during 4 week treatment duration. Mefluidide + imazethapyr + imazapyr at 38 fl. oz/A and imazapic at 4 fl. oz/A resulted in acceptable turf quality and injury ratings on all rating dates, as well as significantly lower turf height on all rating dates 2 WAIT. Trinexapac-ethyl at 22 fl. oz/A had acceptable quality on all rating dates and significantly lower turf height on all rating dates except 1 and 5 WAIT. Imazapic + glyphosate and the tank mix of mefluidide + plateau + trinexapac-ethyl produced significantly lower turf height on all dates 2 WAIT, but significantly lower quality ratings.

PREEMERGENCE AND POSTEMERGENCE DOVEWEED (*MURDANNIA NUDIFLORA*Â (L.) BRENAN) CONTROL. J. L. Atkinson*, L. B. McCarty, A. G. Estes; Clemson University, Clemson, SC (227)

ABSTRACT

Doveweed (*Murdannia nudiflora* (L.) Brenan) is a problematic weed of golf course roughs, fairways and tees that germinates much later in the growing season than traditional summer annual grassy weeds such as crabgrass (*Digitaria spp.)* and goosegrass (*Eleusine indica* (L.) Gaertn.). Due to its late germination period, traditional early spring application of preemergence herbicides generally lack adequate residual for full season doveweed control, making identification of alternate control strategies necessary. Previous research demonstrated the efficacy of several pre and post-emergence herbicides on doveweed. Specticle 7.4 SC 9 fl oz/ac (Indaziflam) and Tower 6 L 32 fl oz/ac (Dimethenamid-p) provided approximately 12 and 6 weeks of preemergence control, respectively, when applied between May 1 and May 15 in Augusta, GA. Post-emergence herbicide applications of Blindside 66 WDG (Sulfentrazone, Metsulfuron-methyl), Celsius 68 WDG (Thiencarbazone-methyl, Iodosulfuron-methyl-sodium, Dicamba), and Speedzone 2.2 L (Carfentrazone-ethyl, 2,4-D, Mecoprop-p acid, Dicamba) provided between 70 and 90% control 2 WAIT then <40% control 4 WAIT. When applied alone, pre and post-emergence herbicides will not provide adequate long-term control; thus, sequential post emergence applications or tank mixtures of post and pre-emergence herbicides followed by a post-emergence herbicide may prove as alternate strategies for long-term doveweed control. The goal of this research was to compare preemergence herbicides applied to target doveweed's late germination period to alternate strategies for long-term doveweed control. Treatments included Tower 32 fl oz/ac and Specticle 9 fl oz/ac applied May 15, 2012, Speedzone 4pt/ac fb Speedzone 4pt/ac, Speedzone 4 pt/ac + Tower 32 fl oz/ac fb Speedzone 4 pt/ac, Speedzone 4 pt/ac + Specticle 9 fl oz/ac fb Speedzone 4 pt/ac, Celsius 3.7 oz/ac fb Celsius 3.7 oz/ac, Celsius 3.7 oz/ac + Tower 32 fl oz/ac fb Celsius 3.7 oz/ac, Celsius 3.7 oz/ac + Specticle 9 fl oz/ac fb Celsius 3.7 oz/ac, Blindside 6.5 oz/ac fb Blindside 6.5 oz/ac, Blindside 6.5 oz/ac + Tower 32 fl oz/ac fb Blindside 6.5 oz/ac, Blindside 6.5 oz/ac + Specticle 9 fl oz/ac fb Blindside 6.5 oz/ac. Initial post-emergence and post-emergence + pre-emergence tank mixtures were applied June 25, 2012. Sequential applications were made 28 DAIT. The study was conducted at Augusta Country Club in Augusta, GA on irrigated golf course rough comprised of 'Tifway' bermudagrass. Applications were made using a CO_2 powered sprayer calibrated at 20 GPA. Three treatment replications were applied on 1.5 X 2 meter plots. Visual ratings were based on a 0-100% scale, 0% indicating no control and 100% indicating complete control. All applications received a non-ionic surfactant at 0.25% V/V. ANOVA was evaluated with alpha at 0.05. Pre-emergence herbicides applied May 15 provided ≥90% control July 26, or 10 WAIT while all post-emergence and post-emergence + pre-emergence herbicide tank mixtures provided similar control at the same rating date, 4 weeks after initial post-emergence herbicide application. Sixteen weeks after preemergence herbicide application and 10 weeks after initial post-emergence herbicide and post + pre-emergence herbicide tank mixtures, Specticle 9 fl/oz ac continued to provide >90% control while all other treatments provided <70% control. Sequential applications of post emergence herbicides provided <10% control 12 WAIT. Tank mixture of Tower and Specticle with initial post-emergence applications increased control ~40 and 60% respectively. Additional herbicides will continue to be evaluated for pre and post-emergence doveweed control along with alternate application timings to target doveweed's late germination period.

PREEMERGENCE CONTROL OF SILVERY THREADMOSS PROTONEM. A. R. Post*, D. S. McCall, S. D. Askew; Virginia Tech, Blacksburg, VA (228)

ABSTRACT

Silvery threadmoss has become a major weed problem on creeping bentgrass putting greens and there are limited pesticide options for postemergece silvery threadmoss control in this system. Carfentrazone is the only herbicide currently labeled for silvery threadmoss control on putting greens. Several fungicides also have supplemental registrations for postemergent moss control on putting greens. Although these products are marketed for control of mature moss stands, the literature contains no information on pesticide effects on moss establishment from propagules. Silvery threadmoss has three propagule types that allow it to spread on a putting green: spores, bulbils, and fragments. Since little is known about how pesticides affect these propagules or whether they are affected differently, our objective was to evaluate the efficacy of several herbicide, fungicide, and herbicide + fungicide combinations for preemergent control of silvery threadmoss spores and bulbils. Three studies were initiated in three growth chambers at the Glade Road Research Facility at Virginia Tech, Blacksburg, VA. Treatments were arranged in a 2 x 20 factorial design and replicated three times in each growth chamber. Factor one was propagule type (bulbil or spore) and factor two was pesticide treatments (Table 1). Pesticides were homogenized into a solid 0.7% GelRite media amended with MS media + Gamborg vitamins. Each treatment (Table 1) was added to the media prior to pouring plates so that it equaled 80% of a v/v field rate applied over 6cm depth of soil. Spores or bulbils were plated into each treatment and placed in growth chambers at 25°C for three weeks. Digital images were taken 0, 7, 14, and 21 days after treatment. Green pixel count data were captured in Sigma Scan Pro 5 and analyzed using proc glm in SAS 9.2. After 21 days 10 treatments controlled spores and bulbils 95% or greater including carfentrazone, all combinations with carfentrazone (n=3), pyraflufen-ethyl, oxadiazon, oxyfluorfen, sulfentrazone, experimental 2, and flumioxazin. The remaining nine treatments were not effective at preventing moss establishment from spores or bulbils. Two treatments increased moss growth: methiozolin caused bulbils to grow 24% more than the nontreated and foestyl-Al cause spores to grow 6% more than the nontreated control. This research suggests several additional options for effective moss control on putting greens and the first reports of preemergent silvery threadmoss control with registered pesticides.

Table 1. Pesticide treatments were added to solid 0.7% GelRite media amended with MS + Gamborg vitamins at 80% v/v of the field rates shown here based on a hypothetical 6cm soil depth.

Fungicide Treatments	Field Rate (kg ai/ha)	Herbicide Treatments (kg ai/ha)	Field Rate (kg ai/ha)	Combination Treatments (kg ai/ha)	Field Rate (kg ai/ha)
chlorothalonil Zn	7.95	Carfentrazone	0.112	carfentrazone + chlorothalonil Zn	0.112+7.95
fosetyl –Al	9.8	methiozolin	1.5		
mancozeb	1.90	flumioxazin	0.223	carfentrazone + chlorothalonil Zn + fosetyl-Al	
Signature	9.8	sulfentrazone	0.14		0.122+7.95+9.8
Civitas	53	pyraflufen-ethyl	0.006	carfentrazone + fosetyl-Al	
Phosphite	4.97	exp #1	5.8		0.122+7.95
		exp #2	0.025	fosetyl-Al + propiconizole	
		oxadiazon	1.7		7.95+496
		oxyfluorfen	2.24		

PREEMERGENCE CONTROL OF LESPEDEZA IN BERMUDAGRASS. D. Gomez de Barreda[1], P. McCullough*[2]; [1]Polytechnic Univ. of Valencia, Valencia, Spain, [2]University of Georgia, Griffin, GA (229)

ABSTRACT

Common lespedeza is problematic annual weed in lawns and postemergence herbicides often provide erratic levels of control. The objective of this research was to evaluate efficacy of preemergence herbicides for common lespedeza and smooth crabgrass control in a bermudagrass lawn. Treatments included single and sequential treatments of dithiopyr at 420 or 560 g ai/ha and sequential treatments of indaziflam at 34 or 53 g ai/ha at preemergence crabgrass timings, and single treatments of indaziflam at 53 or 60 g ai/ha. Initial applications of sequential treatments were applied at preemergence crabgrass timings while single treatments were applied later in spring. In 2011, all dithiopyr treatments provided excellent control (>90%) of common lespedeza but control from indaziflam was poor (<70%) at 6 months after initial treatments (MAIT). Both dithiopyr rates and indaziflam at 53 g ai/ha applied sequentially provided excellent control of smooth crabgrass but delayed applications of both herbicides provided poor control. In 2012, sequential dithiopyr applications provided good (80 to 89%) to excellent control of common lespedeza and smooth crabgrass but applications later in spring were inconsistent. Sequential indaziflam applications provided poor lespedeza control but controlled crabgrass >95%.

A SUSPECTED OXADIAZON-RESISTANT GOOSEGRASS POPULATION IN VIRGINIA. S. D. Askew*[1], M. Cox[2], D. R. Spak[3]; [1]Virginia Tech, Blacksburg, VA, [2]Virginia Tech, Blaksburg, VA, [3]BayerCropScience, Cary, NC (230)

ABSTRACT

Oxadiazon is a preemergent herbicide that has been used commercially for control of annual grasses, including goosegrass (*Eleusine indica*) in warm season turf since it was registered in the late-1970's. During 2009 and 2010, a golf course superintendent in the Richmond, VA area began to experience lack of goosegrass control with oxadiazon applied at 3.4 to 4.5 kg ai/ha. This golf course had successfully used oxadiazon for preemergence goosegrass control since it opened in the early 1990's. In 2011, Virginia Tech and Bayer CropScience LP independently sampled escaped goosegrass plants/seed and tested to determine if herbicide resistance might explain the lack of product performance. Six unique ecotypes or seed sources were tested. Seed of native goosegrass was collected near Clayton, NC and Blacksburg, VA in areas known to have no prior history of oxadiazon use to serve as wild type comparisons. Three mature goosegrass plants collected from the Richmond, VA golf course served as seed donors for three suspected resistant ecotypes that were evaluated in the study by Bayer. A composite of seed from plants growing at random locations on previously oxadiazon-treated fairways at the same golf course was collected for use in the Virginia Tech trial. Approximately 100 seeds were evenly spread over a soil-mix (3 part sand: 1 part potting soil) packed lightly, then irrigated with enough water to allow soil to settle and drain for 24 hrs. Seed was then topdressed lightly with dry sand and irrigated lightly to encourage seed/soil settling. Pots were treated with Ronstar FLO (380 g oxadiazon/L) in a spray chamber equipped with flat fan nozzles at a spray volume of 373 L/ha. Treatments included oxadiazon applied at rates of 4.48, 3.4, 2.2, 1.1, 0.56, 0.28, 0.14, 0.07, and 0.03 kg ai/ha. Specticle FLO (indaziflam at 0.05 kg ai/ha) and Barricade (prodiamine at 0.84 kg ai/ha) were included as reference standards. Pots were then placed in a greenhouse and irrigated regularly to encourage seed germination. Emerged seedlings were counted weekly. Seedling counts were transformed to percent reduction of counts in nontreated pots and oxadiazon rate responses were fit to the hyperbolic function using Proc Nlin in SAS. Estimated *i* values and LC95 values were subjected to ANOVA to test for differences in lethal concentration required to reduce seedling counts between ecotypes/seed sources. Seedling population reductions for all seed sources fit the hyperbolic function in response to oxadiazon rate with wild-type plants (WT) having rapid ascent to 100% reduction compared to slower ascents from suspected resistant plants (SR). Estimated *i* values from WT seed were several orders of magnitude higher than *i* values from SR plants. The SR population in Virginia Tech trials required an estimated 16.5 kg ai/ha oxadiazon to kill 95% of the population at 9 WAT while the Virginia Tech WT seed required only 0.5 kg ai/ha. Likewise, WT seed was 24, 45, 87, and 105 times more susceptible to oxadiazon than SR plants in the studies conducted by Bayer in North Carolina. Seedlings were never observed in the pots treated with prodiamine or indaziflam at any time in any study. Based on these results, the goosegrass collected from the Richmond golf course has tested positively for oxadiazon resistance. Oxadiazon is a PPO inhibitor with no documented cases of annual grass resistance globally. This is the first reported case of herbicide resistance development of an annual grass to oxadiazon. It is not known if this is an isolated biotype or if other sites may also be at risk. However, it does indicate that the potential to develop resistance is relatively low given the ~20 years of use at the golf course where resistant goosegrass was found and over 40 years of general use after introduction, but resistance management strategies should be implemented before options become limited.

