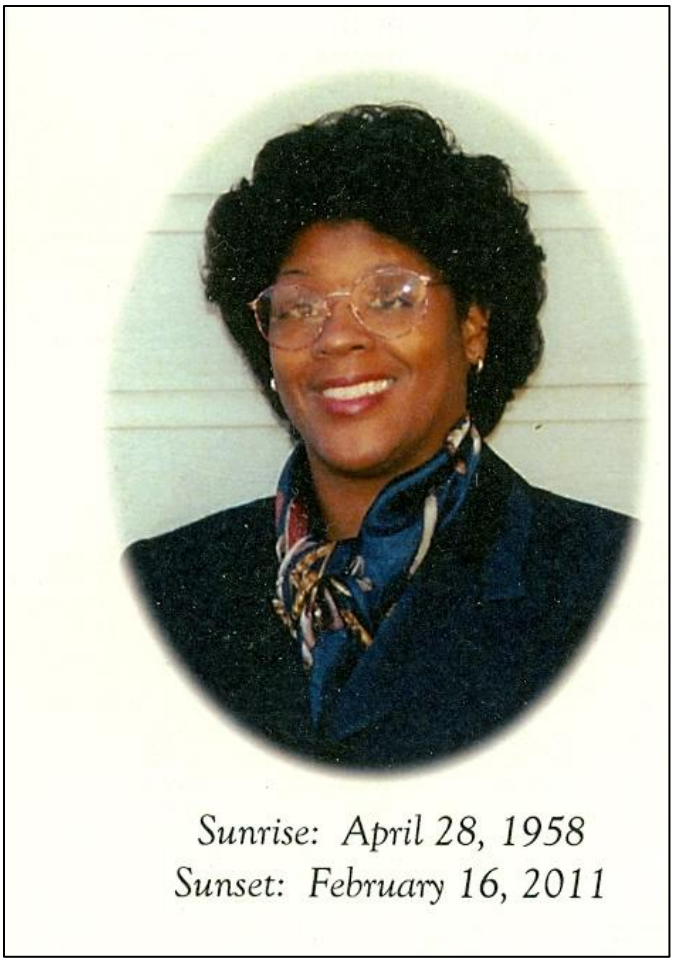
Dedication Statement

By order of the Executive Board of the Southern Weed Science Society, the program and the 64th Proceedings of the Southern Weed Science Society's meeting is hereby dedicated to the memory and in grateful appreciation to the service of Dr. Jacquelyn Edwards Driver.



Dr. Jacquelyn Driver was born in Pine Bluff, AR. After living and working (chopping and picking cotton) on the family farm near Sherrill, AR, she attended the University of Arkansas at Pine Bluff and obtained a B.S. Degree in Agronomy in 1980. During her undergraduate studies, she worked as an intern for Dow Chemical, USA and Natural Resources Conservation Service. She later became a Soil Conservationist with NRCS. She continued her studies at the University of Arkansas in Fayetteville, under the leadership of Dr. Bob Frans, and received her M.S. Degree with a Weed Science emphasis in 1983. Following graduation, she worked as an Extension Agricultural Agent and later taught soil and crops courses at Texas A&M University in Kingsville. She accepted a position with Syngenta Crop Protection, Inc. after receiving her Ph.D. Degree from Oklahoma State University in 1993 under the direction of Dr. Tom Peeper. She worked for Syngenta Crop Protection, Inc. for 18 years as a Biological Research and Development Representative, while later in her career she was involved in research activities in turf, ornamentals, and professional pest management.

Jackie was a member of SWSS since 1980 for a total of 31 years. As a graduate student, she received 1st place in the Graduate Student Research Paper Contest and was a member of the Arkansas Weed Team. She was active in the Society on various committees. Jackie served as a member of the Graduate Program Committee, Nomination Committee, Local Arrangements Committee, and Sales Coordination Committee. She served as Chairperson of the Graduate Student Program Committee in 1997. She also participated as a judge of the SWSS Student Paper and Poster Contests and assisted with the Summer Weed Contest when hosted by Syngenta in MS and FL. She continued her participation and service to the Society as a Member-at-Large representing Industry on the SWSS Executive Board for several years. Jackie was elected to serve as Vice-President of the SWSS and later served in the role of President. Jackie was awarded the Distinguished Service Award by the Society in 2009. Jackie was also a member of WSSA, Sigma Xi, and Gamma Sigma Delta. She and her husband Tony resided in Crawford, TX, and both were active members in their community and church.

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Preface

These PROCEEDINGS of the 65th Annual Meeting of the Southern Weed Science Society contain papers and abstracts of presentations in Charleston, SC at the Francis Marion 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 does not constitute an endorsement, nor does the non-use of similar products constitute a criticism by the Southern Weed Science Society.

This document is 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.

2012 Distinguished Service Award from Industry

Robert L. Nichols

Since 1992 Bob Nichols has managed research in crop production and pest protection for Cotton Incorporated, and has served in leadership and advisory roles on several cotton industry and agricultural action groups. He has broad experience in crop agriculture and pest management, including experience in agronomic research and management of products, staff, research stations, and regional and national development programs in the crop protection industry.

Before joining Cotton Incorporated, Dr. Nichols held positions in research with USDA-ARS, in product development with PPG Industries, in research management with F. Hoffmann La Roche Company and in marketing management with Agri-Growth Research. Dr. Nichols has worked in plant biology, crop production, and pest management for more than 30 years.

He has been an active member of the Southern Weed Science Society (SWSS) since 1980, and has formally and informally served the SWSS during that period. In addition to the SWSS, Dr. Nichols is a member of the American Chemical Society, the American Society of Agronomy, the American Phytopathological Society and the Weed Science Society of America. While chair of the Herbicide Resistant Weeds Committee of the SWSS, he petitioned on behalf of the committee and secured establishment of the group as a permanent Special Committee of the Society. Subsequently much of his activity has been directed to development of management programs to sustain the utility of critical herbicide mechanisms of action in agronomic crops.

Dr. Nichols has a B.A. from Yale University and a Master of Science and Doctorate of Agronomy from the University of Connecticut. He served four years with the U.S. Army Security Agency, including three tours in Vietnam. He is married with five children and five grandchildren. He has lived in eight U.S. states, including Georgia, Florida, and North Carolina; and now resides in Wake County, North Carolina.

2012 Distinguished Service Award from Academia

David R. Shaw

David Shaw is the Past-President of the Weed Science Society of America. He currently is chair of the WSSA's S-71 Herbicide Resistance Education Committee. He is also chair of the task force developing the USDA-APHIS report on Herbicide Resistance Best Management Practices and Recommendations. He is chair of the Council for Agricultural Science and Technology task force on Impacts of Herbicide Resistant Weeds on Tillage Systems. Professionally he is the Vice President for Research and Economic Development at Mississippi State University. He received his Ph.D. in Weed Science from Oklahoma State University in 1985, his M.S. from OSU in 1983, and his B.S. from Cameron University in 1981. Dr. Shaw began his career at Mississippi State in 1985 as an Assistant Professor of Weed Science.

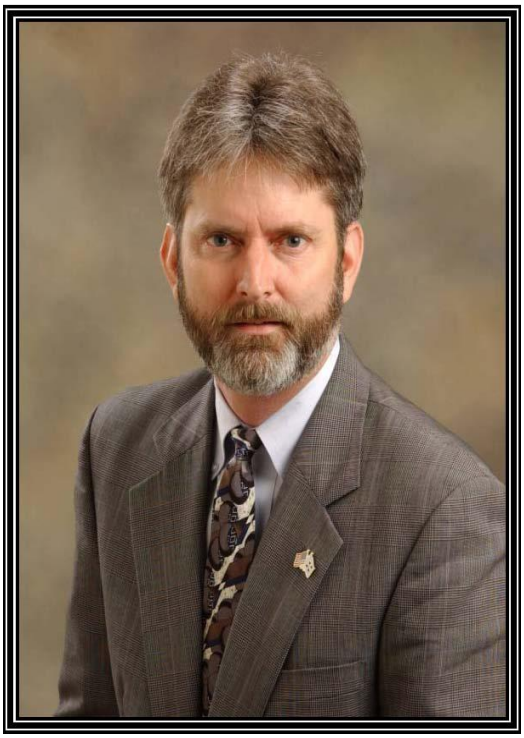
His research focused particularly on optimizing pest management practices to maintain farm productivity while improving surface water protection and management, and development of Best Management Practices for protection of surface waters from pesticides. He has also provided leadership in herbicide resistance management issues, and is participating in one of the largest long-term field projects on glyphosate resistance management ever established.

Because of his developmental efforts in applying spatial technologies to these research areas, MSU appointed Dr. Shaw as the first Director of the Remote Sensing Technologies Center in 1998. The RSTC was merged into the Geosystems Research Institute in 2003, and Dr. Shaw served as its director until his current appointment, which began in January 2010. The Geosystems Research Institute at Mississippi State University is a research and outreach institute focused on understanding Earth's natural and managed systems to provide comprehensive solutions for socioeconomic and environmental requirements. Initially GRI's focus was in agriculture, forestry, water resources, information technology, visualization of complex datasets, and computational modeling, but recently expanding to include geospatial applications in any suitable domain, such as climate, weather, and oceanography to support state and local government issues, homeland security, and economic development. He and his Institute currently work with numerous federal agencies, including USDA, USGS, NOAA, NASA, US DOT, DoD, and NSF.

Honors and awards include MSU's highest distinction as a Giles Distinguished Professor in 1998, the Ralph E. Powe Research Award (MSU's highest recognition for research) in 2000, election as a Fellow in the American Association for the Advancement of Science in 2008, the Outstanding Alumnus Award from Cameron University in 1999, and the Grantsmanship Award from the Mississippi Agricultural and Forestry Experiment Station in 1997. He has received several awards from WSSA, including the Research Award, the Education Award, and recognition as a Fellow in that organization. Dr. Shaw currently chairs a WSSA Task Force on Herbicide Resistance Education, and is leading the effort to develop a comprehensive suite of educational materials on resistance management based on sound scientific principles.

2012 Weed Scientist of the Year

Daniel B. Reynolds



Dr. Daniel B. Reynolds is a Professor of Weed Science with Mississippi State University. He is a native of Jerome, Arkansas and received the B.S. degree in Agricultural Science from the University of Arkansas at Monticello and the M.S. degree in Agronomy from the University of Arkansas at Fayetteville. He received the Ph.D. in Crop Science from Oklahoma State University and joined the staff of the Louisiana Agricultural Experiment Station at the Northeast Research Station in 1986. Dan conducted weed control research in soybean, corn, cotton, and cereal grains in northeast Louisiana. In 1996, he joined the department of Plant & Soil Science with Mississippi State University. Currently his responsibilities include teaching, weed control research in corn and cotton, and cotton defoliation. His research program is now focusing on the use of spatial technologies to assess the needs and application of herbicides, plant growth regulators, and harvest-aids site-specifically. The introduction of transgenic crops has lead to increased incidents of off-target deposition of herbicides such as glyphosate. Dan has worked with computer and electrical engineers to develop methods for detection and assessment of these events by utilizing multi-spectral and hyper-spectral data. Dan has served or currently serves as major advisor of 18 graduate students and has served on the committee of 26 others. With the assistance of colleagues, Dan has developed effective weed control programs for the crops grown in Louisiana and Mississippi. He has been an invited speaker at many weed control program training seminars for extension, agri-chemical company, and farm personnel. He is author or coauthor of 230 abstracts, 35 journal articles, 24 popular press articles, and several software series.

Dan has been actively involved in weed science societies at the state, regional, and national levels. He attended his first SWSS meeting in 1980 and during his graduate career he participated and placed in both the SWSS Paper Contest and the SWSS Weed Contest. Since that time he has served as chair of the Graduate Program, Terminology, Placement, Agronomics Program, Poster Section, Site-Selection, and Computer Applications Committees. He has served as the SWSS Newsletter Editor, Editor of the SWSS Proceedings, Executive Board Member at Large, and Web Master. In 1999, he received the SWSS Outstanding Young Weed Scientist Award and in 2003 he was the recipient of the SWSS Outstanding Educator Award. Dan has also served as President of SWSS.

2012 Outstanding Young Weed Scientist-Academia

Jason Bond

Jason Bond grew up on a cotton, rice, and soybean farm in southeast Arkansas, near Lake Village. He earned a Bachelor of Science degree in Agronomy with a crop science concentration from Louisiana State University in 1997. Following graduation, Jason began graduate work in Weed Science at Louisiana State University under the direction of Dr. Jim Griffin, and he received a Master of Science degree in May, 2000. Jason continued graduate work at the University of Arkansas under Dr. Dick Oliver and earned his Doctor of Philosophy degree in Agronomy/Weed Science in 2004. Jason accepted an Assistant Professor position as the project leader for the Rice and Rotational Crops Agronomy project with the Louisiana State University AgCenter at the Rice Research Station in Crowley, LA. Responsibilities with the LSU AgCenter included evaluating the response of rice varieties and hybrids to different agronomic parameters such as seeding rates, fertilization regimes, and tillage practices. He served in that role for two years before relocating to Mississippi State University's Delta Research and Extension Center in Stoneville, MS, in 2006.

As an Associate Research Professor with Mississippi State University, Jason has developed an extensive applied weed science research program in rice, cotton, and corn. His major research emphases include identification and management of herbicide-resistant weeds, developing economic weed management programs, and investigating the interactions among crops and weeds. Jason is also involved in technology transfer to growers through technical presentations and training sessions at local and regional grower meetings and field days. Jason is an active member of state, regional, and national weed science organizations. He has served on the Executive Board as well as several committees with the Mississippi Weed Science Society. Within the Southern Weed Science Society, Jason was a member of the Student Contest Committee from 2006 to 2010 and chaired the committee in 2009. He is also a member of the Weed Contest, Herbicide Resistance, and Sustaining Membership Committees. Jason is a member of the History and Archive Committee within the Weed Science Society of America and serves as an Associate Editor for *Weed Technology*. He is also a member of the Executive Committee for the Rice Technical Working Group.

Jason has authored or co-authored one book chapter, 41 refereed journal articles, 81 abstracts, 47 extension publications, and 29 popular press articles. In addition to *Weed Science* and *Weed Technology*, his publications appear in *Agronomy Journal*, *American Journal of Plant Science*, *Communications in Soil Science and Plant Analysis*, *Crop Management*, *Crop Protection*, *Crop Science*, *Field Crops Research*, *Journal of Economic Entomology*, *Journal of Plant Nutrition*, and *Plant Disease*. Jason was recognized in 2006 as a member of the Delta's Top Business Leaders Under 50 by the Delta Business Journal. In 2010, he was awarded the Mississippi State Pride Award and received the Research Award from the Mississippi Weed Science Society.

2012 Outstanding Young Weed Scientist- Industry

Cody Gray

Cody was born and raised on his grandfather's dairy farm near Ralston, OK. He received his Bachelor's degree in chemistry at Southwestern Oklahoma State University in 1998. He received his M.S. at Oklahoma State University in Weed Science in 2001. In 2005, Cody completed his graduate education with a Ph.D. in Weed Science at Mississippi State University. After completing his graduate education he accepted an Assistant Professor position with the University of Florida at the Fort Lauderdale Research and Education Center located in Fort Lauderdale, FL where his appointment included research on invasive aquatic plants, aquatic extension specialist for the southern half of Florida and taught a pesticide application course. Cody is currently employed by United Phosphorus, Inc. (UPI) as a Field Development Representative, in which, he oversees all aquatic herbicide and algaecide market development and research trials conducted in the United States, Canada, Australia, and New Zealand. Additionally, Cody is responsible for all UPI product development, including herbicides, insecticides, fungicides, and fumigants, for the following states: Oklahoma, Texas, New Mexico, Colorado, Kansas, Wyoming, Montana, Idaho, Oregon, and Washington.