MSMA LEACHING POTENTIAL IN A SIMULATED TURFGRASS SYSTEM. G. M. Henry*[1], C. M. Straw[1], J. Moore-Kucera[2], A. Jackson[2], T. Cooper[2], L. Beck[2]; [1]University of Georgia, Athens, GA, [2]Texas Tech University, Lubbock, TX (231)

ABSTRACT

Since the 1960s, monosodium methanearsonate (MSMA), an organic form of arsenic, has been used to manage several weed species in warm-season turf. In its organic form [monomethylarsonic acid (MMA) and dimethylarsinic acid (DMA)], arsenic is relatively non-toxic. However, inorganic arsenic species [arsenite (As^{III}) and arsenate (As^{V})] can be highly toxic. Transformation and translocation of MSMA in soil is highly dependent upon soil properties and environmental conditions. Experiments were conducted at the Plant and Soil Science greenhouses in Lubbock, TX during spring of 2012 to evaluate the influence of soil texture on the transformation and translocation of MSMA in leachate collected from a simulated turfgrass environment. Pots (30 cm diameter, 0.03 yd^3) were lined with 20x20 mesh screen and filled with sandy clay loam or sand soil. 'Tifsport' hybrid bermudagrass sod (10-years old) was cut to a depth of 5 cm, washed of all soil, and transplanted into pots on February 27, 2012. Sod was placed flush with the edge of each pot and maintained at a height of 0.6 cm. A starter fertilizer ($7N\text{-}7P_2O_5\text{-}7K_2O$) was applied at transplant at a rate of 24 kg N ha^{-1}. Greenhouse temperatures were maintained at 34/26 C (day/night) with average midday solar radiation ranging from 636 to 754 µmol m^{-2} s^{-1}. Irrigation (3.8 cm of water wk^{-1}) was supplied through an overhead irrigation system. Soil and water samples were taken prior to trial initiation and analyzed for background arsenic levels. Bermudagrass grew and acclimated in the greenhouse for one month. MSMA (2.5 kg ai ha^{-1}) was applied on April 3, 2012 with a CO_2 backpack sprayer equipped with XR8004VS nozzles calibrated to deliver 375 L ha^{-1} at 221 kPa. Leachate was collected 1, 3, 7, and 14 days after treatment (DAT); and analyzed for As^{III}, As^{V}, monomethylarsonic acid (MMA), and dimethlyarsinic acid (DMA). As^{III} and MMA concentrations of 27 to 97 and 20 to 89 ppb, respectively, were recorded for several sandy clay loam leachates 1 DAT. Concentrations were 12 to 19 and 11 to 12 ppb, respectively, 3 DAT. As^{V} and DMA concentrations of 12 to 66 and 15 to 179 ppb, respectively, were recorded for several sand leachates 7 DAT. As^{III}, As^{V}, MMA, and DMA concentrations of 12 to 30, 14 to 96, 13 to 288, and 32 to 73 ppb, respectively, were recorded for several sand leachates 14 DAT. In general, higher concentrations of arsenic species were detected in earlier leachate concentrations (1 to 3 DAT) of sandy clay loam soil, while higher concentrations were observed in later leachate collections (7 to 14 DAT) from sand. This may be explained by preferential water flow.

EFFECT OF DIURON CONTAMINATED IRRIGATION WATER ON WARM-SEASON TURFGRASSES. J. W. Boyd*; University of Arkansas, Little Rock, AR (256)

NO ABSTRACT SUBMITTED

WARM-SEASON TURFGRASS ESTABLISHMENT IN SPRING AFTER FALL INDAZIFLAM APPLICATIONS. S. Sidhu*, P. McCullough; University of Georgia, Griffin, GA (257)

ABSTRACT

Indaziflam is an effective preemergence herbicide for annual bluegrass control but soil residual effects could inhibit spring turf establishment in treated areas. To test this hypothesis, field experiments were conducted to evaluate establishment of bermudagrass, centipedegrass, St. Augustinegrass, and zoysiagrass after fall indaziflam applications. Lateral spread of turfgrasses from plugs in summer generally had no meaningful differences from treatments. However, high indaziflam rates (70 and 140 g ai ha^{-1}) had ≈twofold more non-rooted stolons than the untreated while low rates (17.5 and 35 g ai ha^{-1}), oxadiazon at 3360 g ai ha^{-1}, and prodiamine at 840 g ai ha^{-1} were similar to the untreated. Indaziflam at 70 g ha^{-1} and prodiamine applications in fall reduced sprig establishment of the four turf species from the untreated but oxadiazon and low rates of indaziflam were similar. Bermudagrass establishment from seed was significantly reduced from the untreated by indaziflam at 35 to 140 g ha^{-1}, prodiamine, and oxadiazon, ranging 20 to 50% on several dates, but the low rate of indaziflam was similar to the untreated at 10 weeks after seeding. Overall, fall indaziflam applications at 17.5 to 35 g ha^{-1} appear safe on vegetative establishment of four warm-season turfgrasses in spring but reseeding bermudagrass in areas treated with rates >17.5 g ha^{-1} may cause unacceptable losses in cover.

ANNUAL GRASS CONTROL IN WARM-SEASON TUFGRASS. B. J. Brecke*, R. G. Leon, J. Unruh; University of Florida, Jay, FL (258)

ABSTRACT

Studies were conducted from 2008 through 2012 at the University of Florida, West Florida Research and Education Center near Jay, FL to determine the effectiveness of selected herbicides for annual grass control in warm-season turfgrass. Annual bluegrass (*Poa annua* L.) was controlled with a single fall preemergence application of indaziflam. When evaluated 100 days after application, 35 and 55 g a.i. indaziflam/ha provided 95% control. At 160 days after treatment control with 35 g/ha had decreased to 80% while 55 g/ha still controlled annual bluegrass at 95%. The standard treatments of prodiamine or foramsulfuron controlled annual bluegrass lest than 75%. Both methiozolin and amicarbazone applied postemergence controlled annual bluegrass 85 to 90% for up to 150 days after application. A single application of indaziflam preemergence at 50 to 60 g a.i./ha provided long-term control (85 to 90% for 170 days) of southern crabgrass (*Digitaria ciliaris* (Retz.) Koel.). Dithiopyr controlled southern crabgrass 95 to 100% when applied preemergence and 85 to 95% when applied to southern crabgrass at the 1 to 4 leaf stage. However control with dithiopyr declined to 60% 120 days after treatment when applied to crabgrass at the 1 to 2 tiller stage and to 45% when applied at the 3 to 5 tiller stage. Quinclorac and mesotrione were both effective in controlling southern crabgrass (85% control 85 days after treatment) when applied postemergence. Indaziflam applied preemergence provided 85 to 95 % goosegrass (*Eleusine indica* (L.) Gaertn.) control 110 days after application. A single application of indaziflam at 53 g/ha in March 2011controlled goosegrass at 95% the following July and at 60% when evaluated July 2012. Dimethenamid provided 95% control of goosegrass 120 days after application when applied as a sequential treatment 60 days after a preemergence application of pendimethalin. This combination controlled goosegrass better than a sequential of pendimethalin preemergence followed by a second application of pendimethalin.

DITHIOPYR AND FLORASULAM COMBINATIONS FOR BROADLEAF WEED CONTROL IN TURF. D. L. Loughner[1], A. L. Alexander*[2], J. M. Breuninger[3]; [1]Dow AgroSciences, Lawrenceville, NJ, [2]Dow AgroSciences, LLC, Lawrenceville, GA, [3]Dow AgroSciences LLC, Indianapolis, IN (259)

ABSTRACT

Most lawn care professionals use phenoxy-based herbicides to control broadleaf weeds in the spring but applications are often ineffective when temperatures are suboptimal. This research was initiated to determine if florasulam (N-(2,6-difluorophenyl)-8-fluoro-5-methoxy (1,2,4)triazolo(1,5-c)pyrimidine-2-sulfonamide) when mixed with dithiopyr (S,S'-dimethyl 2-(difluoromethyl)-4-(2-methylpropyl)-6-(trifluoromethyl)-3,5-pyridinedicarbothioate) would be effective for broadleaf weed control during these conditions. Field studies were conducted from 2007 through 2012 to determine the effect of florasulam and dithiopyr applied alone and in tank mixtures on broadleaf weed control in both cool and warm season turfgrass. Applications were made prior to or at typical preemergence crabgrass, *Digitaria* sp. timings across the eastern and midwestern US. Studies were conducted in locations that contained white clover, *Trifolium repens*, and dandelion, *Taraxacum officinale*, to assess efficacy of these herbicides applied at this early timing on key weeds common in residential turf. Florasulam applied alone or in combination with dithiopyr controlled white clover, dandelion and other broadleaf weeds. At this early timing, other herbicide mixtures containing 2,4-D were less effective. Florasulam combined with dithiopyr improved weed control in an additive or synergistic manner. These two herbicides applied together may reduce or eliminate the need for a later season postemergent herbicide treatment.

EVALUATION OF HPPD-INHIBITING HERBICIDES FOR WEED CONTROL IN ORNAMENTAL SPECIES.
M. A. Cutulle*[1], G. R. Armel[2], J. Brosnan[1], D. A. Kopsell[1], J. J. Vargas[1], W. Klingeman[1]; [1]University of Tennessee, Knoxville, TN, [2]BASF, Raleigh, NC (260)

ABSTRACT

Selective weed control in ornamental plant production can be difficult as many herbicides can cause unacceptable injury. Research was conducted to evaluate the tolerance of several ornamental species to applications of *p*-hydroxyphenylpyruvate dioxygenase (HPPD) inhibiting herbicides for control of problematic weeds in ornamental production..Mestotrione (105, 210, and 420 $g \cdot ha^{-1}$), tembotrione (92, 184, and 370 $g \cdot ha^{-1}$), and topramezone (18, 37, and 74 $g \cdot ha^{-1}$) were applied postemergence (POST) and compared to the photosystem II inhibiting herbicide bentazon (560 $g \cdot ha^{-1}$). All herbicide treatments with the exception of the two highest rates of tembotrione caused ≤ 8% injury to Japanese holly (*Ilex crenata* 'Noble's upright') and burning bush (*Euonymus alatus* 'Compactus'). Similarly, no herbicide treatment caused > 12% injury to azalea (*Azalea* 'Girard's Rose'). Conversely, all herbicides injured flowering dogwood (*Cornus florida*) 10 to 23%. Mesotrione and tembotrione injured rose (*Rosa* spp. 'Radrazz') 18 to 55%, compared to only 5 to 18% with topramezone. Daylily (*Hemerocallis* 'Siloam June Bug') injury with topramezone and tembotrione was ≤ 10%. Topramezone was the only herbicide evaluated that provided at least 93% control of redroot pigweed (*Amaranthus retroflexus*) with all application rates by 4 weeks after treatment (WAT). Redroot pigweed was controlled 67 to 100% with mesotrione and tembotrione by 4 WAT, but this activity was variable amongst application rates. Spotted spurge (*Chamaesyce maculata*) was only adequately controlled by mesotrione applications at 210 and 420 $g \cdot ha^{-1}$, while chamberbitter (*Phyllanthus urinaria*) was not controlled sufficiently with any herbicide evaluated in these studies. Yellow nutsedge (*Cyperus esculentus*) was suppressed 72 to 87% with mesotrione applications ≥ 210 $g \cdot ha^{-1}$ and with bentazon at 560 $g \cdot ha^{-1}$ by 4 WAT. All other herbicide treatments provided < 58% control of yellow nutsedge. Additional studies illustrated that hosta (*Hosta plantaginea*), pachysandra (*Pachysandra procumbens*), autumn fern (*Dryopteris erythrosora*), spirea (*Spirae japonica* 'Little Princess'), arborvitae (*Thuja plicata* 'Green Giant'), and weigela (*Weigela florida* 'Rosea') were not injured following applications of topramezone at 27 and 106 $g \cdot ha^{-1}$. Interpretations of these data could suggest that HPPD-inhibiting herbicides may provide a new option for selective POST weed control in ornamental production systems. Furthermore, off-target movement of mesotrione, topramezone, or tembotrione applications to turfgrass may not be problematic in mixed landscapes of turf and ornamental beds containing many of the species evaluated in this study.