2012 Outstanding Educator Award

Gregory MacDonald

Gregory E. MacDonald was born on October 14, 1963 in Geneva, New York. He graduated from Geneva High School in 1981 and received an Associate of Applied Science in agricultural engineering from Alfred State University. In May of 1986, he received a Bachelor's of Science from Cornell University in vegetable crop production. He received his Master of Science in Agronomy/Weed Science at the University of Florida in 1991 and PhD from the same institution in 1994 under the supervision of Dr. Donn Shilling. From 1994 to 1998 he was employed as a weed extension specialist for The University of Georgia, based in Tifton, GA. In December 1998 he returned to Gainesville as a faculty in Agronomy at the University of Florida. His current position is 70% research and 30% teaching in weed science, focusing on invasive species management. While at the University of Florida he has helped mentor over 40 graduate students and taught numerous weed science related classes. He and his wife Mickey have two boys, George who is 10 and Joey 7. Greg enjoys spending time with his family and volunteering as a Cub Scout leader.

2012 Outstanding Graduate Student Award (MS)

Josh Wilson

Josh Wilson is currently working on his M.S. under the guidance of Dr. Jason Norsworthy at the University of Arkansas, Fayetteville. Josh's thesis research consists of documenting and controlling acetolactate synthase (ALS)-resistant barnyardgrass in Arkansas rice. The goal of his research is to determine the level of resistance of the ALS-resistant biotype and provide alternative herbicide programs to control ALS-, propanil-, quinclorac-, and clomazone-resistant barnyardgrass in rice production. Josh is from West Helena, Arkansas and received his B.S. from the University of Arkansas, Fayetteville in crop management. While pursuing his B.S. degree, he worked for Dr. Jason Norsworthy as an undergraduate assistant screening weed samples for herbicide resistance and conducting field trials for weed control and evaluation of new herbicides in rice. Josh's research has led to him authoring or co-authoring one refereed journal article, 11 non-refereed articles, and 57 abstracts. Josh has been a member of the University of Arkansas Weed Team, finishing as the 4th place overall individual along with high individual in herbicide symptomology in 2010 and 2011, and 1st place individual as an undergraduate with high individual in herbicide symptomology in 2009. In addition, he has won oral presentation competitions at the University of Arkansas, Southern Weed Science Society, Arkansas Crop Protection Association, and Beltwide Cotton Conferences.

2012 Outstanding Graduate Student Award (PhD)

Edinalvo Camargo

Edinalvo (Edge) Camargo was born in Constantina, RS, Brazil. At an early age he was involved with animal and crop production while helping his parents carry out the daily activities of their small farm. By experiencing the hands-on efforts of food production, Edge decided to obtain technical training in agriculture that could help his family farm activities. In order to receive this training, he moved away from home when he was 14-years old to go to a high school/technical school in agriculture in Santa Maria, RS, Brazil. After finishing high school and the technical course in agriculture, Edge made a decision of continuing his formal education and was selected to begin a B.S. Degree in Agronomy at University Federal of Santa Maria (UFSM) in 2000. Since the first day in college, he worked voluntarily with Dr. Enio Marchesan and Dr. Luis Antonio de Avila in their rice research program. He worked with rice production and sustainable management of lowland rice during his entire bachelor degree. As part of the rice research team at UFSM, he was awarded with undergraduate research scholarships for four years. The training received in research and extension during his undergraduate program facilitated the decision of applying for a M.S. Degree. Edge was then selected to start his Master degree in 2005 after a vigorous selection process. He continued to work in the rice research area studying the effect of fertilizers and fungicide application on grain filling and rice performance. During the first year of his Master he met Dr. Scott Senseman while at a sabbatical leave from Texas A&M University in Brazil. As a result, Edge became motivated to go abroad for his Ph.D. program. He prepared and submitted a proposal to Conselho Nacional de Desenvolvimento Científico e Tecnlógico (CNPq, Brazil) toward the end of his master's degree. The proposal was granted and he was awarded a four-year scholarship to come to the United States and to work in environmental fate of pesticides under the supervision of Dr. Senseman. Currently, Edge is a Ph.D. candidate in Agronomy in the Soil and Crop Sciences Department at Texas A&M University. His doctoral work investigates the potential of saflufenacil for rice producers considering the agronomic and environment aspects such as herbicide-plant interactions as well as herbicide degradation, persistence and adsorption in soils. During his Ph.D. program, Edge has been actively involved with the Texas Plant Protection Association, Southern Weed Science Society, Weed Science Society of America, and American Chemical Society. Scientific accomplishments obtained during his Ph.D. program have been recognized at the departmental, college, regional and national society levels. He and his wife Síglia live in College Station, TX. Edge enjoys playing and watching soccer, barbecuing in the Brazilian style and spending time with family and friends.

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	DowElanco
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 Stoneville
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	--

Previous Winners of the

Weed Scientist of the Year Award

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

Previous Winners of the

Outstanding Young Weed Scientist Award

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: industry	
2008	Stanley Culpepper	University of Georgia
2008	no nomination: industry	
2009	Jason K. Norsworthy	University of Arkansas
2009	no nomination: industry	
2010	Bob Scott	University of Arkansas
2010	no nomination: industry	
2011	J. Scott McElroy	Auburn University
2011	Eric Palmer	Syngenta Crop Protection

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

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

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

Dedication of the

Proceedings of the SWSS

Year	Name	University or Company
1973	William L. Lett, Jr.	Colloidal Products Corporation
1975	Hoyt A. Nation	Dow Chemical Company
1978	John T. Holstun, Jr.	USDA, ARS
1988	V. Shorty Searcy	Ciba-Geigy
1995	Arlen W. Evans	DuPont
1997	Michael & Karen DeFelice	Information Design
1999	Glenn C. Klingman	Eli Lilly and Company
1999	Allen F. Wiese	Texas A&M University
2004	Chester G. McWhorter	USDA, ARS
2004	Charles E. Moore	Lilly Research Laboratories
2008	John Wilcut	North Carolina State University
2008	Larry Nelson	Clemson University
2011	William Lewis Barrentine	Mississippi State University
2012	Jacquelyn Edwards Driver	Syngenta Crop Protection

Southern Weed Science Society Officers and Executive Board

Officers

President	**Barry Brecke**
President-Elect	**Tom Mueller**
Vice President	**Steve Kelly**
Secretary-Treasurer	**Greg MacDonald**
Editor	**Ted Webster**
Immediate Past President	**Tom Holt**

Additional Executive Board Members

Member-At-Large (Academia)	**Larry Steckel**
Member-At-Large (Academia)	**Shawn Askew**
Member-At-Large (Industry)	**Eric Palmer**
Member-At-Large (Industry)	**Larry Newsom**
WSSA Representative	**Darrin Dodds**

Ex-Officio Board Members

Constitution And Operating Procedures	**John Byrd**
Business Manager	**Phil Banks**
Student Representative	**Dustin Lewis**
Web Master	**Tony White**

Minutes of the Southern Weed Science Society Board Meeting
January 27, 2011

Attending: Barry Brecke, Tom Mueller, Steve Kelly, Tom Holt, Larry Newsom, Darrin Dodds, Shawn Askew, Shawn Askew, Eric Palmer, Ted Webster, Phil Banks, Dustin Lewis, Tony White, Dearl Sanders,

President Barry Brecke called the meeting to order on January 27, 2011.

Barry introduced new board members – Steve Kelly, Vice-President; Eric Palmer, Member-At-Large Industry; Dustin Lewis, Graduate Student Representative; in absentia Greg MacDonald, Secretary-Treasure; Larry Steckle, Member-At-Large Academia.

Todd Baughman reviewed the minutes from January 22 and 24. The format to submit abstracts in future meetings was still left for discussion from the January 24 meeting. A motion was made to accept the minutes. Motion Approved.

Phil Banks indicated that we had 36 full registration walk-ins for the 2011 meeting (many of these were Puerto Rico University employes). There were a total of 388 full registrations and 13 one-day registrations (most onde day attendees were attending the aquatics section) for a total of 401 total registrations. There were 78 spouses registered for the meeting. The banquet was set for 360 attendees with an estimate of 330 to 340 actual attendees. He also indicated that Memphis, Nashville, Bilioxi, and Gulf Shores were potential locations for the 2014 meeting.

Dearl Sanders will provide the names of the Puerto Rico speakers to Barry Brecke to thank them for participating in the meeting. Dearl indicated he will take care of thanking the local arrangements committee. Larry Newsom stated that the spouse program went well. The spouses indicated they liked that varying schedule provided for transportation. They were provided with two vans plus a charter bus. Larry agreed to assist with the spouses program again in Charleston.

Phil Banks indicated that he will plan to conduct an officers training in Charleston. It was discussed about doing a teleconference or webinar. Phil indicated would be better to conduct the training at the meeting that way other interested members could also attend the training. It was suggested that we conduct a training for already elected officers. However, we need to update officers MOP's prior to any planned training for this year's new officers. Phil will work with Tom Mueller and Steve Kelly to determine when best to schedule the training.

Ted Webster and Tony White asked about the abstract submission process again. The WSSA submission program allows for uploading of presentations as well as abstracts. A question was asked about the cost of going to this program. It was stated that there should not be a charge if the society does not require any significant changes to the program. Phil Banks indicated that the current WSSA abstract submission program could increase the cost of publication of the program. Tony would like to develop a detail set of instructions regardless of what type of program we use. Currently the instructions are non-existent or not clear. There should be a way to develop previewing of the abstracts prior to publication of the proceedings. **Motion:** to move to the WSSA abstract submission program with allowance for $1000 for any needed programming changes. **Motion Approved**.

Proposed dates for the summer board meeting are for June 30-July 1, July 7-8, or July 11-12 for Charleston, SC.

Tom Mueller provided an update for the 2012 program. Bert McCarthy has agreed to serve as local arrangements chair. All the section chairs have been named. The MOP states that you can only have one paper because of physical limitation to space. Suggestion was made to add all the sections back in the title submission and then

determine how to handle the sections. Tom suggested not separating graduate student paper competition by M.S. and Ph.D. Tom Mueller and Drew Ellis will provide a recommendation at the summer board meeting on the plans for the guidelines for the student paper contest. There does need to be a separate graduate student section to the website to address contest rules changes.

There was a discussion about possible fee changes for meeting attendees. Phil suggested that the current $275 registration fee if fine. This amount is higher than the other regional societies but less than the WSSA. It does not appear to be an empedence to attendance. Spouses registration is subsidized 35-40 to attend the banquet. The recommendation is to leave the spouses registration at $30.

There are plans to have a teleconference between January meeting and the summer board meeting. John Byrd will assist in developing MOP guidelines for the webmaster. Plan to have all changes to the MOP for approval to board at the spring teleconference.

Barry Brecke will prepare a latter on issues with Weed Technology and Weed Science. It was stated to make sure that those go to all the officers of WSSA and not just the president or the publication committee.

The possibility of any type of joint meeting would be 2015 at the earliest. Todd Baughman was asked to serve as chair of a committee to look at possible joint meeting. Tom Holt agreed to serve on that committee. Possible suggestions were the Northeast Weed Science Society, Southern Branch ASA, Southern Entomology, Southern Plant Pathology, Beltwide, North Central Weed Science Society.

It was mentioned that the site selection will be requested to look at Puerto Rico as a future site.

There was a discussion about the economics loss due to weeds report that was provided in the proceedings. The thought was that we need this information but may need to streamline the process. Suggestion was that Daniel Stephenson or Jacoby Barney or Joe Armstrong could possibly develop and conduct the survey.

A question was asked do we want the proceedings password protected? Decision was that abstracts prior to meeting will be password protected but after publication will allow free access.

Tom Holt requested a list of possible candidates for officer nominees for 2011. Those included: Member-At-Large for Industry – James Holloway, Drew Ellis, Bobby Walls, Mike Edwards, David Black; Member-At-Large for Academia – Peter Dotray, Stanley Culpepper, Scott McElroy, Jay Ferrell, Daniel Stevenson; Vice-President – Ted Webster, Eric Prostko, Scott Senseman, Peter Dotray.

Tony White asked whether committee reports need to be printed on the website as well as in the proceedings. There was also a question about the due date for abstracts if we will provide a preview of the abstracts online.

It was also suggested that we visit with companies to ensure that companies do not schedule an activity when SWSS events are on-going. It was suggested that we continue to host a Southern Hospitality Reception. It was also suggested that at the summer board meeting we allow adequate time to walk through the meeting facilities to determine the amount of space required for events.

Meeting adjourned.

Minutes of the Southern Weed Science Society Board Meeting

June 30 to July 1

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, and Phil Banks. Ted Webster, Chad Brommer and Shawn Askew joined via teleconference.

Meeting was called to motion by President Brecke at 12:40pm on 30 June 2011. The agenda as presented by the president was reviewed and a motion to approve was put forth by Tom Holt, seconded by Tom Mueller. MOTION PASSED -UNANIMOUSLY.

The minutes of the January 27th post-annual meeting of the Board of Directors, and the minutes of the May 5th conference call were passed out by Secretary/Treasurer Greg MacDonald. These were reviewed and, with a few minor edits, a motion to approve both sets of minutes was called by Tom Mueller and seconded by Steve Kelly. MOTION PASSED - UNANIMOUSLY.

The treasury balance sheets were provided by Business Manager Phil Banks and presented by Greg MacDonald. These included total assets as of 5/31/11 and cash flow for the last fiscal year (see attached). Total assets for the society as of May 31, is $264,386.91. Of that amount, $12,101.56 has been set aside for the weed contest. Motion to approve the treasurer's report was made by Larry Steckel and seconded by Tom Holt. MOTION PASSED - UNANIMOUSLY.

Business Manager Phil Banks – provided a report (see attached) and discussed the annual meeting in Puerto Rico. Highlights from that meeting are as follows:

1) made money primarily due to sponsors
2) expensive meeting to hold
3) confusion with who was the point person from the society to the hotel
4) hotel tried to severely overcharge
    a. there was a set limit on the number of drinks at the break – the hotel did not listen and kept replenishing
    b. the hotel over billed for water consumption and the quiz bowl
    c. end result was Phil and Dearl Sanders had to confront the hotel and were able to reduce the total bill by $9,500.
5) Due to this problem of miss-communication, it was suggested that there be a pre meeting of the local arrangements person or persons and that one person plus Phil Banks be solely responsible for making money based decisions with the hotel – i.e. point person
6) satellite events went well – tours, golf tournament but there needs to be a separate way to pay for extra events at registration.
7) operating expenses for spouses program – underpriced last year $30, Phil Banks suggested it be priced based on actual costs of their program, or the price of the banquet. Sponsors were able to offset the cost at this meeting, but several board members cautioned that this may not be a long-term solution.

Phil Banks mentioned that our (SWSS's) sources of income were the annual meeting and sales of the weed ID book "Weeds of the South" and partial proceeds from "Weeds of the Midwest and Canada". Royalties from these sales were initially good but likely to drop off. Nothing more was mentioned, but it was mentioned that we need to keep 2 years' worth of operating expenses in the bank at all times. Phil also mentioned that making a budget for each year was difficult and rarely accurate with respect to actual expenditures.

Another item brought up by Phil was that retired business manager Bob Schmidt was unable to attend the SWSS meeting in Puerto Rico due to family issues, but would like to attend the meeting in Charleston, SC in 2012. There was a motion to pay for Bob Schmidt and a guest to attend the meeting in Charleston, SC by Tim Mueller, seconded by Larry Steckel. MOTION PASSED - UNANIMOUSLY.

Phil also mentioned that he is planning on holding a training session for new officers at the annual meeting. This would be brief, 30 to 45 minutes and would not hold it during the meeting session

Following the motion for Bob Schmidt there was considerable discussion regarding recognition for retirees and other important people associated with the society. There was a question to honor Bob Schmidt with a Distinguished Service Award or something else. There was also discussion about dedicating the proceedings for retirees. A fair amount of discussion followed concerning the appropriateness of awards for individuals. Some of this discussion ensued because there were awards not given last meeting due to a lack of nominations. President Brecke assured the BOD that there would be nominations this year for each award – he would contact folks to make sure nominations were put forth. It was suggested that Bob Schmidt be considered for a Distinguished Service Award. The criteria were read for the award and it was decided that the Lifetime Achievement Award – already designated, was the more appropriate award for Bob. As the discussion continued, it was decided that dedication of proceedings would be more appropriate to those members that have passed away, rather than retirees. It was then suggested that the necrology committee should be involved in identifying appropriate persons, and developing the biographical sketch of said persons.

Ted Webster, via telecom then gave the editors report. He said a draft of this year's proceedings was sent to webmaster Tony White and Phil Banks - they will correct and send back to Ted for final editing. Ted will then submit the document for uploading on the website. Ted mentioned that all winners were included and all committee and other reports as well.

Regarding other reports, Ted mentioned that the weed survey (most troublesome and common weeds) was included in this year's proceedings, but we have not done the economic losses in some years. There was some discussion concerning the validity and use of these data and whether we should revisit. Some members mentioned this data was useful when writing grants. President Brecke said he would contact Drs. Stevenson, Barney, and Armstrong; to name a few, to determine if this should and can be viably continued.

Ted also mentioned that he is basically recycling the list of state extension weed publications, the membership list (updating with names from each year's presentations at the meeting), names and herbicide manufacturers. He asked who is responsible for making sure those things are up to date. President Brecke stated it should the role of the terminology committee. It was also mentioned that industry should be involved to ensure current and correct trade names.

Ted also said that electronic versions of prior proceedings from 1999 through current should be on the SWSS website by the Charleston meeting. Someone mentioned that the 2010 proceedings had a duplicate table of contents – Ted said he would correct.

Tom Mueller said he wanted to dedicate the 2012 Proceedings to Jackie Driver. He made a motion to that affect and this was seconded by Eric Palmer. MOTION PASSED – UNANIMOUS LY. Mueller said he will write the biographical sketch. During this discussion, it was mentioned that the 2011 Proceedings were not dedicated to anyone. John Byrd made a motion to dedicate the 2011 SWSS Proceedings to Bill Barrentine. This motion was seconded by Ted Webster. MOTION PASSED - UNANIMOUSLY. John Byrd volunteered Charles Bryson to write the biographical sketch. Ted Webster mentioned that he agreed to stay on as editor for the 2012 proceedings.

Site selection was discussed next by Phil Banks for the chair of the committee, Cletus Yeomans. The committee sent requests for proposals to large cities in the states of Tennessee, Alabama, Mississippi and the Florida panhandle. From those proposals returned for bid, the committee ranked them based on the following criteria: dates, room rates, meeting rooms – space and cost, concessions required, complimentary rooms, one facility or multiple, same floor for meeting rooms, ability to provide government rates for federal employees, presidential suite,

any commission or rebates, parking costs, AV charges, reduced rates or the ability to sponsor summer BOD meeting, food beverage minimum, airport and dining close by.

The committee received 9 proposals – Cletus Yeomans is currently in negotiations chair of at the Birmingham Winfrey Hotel in Birmingham, AL. The second choice of the committee was the Beau Rivage in Biloxi, MS. Tom Mueller made a motion to go with the first choice of the committee and if that didn't work then to go with the second choice. This motion was seconded by Tom Holt. MOTION PASSED - UNANIMOUSLY.

There was a lot of interest in returning to Puerto Rico in 2015 - this coming from the WSSA and the southern/eastern branches of entomology and plant pathology. Darrin Dodds was going to pursue the joint meeting issue with WSSA. It was suggested that Todd Baughman and Tom Holt look into the possibility of a joint meeting with plant pathology and/or entomology. They would look into coordination with the long-range planning committee.

Membership committee report was given by Chad Brommer, who joined via teleconference. His committee is charged to ensure continued growth – both in meeting attendance and membership. In the past 10 years we have dropped – so the question was what demographics are we missing? Chad said we need more data, particularly from individual members, as to why they attend or do not attend. As a society we saw a dramatic increase in the early 1980's to a peak in 1986 with over 1000 members. We are now running between 320 to 400 members based on location. Can we keep the level at 400 consistently? Banks suggested that encouraging pre-registrations will help to keep meeting attendance higher. Financially how many attendees to we need? Is there a threshold? Brommer is currently developing a questionnaire. Tom Holt suggested the numbers declined due to the decline in industry from the advent of Roundup Ready technology. Now that tide has turned and he thinks we will see more industry representation. However, he said we must be ready to capture that need. It was also mentioned by John Byrd that we are not capturing the generic groups.

Bert McCarty, local arrangements chair said he was working on signs, breaks, meals, golf tournament at Wild Dunes Golf Course in Mt. Pleasant (Tom Holt is helping out – value in kind). Bert is going to coordinate with section chairs on projects and laptops. He said he would like to emphasize the uniqueness of Charleston and is trying to arrange alternative tours for spouses; possibly opposite the golf tournament. Larry Newsom mentioned that we should try to keep costs low for the spouses program to help get folks to Charleston. He strongly suggested that we offset with sponsorship. A base rate was discussed as a good idea for planning, but a firm number was not agreed upon. Tom Mueller said he will draft a preliminary publicity report on things to do in Charleston – tourism guide. Larry Newsom said he will send something directly to the spouses that attended last year.

President Elect Tom Mueller provided an overview of the program thus far – see below:

1) Some tours Sunday afternoon
2) There are 2 technical symposia – 1) dicamba crop resistance– BASF/Monsanto, and 2) herbicide stewardship - Neal Rhodes and several industry reps,
3) There will be a grad student symposia focusing on statistics in 3 parts
    a. Experimental design, RBCD, data collection, reps;
    b. Analysis;
    c. Publishing, reporting ANOVA, stats methods for Weed Science and Weed Technology but also publications like Crop Science.
4) Constricted meeting room size that limits the program to only 4 concurrent sessions – program chair has the discretion to limit participants to only one talk or poster during the meeting. It was suggested that on the title submission form there would be an asterisk – if you submit multiple talks because of space you may be asked to pull one talk. If we have too many talks we may have to hold a conference call after submission to decide on which way to go. The symposium chair will collect titles and abstracts and then submit under the heading of the particular symposia.

5) Graduate student talks very poorly attended – judges stuck in the talks all day. Tom Mueller suggested that all graduate student talks be in the morning on Tuesday. Drew Ellis is graduate paper and poster judge chair.

Tom Holt suggested that we try to build the ornamental group that was lost to the Northeast Weed Science Society and increase CEU's for turf, ornamental and aquatics. Bert McCarty mentioned that aquatic weed management was a big deal in the Charleston area and CEU's would be a possible draw for local folks, esp. one day registrations. Tom Mueller mentioned there would be an Industry section included in the program.

Past President Tom Holt presented the slate of candidates for offices this coming year. They are as follows:

Vice President - Scott Sensman – Texas A&M University; Wes Everman – North Carolina State University
Member at Large for Industry - David Black – Syngenta; Drew Ellis – Dow AgroSciences
Member at Large Academia – Peter Dotray – Texas Tech University; Daniel Stevenson – Louisiana State University
Endowment Foundation - Renee Keese – BASF; other candidates to be determined from a list of names given to Tom Holt
Tom Mueller made a motion to accept the slate of candidates as put forth by Tom Holt with the addition of 3 candidates for the endowment foundation. MacDonald seconded. MOTION PASSED - UNANIMOUSLY.

Webmaster Tony White said that a formal report has been written and passed on to President Brecke and Business Manager Phil Banks. To summarize he said the website had been active for about a year. For abstract and presentation titles, etc., access will be allowed for the program chair, Phil Banks – Business Manager and individual section chairs. Presenters will be able to upload their abstracts on the site before the meeting and not bring the abstract to the meeting. It was decided that titles and registration will be open August 1 and close for title submission in September (date to be determined). Election results from the web balloting are reviewed by the webmaster – Tony White, the immediate Past President (this year - Tom Holt), and the business manager (Phil Banks). We are initiating a student page on the website. Tony also asked about stuff to add to the site – John Byrd asked if the award forms could be filled out on the web site. It was discussed and the question of whether it was worth the significant effort for the relatively small number of actual forms. It was decided that the forms be fillable but not remain active on the website, but rather folks could download and save as WORD or PDF files. Tom Holt mentioned the WORD format was not compatible and Tony would look into this issue.

Student Representative Dustin Lewis asked about books for students that have made presentations. Endowment group would handle and provide a list of books that the students could choose from. This would be coordinated by this group and the students would be presented at the meeting

John Byrd discussed the Forestry rep on the BOD as this position is in the MOP's. However, this position has not been filled for several years even though appointed as a voting BOD member since 2006. The group stopped coming to the SWSS meeting after Nashville. The person on the BOD passed away and was never filled by the group. Tom Holt made a motion to delete this position from the MOP's and this motion seconded by John Byrd. MOTION PASSED - UNANIMOUSLY.

1 July 2011: Attending - Barry Brecke, Tom Mueller, Steve Kelly, Bert McCarty, Tony White, Greg MacDonald, John Byrd, Darrin Dodds, Tom Holt, Larry Newsom, Larry Steckel, Eric Palmer, and Phil Banks. Shawn Askew joined via teleconference.

President Brecke opened the meeting at 7:40am. The board immediately began on the MOP editing coordinated by John Byrd. Each board member was given the task of updating certain sections of the MOP and these were collectively discussed as a group. John Byrd mentioned he would provide the old copies archived on the website – with those changes and provide a new, updated copy, also on the website. The following reflects *major* changes in the MOP's, but not all changes. These can be viewed on the web.

Section:

President – added duties specific to committee chairs and committee assignments; deleted items relating to society managerial functions (mainly hotel arrangements) and transferred those responsibilities to the business manager. Another major change was the dates of submission for awards and election results. (for these changes in dates – please see those individual sections).

President Elect – no major changes, only those specific to changes from written to electronic formatting.

Executive Board – minor changes, deletion of Forestry Rep to the board.

Editor – considerable changes but generally related to the transition from written/printed format of the proceedings to electronic/web-based format; deleted page charges, added emails to addresses. Also added changes pertaining to those comments in the editors report – see above.

Finance – minor changes, generally specific to a shift in responsibilities to business manager.

Registration – ***These are the updates directly placed in the MOP's.***
"Registration fees beginning in 2010 as recommended by the Executive Board at the 2009 summer board meeting of the SWSS are: preregistration fee, $275; registration fee at the meeting, $325 (each to include the cost of the membership and banquet). Student pre-registration fee, $100; registration fee at the meeting, $125; absentee registration $40 (each are voting members to receive ballots and newsletters) Daily registration fee, $100 (non-voting member, no mail-outs). Also, $40 from the member registration is allotted for membership dues ($25 students). Fees for sustaining members are; for companies with sales of less than $10,000,000 per year - $200.00; for companies with sales of $10,000,000 to $100,000,000 per year - $500.00, and for companies with sales over $100,000,000 per year - $1,000.00. Sustaining membership for state weed science and other plant protection organizations per year-$100.00".

Local Arrangements - Several duties of this committee, generally associated with the hotel - complimentary rooms, guest rooms, etc.), were transferred to the business manager. Other than that, only minor edits to the MOP's for this section.

Display Committee – minor edits

Nominating Committee – minor edits

Placement Committee – based on the recommendation of the committee chair, this committee was deleted from the MOP's. The motion to this affect was put forth by Greg MacDonald, and seconded by Tom Mueller. MOTION PASSED - UNANIMOUSLY.

Research Committee – no direct changes, but there was concern as to the current role and function of this committee. President Brecke stated he would look into this matter with the member s of this committee. Some of this tie in with the changes/questions brought forth by the editor.

Long-Range Planning – The members of this committee was originally the immediate past-presidents of the society. However, this was reworded to include other interested members on this committee. *"Consist of five members (preferably the most recent Past Presidents of the Society) with each rotating off after 5 years a). The Chairperson shall be appointed by the President and serve for a period of three years even if beyond 5 years on the committee. The Past President in the third year of the five-year rotation shall serve as Chairperson. b). Vacancies shall be filled by appointment by the President to complete the existing terms. "*

Public Relations and Sales Coordination Committees – There was concern over the need for these committees, particularly as the role and duties of these committees is no longer applicable with electronic and internet accessibility. Tom Holt stated that the public relations committee was necessary to inform

interested persons about the SWSS, but this generated little discussion. Greg MacDonald suggested maybe a combination of these committees would be beneficial. Nothing more on this issue was discussed.

Sustaining Membership Committee – nothing discussed

Program Committee – format changes with respect from print to now electronic format, email instead of letters, etc. Another change was the institution of a conference call prior to program finalization. Call for papers will go out on the website after the summer BOD meeting and in the August newsletter.

Awards Committee – changes to this MOP's basically concerned with dates of submission, review, etc. Please see a summary of these deadlines as follows:

1) Call for nominations – on website after the summer BOD meeting and in August newsletter
2) Deadline for full submission – September 30th to the appropriate subcommittee chairperson
3) Subcommittee chair sends nominations to committee members by October 15th for their review
4) By November 10th, each subcommittee chair sends the recommendation from each subcommittee to the Executive SWSS Board for confirmation.
5) The BOD will provide confirmation back to each subcommittee chair by November 20th. No response by the BOD will be considered an affirmative confirmation.
6) The business manager is informed by December 1 as to the award winners, including biosketch and photos, so as to order plaques.

Larry Steckel was asked to develop a MOP for a standing Herbicide Resistance Committee to be presented at the BOD meeting in January.

Tony White suggested that we have a web-based calendar that included due dates, deadlines, etc. for all committees. Tony said he would try to accomplish by the January meeting.

Spouse's fee for attending the meeting will remain at $30 as was determined last year. Sponsorship for additional funding for special events will be coordinated by the head of the spouses committee through Phil Banks.

There continues to be major concerns over the rejection of papers for the use of visual observations only as a method of data reporting. The editor of Weed Technology requires one hard data set to be accepted. President Brecke will work with weed science turfgrass researchers and Darrin Dodds will work with crop science turf researchers to send a letter(s) to the editor with these concerns. There have also been concerns regarding the rejection of papers based on statistics even when a statistician is an author and has analyzed the data.

Whistleblower policy with respect to ethical concerns - Banks will handle.

President Brecke will work on list of committee chairs and members and try to get it updated and make an effort to get young people involved.

Tentative teleconference scheduled for the first 2 weeks of November.

John Byrd will send out the changes to the constitution based on the discussion during the meeting.

There was a motion to adjourn at 11:55am by Greg MacDonald, seconded by Tom Mueller. MOTION PASSED - UNANIMOUSLY.

Minutes of the Southern Weed Science Society Board Meeting

November 9, 2011, Conference Call

Attending: Barry Brecke, Tom Mueller, Steve Kelly, Bert McCarty, Tony White, Greg MacDonald, Darrin Dodds, Dustin Lewis, Tom Holt, Larry Newsom, Ted Webster, Eric Palmer, and Phil Banks.