POSTEMERGENCE CONTROL OF COMMON CARPETGRASS IN A HYBRID BERMUDAGRASS PUTTING GREEN. J. A. Hoyle*, C. M. Straw, G. M. Henry; University of Georgia, Athens, GA (261)

ABSTRACT

Common carpetgrass [*Axonopus fissifolius* (Raddi) Kuhlm.] is a stoloniferous, warm season perennial grass with medium- to course-textured leaves. Leaves of carpetgrass are light green, 4-15 cm in length, 4-10 mm wide, and usually contain 2 to 4 slender, dense spikes (3-10 cm long). Carpetgrass is adapted to moderately acidic, low fertility, and sandy wet soils which are commonly found in golf course roughs. However, carpetgrass infestations are not only limited to golf course roughs. Infestations have been documented on bermudagrass putting greens. Tolerance to low mowing height and limited amount of labeled herbicides has increased the prevalence of carpetgrass in bermudagrass putting greens. Field experiments were conducted at Pine Hills Golf Club in Winder, GA to examine the control of carpetgrass in a hybrid bermudagrass putting green. The soil was an Appling sandy loam (Fine, kaolinitic, thermic Typic Kanhapludult). Research was performed on a 'Tifdwarf' hybrid bermudagrass [*Cynodon dactylon* (L.) Pers. × *C. transvaalensis* Burtt-Davy] putting green maintained at a 0.3 cm height . Carpetgrass cover (40 to 75%) within each plot was determined at the time of initial herbicide application. Treatments were applied to plots (0.6 m x 0.9 m) arranged in a randomized complete block design with three replications. Treatments included a non-treated check, foramsulfuron [Revolver] (0.06 kg ai ha^{-1}), MSMA (1.15 kg ai ha^{-1}), trifloxysulfuron [Monument] (0.01 kg ai ha^{-1}), nicosulfuron [Accent] (0.03 kg ai ha^{-1}), thiencarbazone + iodosulfuron + dicamba [Celsius] (0.13 kg ai ha^{-1}), and thiencarbazone + foramsulfuron + halosulfuron [Tribute Total] (0.08 kg ai ha^{-1}). Initial applications were conducted on 2 July 2012 and sequential applications were made 2 and 4 weeks later (16 July 2012 and 30 July 2012, respectively) using the same rates. Treatments were applied using a CO_2 pressurized backpack sprayer equipped with XR8004VS nozzle tips calibrated to deliver 375 L ha^{-1} at 221 kPa. Percent bermudagrass phytotoxicity and carpetgrass cover were visually evaluated 1, 3, 5, and 10 weeks after initial treatment (WAIT). Percent carpetgrass control for each treatment was calculated relative to initial carpetgrass cover. Analysis of variance was performed in SAS and means were separated according to Fisher's protected LSD at the 0.05 significance level. No bermudagrass phytotoxicity was observed throughout the length of the experiment regardless of treatment. Tribute Total exhibited moderate (68%) carpetgrass control, 1 WAIT. All other treatments 1 WAIT resulted in $\leq$ 20% carpetgrass control. Tribute Total, Celsius, and MSMA (95%, 92%, and 77% control, respectively) outperformed Accent, Monument, and Revolver (47%, 43%, and 7% control, respectively) 5 WAIT. Carpetgrass control was greatest 10 WAIT. Tribute Total, Celsius, MSMA, Accent, Monument, and Revolver exhibited 100%, 100%, 93%, 92%, 53%, and 7% control, respectively, 10 WAIT. Research concludes that viable options are available for safe carpetgrass control in bermudagrass putting greens with sequential applications at low use rates.

CONTROL OF AMERCIAN BURNWEED (*ERECHTITES HIERACIIFOLIA*) IN TURF. L. B. McCarty*, A. G. Estes; Clemson University, Clemson, SC (262)

ABSTRACT

American burnweed (aka, Fireweed) is a robust summer annual in the Asteraceae family. It has an erect growth habit with smooth to hairy stems growing to 8 ft. (2.5 m) tall. Stems are solid with white pith and large plants are branched above the midpoint. Leaves alternate, spiraling, elliptic to lance shaped with narrow, sharp-pointed bases on lower part of stems and clasping bases on upper part of stem. Leaf margins are lobed or unlobed, unevenly toothed; midrib white. Flowers are white to pinkish in elongate heads, blooming late spring through fall and is the means of spread. Burnweed is found in almost any disturbed area, pastures, roadsides, or open forests, especially following fire. It occurs through most of the eastern, central, and southern states of the USA as well as Newfoundland, Quebec, the West Indies, Mexico south through Central America, South America, and Asia. Burnweed is native to North America. The objective of this study was to evaluate preemergence and postemergence control of American Burnweed in a bermudagrass (*Cynodon dactylon*) golf course rough. Plot sizes for each treatment were 2.0 by 3.0 m, with three replications. Treatments were applied using a CO_2 pressurized backpack sprayer calibrated at 20 gallons per acre. Visual ratings were taken at various intervals throughout the study including weed control from 0-100% with 0% representing no control and 100% being no burnweed present. Visual bermudagrass turf quality ratings were also taken on a scale from 0 to 9 (9=best).

Preemergence Control: All preemergence herbicides had an initial application on February 21, 2012 with repeat applications for indicated treatments on April 17, 2012. Control in mid-June (112 DAIT) was >90% following single applications of simazine 4L at 0.5 gal/acre, Specticle 20WP at 4.4 oz/acre, repeat applications of Free Hand 1.75G at 200 lbs/acre each and a combination repeat application of pendimethalin 3.8L (2 lb ai/a) + Tower 6L (32 oz/acre). Sixty to 80% control followed single applications of Gallery 75DF at 1 lb ai/acre and repeat applications of Tower 6L at 32 oz/acre each. Less than 60% control followed Tower 6L at 21 oz/acre (applied twice), Prodiamine 4L at 1 lb ai/acre, Pennant Magnum 7.62L at 4 pt/acre, and Oxadiazon Flo 3.2 L (3 lbs ai/acre). Control 168 DAIT (August 7, 2012) was >85% for the single simazine application (0.5 gal/acre), Free Hand (twice) at 200 lbs/acre each, combinations of pendimethalin (2 lbs ai/a) + Tower (32 oz/acre) applied twice, and single applications of Specticle at 4.4 oz/acre. All remaining treatments provided $\leq$60% American Burnweed control at this time.

Postemergence Control: Postemergence herbicide treatments were applied only once and on April 17, 2012 to Burnweed plants 6- to 12-inches tall with a NIS (0.25% v/v) added to all treatments. Control 2 months later (June 12, 2012) was $\geq$90% for Tribute Total at 3.2 oz/acre, Celsius at 3.7 oz/acre, BlindSide at 9.6 oz/acre and Confront at 2 pts/acre. Spotlight at 2 pts/acre and SpeedZone at 4 pts/acre provided 60 to 80% control at this time. Postemergence control 4 months after treatment (August 7, 2012) was >90% for Tribute Total, BlindSide, Celsius, and Confront. Spotlight and SpeedZone provided between 70 and 82% control at this time.

Overall, the best long-term preemergence control followed single applications of simazine and Specticle as well as repeat applications of Pendulum + Tower and Free Hand. Postemergence control from single applications was best for BlindSide, Tribute Total, Celsius, and Confront. No noticeable turf damage occurred from any treatment at any time. Future research will involve repeating this study and screening additional products alone and in various combinations with single and repeat applications.

TOPRAMEZONE FOR BERMUDAGRASS (*CYNODON DACTYLON*) CONTROL IN TALL FESCUE (*FESTUCA ARUNDINACEA*). G. K. Breeden*, J. Brosnan; University of Tennessee, Knoxville, TN (263)

ABSTRACT

Common bermudagrass (*Cynodon dactylon*) is a problematic weed of tall fescue (*Festuca arundinacea*) turfgrass. Topramezone is a new hydroxyphenylpyruvate dioxygenase (HPPD) inhibiting herbicide being evaluated for use in cool-season turfgrass. Field research was conducted from 2010 to 2012 in Knoxville, TN evaluating the efficacy of sequential applications of topramezone, triclopyr, and mixtures of topramezone-plus-triclopyr for bermudagrass control in tall fescue turf. Field research was conducted on a mature stand of tall fescue (*Festuca arundinacea*) infested with common bermudagrass (*Cynodon dactylon*) at the East Tennessee Research and Education Center in Knoxville, TN. Plots (1.5 by 3 m) were maintained as a golf course rough and arranged in a strip-plot with three replications. Whole plot treatments included sequential applications of topramezone (12.5 and 25 g ha^{-1}), triclopyr (1120 g ha^{-1}), mixtures of topramezone-plus-triclopyr and fenoxaprop-plus-triclopyr (100 + 1120 g ha^{-1}). Three applications of each treatment were applied on a 21 d interval during July, August, and September of 2010 and 2011. Plots were stripped to receive tall fescue interseeding at 0 or 490 kg ha^{-1} during September 2010 and 2011. Treatments in all trials were applied with a CO_2 powered boom sprayer calibrated to deliver 280.5 L ha^{-1} utilizing four, flat-fan, 8002 nozzles at 124 kPa, configured to provide a 1.5-m spray swath. Weed control and turf injury were visually evaluated in all trials utilizing a 0 (i.e., no weed control or turf injury) to 100 % (i.e., complete weed control or turf injury) scale at 2, 5, 8, and 14 weeks after initial treatment (WAIT). Bermudagrass control data and grid counts were also collected from each sub-plot 52 WAIT each year to determine long-term control efficacy and effects of interseeding. At no time during these studies was tall fescue injury observed. Bermudagrass control with topramezone-plus-triclopyr mixtures was greater than topramezone or triclopyr applied alone at 5, 8, and 14 WAIT each year. After two years of applications, topramezone-plus-triclopyr mixtures controlled bermudagrass 27 to 50%. However, bermudagrass control with topramezone-plus-triclopyr mixtures increased to 88 to 92% 52 WAIT when accompanied with tall fescue interseeding at 490 kg ha^{-1}. These data suggest that sequential applications of topramezone-plus-triclopyr can be utilized to manage bermudagrass and these applications in combination with interseeding tall fescue can increase bermudagrass control when compared to herbicide applications alone.