President Brecke opened the teleconference at 10am EST. A prior agenda was sent via email and approved with the addition of items requested to be brought forth by Ted Webster regarding the SWSS proceedings. A motion to approve the agenda was made by Tom Holt, seconded by Tom Mueller, unanimously approved.

Business Managers Update - Phil Banks, SWSS Business Manager reported slow registration with 85 registered for the meeting thus far. This included 23 students and 8 spouses. He also reported that financial support for the meeting through the efforts of John Richburg and Renee Keese has raised $11,000 so far. This amount will cover the breaks and some of the social. There has been $5,000 raised for the golf tournament thus far, but no registrants as of yet. VIK to be determined once the decision to hold the tournament has been made and we will only pay if SWSS holds the tournament. Phil Banks asked what happens if the tournament is cancelled and folks have provided payment. The persons who pay their $50 and don't play have the option to put money to endowment, or returned.

Phil Banks stated the room block was 55% full, Dec 22nd was the room block cut-off. We will likely fill the hotel, so late registrants will have to go to alternative hotels. He also stated there would be special room rates for students, but not enough for all the students. Darin Dodds said he had troubles with getting a room for his students and that the hotel didn't know about, but Phil checked and they were in.

Sustaining member renewals are going well, most all have paid. Phil will send sustaining member list to Tom for him to build into the program. The Encyclopedia of Weeds updated version has been completed and will begin selling next week. Phil will bring copies to the meeting for sale and envisions a revenue stream of several $1000's per year.

Program Update - Tom Mueller has sent out files to program chairs and is working with Drew Ellis on the oral paper contest for students. Tom asked Phil Banks about a time slot for officer training. Phil needs about 30 minutes, he suggested Sunday or in a morning prior to oral sessions. Tom dedicated the proceedings to Jackie Driver, and has sent an email to Tony Driver, Jackie's husband. Tom will send program to Brecke and Banks for review as well as the program committee. Program highlights include general session - speaker is set for 45 minutes and will give an overview of rice production in the area. There is also 3 symposiums - 1) stewardship on Monday after the general session, 2) dicamba symposium Tuesday morning and 3) graduate student symposium Wednesday afternoon. Graduate student talks are on Tuesday.

Grad student program – Dustin Lewis reported that the symposium will feature publication of research. Tom Mueller will provide an introduction, Grady Miller will do a stats talk including problem data sets, Stephen Dukes will discuss the ethics of scientific publications and Bill Vencill on why papers are commonly rejected. There will then be an open panel with Scott Senseman and Jason Norswrothy on how to respond to reviewers comments, Scott McElroy on how to communicate with popular press on emotional charged issues. Dustin asked Phil Banks and Tony White about a speaker gift for students? Dustin will contact students and see if they want to proceed. Endowment fund should handle, Mueller concerned that students get a 'gift'.

Spouses Program - Larry Newsome – Lisa Newsome been in contact with spouses and 6 spouses are currently registered; Phil has 8 on his list. On the list of potential tours include walking tours, cooking class indoors, band tours; Larry Newsome will try to find support through BASF. Plantation tours are not an option because they are too far away – 45 to 60 minutes. Spouses will meet on the balcony at the hotel to coordinate each day. Phil will send his list to Larry/Lisa in a month or so when registration begins to be finalized.

Local Arrangements - Bert McCarty reported that Merle Shepard, retired entomologist, will talk about the history of rice production in the area. Pre-tour possibilities prior to meeting, along with the golf tournament would be a combination traditional horse drawn tour followed by a boat harbor tour. If the numbers are larger he would include the plantation tours. Bert is waiting on numbers to arrange rooms, lunches, costs, etc. Bert will send out some information to the membership via Phil Banks. Tom Mueller sent out room allocations, mainly posters. There are 84 posters and Bert will reserve 90 poster easels through the hotel.

Golf Tournament Update - Tom Holt. Phil has sent out sign-up sheet/letter (see attached). There will be a reception afterwards and this will be finished by 5:30pm so participants will be back for the SWSS board meeting at 6:30pm. All proceeds will go to the endowment fund. Tom Holt applauded Bert McCarty for coordinating the effort with Scott Ferguson at Wild Dunes Golf Course.

Elections - Tom Holt stated that elections have been completed with VP Scott Sensman, Member at Large – Industry Drew Ellis, Member at Large – Academia Peter Dotray. Board of Trustees 3 year term, Renee Keese, 5 year term James Holloway. Barry Brecke has contacted the winners and those who ran and lost. Ted Webster – questioned whether we have followed the protocol of academia one year/one industry. We are back on track on that rotation. Ted Webster also cautioned that we need to be careful with younger professors trying to make tenure, easy to get overcommitted. Brecke said he would take that into consideration next year.

Joint Meeting - Darren Dodds, Larry Steckel, Todd Baughman have written a note to American Phytopathology – Southern Division with David Langston as President and also to Norm Leppla – Southeast Branch of ESA to gauge interest in a joint meeting, the earliest being in 2015. They will discuss at their board meeting in March of 2012. Barry Brecke would like to have this completed by the summer BOD meeting.

Awards Banquet Tom Holt asked if the cooperate sponsors have been notified to make sure they will continue to sponsor? They have not was the answer and Phil Banks will handle. Brecke suggested that the nominator will be contacted by the individual award committee chair. The nominator can then contact the award winner that they nominated. Brecke will email the list to the BOD. Phil needs to have the name (as to be on the plaque and then he needs a biosketch and picture for the awards booklet. Awards program – Tom Holt said he might be able to get the awards program printed through BASF. Lifetime award for Bob Schmidt – he has been contacted by Phil Banks, he is thinking about coming, but no official commitment. Tom asked about who would MC the program. Mueller said he would handle, Tom Holt wants to be involved. Tom Mueller also suggested that Phil Banks and Bert McCarty be involved as well.

Newsletter - Bob Scott was not in attendance – no report.

MOP Revisions - John Byrd was not in attendance but has completed most MOP revisions and when finished Brecke will distribute to BOD. The BOD will make final edits then these will need to be voted on by membership.

Atrazine Petition – Jerry Wells sent a letter to President Brecke concerning this petition. There was a motion made by Steve Kelly to have a letter written by President Brecke in response to the petition. Seconded by Holt. Tom Holt asked to have the letter sent out for review to the BOD. Motion passed.

Proceedings - Ted Webster is making progress on back issues of the SWSS proceedings, and has been sending to Tony White. He asked who is responsible for collating extension publications. Tom Mueller asked why do we have these publications. It was suggested that section be deleted. Brecke said to make sure it was not in the MOPS, and if so have it taken care of during the MOP revisions. Trade names and common names – why included, but also in the program. Tom Mueller will send program to Webster and this issue is resolved. Economic losses section – not been completed in several years. Do we need this? Eric Webster was in charge – stopped taking to lack of need. On a rotating basis every 4 years – grass crops, BL crops, Vegetables, miscellaneous. Mueller suggested that this be tabled for the meeting BOD. Some folks said it was useful to have some kind of data when preparing grants. Mueller commented that some numbers are better than no numbers.

Rod Lym, WSSA program chair will be attending the SWSS meeting and wants to attend the BOD meeting.

Weed Olympics – President Brecke wrote a letter commending the organizers for putting on a great contest and that the BOD supports the outcome (results) of the contest. Greg Armel looked through the letter and said it accurately stated the contest. Tom Mueller said a formal response is needed and that the board needs to state that this matter is closed for discussion. Tom Mueller also said he was planning an open slot in the program for the weed contest committee to allow for maximum participation from the society to air their opinions about the contest. Newsome said whatever we do, it must be transparent to the society as many folks have asked about the situation. Tom Holt/BASF is hosting the contest next year 2012. He is concerned that several states are bailing out – Brecke said states could choose their region to go in and at least 4 states within SWSS chose to go elsewhere. Darrin Dodds – noticed that participation has been going down for several years. Need to find a way to improve the contest. Newsome – fine line between educational tool and a competitive contest – too much emphasis on winning. DPM students were mentioned as students who were obviously learning from the contest. A couple of suggestions were mentioned including: reduce the prize money for winning, mix students from other universities together in a team approach, make it an individual event only, etc.

Mueller suggested that President Brecke should chair the content meeting at the SWSS meeting. Andy Price has resigned and suggested Tom Eubanks as the next chair. There is confusion as to whether he will or will not take this responsibility. Tom Holt said it needs to be conveyed that the SWSS BOD is committed to making sure the contest improves and continues. Brecke asked the BOD if he should write a resolution to be voted on by the BOD, and read at the Business meeting.

Steve Kelley asked for ideas suggestions for the new chair to be emailed for all folks to see. Phil asked Brecke for a completed committee list and he will get that to him soon.

Meeting Adjourned at 11:05am EST.

Weed Science Society of America Representative Report

Submitted by Darrin Dodds

2012 WSSA Annual Meeting: Meeting was held at the Hilton Waikoloa Village. Attendance at the conference was good. Most people seemed to enjoy the location as well as the meeting itself.

WSSA budget is currently operating is deficit status. Recommendations for reducing expenses included: increase spouse charges, consider food and entertainment costs, consider additional sources of revenue such as electronic products, reduce audio/visual charges from hotel as they are very expensive.

Weed Technology: Spanish abstracts will be continued for another two years as an experiment. WSSA is working to develop a proposal for a Spanish abstracts editor. Jason Norsworthy, University of Arkansas, has been unanimously approved for a three-year term as Editor of Weed Technology.

Herbicide Handbook: The previous editor of the Herbicide Handbook has stepped down and has been replaced by Dale Shaner. Numerous ideas are being entertained for delivery of the next Herbicide Handbook included electronic only, print on demand as well as electronic, print of demand only, etc. Additional considerations are being given to delivery on electronic devices such as IPAD's, smartphones, etc. as well as potentially tying herbicide labels in with technical data.

Committee Activity: Work is underway on several committees including the Science Policy Committee, the Education Committee, the Terminology Committee, as well as revisions to the MoP. The Science Policy Committee is working toward approaching APHIS concerning how to select and evaluate species for use as biofuels taking into consideration potential weediness and invasiveness. The Education Committee is working toward providing educational material to grade school groups. Several discrepancies have been found in Weed Science as well as in the Herbicide Handbook. These will be resolved with Jim Anderson. Alterations to the MoP have been suggested including those on committee structure. Peter Porpiglia will draft these recommendations.

Future Site Selection: Potential sites for the 2015 meeting are as follows: Chicago, IL (2 properties); Columbus, OH (2 properties); Detroit, MI (1 property); Indianapolis, IN (2 properties); Louisville, KY (2 properties); St. Louis, MO (2 properties). Strongest for 2015 was for the Galt House in Louisville, KY.

Potential sites for 2016 include: Atlanta, GA (3 properties); Charlotte, NC (1 property); San Juan, PR (1 property). Strongest sentiment was for the Sheraton Puerto Rico. However, give that SWSS will likely go there in 2016 another property will likely be given precedence.

Potential sites for 2017 include: Albuquerque, NM (1 property); Austin, TX (2 properties); Burlingame (San Francisco), CA (1 property); Las Vegas, NV (7 properties); San Diego, CA (1 property); Tucson, AZ (2 properties). Strongest sentiment was for the Hyatt Regency in Albuquerque, NM.

Editor's Report

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: Managing Invasive Aquatics 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, 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. 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

Business Manager's Report for the 2012 SWSS Meeting: Charleston, SC

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, Cletus Youmans, 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

Cash Flow for SWSS since 2011 Annual Meeting

2/28/11-1/11/2012

Category Description	
INFLOWS	
Annual Meeting Registration	59,025.59
Annual Meeting Support	18,802.39
Endowment Funds Received	1,275.00
Forest Plants Of The SE	1,932.99
Golf Tournament	1,050.00
Interest Inc	1,857.51
Renewal	2,703.22
Royalty On Pubs	157.26
Sustaining Member Dues	15,237.10
Transfer	2,400.00
Weed DVD	-5,031.26
Weeds Of Midwestern US & Candada	1,060.63
Weeds Of The South	3,003.61
TOTAL INFLOWS	**103,474.04**
OUTFLOWS	
Account Fee	125
AMEX	181.23
Annual Meeting Expense	2,985.34
Director Of Science Policy	10,802.00
Endowment Funds Transferred	10,775.00
Insurance	1,158.24
Management Fee	20,000.00
Merchant Acct.	788.48
Newsletter	200
Power Pay	273.08
Supplies	49.92
Tax Preparation	699.16
Travel To Annual Meeting	4,079.40
Travel To Summer Meeting	1,315.60
Value Change Wells Fargo Account	553.04
Website Host	620
Weed Contest	2,655.25
TOTAL OUTFLOWS	**57,260.74**
OVERALL TOTAL	**46,213.30**

SWSS Net Worth Report

Account	Balance	**1/11/2012**
ASSETS		
Cash and Bank Accounts		
Merrill Lynch		111,573.58
Money Market		120,282.73
SWSS Checking		49,037.12
Wells Fargo Savings		32,340.11
TOTAL Cash and Bank Accounts		313,233.54
TOTAL ASSETS		313,233.54
LIABILITIES		
Other Liabilities		
Liability for Weed Contest Fund		9,446.31
TOTAL Other Liabilities		9,446.31
TOTAL LIABILITIES Weed Contest		9,446.31
OVERALL TOTAL		303,787.23

SWSS Weed Contest Committee

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."

2012 SWSS Legislative and Regulatory Committee Report

SWSS Legislative and Regulatory Committee meeting

Monday, January 23, 2012
Francis Marion Hotel, Charleston, SC

AGENDA

1. Discussion of on-going issues
    a. USDA Research Funding
        i. NIFA AFRI
        ii. Smith-Lever, Hatch Act, Formula Funds
        iii. Regional IPM Centers, IR-4
    b. Herbicide Resistance Education and Outreach
        i. APHIS I – Vencill group white paper
        ii. APHIS II – Shaw group white paper
        iii. NAS Herbicide Resistance Summit
    c. NPDES Permits
    d. Aquatic Plant Control Research Program
    e. Pesticide Safety Education Program
    f. National Invasive Species Awareness Week
2. Other Issues
    a. Save the Frogs petition to ban atrazine
    b. RR-Sugar beets
    c. USDA NASS Chemical Use Survey
    d. Comments on MSMA use in turf
3. Setting priorities for 2012
4. Other issues

Meeting report

- Attendees
    - Donn Shilling, Lee Van Wychen, Bill Vencill, Bob Nichols
- Above items covered, plus
    - Jim Parechetti retired
    - *voted to draft letter of support encouraging NIFA to fill National Program Leader position in weed science

Action Items

- Lee will draft an email to the Presidents of regional societies on the status of NPDES
- MSMA – assess whether manufacturer's support reregistration
- Ask WSSA Science Policy committee if the society should take a position with regard to USDA supporting AIPHS releasing herbicide resistance trait allowing use of phenoxy and aryloxyphenoxy herbicides in corn

- Lee will contact other pest management societies to assess their interest in taking position on redefining IPM to mean that pesticides would only be used as a last resort
- Tabled pesticide training program funding
- Ranking of USDA funding
    - Smith-Lever
    - NPES Aquatic
    - NIGA
    - IR-4
    - Hatch
    - IPM

Washington Report
January 1, 2012
Lee Van Wychen

FY 2012 Ag Appropriations Bill Signed into Law

Three of the twelve federal appropriations bills, were passed by both the House and Senate and signed into law on the Friday before Thanksgiving. The agriculture appropriations bill was one of them (H.R. 2112 – H. Report 112-284). It's only the second time in 10 years that USDA will know its fiscal year appropriations before Thanksgiving, meaning Congress was only 2 months late. The remaining nine appropriations bills were signed into law on Dec. 23, 2011.

Given the current fiscal climate, federal programs were facing double digit reductions in many areas. It was considered a victory to get the same amount appropriated in 2012 as in 2011 (i.e. 0% change), and this was the case for three of our highest priority programs: the AFRI competitive grants program, Hatch Act, and Smith-Lever Act. The Regional IPM Centers, which were on the chopping block in FY 2011, got their funding almost back to where it was in FY 2010 at $4.1 million. The IR-4 program, which is vital for researching minor crop weed control, took a 2% cut from FY 2011. We will work to make sure that number does not decrease any further. Other program areas that support weed science that took big cuts for FY 2012 are APHIS and ARS. We will need to provide stronger support for those programs as well.

USDA Program Description	FY 2011	FY 2012	% Change
	(in thousands of dollars)		
APHIS	863,270	816,534	-5.4
ARS	1,133,230	1,094,647	-3.4
ERS	81,814	77,723	-5.0
NASS	156,447	158,616	1.4
NIFA	698,740	705,599	1.0
- Hatch Act	236,334	236,334	0.0
- Cooperative Forestry Research	32,934	32,934	0.0
- Improved Pest Mang't & Bio Control	16,153	15,830	-2.0
Expert IPM Decision Support System	156	153	-2.0
IPM	2,410	2362	-2.0
IR-4	12,156	11,913	-2.0
Pest Mang't Alternatives (PMAP)	1,431	1402	-2.0
- AFRI	264,470	264,470	0.0
- Sustainable Ag Res. and Ed. (SARE)	14,970	14,471	-3.3
Extension Activities	479,132	475,183	-0.8
- Smith Lever	293,911	294,000	0.0
Integrated Activities	36,926	21,482	-41.8
- Section 406	29,000	14,496	-50.0
- Regional IPM Centers	3,000	4,000	33.3
- FQPA Risk Mitigation (RAMP)	$0	$0	n/a
- Crops affected by FQPA (CAR)	$0	$0	n/a
- Methyl Bromide Transition	2,000	1,996	-0.2
- Organic Transitions	4,000	4,000	0.0

NPDES Permits now Required for Aquatic Applications

Despite having a 2/3's majority support in both the House and Senate, Sen. Barbara Boxer (CA) managed to block H.R. 872 from coming to the Senate floor for a vote. H.R. 872 ensures that pesticide applications over or near water are regulated through the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and fixes some misguided

court decisions that have resulted in a duplicative and costly National Pollutant Discharge Elimination System (NPDES) permit.

On October 31, 2011, NPDES permits are now required for point source discharges from applications of pesticides. Some examples of pesticide applications that now require NPDES permit coverage are applications made to control aquatic weeds or fish, flying insects above U.S. waters, or pests present near these waters, such that it is unavoidable that pesticides will be deposited to these waters during application. NPDES permits establish conditions under which discharges may legally occur. Provided that an operator meets the conditions of their permit, the operator may be shielded from Clean Water Act-related citizen lawsuits.

Agricultural water runoff and irrigation return flow, both of which may contain pesticides, are exempt from NPDES permit requirements. Also, pesticide applications to land that do not result in point source discharges of pesticides to waters of the U.S., such as for controlling pests on agricultural crops, forest floors, or range lands, do not require NPDES permit coverage.

EPA is the NPDES permitting authority for six states (Alaska, Idaho, Massachusetts, New Hampshire, New Mexico, and Oklahoma), Washington, D.C., and all U.S. territories except the Virgin Islands, most Indian Country lands, and federal facilities in Colorado, Delaware, Vermont, and Washington. The remaining 44 states and the Virgin Islands are authorized to develop and issue their own NPDES pesticide permits.

Please see the attached document "State Pesticide NPDES Permit Requirements" for a state by state breakdown of the requirements for obtaining an NPDES permit.

The Corps' Aquatic Plant Control Research Program Gets $3 million

The Assistant Secretary of the Army for Civil Works, Jo-Ellen Darcy, made the poorly informed decision to eliminate funding the U.S. Army Corps of Engineers' Aquatic Plant Control Research Program (APCRP) in the FY 2012 budget. This is the nation's only federally authorized program for research and development of science-based management strategies for invasive aquatic weeds. There is no question that the work conducted by APCRP's 18 research staff has been effective, efficient, and invaluable in our nation's fight against foreign aquatic invaders. It would be a grave mistake by the Corps' to eliminate the expertise and institutional knowledge encompassed by APCRP.

We asked the Army Corps of Engineers and Congress to restore funding to $4 million for FY 2012. While our efforts to get the funding restored by the House fell on deaf ears, the Senate Appropriations Committee included that amount in their mark-up of the FY 2012 Energy and Water appropriations bill. I am happy to report that the final conference agreement on the FY 2012 Energy and Water Appropriations bill provided $3 million for APCRP.

Precarious State of U.S. Pesticide Safety Education Program – WSSA Press Release

Today scientists with the Weed Science Society of America (WSSA), the American Phytopathological Society (APS) and the Entomological Society of America (ESA) expressed concern about the precarious state of the U.S. Pesticide Safety Education Program (PSEP). Funding for the program has plummeted in recent years and is now in danger of evaporating completely.

As the nation's primary pesticide applicator training and education program, PSEP is responsible for ensuring the safety of applicators, other workers and the public, for protecting the environment and for providing guidance in the proper use and security of pesticides.

"In addition to certifying applicators and delivering education on the safe use of pesticides, the program today is tasked to provide guidance on a wide range of pesticide-related topics – from avoiding spray drift and minimizing development of pest resistance to protecting endangered species," says Lee Van Wychen, science policy director for WSSA.

Collectively, the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Agriculture (USDA) are responsible for ensuring that the nation's pesticide training needs are met. Since 1965, federal funds to support PSEP and its coordinators have been provided annually by EPA through USDA's Cooperative Extension System. In fiscal year 2000, for example, EPA provided $1.9 million for PSEP, but in fiscal year 2011, EPA funding has been eliminated.

The only remaining source of federal funding for PSEP is $500,000 mandated by the Pesticide Registration Improvement Renewal Act (PRIA II), which translates to only $10,000 per state. However, this funding will end in fiscal year 2012 when the statutory authority of PRIA II expires. To compound the problem, most states have significantly reduced their funding for the personnel and basic services needed to support pesticide education through the Cooperative Extension System.

Statistics show close to 900,000 private and commercial applicators holding PSEP certification in 2010, including more than 100,000 new certifications and more than 225,000 applicators pursuing recertification. In addition, the program has educated more than a million other pesticide users.

"With nearly a 75 percent reduction in federal support for PSEP over the past decade, there is no question that states will not be able to deliver the same quality of PSEP training or to certify the same number of individuals," says Carol Ishimaru, APS president.

Earlier today, WSSA released a technical paper on PSEP that addresses its history, goals and funding. The paper also discusses proposed ideas for ensuring more stable financial resources for PSEP in the future. Examples include:

- Allocating additional dollars from federal and state pesticide product registration fees to cover education on the proper use of pesticides.
- Pursuing grants from pesticide companies, commodity groups, conservation groups and others with an interest in pesticide safety education.
- Changing policies, regulations and statutes to better support funding. For example, most states direct fines for improper use of pesticides into their general funds. These dollars would be an especially appropriate source of support for pesticide safety education.

"There is no one solution to the increasingly precarious state of the Pesticide Safety Education Program," Van Wychen says. "A grassroots effort is needed by stakeholders at the state and national level to overcome policy and regulatory impediments and to ensure the program's sustainability and focus."

The WSSA technical paper on pesticide safety education is available on the WSSA website: View the technical paper.

SAVE THE DATE – the next National Invasive Species Awareness Week (NISAW) will be held February 26 to March 3, 2012 in Washington DC. A week of activities, briefings, workshops and events focused on strategizing solutions to address invasive species prevention, detection, monitoring, and control and management issues at local, state, tribal, regional, national and international scales.

HIGHLIGHTS INCLUDE:

- National Invasive Species Council public meeting
- Grassroots action to prevent and control invasive species – Panel discussions and Webinar
    - Success stories and challenges
    - Cooperative Weed and Invasive Species Management Areas and Tribal efforts
- Capitol Hill Briefings on aquatic invasive species, including quagga and zebra mussels and Asian Carp
- Workshop on invasive species prevention and management in urban areas
- Invasive Species Award Ceremony and Reception
- Kids Invasive Species Awareness Day at the US Botanic Garden
- Invasive Plant Issues and Solutions
- Prevention through outreach and awareness – Experts panel on lessons learned
- Invasive Species Solutions – poster session
- Update by federal agencies on important invasive species issues and initiatives
- State and Local events highlighting invasive species efforts throughout the country!

Check www.nisaw.org for more details and further developments.

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Report of the 2012 SWSS Meeting Site Selection Committee

Charleston, SC

The 2014 SWSS meeting will take place in the Central region of SWSS. The committe suggested Request For Proposals be sent to Convention & Visitors Bureaus for San Juan, Puerto Rico; Savannah, GA; Jacksonville, FL; and Tampa/St. Pete/Clearwater, FL. We received a large number of proposals including Orlando, FL and Atlanta, GA with excellent properties to consider. The committee ranked the proposals considered, and Dr. Tom Mueller assisted the committe in narrowing the selections in Savannah based on the on-site visits. Currently we have not decided on a final site, only recommended to the board that we consider either the Hyatt Regency or Marriot in Savannah, GA. Most of our work was done electronically prior to the meeting. Present at the meeting were Mike Edwards, Tim Grey, Tom Mueller, Jason Norsworthy, Glenn Oliver, and Clete Youmans.

We were also charged with the committee make-up and rotation. Below is a list of current and future committee members, the region they represent, and their 6-year term.

Year of Meeting	Location	Chair of Committee	6 yr Term (start, stop)
2010	West	Peter Dotray (for 2013 location)	2008, 2013 (Houston, TX)
2011	Mid	Clete Youmans (for 2014 location)	2009, 2014 (Birmingham AL,)
2012	East	Tim Grey (for 2015 location)	2010, 2015 (Sanavannah, GA)
2013	West	Jason Norsworthy (for 2016 location)	2011, 2016 (TBA)
2014	Mid	Mike Edwards (for 2017 location)	2012, 2017 (TBA)
2015	East	Glenn Oliver (for 2018)	2013, 2018 (TBA)

Necrologies

Mr. Russell F. Richards, 94, died Oct. 4 2011. He was born in Bureau County, IL on May 28, 1917. Red received a Bachelor of Science degree in Agriculture and a Master of Science degree in Agronomy from the University of Illinois in 1939 and1942. During World War II he served on active duty as an officer in the United States Naval Reserve and remained in the Reserve for several years.

He was active in the Southern Weed Science Society, serving on several committees, and was Vice President in 1962-63, and served as the 16th President of the society in 1963-64, being the first President to be elected from Industry. He received the Southern Weed Science Society's Distinguished Service Award in 1977. Richards was helpful in bridging the gap between institutions and industry researchers and leaders. He was also a charter member of the Weed Science Society of America.

His career included service in the Departments of Agronomy of the University of Illinois and the University of Tennessee. He was with the United States Department of Agriculture, had farmed in Illinois, worked in research and development with Geigy Agricultural Chemicals (now Syngenta) for twenty-two years, and was a consultant in pesticide registration. For over thirty years his interest was devoted to improving agriculture.

After retirement Richards was active in emergency communications through his hobby of amateur radio. He also served as a volunteer in church activities, the Alzheimer's Association, and local historical associations. Survivors include son Roger and daughter Lecie and their spouses in Tennessee; a grandson; two granddaughters; a great grandson; and great granddaughter and two brothers and their wives in Illinois. His wife, Dana, and son, Stephen, preceded him in death.

WHEREAS Mr. Russell Richards served with distinction at Geigy Agricultural Chemicals and,

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

THEREFORE 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, Russell Richards, and by copy of this resolution, we express to his family our sincere sympathy and appreciation for his contributions.

Dr. Jacquelyn Edwards Driver, 52, died Feb. 16, 2011. Jackie was born April 28, 1958 in Pine Bluff, AR. After living and working (chopping and picking cotton) on the family farm near Sherrill, AR, she attended the University of Arkansas at Pine Bluff and obtained a B.S. Degree in Agronomy in 1980. During her undergraduate studies, she worked as an intern for Dow Chemical, USA and Natural Resources Conservation Service. She later became a Soil Conservationist with NRCS. She continued her studies at the University of Arkansas in Fayetteville, under the leadership of Dr. Bob Frans, and received her M.S. Degree with a Weed Science emphasis in 1983. Following graduation, she worked as an Extension Agricultural Agent and later taught soil and crops courses at Texas A&M University in Kingsville. She accepted a position with Syngenta Crop Protection, Inc. after receiving her Ph.D. Degree from Oklahoma State University in 1993 under the direction of Dr. Tom Peeper. She worked for Syngenta Crop Protection, Inc. for 18 years as a Biological Research and Development Representative, while later in her career she was involved in research activities in turf, ornamentals, and professional pest management.

Jackie was a member of SWSS since 1980 for a total of 31 years. As a graduate student, she received 1st place in the Graduate Student Research Paper Contest and was a member of the Arkansas Weed Team. She was active in the Society on various committees. Jackie served as a member of the Graduate Program Committee, Nomination Committee, Local Arrangements Committee, and Sales Coordination Committee. She served as Chairperson of the Graduate Student Program Committee in 1997. She also participated as a judge of the SWSS Student Paper and Poster Contests and assisted with the Summer Weed Contest when hosted by Syngenta in MS and FL. She

continued her participation and service to the Society as a Member-at-Large representing Industry on the SWSS Executive Board for several years. Jackie was elected to serve as Vice-President of the SWSS and later served in the role of President. Jackie was awarded the Distinguished Service Award by the Society in 2009. Jackie was also a member of WSSA, Sigma Xi, and Gamma Sigma Delta. She and her husband Tony resided in Crawford, TX, and both were active members in their community and church.

WHEREAS Dr. Jacquelin Driver served with distinction at Syngenta crop protection,

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

THEREFORE 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, Jackie Driver, and by copy of this resolution, we express to her family our sincere sympathy and appreciation for her contributions.

Report of the Constitution and By-Laws Committee

Summary of Progress: Committee chairs and officers were again asked to submit proposed changes to MOPs and committees in the May newsletter. Several committee chairs submitted suggested changes. Officers on the board were also asked to closely review the duties of their respective office and suggest modifications. Proposed revisions to committee and officer duties were discussed at length at the summer board meeting. Revisons to these duties were continued when the board met prior to and after the Annual Meeting in Charleston. Revisions will be completed in early 2012 and both the MOP and Officer duties will be put on the SWSS website. Part of the difficulty associated with the revisions was the lack of clear detail of names and contact information of individuals that had been appointed to chair various committees.

Objective(s) for Next Year: Continue to revise and update the SWSS Manual of Operating Procedures following the annual meeting of the SWSS Executive Board or as needed.

Recommendation or Request for Board Action: Send requests for revisions to Chair.

Finances (if any) Requested: None

Respectfully Submitted:

John D. Byrd, Jr., Chairperson

BENCHMARK STUDY: ECONOMIC VIABILITY OF HERBICIDE RESISTANCE MANAGEMENT PROGRAMS.