QUALIPRO NEGATE HERBICIDE FOR PERENNIAL RYEGRASS TRANSITION. S. D. Askew*[1], M. Cox[2], J. Corbett[3]; [1]Virginia Tech, Blacksburg, VA, [2]Virginia Tech, Blaksburg, VA, [3]Qualipro, Clayton, NC (264)

ABSTRACT

Bermudagrass turf is commonly overseeded with perennial ryegrass during winter dormancy to provide improved aesthetics. Several herbicides are available for controlling the perennial ryegrass during spring transition back to a bermudagrass monoculture. QualiPro recently received registration for Negate Herbicide, which will be the first transition-assisting herbicide comprised of two sulfonylurea active ingredients. It will be marketed for use in warm-season turfgrass for controlling cool-season grass weeds and a broad spectrum of broadleaf weeds. The objectives of this study were to evaluate Negate compared to industry standards foramsulfuron, trifloxysulfuron, and flazasulfuron for perennial ryegrass and broadleaf control during spring transition. Three studies were conducted in a randomized complete block design and initiated on May 22, 2009 and April 20, 2010 in North Carolina, and May 16, 2012 in Virginia. Golf fairway turf consisting of bermudagrass overseeded the previous fall with perennial ryegrass was used for these experiments. Plots were 2 m by 2 m and treated with CO_2 pressurized sprayers to deliver 280 L/ha at 262 kPa using Visiflo Flat Fan or Turbo Tee Jet 11004 nozzles. Herbicides included metsulfuron, rimsulfuron, Negate, flazasulfuron, foramsulfuron, and trifloxysulfuron applied once at 21, 18, 40, 26, 28, and 18 g ai/ha, respectively. Weed control and bermudagrass injury was visually estimated as a percentage of untreated turf. Bermudagrass was not injured by any treatment at any site. Negate and industry standards foramsulfuron, flazasulfuron, and trifloxysulfuron completely controlled perennial ryegrass and annual bluegrass by 21 DAT at all three sites. Metsulfuron failed to control annual bluegrass at one site. All treatments controlled white clover and dandelion 90% or greater. Negate, trifloxysulfuron, metsulfuron, rimsulfuron, and flazasulfuron controlled prostrate knotweed at least 97% and more than foramsulfuron, which controlled prostrate knotweed 40%. Based on these data, Negate appears to be a viable option for weed control and perennial ryegrass transition and could offer an improved broadleaf weed control spectrum compared to industry standards. More work is needed to better assess the range of broadleaf weeds controlled by Negate compared to standard transition-assisting herbicides.

DIFFERENTIAL RESPONSE TO FLUAZIFOP-P-BUTYL IN ZOYSIAGRASS CULTIVARS. R. G. Leon*[1], B. J. Brecke[1], J. Unruh[1], K. E. Kenworthy[2]; [1]University of Florida, Jay, FL, [2]University of Florida, Gainesville, FL (265)

ABSTRACT

Control of grass weed species in turfgrasses is a challenge due to the limited number of herbicides that will kill the weeds without seriously injuring the turfgrass. Fluazifop-P-butyl is a grass herbicide that can provide effective control of multiple grass weeds, and at label rates should only cause transient phytotoxicity to zoysiagrass. For this reason, fluazifop-P-butyl is an option for controlling contaminant grass species such as common and hybrid bermudagrass in zoysiagrass. However, zoysiagrass has a high genetic diversity, so it is not clear whether different commercial cultivars have the same level of tolerance to this herbicide, or if the current label rates are appropriate for all of them. Greenhouse and field experiments were conducted to determine the level of zoysiagrass cultivar tolerance to fluazifop-P-butyl. The greenhouse experiments indicated that 5 of the 12 cultivars evaluated differed in visual injury or biomass production after one application of fluazifop-P-butyl at 1.25 oz ai/A. 'JaMur' and 'Geo' were the most tolerant cultivars exhibiting approximately half the injury (16%) compared with the other cultivars (34%) 21 DAT. Dose response experiments were conducted in the field to better describe tolerance responses using 0, 0.62, 1.25, 1.88, 2.50 and 3.75 oz ai/A, which were equivalent to 0X, 0.5X, 1X, 1.5X 2X and 3X the highest label rate, respectively. 'Pristine' and 'Zeon' showed the highest injury, which was 50-86% when rates were ≥ 1.25 oz/A. 'Empire', 'Geo', 'Meyer' and 'JaMur' showed higher levels of tolerance with half or less injury levels than 'Pristine' and 'Zeon'. 'Emerald', 'Palisades', 'Royal', 'Crown' and 'Ultimate' showed intermediate tolerance. All zoysiagrass cultivars recovered with no visual injury 60 DAT. Common bermudagrass was controlled >95% with most rates except 0.62 oz/A, which provided only 73% control 30 DAT. The results indicated that the highest label rate of fluazifop-P-butyl at 1.25 oz/A can provide control of common bermudagrass without causing significant phytotoxicity to most zoysiagrass cultivars. 'Pristine' and 'Zeon' should not be treated with rates higher than 0.75 oz/A, but the other evaluated cultivars appear to tolerate up to 1.88 oz/A of fluazifop-P-butyl without causing injury that is significantly higher than the injury at 1.25 oz/A. This higher application rate might be more viable for sod growers because 6 to 8 weeks will be required for the turfgrass to fully recover after treatment. Additionally, eighty new zoysiagrass genotypes were screened for fluazifop-P-butyl tolerance, and 10 genotypes showed <5% visual injury after an application with 1.25 oz/A, suggesting that there is potential to develop new zoysiagrass cultivars with significantly higher tolerance compared with current commercial cultivars.

EXAMINATION INTO THE GEOGRAPHICAL DISTRIBUTION OF BAHIAGRASS HYBRIDS IN GEORGIA.
G. M. Henry*, J. A. Hoyle, C. M. Straw; University of Georgia, Athens, GA (266)

ABSTRACT

Bahiagrass (*Paspalum notatum*) has long been used in pastures, forages, and roadsides, but its ability to grow and reproduce in a wide range of environments has contributed to its success and spread as a turfgrass weed. Differences have been observed in bahiagrass seedhead morphology over the past decade and hybridization has been documented between several *Paspalum* spp. The existence and spread of bahiagrass hybrids may reduce the efficacy of current herbicidal controls and increase the magnitude of weed infestation in turfgrass systems. Therefore, the objective of this research was to identify hybrid bahiagrass biotypes and document their distribution throughout the state of Georgia. Twelve counties were selected throughout the state of Georgia to represent the various climatic differences. Hybrid bahiagrass biotypes were collected from roadsides over a 2 week period during the summer of 2012. Approximately 12 to 15 hybrid bahiagrass biotypes were obtained from 3 to 4 roadside locations within each county. Seedhead branch number was used to identify possible hybrid bahiagrass biotypes. Hybrid bahiagrass biotypes with seedhead branch numbers ranging from 3 to 8 were collected throughout the state. A non-hybridized bahiagrass biotype (V-shaped seedhead) was collected from each location for comparison purposes. Each hybrid bahiagrass biotype (above-ground biomass + rhizomes and roots) were excavated from each site and transplanted into 1 liter pots containing soil native to that location. Hybrid bahiagrass biotypes with 3 and 4 seedhead branches were collected from all 12 counties. Hybrid bahiagrass biotypes with 5 seedhead branches were collected in 9 counties, while biotypes with 6, 7, and 8 branches were collected from 6, 3, and 1 counties, respectively. The occurrence of 3- to 8-branched seedhead hybrid bahiagrass biotypes was visually correlated with the close proximity of dallisgrass (*Paspalum dilatatum*) and/or vaseygrass (*Paspalum urvillei*). Morphological and genetic differences are currently being determined for each collected biotype. Initial observations suggest that differences may exist with respect to plant height, leaf blade width, and rhizome morphology.

WEED AND BRUSH CONTROL IN TEXAS PASTURES AND RANGELANDS WITH CHAPARRAL® HERBICIDE. V. B. Langston*[1], D. C. Cummings[2]; [1]Dow AgroSciences LLC, The Woodlands, TX, [2]Dow AgroSciences LLC, Perry, OK (248)

ABSTRACT

Aminopyralid is an herbicide developed by Dow AgroSciences to control weeds including noxious and invasive weeds and brush on pastures and rangelands. The product, Chaparral herbicide, is formulated as a wettable granule containing 525 g ae aminopyralid + 94.5 g ae ai metsulfuron methyl per kg of product. The herbicide has postemergence activity on established broadleaf plants and brush and provides residual control of susceptible plants that emerge following application. Chaparral herbicide provides broad spectrum control required to manage weed species complexes common to many pastures and rangeland sites across the USA. These weed species include Canada thistle (*Circium arvense*), musk thistle (*Carduus nutans*), plumeless thistle (*Carduus acanthoides*), horsenettle (*Solanum carolinense*), annual broomweed (*Amphiachyris 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*), common milkweed (*Asclepias syrica*) bitter sneezeweed (*Helenium amarum*), Texas bullnettle (*Cnidoscolus texanus*), and snow-on-the-mountain (*Euphorbia marginata*). Chaparral herbicide provides control or suppression of many brush species including huisache (*Acacia farnesiana*), Rose spp. (*Rosa spp.*) and honey locust (*Gleditsia triacanthos*).

Always read and follow the label directions.

PASTURE BRUSH CONTROL OPTIONS WITH PASTUREGARD HL HERBICIDE. P. L. Burch*[1], E. S. Flynn[2]; [1]Dow AgroSciences, Christianburg, VA, [2]Dow AgroSciences, Ankeny, IA (249)

ABSTRACT

PastureGard® HL herbicide (triclopyr 3.0 lb acid equivalent (ae)/gallon + fluroxypyr 1.0 lb ae/gallon) is designed for control of brush and specific weed species in range and pastures. PastureGard HL provides excellent control of difficult to control woody species including wax myrtle, oak, persimmon, and osage orange (bois d'arc). It is the standard for sericea lespedeza control. A limitation of the former PastureGard formulation was a- reported undesirable odor and wear of application equipment seals caused by the solvent system in the formulation. A project was initiated in 2009 to improve the handling characteristics of several range and pasture herbicide products and to reduce associated container usage. Formulation enhancements were successfully developed, tested, and registrations approved by the US EPA. The new PastureGard HL solvent system improved handling characteristics and enabled the concentration of herbicides to be doubled. The new formulation can be applied in multiple ways and provides users increased flexibility in controlling unwanted brush in range and pastures. Weed control and grass tolerance trials were conducted at multiple locations across the United States. No injury was observed on several forage grass species evaluated. Overall, there were no differences observed in efficacy of the new formulation (PastureGard HL) compared to the former formulation (PastureGard) when applied at the same rate of active ingredient per acre. PastureGard HL was applied using foliar and basal techniques to confirm its utility in both growing season and dormant application techniques. The concentrations used in low volume basal make this an economical option for range and pasture brush management. Transition to the PastureGard HL formulation is underway. Packaging will be differentiated to make the user aware of the loading and lower use rates of PastureGard HL.

Consult the label before purchase or use for full details.

Always read and follow the label directions.

OUR EXPERIENCE WITH AMINOCYCLOPYRACHLOR IN TENNESSEE PASTURES. N. Rhodes*[1], T. D. Israel[2], W. P. Phillips, Jr.[1]; [1]University of Tennessee, Knoxville, TN, [2]University of Tennessee Knoxville, Knoxville, TN (250)

ABSTRACT

Aminocyclopyrachlor (MAT 28) is a new synthetic auxin herbicide that is currently registered for use for weed control in noncrop and right-of way situations. Registration for use in grass pastures and hay fields is anticipated during the next 18 months. We have evaluated MAT 28 POST extensively in Tennessee since 2008 on numerous broadleaf weeds and brush species in tall fescue (*Lolium arundinaceum*) and mixtures of tall fescue and orchardgrass (*Dactylis glomerata*); these two species comprise greater than 90 percent of our state's forage base. All experiments were replicated trials utilizing 3 replications in a randomized complete block design. Herbicides were applied with CO2 backpack or tractor sprayers in 15 to 20 gallons for water per acre. MAT28 alone or in combination with 2,4-D gave good-to-excellent (greater than 85 percent) control of numerous troublesome annual broadleaf weeds including 2 cool-season weeds, buttercup (*Ranunculus spp*.) and musk thistle (*Carduus nutans*). Likewise, MAT 28 with or without 2,4-D effectively controlled several warm season annual broadleaf weeds including common cocklebur (*Xanthium strumarium*), common ragweed (*Ambrosia atemisiifolia*), and spiny amaranth (*Amaranthus spinosus*). MAT 28 combined with either metsulfuron or triclopyr gave excellent control of dogfennel (*Eupatorium capillifolium*), an annual that is common in the central and western parts of Tennessee. MAT 28 in combination with 2,4-D shows great promise for use in horsenettle (Solanum carolinense) and tall ironweed (*Vernonia gigantea*) management programs. For horsenettle, applications at the full flower or berry stage resulted in good (greater than 75%) control one year later; earlier applications (full vegetative stage) were not as effective. We found tall ironweed to be very sensitive to MAT 28 plus 2,4-D. Pre-bloom or full-bloom applications gave excellent control one year later. MAT 28 combinations also appear to offer promise for use in brush and abandoned pasture situations. Good activity was noted in one year after treatment evaluations on brambles (*Rubus spp*.), goldenrod (*Salidago spp.*), and eastern persimmon (*Diospyrus virginiana*). Renovation (the addition of clovers) in tall fescue is a commonly used tool for improvement of nutrition and partial mitigation of the effects of fescue toxicosis in Tennessee pastures. MAT 28 was found to be similar to picloram and aminopyralid in terms of clover mortality. Plant-back studies revealed that only a partial stand of clover resulted from plantings within a year of MAT 28 application. Our recommendation will likely be to delay replanting of clovers for at least 18 months after an application of MAT 28.

BRUSH CONTROL IN THE SOUTHERN U.S. WITH AMINOCYCLOPYRACHLOR.
M. T. Edwards*[1], J. H. Meredith[2], M. L. Link[3], J. Smith[3], S. K. Rick[3]; [1]E. I. DuPont, Pierre Part, LA, [2]DuPont Crop Protection, Memphis, TN, [3]E. I. DuPont, Wilmington, DE (251)

ABSTRACT

DuPont Crop Protection is evaluating aminocyclopyrachlor for brush control in the southern United States pasture and rangeland. Aminocyclopyrachlor is characterized by low use rates, favorable mammalian toxicological profile, and a favorable environmental profile. Aminocyclopyrachlor demonstrates both foliar and residual activity on a broad spectrum of brush species, including many invasive species. Data is presented at 1 and 2 years after application on the control of key brush species from 161 trials in the southern states from 2006 – 2012 (12 States = Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, Missouri, North Carolina, South Carolina, Virginia, Tennessee, Texas). Majority of trials 3 – 4 replicates, applications made at 40 – 60 PSI and 10 – 100 GPA using backpack or tractor mounted sprayers. Aminocyclopyrachlor is planned to be sold under the brand names DuPont™ Rejuvra™ and DuPont™ Invora™ – anticipated market entry 2014. Controlled species - Maple, Box Elder, Baccharis, Locust, Privet, False Acacia, Multiflora Rose, Brambles, Acacia Difficult to control species - Hickory, Ash, Yaupon, Red Cedar, Sweet Gum, Wax Myrtle, McCartney Rose, Mesquite, Red/White Oak species. Products containing aminocyclopyrachlor for use on range and pasture are not registered for sale or use in the United States. No offer for sale, sale or use of these products is permitted prior to the issuance of the required EPA and state registrations. The information contained in this presentation is based on the latest to-date technical information available to DuPont, and DuPont reserves the right to update this information at any time.

AMINOCYCLOPYRACHLOR PERFORMANCE FOR WEED AND BRUSH MANAGEMENT IN TEXAS. P. A. Baumann*[1], J. A. McGinty[2], M. E. Matocha[2]; [1]Texas AgriLife Extension, College Station, TX, [2]Texas A&M AgriLife Extension, College Station, TX (252)

ABSTRACT

Aminocyclopyrachlor was evaluated alone and in combination with other active ingredients for control of a number of weed species and one brush species from 2009 to 2012. Other combination components included the herbicides triclopyr, metsulfuron-methyl, and chlorsulfuron. Weed species evaluated were bitter sneezeweed (Helenium amarum), woolly croton (Croton capitatus), dogfennel (Eupatorium capillofolium), silverleaf nightshade (Solanum eleagnifolium), western ragweed (Ambrosia psilostachya), bahiagrass (Paspalum notatum) and Chinese tallow (Sapium sebiferum). All herbaceous broadleaf experiments included broadcast applications employing a CO2 backpack sprayer over plots that were 10 ft. X 25 ft., replicated 3-4 times and arranged in a randomized complete block design. The Chinese tallow experiments employed a broadcast cantilever boom to allow coverage over the top of the trees. The individual plant treatment (IPT) applications were made with a CO2 pressured single nozzle sprayer. Aminocyclopyrachlor rates of 1.0 oz a.i./acre or greater provided 100% percent kill of bitter sneezeweed at 41 DAT. When 1.0 oz of this herbicide was applied with 0.2 oz a.i./acre of metsulfuron, 100 % kill was also achieved by 41 DAT. Dogfennel control was evaluated during the application season (2009) and again at 373 DAT. At the latter rating date, this species was controlled from 92 to 100% at aminocyclopyrachlor rates of 1.0 to 3.0 oz a.i./acre. When this herbicide was applied at 1.0 oz a.i./A combined with metsulfuron (0.2 oz a.i./A) or 2,4-D (8.0 oz a.i./acre), control of dogfennel was 97 and 94%, respectively, at 373 DAT. Silverleaf nightshade was less susceptible to aminocyclopyrachlor although treatment season evaluations showed 100% desiccation at rates ranging from 0.5 to 2.0 oz a.i./A. However, when evaluated at 371 DAT, control ranged from 65 to 86% at rates of 1.0, 1.5, and 2.0 oz a.i./A. When aminocyclopyrachlor was combined with chlorsulfuron in the product “Perspective”, control of woolly croton was excellent. Application rates of Perspective ranging from 1.5 to 4.5 oz/A provided from 97 to 100% control 60 DAT. Bahiagrass control from these treatments ranged from 25 to 35%. When aminocyclopyrachlor was combined with metsulfuron in the product “Rejuvra” at rates of 1.5, 2.5 and 4.0 oz/A, control of western ragweed ranged from 82 to 98%, when evaluated 60 DAT. Bahiagrass control from these rates ranged from 48 to 68% at 60 DAT. Broadcast applications of aminocyclopyrachlor over the top of Chinese tallow at rates ranging from 1.0 to 4.0 oz a.i./A provided control from 80 to 92% when evaluated 415 DAT. The addition of metsulfuron (0.2 or 0.367 oz a.i./A) to 1.33 oz a.i./A of aminocyclopyrachlor did not significantly improve control over 1.0 oz a.i./A of aminocyclopyrachlor applied alone. When 1.0 oz a.i. of aminocyclopyrachlor was combined with 4.0 oz a.i./A of triclopyr, control was 85% at 415 DAT. When aminocyclopyrachlor was applied as a foliar IPT treatment at concentrations ranging from 0.125 to 1% v/v, control was 100% at 365 DAT. Cut-stump applications of this herbicide, applied at either a 2.5 or 5 % v/v solution or in a combination of 5% aminocyclopyrachlor with 95% diesel, control was also 100% at 365 DAT. Basal bark applications where aminocyclopyrachlor was applied at 10% with 90% v/v of diesel, control at this date was also 100%. The same results were obtained when 10 to 30% v/v concentrations of aminocyclopyrachlor were combined with 90 to 70% v/v amounts of basal oil.

CONTROL OF VARIOUS PASTURE WEEDS WITH AMINOCYCLOPYRACHLOR PREMIXES. B. A. Sellers*[1], D. G. Abe[2], J. Ferrell[2]; [1]University of Florida, 33865, FL, [2]University of Florida, Gainesville, FL (253)

ABSTRACT

Aminocyclopyrachlor (ACP) is a relatively new active ingredient that is currently under investigation for weed control in pastures. It is likely that ACP will not be sold along, but rather, with other active ingredients. Experiments were conducted from 2009 to 2012 to evaluate the effect of ACP and various premixes on the control of dogfennel (*Eupatorium capillifolium*), tropical soda apple (*Solanum viarum*), St. John's wort (*Hypericum edisonianum*), whitehead broom (*Spermacoce verticillata*), Elliott's milkpea (*Galactia elliottii*), common ragweed (*Ambrosia artermisiifolia*) , parthenium ragweed (*Parthenium hysterophorus*), and spiny pigweed (*Amaranthus spinosus*). Herbicide rates and treatments varied from study to study, but general treatments included ACP at 0.5, 1.0, 1.5, and 2.0 oz/A, ACP + chlorsulfuron at 1.0 + 0.4 and 2.0 + 0.8 oz/A, ACP + 2,4-D amine at 1.0 + 8.0 and 2.0 + 15.2 oz/A, ACP + triclopyr at 1.0 + 2.0 and 2.0 + 4.0 oz/A, and ACP + metsulfuron at 0.7 + 0.1, 1.1 + 0.17, and 2.4 + 0.37 oz/A. Plots measured 20 by 50 ft, and treatments were applied using a randomized complete block design. Herbicide treatments were applied using an ATV-equipped sprayer calibrated to deliver 30 gallons/A. Aminocyclopyrachlor alone was highly effective on Elliott's milkpea, providing 100% control across all rates. At least 1.0 oz/A ACP was required for >90% control of dogfennel and common ragweed, but 2.0 oz/A was required to obtain >90% control of tropical soda apple, Carolina goldenrod, and ragweed parthenium. Control of St. John's wort, spiny amaranth, and whitehead broom was less than 50% with ACP alone. Dogfennel control was similar to ACP alone when premixed with triclopyr, however, premixing ACP with metsulfuron resulted in reduced control, regardless of application rate. Tropical soda apple control was enhanced by the addition of the high rate of triclopyr, and treatments containing ACP resulted in similar levels of residual control as the standard treatment of aminopyralid at 1.25 oz/A. All premixes, except for the lowest rate of ACP + metsulfuron, provided >80% control of St. John's wort at 30 and 365 DAT. Although the premixes of ACP + chlorsulfuron at 2.0 + 0.8 oz/A and the two highest rates of ACP + metsulfuron resulted in increased control of whitehead broom compared to ACP alone, control was less than 50%. The premix of ACP + 2,4-D at 2.0 + 15.2 oz/A provided >95% Carolina goldenrod control, but this level of control was not different from the low rate of the 2,4-D premix (88%), ACP + triclopyr at either rate (76-85%), or ACP at 2.0 oz/A (78%). Parthenium ragweed control was enhanced by all premix treatments when compared to ACP alone at 1.0 oz/A or lower, except for ACP + triclopyr at 1.0 + 2.0 oz/A. All premixes containing at least 1.0 oz/A ACP provided >80% control of common ragweed. Spiny amaranth control was enhanced by all metsulfuron and premixes, and the highest rate of the 2,4-D premix compared to ACP alone. These data indicate that ACP alone is not effective on all species, but at least one of the premixes provides good to excellent control of these various weeds. Since metsulfuron and chlorsulfuron have been shown to cause moderate to severe injury of bahiagrass, the use of these premixes may be limited in Florida. However, the use of triclopyr and 2,4-D amine premixes do show some promise for broadspectrum weed control.

WEED CONTROL IN SOUTHERN PASTURES WITH AMINOCYCLOPYRACHLOR.
J. H. Meredith*[1], C. R. Medlin[2], R. N. Rupp[3], E. P. Castner[4], R. W. Williams[5]; [1]DuPont Crop Protection, Memphis, TN, [2]DuPont Crop Protection, Paradise, TX, [3]DuPont Crop Protection, Edmond, OK, [4]DuPont Crop Protection, Weatherford, TX, [5]DuPont Crop Protection, Raleigh, NC (254)

ABSTRACT

DuPont Crop Protection is evaluating aminocyclopyrachlor for weed control in the southern United States pasture and rangeland. Aminocyclopyrachlor is characterized by low use rates, favorable mammalian toxicological profile, and a favorable environmental profile. Aminocyclopyrachlor demonstrates both foliar and residual activity on a broad spectrum of broadleaf weeds, vines and brush species. Data is presented on the control of key broadleaf weed species from trials across in the southern states from 2009 – 2012. Most trials had 3 – 4 replicates, applications made at 20 - 40 PSI and 15 - 30 GPA using backpack or tractor mounted sprayers. The following species were controlled by aminocyclopyrachlor-based product concepts: Carolina horsenettle, musk thistle, rubus species, spiny amaranth, dogfennel, Canada thistle, bitter sneezeweed, woolly croton, tall ironweed, common cocklebur, Western ragweed and common broomweed. Products containing aminocyclopyrachlor for use on range and pasture are not registered for sale or use in the United States. No offer for sale, sale or use of these products is permitted prior to the issuance of the required EPA and state registrations. The information contained in this presentation is based on the latest to-date technical information available to DuPont, and DuPont reserves the right to update this information at any time.