C.B. Edwards*[1], D.R. Shaw[2], J.W. Weirich[3], M.D. Owen[4], P. Dixon[4], B. Young[5], R. Wilson[6], D. Jordan[7], S. Weller[8]; [1]Mississippi State University, Starkville,MS, MS, [2]Mississippi State University, Starkville, Ms, MS, [3]University of Missouri, Portageville, MO, [4]Iowa State University, Ames, IA, [5]Southern Illinois University, Carbondale, IL, [6]University of Nebraska, Scotts Bluff, NE, [7]North Carolina State University, Raleigh, NC, [8]Purdue University, West Lafayette, IN

ABSTRACT

Herbicide resistance best management practices (BMPs), such as the addition of a residual herbicide or use of alternative mechanisms of action, play a fundamental role in the preservation of glyphosate-based cropping systems. However, these BMPs will not be widely adopted until they are shown to be economically viable and sustainable. On-farm studies are critically needed that demonstrate the short- and long-term economics of herbicide resistance management strategies. Research to address this question was conducted in six states – Iowa, Illinois, Indiana, Mississippi, North Carolina, and Nebraska – from 2006 through 2010. Over 150 locations were used in the study, with production systems including continuous glyphosate-resistant (GR) crops, GR crops rotated with another GR crop, and GR crops rotated with a non-GR crop. Each of these on-farm research fields contained paired treatments; one remained as the producer's normal glyphosate-based program of weed control and the other follows herbicide resistance BMP recommendations set forth by the university. All input costs were recorded throughout the year, and variable costs between the two treatments were analyzed. An economic analysis of herbicide cost, crop yield, and net return was formulated for comparison across productions systems and by the producers' glyphosate-based program compared to the university recommendation. As expected, the herbicide resistance BMPs were more expensive than the producers' management system with regard to herbicide costs. However, there was no difference in net returns due to a slight increase in yields from the BMP systems. These occurred across all cropping systems, and in every state. Thus, by implementing the herbicide resistance BMPs in the short term there is no economic disadvantage to using a resistance management approach. In the longer term, these BMPs will prolong the value of the glyphosate-resistant crop technology by preventing or delaying the development of herbicide-resistant weeds.

GLYPHOSATE FOR RICE SEEDHEAD SUPPRESSION IN RICE PRODUCED FOR CRAWFISH.

E.L. Thevis*[1], E.P. Webster[2], J.C. Fish[1], N.D. Fickett[2]; [1]Louisiana State University, Baton Rouge, LA, [2]LSU AgCenter, Baton Rouge, LA (2)

ABSTRACT

Crawfish producers prefer rice to remain in the vegetative stage in order to provide forage for a longer period of time into the fall and winter. However, when rice is allowed to head the plant matures and foliage desiccates; therefore, reducing the total amount of forage available to crawfish. Based on herbicide drift research conducted at the LSU AgCenter, it was observed that rice maturity would delay or fail to advance into the reproductive stage when treated with drift rates of glyphosate. Previous research indicated that reduced spray volume results in higher activity of glyphosate when applied at reduced rates. Rice treated with a reduced rate of glyphosate and with a low carrier volume caused rice to remain in the vegetative stage for a longer period. With this in mind, a study was conducted at the LSU AgCenter Rice Research Station near Crowley, Louisiana in 2011 to evaluate the effects of glyphosate on 'Jupiter' rice. The experimental design was a randomized complete block with four replications in an augmented two-factor factorial arrangement of treatments. A nontreated was added for comparison. The study was conducted at two locations in 2011. Factor A consisted of application timings at two different growth stages: early boot and boot split. The EARLY BOOT timing corresponds to the panicle being totally enclosed within the flag leaf sheath, and boot split is when the flag leaf sheath begins to separate open due to swelling of the panicle. Factor B consisted of herbicide rate. Glyphosate in the formulation of Honcho Plus was applied at rates of 2, 4, 6, and 8 fluid oz/A, or 53, 105, 160, 210 g ae/ha. Each treatment was made with a CO_2-pressurized backpack sprayer calibrated to deliver a constant carrier volume of 9 GPA. Two plant heights were taken: overall plant canopy height and height from the ground to the tip of the extended panicle. Percent rice panicle emergence, rough rice yield, 100 count seed weights, and percent seed germination of harvested seed were determined. Percent germination was determined by calculating the total number of germinated seed out of a hundred, held at 19 C for 14 days. Injury was visually assessed at 4, 14, and 28 DAT; however, injury did not exceed 15% at all evaluation dates. An application timing by glyphosate rate interaction occurred for heading, plant height to extended panicle, and germination. At 4, 14, and 28 days after the boot split application, rice panicle emergence was reduced when rice was treated with 4, 6, and 8 oz/A of glyphosate applied at the early boot timing. Rice treated with glyphosate at 8 oz/A at the EARLY BOOT timing reduced panicle emergence approximately 95% compared with rice treated with 2 oz/A. However, rice panicle emergence was not reduced with any of the glyphosate rates applied at the boot split timing. Rice treated with 4, 6, or 8 oz/A of glyphosate at early boot had a reduced plant height to the extended panicle compared with those treated with any rate at boot split. This supports the percent panicle emergence rating, indicating reduced panicle emergence which resulted in an overall reduction in height to the tip of the extended panicle. Percent germination of rice seed collected was 80% when rice was treated with 2 oz/A, and the rice treated with 6 and 8 oz/A at the early boot timing had reduced seed germination of 42 and 37%, respectively. A glyphosate rate main effect occurred for overall canopy height and rice yield. Overall canopy height was slightly reduced in rice treated with 8 oz/A of glyphosate compared with the nontreated and rice treated with 2 oz/A of glyphosate. Averaged across timings, rice treated with higher rates of glyphosate had reduced yield compared with the nontreated and the 2 oz/A rate. Yield of rice treated with 8 oz/A of glyphosate was reduced 70% compared with rice treated with 2 oz/A. Rice treated with 4 oz/A of glyphosate had a higher yield than rice treated with either 6 or 8 oz/A. This research indicates that 6 to 8 oz/A of glyphosate applied to rice in the early boot stage would help prevent rice from maturing. These rates reduced panicle emergence, resulted in little to no reduction in canopy height, little to no crop injury, rice yield was less than 20% of the nontreated, and visual observation indicated the rice remained in the vegetative state. Though there was minimal effect on canopy height, the reduced height to extended panicle indicates that glyphosate application inhibits rice maturation. This delay in maturity would provide crawfish with an extended period of available forage and reduce the cost to producers by reducing the need for supplemental feed.

CONFIRMATION OF ALS- RESISTANT RICE FLATSEDGE.

A.L. Lewis*[1], J.K. Norsworthy[2], J.A. Bond[3], C.T. Bryson[4]; [1]University Of Arkansas, Fayetteville, AR, [2]University of Arkansas, Fayetteville, AR, [3]Mississippi State University, Stoneville, MS, [4]USDA-ARS, Stoneville, MS (3)

ABSTRACT

Rice flatsedge is becoming detrimental to the Midsouth rice crop. In 2010, the recommended field rate application of halosulfuron (52 g/ha) failed to control rice flatsedge in rice fields of Arkansas and Mississippi. Halosulfuron resistance in Arkansas (AR) and Mississippi (MS) biotypes was confirmed in a greenhouse study conducted at the University of Arkansas in Fayetteville, Arkansas. A dose response study was conducted to characterize the level of resistance to halosulfuron in both Arkansas and Mississippi rice flatsedge biotypes. The experiment was arranged as a randomized complete block design with twenty replications. Treatments included nine rates of halosulfuron including the recommended field application rate, and rates above and below the field application rate. Susceptible biotypes were sprayed with 1/128-, 1/64-, 1/32-, 1/16-, 1/8-, 1/4-, 1/2-, 1-, and 2-times, and the resistant biotypes were sprayed with 1/4-, 1/2-, 1-, 2-, 4-, 8-, 16-, 32-, and 64-times the recommended field application rate of halosulfuron. Plant mortality data were then subjected to probit analysis to find the dose required to kill 50% of the plants (LD_{50}) and the dose required to kill 90% of the plants (LD_{90}). The LD_{50} value for susceptible biotype was 6.89 g/ha. Both resistant rice flatsedge biotypes were >488-times more resistant to halosulfuron compared to the susceptible biotype. The LD_{90} value for susceptible biotype was 23.63 g/ha. Both resistant rice flatsedge biotypes were >141-times more resistant to halosulfuron compared to the susceptible biotype.

EFFICACY OF GLUFOSINATE TANK MIXED WITH DICAMBA, TEMBOTRIONE OR 2,4-D AMINE FOR THE CONTROL OF GLYPHOSATE-RESISTANT PALMER AMARANTH.

G.M. Botha*[1], N.R. Burgos[1], E.A. Alcobar[2]; [1]University of Arkansas, Fayetteville, AR, [2]UNIVERSITY OF ARKANSAS, Fayetteville, AR (4)

ABSTRACT

Palmer amaranth (*Amaranthus palmeri*) is a major weed problem in the southern USA. It grows fast and is efficient in using water and intercepting light. Resistance to glycine, acetolactate synthase, dinitroaniline, and photosysytem II herbicides caused a shift in weed management systems leading to increased adoption of Liberty Link® crops and other technologies. The use of glufosinate in Liberty Link® crops is one alternative tool for glyphosate-resistant Palmer amaranth management. However, continuous application of glufosinate alone to a large population of genetically diverse weedy plants like Palmer amaranth would exert a strong selection pressure resulting in evolution of resistance. Tank mixing is one practice that would reduce selection pressure and delay resistance evolution. This research aimed to evaluate the efficacy of glufosinate applied in a tank mix with dicamba, tembotrione or 2,4-D amine, and assess potential antagonism between these herbicides. Pra-C, a glyphosate-resistant Palmer amaranth accession from Arkansas was evaluated in the greenhouse at the University of Arkansas Main Agricultural Research Center, Fayetteville, in July 2011for tolerance to glufosinate tank mixed with dicamba, tembotrione or 2,4-D. The experiment was laid out in a RCBD, with factorial treatment arrangement. The glufosinate rates evaluated were 0.18, 0.37, and 0.73 kg ai ha^{-1}. The tank mix options were 0.02, 0.04, and 0.08 kg ha^{-1} tembotrione; 0.28, 0.56, and 1.12 kg ha^{-1} 2,4-D; and 0.56 and 1.12 kg ha^{-1} dicamba. Recommended doses are 0.73, 0.08, 1.12, and 0.56 kg ha^{-1} for glufosinate, tembotrione, 2,4-D and dicamba, respectively. Adjuvants (NIS and AMS) were added where necessary. Herbicide antagonism was analyzed using a formula by Colby 1967. All herbicides were applied in 187 L ha^{-1} at 275 kPa. Commercial rates of glufosinate, dicamba, tembotrione, or 2,4-D provided similar Palmer amaranth control (93 to 100%). However, reduced rate (0.5x) of tembotrione was significantly less effective. The control of Palmer amaranth by the half doses of 2,4-D and glufosinate was similar to commercial rate of the two herbicides. The lowest rates of tembotrione and glufosinate controlled Palmer amaranth 57 and 60%, respectively. The activity of reduced rate of glufosinate on Palmer amaranth was antagonized by any tembotrione rate. Antagonism was also observed between reduced glufosinate rate and commercial rate of dicamba. This antagonism was overcome when the 1x rate of dicamba was doubled. No antagonism occurred between glufosinate and 2,4-D. This study showed that labeled rates of all herbicides effectively controlled the glyphosate-resistant Palmer amaranth accession evaluated in this experiment. In previous experiments, 1x rate glufosinate controlled 76% only. These variations may have resulted from the temperature variations since the other evaluation was done in winter time. Reduced rates did not provide much control, except for 0.5x of 2,4-D. Where glufosinate and tembotrione are mixed, commercial rates should be used to overcome potential reduced efficacy.

A FIELD STUDY COMPARING CONVENTIONAL AND ROUNDUPREADY SOYBEAN ISOLINES FOR WEED CONTROL AND YIELD.

B.L. Gaban*[1], L.E. Steckel[2], T.C. Mueller[1]; [1]University of Tennessee, Knoxville, TN, [2]University of Tennessee, Jackson, TN (5)

ABSTRACT

A field study was conducted in 2010 and 2011 in Knoxville, TN to contrast levels of weed control (i.e. untreated, low, medium, and high) in glyphosate-resistant soybeans (*Glycine max*), 'Allen', with a near genetically identical variety of conventional soybeans, '5601T'. In correlation with the soybean variety comparison, different herbicide treatments were applied in order to determine overall economic benefit. Weed control methods included herbicide applications of only glyphosate herbicide on the Allen soybeans and various combinations of pendimethalin, imazaquin, clethodim, and imazethapyr on the 5601T soybeans. High level weed control plots in both Allen and 5601T soybeans were also hand weeded. Both Allen and 5601T varieties had comparable yield data within all levels of weed control, regardless of herbicide treatment, with lower yields associated with less weed control.

MOBILITY OF GLYPHOSATE IN RESISTANT ITALIAN RYEGRASS FROM ARKANSAS. **R. A. Salas, N. R. Burgos, G. M. Botha, D. Riar, University of Arkansas, Fayetteville, AR; N. Polge, Syngenta Crop Corporation, Vero Beach, FL; R. C. Scott, J. W. Dickson, University of Arkansas-Extension, Lonoke, AR.**

ABSTRACT

Italian ryegrass (*Lolium perenne* ssp. *multiflorum*) is a principal weed problem in wheat production fields, which also extends over to cotton and soybean. Suspected glyphosate-resistant Italian ryegrass populations were reported from Desha, AR. Resistance to glyphosate results from a number of mechanisms, with reduced glyphosate translocation and altered *EPSPS* being the most common. Previous studies on Des05 and Des14 populations indicated that resistance to glyphosate was not due to target site mutation, but rather to *EPSPS* gene amplification. To verify if another resistance mechanism exists in these populations, glyphosate absorption and translocation was investigated. A dose-response bioassay was conducted in the greenhouse to determine the levels of resistance to glyphosate in Des05 and Des14 Italian populations. The translocation experiment was performed to determine whether glyphosate is absorbed and moved differentially between resistant and susceptible plants. Seedlings at one-tiller stage were sprayed with 870 g ae ha^{-1} of formulated glyphosate at 20 gallons per acre (GPA) and then spotted with 4-µL of herbicide solution containing 1.776 kBq ^{14}C-glyphosate. Plants were harvested at 24 and 48 hr after treatment (HAT) and sectioned into four parts: treated leaf (TL), above treated leaf (ATL), below treated leaf (BTL), and roots (R). The treated leaf was rinsed with methanol:water (1:1 v/v) solution containing 0.25% (v/v) NIS at each harvest and the recovered radioactivity was quantified by liquid scintillation spectroscopy. The plant tissues were oven-dried and oxidized and the recovered radioactivity was quantified. The dose-response bioassay revealed that the Des05 and Des14 were seven- and eight-fold more resistant, respectively, relative the susceptible population. Absorption of ^{14}C glyphosate was not different among populations at both harvest times. In both populations the amount of glyphosate absorbed increased from 38 to 44% at 24 HAT to 51 to 59% at 48 HAT. Sixty-five to 71% of the total ^{14}C-glyphosate absorbed remained in the treated leaf after 48 h in both resistant and susceptible populations. The proportions of ^{14}C-glyphosate remaining in the TL, and those translocated to ATL, BTL, and R at 24 and 48 HAT were similar in both populations. These results indicate that glyphosate resistance in Des03 and Des14 populations is not due to reduced glyphosate absorption and translocation. Weed populations are evolving other ways to survive glyphosate application, which threatens the sustainability of glyphosate technology.