GROWTH REGULATOR HERBICIDES AND THEIR EFFECT ON THE UPTAKE AND TRANSLOCATION OF GLYPHOSATE. C. Smith*, D. B. Reynolds, J. Massey; Mississippi State University, Mississippi State, MS (267)

ABSTRACT

Dicamba controls numerous dicotyledonous weed species, including those that may be resistant to other herbicides like glyphosate. The development of dicamba-resistant cropping systems has the potential to provide many additional options in weed control. Plans are to incorporate dicamba, glufosinate, and glyphosate-resistant technology into the same plant. Prior research has indicated that a tank mixture of dicamba and glyphosate can lead to antagonism of glyphosate activity on grasses. Recently conducted field studies, indicate possible antagonism of glyphosate by dicamba when applied to barnyardgrass (*Echinochloa crus-galli*). The same studies also indicated that grass control was not significantly different between dicamba formulations; however, rate of dicamba did affect glyphosate visual control. A study was designed to determine absorption and uptake of glyphosate in response to the presence of dicamba, as well as determine the ability to overcome possible antagonism with increasing rates of glyphosate. Rates of 0.28, 0.56, and 0.84 kg ae/ha of glyphosate as well as, a set of identical glyphosate rates that included the addition of 0.56 lb ae/ha diglycolamine dicamba were evaluated. A radio labeled ^{14}C glyphosate was utilized in and added to a small portion of the prepared spray solution. Plants were treated with the radio labeled spray solution on the 2nd leaf from the top, halfway between the leaf tip and collar on the adaxial leaf surface. At 24 hours after treatment, the treated area was washed and the plant was partitioned into sections. The treated area was washed with water and then chloroform to remove any glyphosate on and in the epicuticular leaf wax, respectively. The majority of the labeled glyphosate was contained in the water wash of the treated area. Total glyphosate uptake after 24 hours ranged from 10 to 28% of the total applied amount. The portion of the plant below the treated leaf had a stair-step pattern of increased glyphosate concentration as glyphosate rates were increased; however, this pattern did not occur when dicamba was added. The presence of dicamba reduced the amount of glyphosate absorption at the 0.56 and the 0.84 kg ae/ha rates. Uptake of glyphosate at the 0.56 kg ae/ha rate was not different to that of the 0.84 kg ae/ha glyphosate plus 0.56 kg ae/ha dicamba, indicating that a 50% rate increase was needed to achieve similar levels within the plant. Overall, the addition of dicamba to glyphosate did result in decreased uptake at the 0.56 and the 0.84 kg ae/ha rates of glyphosate; however, decreased uptake does not necessarily equal decreased efficacy as all may have reached a lethal concentration in the 24 hours uptake period.

GLUFOSINATE TOLERANCE MECHANISM IN GLYPHOSATE-RESISTANT PALMER AMARANTH FROM ARKANSAS. R. A. Salas*, G. M. Botha, N. R. Burgos; University of Arkansas, Fayetteville, AR (268)

ABSTRACT

The widespread occurrence of glyphosate-resistant (GR) Palmer amaranth has prompted a shift in weed management strategies. Glufosinate, in glufosinate-resistant crops, is an alternative tool for controlling glyphosate-resistant weeds. This study was conducted to examine the differential response and tolerance mechanism of Palmer amaranth to glufosinate. Twelve Palmer amaranth populations from Arkansas were tested for tolerance using 0.25 to 1x of 0.73 kg ha^{-1} glufosinate in the greenhouse. Three populations, one each for susceptible, moderately tolerant, and tolerant were sprayed with a range of glufosinate doses from 0.125 to 2x the recommended dose to determine the tolerance levels. The tolerant (Pra-C) and susceptible (Lee-A) populations were analyzed for glutamine synthetase (GS) activity and NH_3 accumulation. Glufosinate applied at 0.25x, 0.5x, and 1x injured Palmer amaranth populations 13 to 67%, 49 to 95%, and 94 to 100%, respectively, 21 d after application. Two percent of Pra-C, 1% of STF and Law-C survivors had <50% injury, implying their potential to reproduce. STF and Law-C were among the 12 populations tested. Estimated glufosinate doses that cause 50% mortality (LD_{50})Â for the tolerant population (Pra-C) was 344 g ha^{-1} and 141 g ha^{-1} for the susceptible population (Lee-A). Pra-C had 20% higher basal GS activity than the Lee-A population.Â Ammonia accumulation was significantly higher and occurred faster in Lee-A than in Pra-C. Fifty percent of NH_3 accumulation occurred within 4 and 8 h after treatment in Lee-A and Pra-C, respectively. Tolerance to glufosinate is due to higher basal activity of GS in the tolerant plants, implying that more herbicide molecules are needed to cause substantial inhibition. Other tolerance mechanism(s) may also be involved. Measures are necessary to prevent survivors from producing seeds and best management strategies should be implemented to curtail resistance evolution.

EFFECTS OF GLYPHOSATE ON MINERAL NUTRITION AND DISEASE IN GLYPHOSATE-RESISTANT CROPS. S. O. Duke*; USDA, ARS, Oxford, MS (269)

ABSTRACT

Recently, there have been reports claiming that glyphosate interferes with mineral nutrition in glyphosate-resistant (GR) crops. Other papers have claimed that there is increased crop disease in GR crops, and some of them have linked deficiencies in Mn with increased plant disease. This presentation describes a recent report (Duke et al., *J. Agric. Food Chem.*, **2012**, *60*, 6764-6771) finding no effects of two applications of a recommended rate of glyphosate on any of 14 minerals, including Mn, measured in GR soybean foliage or harvested seed, whether grown in the greenhouse or field. The presentation also discusses the findings of Duke et al. (*J. Agric. Food Chem.*, **2012**, *60*, 10375-10397), who after analysis of all pertinent peer-reviewed literature concluded that: 1) although there are conflicting studies, most of the labs where the question of mineral nutrition has been studied find no effects of glyphosate on mineral nutrition in GR crops; 2) most of the available data support the view that glyphosate does not increase disease in GR crops; and 3) yield data from ERS of USDA do not support the hypothesis that there are substantive effects of glyphosate on either mineral nutrition or diseases in GR crops.

MECHANISM OF GLYPHOSATE RESISTANCE IN TALL WATERHEMP FROM MISSISSIPPI. V. K. Nandula[1], J. D. Ray[1], D. N. Ribiero[2], Z. Pan[3], K. N. Reddy*[1]; [1]USDA-ARS, Stoneville, MS, [2]Mississippi State University, Starkville, MS, [3]USDA-ARS, Oxford, MS (270)

ABSTRACT

A tall waterhemp population from Missisippi was suspected to be resistant to glyphosate. Glyphosate dose response experiments resulted in GR_{50} values of 1.28 and 0.28 kg ae ha^{-1} glyphosate for the glyphosate-resistant (GR) and -susceptible (GS) populations, respectively, indicating a 5-fold resistance. The absorption pattern of ^{14}C-glyphosate between the GR and GS populations was similar up to 24 h after treatment (HAT). Thereafter, the susceptible population absorbed more glyphosate (55 and 49% of absorbed) compared to the resistant population (41 and 40% of absorbed) by 48 and 72 HAT. Treating a single leaf with glyphosate solution at the field use rate (0.84 kg ha^{-1}) as ten 1-µl droplets provided greater control (85% vs. 29%) and shoot fresh weight reduction (73% vs. 34% of nontreated control) of the GS plants compared to the GR plants, possibly, indicating a reduced movement of glyphosate. The amount of ^{14}C-glyphosate that translocated out of the treated leaves of GR plants (19.8% of absorbed at 24 HAT and 23.3% of absorbed at 48 HAT) was significantly lower than the GS plants (30.9% of absorbed at 24 HAT and 31.9% of absorbed at 48 HAT). The IC_{50} values for the GR and GS populations were 480 and 140 µM of glyphosate, respectively, resulting in more shikimate accumulation in the GS than the GR population. Sequence analysis of 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS), the target site of glyphosate, transcript from GR and GS plants identified a consistent single nucleotide polymorphism (T/C, thymine/cytosine) between GR/GS plants, resulting in a proline to serine amino acid substitution in the GR population. The GR and GS plants contained equal genomic copy number of EPSPS, which was positively correlated with EPSPS gene expression. Thus, glyphosate resistance in the tall waterhemp population from Mississippi is due to both altered target site and non-target site mechanisms.

ASSESSMENT OF CORN INJURY FROM GLYPHOSATE USING AIRBORNE REMOTE SENSING. K. N. Reddy*[1], Y. Huang[2], S. J. Thomson[2]; [1]USDA-ARS, Stoneville, MS, [2]Crop Production Systems Research Unit, Stoneville, MS (271)

ABSTRACT

Glyphosate drift onto off-target sensitive crops can reduce growth and yield, and is of great concern to growers and pesticide applicators. Detection of herbicide injury using biological responses is tedious. The feasibility of using remote sensing as a sensitive method to detect herbicide injury was investigated. The objective was to correlate vegetation indices (VIs) derived from aerial multispectral imagery with biological responses to corn injury. In a field study in 2011, glyphosate was applied at 0, 0.01, 0.05, 0.1, 0.2, 0.5, and 1X (X = 0.866 kg ae/ha) rates to non-glyphosate-resistant corn at the 4-leaf stage. The experiment was conducted in a randomized complete block design with four replications. Each treatment consisted of eight rows spaced 102 cm apart and 27 m long. Fluometuron and *s*-metolachlor were applied at planting and standard crop production practices were used. No POST herbicides were applied until 3 weeks after glyphosate application (WAA). Plant height, shoot dry weight, and chlorophyll measurements and multispectral imagery (Geospatial Systems MS4100 camera on an Air Tractor 402B agricultural airplane) were acquired at 1, 2, and 3 WAA. Corn yield was recorded at harvest. Corn was killed with the 1X rate at 1 WAA. Plant height, shoot dry weight, and chlorophyll content decreased gradually with increasing rate regardless of WAA. Corn yield decreased from 1% at the 0.1X rate to 92% at the 0.5X rate. Similar to biological responses, the VIs from aerial imagery, NDVI (normalized difference vegetation index), SAVI (soil adjusted vegetation index), RVI (ratio vegetation index), and GNDVI (green NDVI) also decreased gradually with increasing glyphosate rate regardless of WAA. Pearson correlation analysis revealed that the VIs were highly correlated with biological responses regardless of WAA and as well as with yield. At 1 WAA, the correlation coefficients for NDVI were 0.76, 0.79, 0.70 and 0.70; for SAVI were 0.76, 0.79, 0.70 and 0.70; for RVI were 0.75, 0.77, 0.68 and 0.68; and for GNDVI were 0.76, 0.79, 0.68 and 0.67 with plant height, shoot dry weight, chlorophyll, and yield, respectively. At 3 WAA, the correlation coefficients for NDVI were 0.97, 0.91, 0.95 and 0.95; for SAVI were 0.97, 0.91, 0.95 and 0.95; for RVI were 0.93, 0.93, 0.86 and 0.90; and for GNDVI were 0.97, 0.90, 0.95 and 0.94 with plant height, dry weight, chlorophyll, and yield, respectively. These results suggest that the VIs were highly correlated with the biological responses and aerial multispectral imagery technology could be used as an alternative method to detect corn injury from glyphosate drift.

INFLUENCE OF WATER QUALITY ON GLYPHOSATE ACTIVITY IN THE TEXAS HIGH PLAINS. M. R. Manuchehri*[1], P. A. Dotray[2], T. S. Morris[3], W. Keeling[2]; [1]Texas Tech University, Lubbock, TX, [2]Texas AgriLife Research, Lubbock, TX, [3]Texas A&M Agrilife Research, Lubbock, TX (272)

ABSTRACT

Water is the primary carrier used in most herbicide applications. The quality of water plays a critical role in the success or failure of herbicide treatments, especially for weak acid herbicides such as glyphosate. In an attempt to offset potential antagonism of herbicides due to poor water quality, some growers in the Texas High Plains are investing in reverse osmosis systems. Reverse osmosis is a filtration process that removes dissolved inorganic solids from water. Understanding how water quality may influence glyphosate efficacy is important due to its increased use over the past 15 years. The effects of water quality and ammonium sulfate on glyphosate efficacy were assessed in five field trials established near Lubbock, TX in 2012. Test plants included volunteer winter wheat (*Triticum aestivum* L.) and Palmer amaranth (*Amaranthus palmeri* S. Wats.). All trials were organized in a randomized complete block design with four replications. Five water samples, ranging in cation concentrations of 519-1,046 ppm, were selected from a collection of 23 wells pumped from the Ogallala Aquifer across the Texas High Plains. The selected five sources plus a reverse osmosis water source were used as carriers for the following four herbicide treatments: glyphosate applied alone at 0.43 and 0.86 kg ae ha^{-1} and glyphosate applied at 0.43 and 0.86 kg ae ha^{-1} with dry ammonium sulfate at 20.37 g L^{-1}. Injury was recorded at 14, 21, and 28 days after application. Differences in efficacy due to water source or a water source by glyphosate rate interaction were observed in three of the four field trials. Additionally, efficacy improved with increasing glyphosate rate and the presence of ammonium sulfate.

POTENTIAL IMPROVEMENT IN RICE SEEDLING ESTABLISHMENT AND WEED SUPPRESSION IN REDUCED-INPUT SYSTEMS USING OSMOTICALLY PRE-CONDITIONED SEEDS. D. R. Gealy*, A. M. McClung; USDA-ARS, Stuttgart, AR (273)

ABSTRACT

Asian indica rice cultivars have exhibited suppression potential against barnyardgrass (*Echinochloa crus-galli*) in drill-seeded, flood-irrigated production systems in the U.S. However, the degree of weed suppression has been inconsistent, and is dependent on environmental and production factors which vary from year to year. Weed-suppressive cultivars could improve the efficacy of low-input/ organic rice systems. In earlier research, increased seedling emergence rates of rice have resulted in improved weed suppression and yield performance in drill-seeded rice systems. Exposing rice seeds to brief, pre-plant soaking in water or aqueous solutions under reduced osmotic potential followed by drying, has been shown to improve the rates and maximum levels of seedling emergence, which resulted in increased grain yield. Our objective was to determine the efficacy of pre-plant seed soaking/drying treatment of diverse rice germplasm to improve yield and suppression of weeds under low input systems. In order to address these objectives, a split-plot experiment was conducted in the field at Stuttgart, AR in 2012. Main plots were a factorial combination of nine cultivars or germplasm lines and three seed treatments. Sub-plots were two levels of barnyardgrass infestation (weedy or weed-free). Rice cultivars consisted of commercial standards (long-grain cultivars, Cocodrie,Katy, Sierra, and Lemont, and medium-grain, Bengal); and indica (or indica-derived) germplasm putatively suited to low-input/organic systems (Rondo, PI 312777, PI 338046, and STG06L-35-061). Rondo and Sierra are being grown in commercial organic systems in the southern U.S. PI 312777 and PI 338046 have been demonstrated to be allelopathic against barnyardgrass, and were among the parental lines used to develop STG06L-35-061. Rice seed treatments were 1) dry (i.e. conventional); 2) two sequential cycles of 24-h soaking/ 24-h drying at 27C in distilled water (DW) followed by chilling at 4 C for 48 h prior to drill-seeding; and 3) a procedure identical to treatment #2 except that the seeds were soaked in a solution of 0.2M CaCl2 (ψs =~ -1.25 Mpa). The soaking/drying treatments serve to initiate key seed germination processes which are then arrested before germination can be completed. Herbicides were applied to control weeds in the weed-free plots. The time to 50% of maximum emergence for the dry seed treatment ranged from 190 hours after planting (HAP) for PI 338046 to 380 HAP for Lemont. Both CaCl2 and DW treatments increased emergence rates of Rondo. For most rice cultivars, however, the DW treatment reduced emergence, and CaCl2 had minimal effect. These results suggest that the soaking treatments may have degraded the vigor of seeds. The DW treatment inhibited emergence of Katy, Lemont, and STG06L-35-061 by more than 50%, but did not affect Bengal. However, a severe drought, which extended through the planting and emergence period, resulted in substantial moisture stress that may have interacted with the seed soaking treatments to reduce seedling emergence of some rice cultivars. In weed-infested plots, PI 338046, PI 312777, and Rondo produced the greatest suppression of weeds and highest grain yields among the rice cultivars tested. Bengal was the most weed-suppressive and highest yielding among the non-indica cultivars. Although atypical environmental stresses occurred during the planting/emergence period in 2012, clear differences in emergence response to the seed treatments were observed among some cultivars, suggesting that further studies conducted under additional (preferably less extreme) environmental conditions are warranted.

GIANT RAGWEED COMPETITION IN COTTON. K. Barnett*, L. E. Steckel; University of Tennessee, Jackson, TN (274)

ABSTRACT

Giant ragweed has been primarily considered a weed of floodplains, fence rows, and ditch banks, but in more recent years has become an issue in agronomic crops across the United States. Previous work determined that giant ragweed was one of the most competitive weeds in corn and soybean and can reduce yields with low populations of giant ragweed. However, little is known about the effects of giant ragweed in cotton. Therefore a field study was conducted in 2011 and 2012 to demonstrate the effect of giant ragweed on cotton maturity, lint yield, and fiber quality. Giant ragweed densities were 0, 1, 2, 4, 8, and 16 weeds per 3.8 by 9 m plot. Plots were maintained weed free throughout the growing season. Cotton heights, node above cracked boll ratings, lint yield, and fiber quality characteristics were assessed. The objectives of this study were to determine if giant ragweed would reduce cotton height, delay maturity, reduce yield, and fiber quality at each of these populations. Cotton height was reduced by low populations of giant ragweed early in the growing season. At the 4-lf stage, a giant ragweed population of 2 or more plants per plot significantly reduced height from the non-treated control and populations of 4 or more plants reduced height at the 8-lf and 12-lf stages. Node above white flower (NAWF) and node above cracked boll (NACB) evaluations indicated that populations of 16 plants (for NAWF) and 8 or 16 plants (NACB) could delay cotton maturity. A hyperbolic decay model indicated that low populations of giant ragweed can significantly reduce yield due to season long competition. One giant ragweed plant per plot reduced yield by 300 kg/ha and yield continued to decrease with increasing populations. Approximately 2.6 giant ragweed plants reduced yield by 50% from the non-treated control. Yield of the border rows where giant ragweed indirectly competed with cotton also resulted in a steady decrease of yield with increasing populations. At 18.5 giant ragweed plants, just slightly higher than the highest population of 16 plants, 50% yield loss would occur with the border rows. Fiber quality was not affected by giant ragweed competition in this study. However, season long giant ragweed competition can significantly impacts cotton growth, development, and yield. Control options will need to be utilized for growers to maintain yields.

WEED SURVEY – SOUTHERN STATES

2013

Broadleaf Crops Subsection

(Cotton, Peanut, Soybean, Tobacco, and Forestry)

Theodore M. Webster

Chairman

Information in this report is provided by the following individuals:

Alabama	Mike Patterson	John Everest
Arkansas	Jason Norsworthy Bob Scott	Nilda Burgos Tom Barber
Florida	Jay Ferrell	Ramon Leon
Georgia	A. Stanley Culpepper David Moorhead	Eric P. Prostko J. Michael Moore
Kentucky	J. D. Green	J. R. Martin
Louisiana	Daniel Stephenson Dearl Sanders	Donnie Miller Jim Griffin
Mississippi	Jason Bond	Tom Eubank
Missouri	Kevin Bradley	
North Carolina	Alan York Loren Fisher	David Jordan

Table 1. The Southern States 10 Most Common and Troublesome Weeds in Cotton.

Ranking	States		
	Alabama	**Arkansas**	**Florida**
Ten Most Common Weeds			
1	crabgrass spp.	Palmer amaranth	Florida pusley
2	morningglory spp.	barnyardgrass	nutsedge spp.
3	prickly sida	morningglory spp.	Southern crabgrass
4	sicklepod	crabgrass spp.	morningglory spp.
5	pigweed spp.	prickly sida	Palmer amaranth
6	nutsedge spp.	horseweed	sicklepod
7	Florida pusley	broadleaf signalgrass	volunteer peanut
8	spurge spp.	nutsedge spp.	Florida beggarweed
9	goosegrass	velvetleaf	crowfootgrass
10	horseweed	spurge spp.	Goosegrass
Ten Most Troublesome Weeds			
1	Glyphosate-resistant Palmer amaranth	Palmer amaranth	Glyphosate-resistant Palmer amaranth
2	pigweed spp.	morningglory spp.	Benghal dayflower*
3	horseweed	nutsedge spp.	morningglory spp.
4	morningglory spp.	horseweed	volunteer peanut
5	nutsedge spp.	velvetleaf	Palmer amaranth
6	spurge spp.	barnyardgrass	Florida pusley
7	tropic croton	fall panicum	nutsedge spp.
8	smartweed spp.	crabgrass spp.	bermudagrass
9	bermudagrass	broadleaf signalgrass	Texas millet**
10	hophornbeam copperleaf	prickly sida	smallflower morningglory

*Benghal dayflower was previously known as tropical spiderwort.

**Texas millet was previously known as Texas panicum

Table 1. The Southern States 10 Most Common and Troublesome Weeds in Cotton (continued).

Ranking	States		
	Georgia	**Louisiana**	**Mississippi**
Ten Most Common Weeds			
1	Palmer amaranth	morningglory spp.	Palmer amaranth
2	Texas millet**	nutsedge spp.	barnyardgrass
3	smallflower morningglory	browntop millet	morningglory spp.
4	*Ipomoea* morningglory spp.	barnyardgrass	broadleaf signalgrass
5	Florida pusley	pigweed spp.	prickly sida
6	crabgrass spp.	prickly sida	spurge spp.
7	Florida beggarweed	hemp sesbania	crabgrass spp.
8	nutsedge spp.	broadleaf signalgrass	velvetleaf
9	sicklepod	redvine	yellow nutsedge
10	bristly starbur	johnsongrass	horseweed
Ten Most Troublesome Weeds			
1	glyphosate+ALS-resistant Palmer amaranth	morningglory spp.	Palmer amaranth
2	glyphosate-resistant Palmer amaranth	nutsedge spp.	morningglory spp.
3	Benghal dayflower*	pigweed spp.	yellow nutsedge
4	Palmer amaranth	browntop millet	barnyardgrass
5	*Ipomoea* morningglory spp.	henbit	horseweed
6	Florida pusley	redvine	goosegrass
7	nutsedge spp.	hemp sesbania	broadleaf signalgrass
8	spreading/Asiatic dayflower	prickly sida	prickly sida
9	smallflower morningglory	johnsongrss	browntop millet
10	goosegrass	alligatroweed	crabgrass spp.

*Benghal dayflower was previously known as tropical spiderwort.

**Texas millet was previously known as Texas panicum

Table 1. The Southern States 10 Most Common and Troublesome Weeds in Cotton (continued).