EFFICACY OF SP25052 FOR THE CONTROL OF YELLOW AND PURPLE NUTSEDGE IN BERMUDAGRASS. **C. Straw*, T. Cooper, L.L. Beck, G.M. Henry; Texas Tech University, Lubbock, TX (7)**

ABSTRACT

Field experiments were conducted at Abilene Country Club in Abilene, TX in the summer of 2011 to quantify the efficacy of SP25052 for the postemergence control of yellow and purple nutsedge. Studies were located on established infestations of yellow and purple nutsedge present in a common bermudagrass rough cut to a height of 3.8 cm. Plots measured 1.5 x 1.5 m and were arranged in a randomized complete block design with four replications. Treatments were applied using a CO_2 backpack sprayer equipped with XR8004VS nozzle tips and calibrated to deliver 375 L ha-1 at 221 kPa. Treatments were initiated on June 22, 2011 and consisted of SP25052 at 127 g ai ha^{-1}, SP25052 (127 g ai ha^{-1}) + MSO (0.5% v/v), SP25052 (137 g ai ha^{-1}) + MSO (0.5% v/v) + AMS (2% w/v), SP25052 (127 g ai ha^{-1}) + NIS (0.5% v/v), trifloxysulfuron (27.8 g ai ha^{-1}) + NIS (0.5% v/v), sulfosulfuron (65.7 g ai ha^{-1}) + NIS (0.5% v/v), and dicamba + iodosulfuron + thiencarbazone at 233.4 g ai ha^{-1} (yellow nutsedge trial only). Sequential applications of all treatments were made on July 20, 2011. Visual estimates of percent yellow and purple nutsedge control and bermudagrass phytotoxicity were recorded 1, 2, 3, 4, 5, 6, 8, and 12 weeks after initial treatment (WAIT). Data were subjected to analysis of variance (ANOVA) and means were separated using Fisher's Protected LSD at the 0.05 significance level. Bermudagrass phytotoxicity was greatest (5 to 6%) 1 week after application (WAA) for SP25052 + MSO + AMS and trifloxysulfuron treatments, regardless of timing or nutsedge trial. Bermudagrass phytotoxicity was no longer visible for all treatments 3 WAA, regardless of timing or nutsedge trial. Yellow nutsedge check plots exhibited approximately 60% cover throughout the duration of the trial. Excellent yellow nutsedge control (≤ 5% cover) was exhibited 4 WAIT with trifloxysulfuron, sulfosulfuron, and SP25052 + MSO. All other SP25052 treatments exhibited 6 to 9% yellow nutsedge cover 4 WAIT. Dicamba + iodosulfuron + thiencarbazone exhibited the least amount of yellow nutsedge control (17% cover) 4 WAIT. All treatments except dicamba + iodosulfuron + thiencarbazone (14% cover) exhibited ≤ 2% yellow nutsedge cover 8 WAIT. Long-term yellow nutsedge control (12 WAIT) was greatest for trifloxysulfuron (2% cover) and sulfosulfuron (0% cover). The greatest long-term yellow nutsedge control (12 WAIT) for SP25052 treatments was exhibited by SP25052 + MSO + AMS (7% cover) followed by SP25052 + MSO (15% cover). Dicamba + iodosulfuron + thiencarbazone exhibited moderate long-term yellow nutsedge control (20% cover) 12 WAIT. SP25052 + MSO + AMS provided equivalent long-term yellow nutsedge control as trifloxysulfuron and sulfosulfuron. However, initial phytotoxicity may exist in response to the addition of AMS. Purple nutsedge check plots exhibited approximately 75% cover throughout the duration of the trial. Purple nutsedge control was greatest 4 WAIT with trifloxysulfuron (0% cover) and sulfosulfuron (2.5% cover). All SP25052 treatments exhibited 9 to 14% purple nutsedge cover 4 WAIT. Purple nutsedge control with trifloxysulfuron and sulfosulfuron was sustained (0% cover) 8 WAIT. All SP25052 treatments exhibited 5 to 11% purple nutsedge cover 8 WAIT. Long-term purple nutsedge control (12 WAIT) was greatest in response to trifloxysulfuron (1% cover) and sulfosulfuron (7% cover). The greatest long-term purple nutsedge control (12 WAIT) for SP25052 treatments was exhibited by SP25052 + MSO + AMS (22% cover). All other SP25052 treatments exhibited > 38% purple nutsedge cover 12 WAIT. No SP25052 treatments exhibited long-term purple nutsedge control similar to trifloxysulfuron or sulfosulfuron.

PALMER AMARANTH CONTROL IN GLYPHOSATE- AND GLUFOSINATE-TOLERANT SOYBEAN.

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ABSTRACT

Soybeans are one of the major agricultural crops grown in South Carolina. Since the discovery of glyphosate resistant Palmer amaranth across the state as well as confirmed ALS resistance the available herbicides for control are limited. A multiple year study was conducted at two locations in South Carolina including the Edisto Research and Education Center in Blackville, SC and the Pee Dee Research and Education Center in Florence, SC. The objective of this study was to evaluate programs for effectiveness in controlling glyphosate resistant Palmer Amaranth in Roundup PowerMAX (glyphosate) and Liberty (glufosinate) tolerant soybean varieties. 15 different spray programs consisting of pre-emergent and post emergent herbicides were evaluated for percent Palmer amaranth control and percent crop injury. 2 checks were sprayed at 6 inch weed height as a control. The studies were arranged in a random complete block and replicated 3 times. The addition of a preemergence (PRE) herbicide increased control of glyphosate-resistant Palmer amaranth in both systems. Plots receiving a preemergence herbicide control were good to excellent (95-100%); however, control diminished slightly across treatment due to late emerging pigweed and decline of soil residual herbicides. The addition of a helper herbicide to Roundup PowerMAX and Liberty early postemergence increased the control of escape from the soil herbicide programs. Weed size is critical in this study because these herbicides have size limitations. After Palmer amaranth exceeds this size, control will fall dramatically. Little to no crop injury was seen from any applied treatment. All treatments rated higher than 95 percent control over all dates while the control treatments had a significantly lower control rating average. The use of a non-PPO preemergence herbicide will be the foundation program for soybean production in South Carolina. This will aid in PPO-resistance management plus allow the full use rate of a PPO-inhibitor at the early postemergence timing in soybean.

WIDESTRIKE™ AND LIBERTY LINK™ COTTON TOLERANCE TO GLUFOSINATE.

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ABSTRACT

Glufosinate-resistant cotton (Liberty Link) was commercialized in 2004 by Bayer Crop Sciences. Liberty Link cotton was developed through the insertion of the bialaphos resistance (BAR) gene, which provides resistance to glufosinate. Widestrike™ technology, which provides resistance to lepidopteron pests, was released in 2005 by Dow AgroSciences. The phosphinothricin acetyltransferase (PAT) gene, which also has confirmed resistance to glufosinate, was used as a selectable marker during plant formation. However, the PAT gene does not provide the same level of resistance to glufosinate as the BAR gene. In addition, limited data is available regarding the effect of glufosinate application rate and timing on Widestrike™ cotton. Therefore, the objective of this research was to evaluate the effect of glufosinate application rate and timing on the growth, development and yield of Widestirke™ and Liberty Link cotton cultivars. Research was conducted in 2010 and 2011 at 10 locations across 7 states including the R.R. Foil Plant Science Research Center near Starkville, Mississippi (2010 & 2011), the West Tennessee Research and Education Center in Jackson, Tennessee (2010 & 2011), the Lon Mann Cotton Research Center in Marianna, Arkansas (2010 & 2011), Onslow County, North Carolina (2011), the Dean Lee Research Station in Alexandria, Louisiana (2011), Plains, Georgia (2010), and at the Tennessee Valley Research and Extension Center in Belle Mina, Alabama (2011). Phytogen 375 WRF and FiberMax 1773 LLB2 were planted at all locations in 2010 and 2011. Glufosinate applications were made to 1 to 3 leaf cotton and/or 6 to 8 leaf cotton. A non-treated check was included for comparison purposes. Four application rates at each application timing included: 0.59, 1.06, 1.59, and 2.37 kg ai ha^{-1}. Phytotoxicity, plant height, and total node data were collected 14 days and also 28 days after each treatment. Node above white flower data were also collected 28 days after the 6-8 leaf treatment. End of season data included node above cracked boll, total nodes, final height, and lint yield. Data were subjected to analysis of variance using the PROC Mixed procedure in SAS 9.2 and means were separated using Fishers Protected LSD at P = 0.05. Visual injury significantly increased after the 1 to 3 leaf application with each increase in application rate on PHY 375 WRF. Visual injury ranged from 8% following application of 0.53 kg ai ha^{-1} glufosinate to 36 % following application of 2.37 kg ai ha^{-1} glufosinate. Less than 6% visual injury was observed on FM 1773 LLB2, regardless of application rate. Visual injury after glufosinate application at 1.59 and 2.37 kg ai ha^{-1} to 6 to 8 leaf glufosinate was 12 and 21%, respectively. No significant differences in plant height due to glufosinate application were observed 14 days after the 1 to 3 leaf application in either variety. Significant height reductions on PHY 375 WRF were observed at glufosinate application rates greater than 0.53 kg ai ha^{-1} following the 6 to 8 leaf application. Final plant heights were unaffected by glufosinate application rate or timing in either variety. Nodes above cracked boll in PHY 375 WRF decreased with each increase in application rate. Significant yield reductions were observed in PHY 375 WRF following glufosinate application rates greater than 0.53 kg ai ha^{-1}. No yield reductions were observed in Liberty Link cotton due to glufosinate application rate and timing. These results indicate that glufosinate application rates above 0.53 kg ai ha^{-1} may have a negative effect on the growth, development, and yield of Widestrike™ cotton. Increased glufosinate application rates, regardless of application timing, did not have a negative effect on the growth, development, and yield of Liberty Link cotton.

FRUITING VEGETABLE AND CUCURBIT RESPONSE TO SIMULATED DRIFT RATES OF 2,4-D.

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ABSTRACT

Nearly all of Georgia's 1.4 million acres of cotton grown in 2011 were infested with glyphosate-resistant Palmer amaranth. Cotton growers are adopting more tillage and greatly increasing herbicide use in an effort to control this pest. The average cotton grower invested $62.50 per acre in herbicides during 2011. Additionally, 92% of these growers hand-weeded 52% of their crop at an average cost of $23.70 per hand weeded acre. Cotton or soybean resistant to 2, 4-D will likely reduce weed management costs but will also increase the potential for damage to non-target vegetable crops grown in close proximity. Georgia vegetables are grown on over 200,000 acres of land having a farm gate value of $1.2 billion. With over 40 crops grown across the state throughout the year, spatial and temporal separation of 2, 4-D-resistant crops and vegetables is not likely. When off target movement of 2, 4-D occurs, understanding the biological sensitivity of vegetables is critical. Therefore, the objective of this study was to determine tomato, pepper, and summer squash response to simulated drift rates of 2,4-D. A pepper and tomato experiment was conducted twice during 2010; once in the spring at the Tifton Vegetable Park in Tifton, GA and again at the University of Georgia Ponder Farm in TyTy, GA. A spring squash experiment was also conducted in the spring of 2011 at the Tifton Vegetable Park. Experimental plots were fumigated with 1,3-dichloropropene + chloropicrin and covered immediately with a high barrier plastic mulch following standard grower practices. Plots included one 32-inch wide by 25 feet in length bed-top with one (tomato 18 inch spacing, squash 12 inch spacing) or two (pepper 12 inch spacing) crop rows. Treatments were applied topically at 15 GPA using a backpack sprayer. In addition to the non-treated control within the study design, potted control plants were placed throughout the study to insure application drift and volatility did not influence results. Each study was maintained weed-free. Tomato and pepper were treated with 2,4-D amine at 1/50, 1/100, 1/150, 1/200, and 1/400X with the X rate being 0.75 lb ae/A. Squash were treated with 1/10, 1/50, 1/100, 1/200, 1/400, 1/600 and 1/800X rates of 2,4-D. Applications were made 3-4 weeks after transplant. Visual injury evaluations, plant heights, bloom counts, and fruit counts were measured throughout the season. Pepper (3 harvests), tomato (4 harvests), and squash (17 harvests) were harvested and graded according to USDA required standards. Treatments were arranged in a RCB with four replications. Data were statistically analyzed using a Mixed Models ANOVA and regressed using an exponential decay model when differences were noted. Pepper was injured 35, 24, 21, 17, and 7% at 2,4-D rates of 1/50, 1/100, 1/150, 1/200, and 1/400X, respectively. Pepper bloom abortion increased as rate of 2,4-D was increased but heights were unaffected by 2,4-D. Total pepper fruit weight of 12780 lb/A were recorded in the non-treated control as compared to 6260, 6726, 9500, 9680, and 10920 lb/A at rates of 1/50, 1/100, 1/150, 1/200, and 1/400X, respectively. Tomato was injured 41, 28, 21, 15, and 9% at 2,4-D rates of 1/50, 1/100, 1/150, 1/200, and 1/400X, respectively. Tomato bloom counts significantly increased as 2,4-D rates decreased but tomato heights were not impacted by 2,4-D. Tomato yields were 40550, 47430, 53920, 51640, and 50370 lb/A at rates of 1/50, 1/100, 1/150, 1/200, and 1/400X, respectively. Non-treated tomato yields were 52420 lb/A. Squash was injured 49, 39, 25, 14, and 4% at 2,4-D rates of 1/10, 1/50, 1/100, 1/200, and 1/400X, respectively. Squash bloom counts were not impacted by 2,4-D but plant heights were reduced 18-11% with 1/10 to 1/100X rates. Marketable squash weights of 10390 lb/A were recorded in the control as compared to 6370, 7550, 9190, 9580, and 10060 lb/A when treated with rates of 1/10, 1/50, 1/100, 1/200, and 1/400X, respectively. Vegetable production and herbicide drift, that could impact maturity or delay yield, will not co-exist simply due to economics. Therefore, research to better understand factors causing drift and to develop new technology for drift reduction is critically needed.

SURVEY OF ARKANSAS BARNYARDGRASS (*ECHINOCHLOA CRUS-GALLI*) POPULATIONS FOR RESISTANCE TO RICE HERBICIDES. **C.E. Starkey*, N.R. Burgos, J.K. Norsworthy, J.D. Devore; University of Arkansas, Fayetteville, AR (11)**

ABSTRACT

Decades of herbicide use in Arkansas rice (*Oryza sativa*) has resulted in evolution of herbicide-resistant barnyardgrass. This study was conducted to determine the spatial distribution of herbicide-resistant barnyardgrass in Arkansas rice. A total of 82 barnyardgrass samples were randomly collected from rice fields in 2010 from 22 of Arkansas' top rice producing counties. GPS coordinates were collected at each sampling location. All samples were grown to the 3- to 4- leaf stage in pots in a greenhouse with approximately 25 plants per pot replicated twice with two runs for a total of 100 plants targeted. Every population was treated with 6 different herbicides in separate runs. The following herbicides were used at the 1x labeled field rate: quinclorac, propanil, imazethapyr, fenoxaprop, clomozone, and glyphosate. Visual control ratings and live dead counts were recorded. Any sample that had less than 70 percent control was considered to be resistant. Of the 82 samples collected, 16 and 45% were found to be quinclorac- and propanil- resistant, respectively. Of the samples collected, 12.5% were resistant to both quinclorac and propanil. Resistance to imazethapyr, fenoxaprop, clomazone, and glyphosate was not found in the samples collected. The samples which were collected showed no spatial pattern of resistance in Arkansas; however the resistant samples do provide an overview of the magnitude of herbicide-resistant barnyardgrass in Arkansas.

EVALUATION OF WIDESTRIKE COTTON RESPONSE TO GLUFOSINATE APPLICATIONS.