Ranking	State	
	Missouri	**North Carolina**
Ten Most Common Weeds		
1	Palmer amaranth	Palmer amaranth
2	crabgrass spp.	morningglory spp.
3	morningglory spp.	large crabgrass
4	common cocklebur	broadleaf signalgrass
5	goosegrass	goosegrass
6	prickly sida	common ragweed
7	velvetleaf	redroot pigweed
8	spurge spp.	common lambsquarters
9	yellow nutsedge	sicklepod
10	johnsongrass	nutsedge spp.
Ten Most Troublesome Weeds		
1	Palmer amaranth	Glyphosate- and ALS-resistant Palmer amaranth
2	morningglory spp.	morningglory spp.
3	prickly sida	Glyphosate-resistant common ragweed
4	johnsongrass	Glyphosate-resistant horseweed
5	horseweed	Florida pusley
6	goosegrass	doveweed
7	yellow nutsedge	wild radish
8	bermudagrass	goosegrass
9	common cocklebur	nutsedge spp.
10	velvetleaf	Texas millet**

**Texas millet was previously known as Texas panicum

Table 2. The Southern States 10 Most Common and Troublesome Weeds in Peanut.

	States		
Ranking	**Alabama**	**Arkansas**	**Florida**
Ten Most Common Weeds			
1	Florida beggarweed	Palmer amaranth	nutsedge spp.
2	nutsedge spp.	nutsedge spp.	sicklepod
3	morningglory spp.	sicklepod	Florida pusley
4	Florida pusley	johnsongrass	Florida beggarweed
5	sicklepod	barnyardgrass	morningglory spp.
6	Texas millet**	morningglory spp.	crabgrass spp.
7	prickly sida	crabgrass spp.	Benghal dayflower
8	Palmer amaranth	Texas millet	Palmer amaranth
9	bristly starbur	prickly sida	crowfootgrass
10	spurge spp.		hairy indigo
Ten Most Troublesome Weeds			
1	Palmer amaranth	AlS-resistant Palmer amaranth	ALS-resistant Palmer amaranth
2	Benghal dayflower*	nutsedge spp.	volunteer cowpea
3	Florida beggarweed	morningglory spp.	hairy indigo
4	nutsedge spp.	johnsongras	groundcherry spp.
5	spurge spp.	broadleaf signalgrass	Benghal dayflower*
6	horsenettle	barnyardgrass	tropic croton
7	tropic croton	horsenettle	Texas millet**
8	wild poinsettia	prickly sida	Florida beggarweed
9	maypop passionflower		morningglory spp.
10	prickly sida		bristly starbur

*Benghal dayflower was previously known as tropical spiderwort.

**Texas millet was previously known as Texas panicum

Table 2. The Southern States 10 Most Common and Troublesome Weeds in Peanut (continued).

	States	
Ranking	**Georgia**	**North Carolina**
Ten Most Common Weeds		
1	Palmer amaranth	large crabgrass
2	Florida beggarweed	Palmer amaranth
3	Texas millet**	morningglory spp.
4	sicklepod	common lambsquarters
5	Florida pusley	broadleaf signalgrass
6	nutsedge spp.	sicklepod
7	morningglory spp.	common ragweed
8	bristly starbur	common cocklebur
9	crabgrass spp.	nutsedge spp.
10	tropic croton	prickly sida
Ten Most Troublesome Weeds		
1	Palmer amaranth	Palmer amaranth
2	Florida pusley	common ragweed
3	Benghal dayflower*	common lambsquarters
4	Florida beggarweed	Bermudagrass
5	sicklepod	Texas millet**
6	tropic croton	eclipta
7	nutsedge spp.	nutsedge spp.
8	Texas millet**	sicklepod
9	morningglory spp.	morningglory spp.
10	common bermudagrass	Florida beggarweed

**Texas millet was previously known as Texas panicum

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Soybean.

	States		
Ranking	**Alabama**	**Arkansas**	**Florida**
Ten Most Common Weeds			
1	sicklepod	Palmer amaranth	nutsedge spp.
2	pigweed spp.	broadleaf signalgrass	sicklepod
3	morningglory spp.	barnyardgrass	Florida pusley
4	crabgrass spp.	morningglory spp.	Florida beggarweed
5	prickly sida	prickly sida	morningglory spp.
6	nutsedge spp.	crabgrass spp.	bristly starbur
7	Florida pusley	nutsedge spp.	Palmer amaranth
8	common ragweed	horseweed	crabgrass spp.
9	common cocklebur	barnyardgrass	crowfootgrass
10	groundcherry spp.	hemp sesbania	common cocklebur
Ten Most Troublesome Weeds			
1	sicklepod	Palmer amaranth	Glyphosate-resistant Palmer amaranth
2	morningglory spp.	morningglory spp.	Benghal dayflower*
3	groundcherry spp.	horseweed	cowpea
4	Palmer amaranth	nutsedge spp.	hairy indigo
5	tropic croton	prickly sida	groundcherry spp.
6	horsenettle	hemp sesbania	tropic croton
7	pigweed spp.	giant ragweed	Texas millet**
8	Florida pusley	barnyardgrass	Florida beggarweed
9	bermudagrass	red rice	morningglory spp.
10	horseweed	broadleaf signalgrass	bristly starbur

*Benghal dayflower was previously known as tropical spiderwort.

**Texas millet was previously known as Texas panicum.

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Soybean (continued).

	States		
Ranking	**Georgia**	**Kentucky**	**Louisiana**
Ten Most Common Weeds			
1	Palmer amaranth	horseweed	morningglory spp.
2	sicklepod	smooth pigweed	browntop millet
3	crabgrass spp.	morningglory spp.	pigweed spp.
4	morningglory spp.	common ragweed	hemp sesbania
5	Texas millet**	prickly sida	prickly sida
6	common cocklebur	common lambsquarters	barnyardgrass
7	nutsedge spp.	johnsongrass	dayflower spp.
8	Florida beggarweed	large crabgrass	jointvetch spp.
9	Florida pusley	giant ragweed	johnsongrass
10	field corn	hophornbeam copperleaf	nutsedge spp.
Ten Most Troublesome Weeds			
1	Palmer amaranth	horseweed	morningglory spp.
2	sicklepod	honeyvine swallowwort***	pigweed spp.
3	morningglory spp.	trumpetcreeper	browntop millet
4	nutsedge spp.	burcucumber	nutsedge spp.
5	Florida pusley	morningglory spp.	redvine
6	Benghal dayflower*	giant ragweed	henbit
7	Texas millet**	Palmer amaranth	dayflower spp.
8	Florida beggarweed	eastern black nightshade	johnsongrass
9	Roundup Ready cotton	waterhemp spp.	prickly sida
10	Roundup Ready corn	yellow nutsedge	red rice

*Benghal dayflower was previously known as tropical spiderwort.

**Texas millet was previously known as Texas panicum.

***honeyvine swallowwort was previously known as honeyvine milkweed

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Soybean (continued).

	States	
Ranking	**Mississippi**	**Missouri**
Ten Most Common Weeds		
1	barnyardgrass	waterhemp spp.
2	prickly sida	morningglory spp.
3	morningglory spp.	prickly sida
4	crabgrass spp.	giant foxtail
5	Palmer amaranth	common cocklebur
6	hemp sesbania	horseweed
7	browntop millet	common ragweed
8	sicklepod	velvetleaf
9	broadleaf signalgrass	large crabgrass
10	yellow nutsedge	yellow nutsedge
Ten Most Troublesome Weeds		
1	Palmer amaranth	waterhemp spp.
2	morningglory spp.	morningglory spp.
3	yellow nutsedge	Palmer amaranth
4	barnyardgrass	giant ragweed
5	redvine	johnsongrass
6	browntop millet	Asiatic dayflower
7	johnsongrass	Horseweed
8	prickly sida	prickly sida
9	horseweed	common ragweed
10	crabgrass spp.	eastern black nightshade

Table 4. The Southern States 10 Most Common and Troublesome Weeds in Tobacco.

	States		
Ranking	**Florida**	**Georgia**	**Kentucky**
Ten Most Common Weeds			
1	crabgrass spp.	crabgrass spp.	smooth pigweed
2	Florida pusley	Florida pusley	foxtail spp.
3	nutsedge spp.	morningglory spp.	large crabgrass
4	sicklepod	nutsedge spp.	morningglory spp.
5	Florida beggarweed	pigweed spp.	common lambsquarters
6	bermudagrass	common lambsquarters	common ragweed
7	morningglory spp.	Florida beggarweed	johnsongrass
8	bristly starbur	bermudagrass	yellow nutsedge
9	Texas millet**	bristly starbur	Carolina horsenettle
10	pigweed spp.	sicklepod	hairy galinsoga
Ten Most Troublesome Weeds			
1	nutsedge spp.	nutsedge spp.	hairy galinsoga
2	bermudagrass	morningglory spp.	yellow nutsedge
3	morningglory spp.	bermudagrass	Carolina horsenettle
4	Benghal dayflower*	pigweed spp.	morningglory spp.
5	sicklepod	Florida pusley	honeyvine swallowwort***
6	Florida beggarweed	Florida beggarweed	johnonsgrass
7	bristly starbur	bristly starbur	smooth pigweed
8	pigweed spp.	Benghal dayflower*	common ragweed
9	hairy indigo	sicklepod	common lambsquarters
10	wild poinsettia	common cocklebur	smooth groundcherry

*Benghal dayflower was previously known as tropical spiderwort.

**Texas millet was previously known as Texas panicum.

***honeyvine swallowwort was previously known as honeyvine milkweed.

Table 4. The Southern States 10 Most Common and Troublesome Weeds in Tobacco (continued).

	State
Ranking	**North Carolina**
Ten Most Common Weeds	
1	nutsedge spp.
2	large crabgrass
3	pigweed spp.
4	sicklepod
5	broadleaf signalgrass
6	common ragweed
7	common lambsquarters
8	morningglory spp.
9	goosegrass
10	bermudagrass
Ten Most Troublesome Weeds	
1	morningglory spp.
2	pigweed spp.
3	nutsedge spp.
4	large crabgrass
5	sicklepod
6	common ragweed
7	common cocklebur
8	Carolina horsenettle
9	common lambsquarters
10	broadleaf signalgrass

Table 5. The Southern States 10 Most Common and Troublesome Weeds in Forestry.

	States		
Ranking	**Arkansas**	**Florida**	**Georgia**[1]
Ten Most Common Weeds			
1	panicum spp.	dogfennel	bermudagrass
2	bahiagrass	gallberry	*Rubus* spp.
3	bermudagrass	saw palmetto	fescue spp.
4	broomsedge	common ragweed	dogfennel
5	goatweed	Japanese climbing fern	horseweed
6	horseweed	broomsedge	sicklepod
7	kudzu	Chinese tallow	eastern baccharis
8	ragweed spp.	cogongrass	Texas millet**
9	goldenrod spp.	Chinese privet	camphorweed
10	morningglory spp.	oak spp.	tropic croton
Ten Most Troublesome Weeds			
1	panicum spp.	cogongrass	bermudagrass
2	bahiagrass	saw palmetto	*Rubus* spp.
3	kudzu	bamboo	fescue spp.
4	morningglory spp.	Chinese privet	dogfennel
5	Japanese climbing fern	Japanese climbing fern	horseweed
6	*Rubus* spp.	broomsedge	sicklepod
7	broomsedge	Chinese tallow	eastern baccharis
8	goatweed	dogfennel	Texas millet**
9	horseweed	blackberry spp.	camphorweed
10	ragweed spp.	titi	tropic croton

[1] Establishment phase for non-cutover sites.

Table 5. The Southern States 10 Most Common and Troublesome Weeds in Forestry (continued).

	States	
Ranking	**Georgia**[2]	**Louisiana**
Ten Most Common Weeds		
1	sweetgum	broomsedge
2	*Quercus* spp.	dogfennel
3	*Acer* spp.	Sweetgum
4	gallberry	fireweed
5	wax myrtle	panicum spp.
6	saw palmetto	goldenrod
7	*Nyssa* spp.	*Rubus* spp.
8	privet	giant ragweed
9	*Carya* spp.	Chinese privet
10	Kudzu	johnsongrass
Ten Most Troublesome Weeds		
1	Sweetgum	sweetgum
2	*Quercus* spp.	Chinese tallow
3	*Acer* spp.	Chinese privet
4	gallberry	yaupon
5	wax myrtle	broomsedge
6	saw palmetto	*Rubus* spp.
7	*Nyssa* spp.	Japanese climbing fern
8	privet	*Smilax* spp.
9	*Carya* spp.	gallberry
10	kudzu	dogfennel

[2] Site prep and woody release sites.

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