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ABSTRACT

Glyphosate-resistant (GR) weeds are a major issue for Georgia, North Carolina and Tennessee cotton growers. These GR weeds can be problematic to control when relying only on timely rains to activate pre applied herbicides. GR horseweed, GR giant ragweed, and GR Palmer amaranth are the three GR weeds that can currently be found in Tennessee. GR Palmer amaranth has become the most difficult to control of these. Fortunately, a timely glufosinate application can control all three of these weeds. As a result, many growers have moved to an glufosinate-based system to manage GR weeds, which includes a pre-applied herbicide followed by at least one over-the-top glufosinate application. Liberty Link cotton varieties are planted on just a few acres in Tennessee due to inconsistent performance of these varieties in the state. Over 60% of the cotton acres in Tennessee are planted to a WideStrike cotton variety which has tolerance to both glyphosate and glufosinate. The WideStrike cotton varieties have moderate tolerance to glufosinate. The injury range is typically in the 5 to 25% range. However, this is for one application and growers are often using multiple applications throughout the growing season in order to control GR Palmer. Growers often call asking how much injury one can encounter from repeated glufosinate applications to WideStrike varieties. Therefore a study was constructed that examined glufosinate applied one, two, or three times throughout the growing season at a rate of 0.59 kg ai/ha. Treatments were applied to cotton at the 2-leaf, 7-leaf, bloom, or two weeks after blooming stage. Plots were maintained weed-free throughout the growing season. The objective of this study was to determine if one or more glufosinate applications at different timings affected cotton growth, development, and yield. The experiment was arranged as a factorial design to examine the effect of timing and number of glufosinate applications on crop injury and yield. Location was not significant; therefore data were combined across locations. Treatment was significant at $p \leq .05$. Therefore, differences between the number of applications were analyzed by constructing single degree of freedom contrast statements. Crop height was reduced after each application, but there were no statistical differences between crop height and the number of glufosinate applications. Crop maturity ratings indicated a delay in maturity at node above cracked boll (NACB). NACB ratings indicated that crop maturity was delayed with the following treatments: bloom plus two weeks after bloom, 2-lf plus 7-lf plus bloom, or 2-lf plus 7-lf plus two weeks after bloom. Crop injury and yield were also significant at $p \leq .05$. Observed injury ratings two weeks after the last application ranged from 9-11% (3 glufosinate applications), 6-7% (2 glufosinate applications), and 3-5% (1 glufosinate application), with no visible crop injury for the non-treated check. Certain application timings as well as the number of application timings significantly reduced yield. One glufosinate application at the bloom stage or two glufosinate applications at the bloom stage followed with another application at the two weeks after bloom stage, reduced lint cotton yield from the highest yielding treatment. However, these applications were not statistically different from the non-treated control. The number of glufosinate applications though, statistically reduced yields from the non-treated control. Three applications of glufosinate resulted in 1676 kg/ha of lint cotton, which was significantly lower when compared with two (1778 kg/ha) or one (1794 kg/ha) applications of glufosinate. The non-treated check had a lint cotton yield of 1769 kg/ha. Results indicate that one to two applications of glufosinate to WideStrike cotton will not negatively impact yields; however, three applications of glufosinate throughout the growing season may decrease crop yield. Data from 2010 and 2011 at three different geographical locations indicates that growers using two or less glufosinate applications (except at the bloom stage), should not observe decreased lint yields in WideStrike cotton.

COMMON LESPEDEZA (*KUMMEROWIA STRIATA*) CONTROL WITHIN MAINTAINED CENTIPEDEGRASS TURF (*EREMOCHLOA OPHIUROIDES*).

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ABSTRACT

Common lespedeza or Japanese clover (*Kummerowia striata* syn. *Lespedeza striata*) is a warm-season, leguminous annual, which is native to Japan. It is a troublesome turfgrass weed within roadsides, home-lawns, and waste-areas of the Southeastern United States. Common lespedeza is similar in distribution to Korean Clover (*K. stipulacea*). However, each can be distinguished by close examination of differences in growth habit. Korean clover is often taller, producing coarse foliage with broader leaflets, and has upwardly pointing stem pubescence. On the contrary common lespedeza has retrorsely appressed (downward pointing) stem pubescence. Despite its prominence within many species of turfgrass, little research has focused upon herbicidal control of common lespedeza within centipedegrass (*Eremochloa ophiuroides*). Our objectives were to evaluate herbicidal control of common lespedeza and the resulting centipedegrass turf-injury. Research was conducted at the Auburn University Turfgrass Research Unit, Auburn, AL. Studies were completely random by design and repeated four times in space and twice in time. Herbicides were applied to mixed centipedegrass-common lespedeza swards on August 4, 2010 and July 11, 2011 via a CO_2 pressurized back-pack sprayer at 280 L Ha^{-1} utilizing Tee-Jet 8002 nozzles. Treatments included a non-treated control and eleven herbicide treatments: 2,4-D amine (15.8 g ae 100 m^{-2}), dicamba (11.2 g ae 100 m^{-2}), Trimec® Southern (12.89 g ae 100 m^{-2}; a combination product of MCPA, 2,4-D, and dicamba), Escalade™ *2* (16.82 g ae 100 m^{-2}; a combination product of 2,4-D, fluroxypyr, and dicamba), Celsius™ (2.34 g ai 100 m^{-2}; a combination product of dicamba, thiencarbazone, and iodosulfuron), carfentrazone (0.34 g ai 100 m^{-2}), fluroxypyr (5.26 g ae 100 m^{-2}), chlorsulfuron (0.53 g ai 100 m^{-2}), two rates of aminocyclopyrachlor (0.79 and 1.05 g ai 100 m^{-2}), and atrazine plus bentazon (22.42 and 8.41 g ai 100 m^{-2}, respectively). Common lespedeza control and centipedegrass injury were visually assessed relative to a non-treated check 1, 2, 4, and 6 weeks after treatment (WAT) in both years. Trifoliate leaf density was measured in 2011 and is presented as reduction relative to the non-treated. Basic normality assumptions were confirmed within SAS Procedure MIXED, and means were separated by Fisher's LSD ($\alpha = 0.05$). Centipedegrass injury occurred more rapidly in week one of 2011 than 2010. This effect was presumably due to a period of high temperatures (> 32° C daytime) in the immediate days following 2011 application. Injury and common lespedeza control were similar between years for all assessment dates that followed; therefore, 2010 and 2011 ratings were analyzed as one. Centipedegrass injury was greatest due to both rates of aminocyclopyrachlor 4 WAT (> 40%). However, injury had subsided by 6 WAT. Centipedegrass injury was minimal (< 10%) due to all other herbicide treatments. Visual assessments of common lespedeza control were similar between years at all assessment dates. We discuss 6 WAT assessments, as they are indicative of the long-term control expected from these herbicides. Escalade *2*, fluroxypyr, and both rates of aminocyclopyrachlor controlled common lespedeza ≥ 99%, while chlorsulfuron, dicamba, and atrazine plus bentazon controlled common lespedeza between 60% and 75%. Trimec Southern, Celsius, carfentrazone, and 2,4-D failed to adequately control common lespedeza (≤ 31%). Trifoliate leaf observations confirm these results. That is, trifoliate leaf density was reduced to zero by Escalade *2*, fluroxypyr, and both rates of aminocyclopyrachlor. Chlorsulfuron and dicamba reduced leaf density 60 and 70%, respectively, while 2,4-D reduced leaf density by only 30%. Atrazine plus bentazon, carfentrazone, Celsius, and Trimec Southern did not statistically reduce trifoliate leaf density. This study highlights several options for herbicidal control of common lespedeza. They include Escalade *2*, shown by previous research to be a highly effective three-way mixture for control of various broadleaf turfgrass-weeds, as well as fluroxypyr (constituent of aforementioned Escalade *2*), and aminocyclopyrachlor.

DIFFERENTIAL RESPONSE OF JOHNSONGRASS POPULATIONS TO HERBICIDES. **V. Singh*, N.R. Burgos, M.B. Batoy, G.M. Botha; University of Arkansas, Fayetteville, AR (14)**

ABSTRACT

Johnsongrass (*Sorghum halepense L.*) is regarded as one of the major weeds of the world and it shows large natural variations in response to herbicides. Seeds of 34 accessions from crop fields, edge of fields and noncrop areas were collected across Arkansas, USA. Bioassays were conducted in the greenhouse to determine the differential response of these accessions to glyphosate, fluazifop-P-butyl and nicosulfuron. The plants were sprayed with glyphosate (0.42 and 0.84 kg ha^{-1}), at the four- to five-leaf stage and with fluazifop (0.10 and 0.21 kg ha^{-1}) and nicosulfuron (0.17 and 0.35 kg ha^{-1}) at the three-to-four leaf stage. Each herbicide test was conducted separately with treatments replicated three times. A nontreated control was included for each accession. Plant height was recorded at the time of herbicide application, injury percentage at 14 days after treatment (DAT), and mortality percentage and biomass at 28 DAT. Injury & mortality differed among populations in response to all herbicides at different rates. Cluster analysis of responses (injury, mortality and biomass) to 0.5x and 1x herbicide rates revealed 3, 2 and 5 groups of accessions at the 1x rate when sprayed with glyphosate, fluazifop and nicosulfuron respectively. Differentiation among accessions was greater at the 0.5x rate. With all 3 herbicides, there was significant interaction effect of rate and accessions on % injury and % mortality. JG-AR39 (cluster 3), of the glyphosate test, showed the most tolerance to 1x rate of glyphosate with <75% mortality 4 wk after treatment (WAT). This accession was from a non-crop area. In the case of fluazifop-P-butyl, 38% of accessions were found to be more tolerant than the rest; of these, five accessions had <75% mortality 4 WAT. With nicosulfuron, JG-AR20 (cluster 4) showed the highest tolerance with <75% mortality at the 1x rate 4 WAT. These results indicate that johnsongrass populations differ in response to glyphosate and the commonly used ALS- and ACCase herbicides. There is also an indication that some populations from noncrop areas, as in crop fields, are no longer killed 100% by the full rate of glyphosate or nicosulfuron. Tests on additional populations are required to substantiate this finding. The separation of accessions into two tolerance categories in response to fluazifop is also noteworthy. More attention is needed on the vegetation management of noncrop areas because resistance to herbicides has already evolved in this setting with other species and seems eminent with johnsongrass.

RECYCLING SYNTHETIC AUXIN TREATED TURFGRASS CLIPPINGS FOR ADDITIONAL WEED CONTROL. **D.F. Lewis*[1], F.H. Yelverton[2]; [1]North Carolina State University, Raleigh, NC, [2]N. C. State University, Raleigh, NC (15)**

ABSTRACT

Synthetic auxin herbicides are utilized for controlling various broadleaf weeds in turfgrass settings. Aminocyclopyrachlor (AMCP) is a newly registered pyrimidine carboxylic acid with a similar chemical mode-of-action and structure to clopyralid. Off-target plant injury has occurred following exposure to compost containing turfgrass clippings previously treated with CLPY. Due to this issue, AMCP and CLPY labels suggest all treated turfgrass clippings be returned following a mowing event. However, large quantities of turfgrass clippings can accumulate if regular mowing practices are not followed. Furthermore, clippings are undesirable in golf course, athletic field, and home lawn turf systems because they can interfere with playability and aesthetics. Therefore, alternative uses for synthetic auxin-treated turfgrass clippings are needed. Research was conducted in 2011 at the North Carolina State University Turfgrass Field Lab in Raleigh, NC to determine the efficacy of recycling AMCP and CLPY treated turfgrass clippings for white clover (*Trifolium repens* L.) control in common bermudagrass [*Cynodon dactylon* (L.) Pers.] utility turf. AMCP [Imprelis™ (79 g ae ha^{-1})] and CLPY [Lontrel® (79 g ha^{-1})] were applied to mature tall fescue [*Lolium arundinaceum* (Schreb.) S.J. Darbyshire] 56, 28, 14, 7, 3, and 1 days before clipping collection (DBC). CLPY rate was less than label recommendation but selected for an equal active ingredient comparison to AMCP. Following collection, previously treated tall fescue [454 g clippings (fresh weight) $plot^{-1}$ (1 m x 1.5 m)] was applied to a white clover/bermudagrass stand. Experimental design was a randomized complete block in a 2x6 factorial arrangement (two herbicides by six clipping collection timings) with four replications and two experimental runs. Visual white clover control and NDVI were recorded over the duration of the experiment. At 8 weeks after initiation (WAI), white clover was harvested to record biomass. Data were subject to ANOVA conducted using MIXED model methodology. ANOVA indicated a significant interaction between main effects of herbicide and clipping collection timings. Means were separated using Fisher's Protected LSD ($P \leq 0.05$) and linearly regressed to illustrate the relationship of herbicide and clipping collection timing. For brevity, only results from 8 WAI are reported. AMCP-treated tall fescue provided greater white clover control than CLPY-treated turf at 28, 14, 7, 3, and 1 DBC. White clover control from AMCP-treated tall fescue followed a linear regression pattern (r^2=0.91), ranging from 16% control 56 DBC to >80% control ≤7 DBC. CLPY-treated turf did not demonstrate a linear pattern, with white clover control not exceeding 40% from any DBC timings. White clover NDVI values were less from tall fescue previously treated with AMCP 14, 7, 3, and 1 DBC compared to CLPY applied at the same timings. NDVI decreased in a linear pattern (r^2=0.83) from AMCP-treated turf but did not follow the same linear pattern from CLPY-treated turf. No differences in NDVI value were detected from CLPY-treated tall fescue from 56 to 1 DBC. Regarding white clover dry biomass, tall fescue applied with AMCP 14, 7, 3, and 1 DBC resulted in less biomass than CLPY applied at the same timings. Dry weight decreased linearly (r^2=0.84) as AMCP-applications went from 56 DBC (114 g) to 1 DBC (48g). Dry biomass from CLPY-applied turf did not follow a linear pattern, as values ranged 24 g from 56 DBC (96 g) to 1 DBC (120 g). These data indicate recycling synthetic auxin treated turfgrass clippings could provide additional weed control. However, turfgrass managers must be proactive in properly recycling treated turfgrass clippings in a manner which avoids potential off-target injury to nontargeted plant species.

WEEDY RED RICE EVOLUTION IN ARKANSAS. T. Tseng*[1], N.R. Burgos[2], A. Lawton-Rauh[3], C.R. Climer[3], V.K. Shivrain[4]; [1]UNIVERSITY OF ARKANSAS, Fayetteville, AR, [2]University of Arkansas, Fayetteville, AR, [3]Clemson University, Clemson, SC, [4]Syngenta, Greensboro, NC (16)

ABSTRACT

Forty-seven percent of the total US rice is produced in Arkansas. About 60% of rice fields in Arkansas are infested with weedy red rice, *Oryza sativa* L. Red rice is a serious threat to the rice industry because of its deleterious effect on rice yield and quality. Its persistence is primarily due to seed dormancy. Red rice exhibits different levels of dormancy allowing it to escape weed management tactics, which also increases the potential for flowering synchronization with cultivated rice, and therefore gene flow from crop to weed. Although predominantly self-pollinated, red rice populations are highly diverse. Genetic introgression and several agroecological factors contribute to red rice diversification and persistence. The objective of this study is to determine the phenotypic and genotypic diversity of red rice using 18 simple sequence repeat (SSR) markers linked to dormancy, and 20 sequence tagged site (STS) loci primers used for rice population genetic studies. Eight red rice accessions representing four populations, dormant blackhull, dormant strawhull, non-dormant blackhull, and non-dormant strawhull, were fingerprinted using SSR markers; and, 17 blackhull red rice accessions, representing different maturity periods and plant heights, were genotyped using STS markers. SSR fingerprinting results show that the overall Nei's genetic diversity (GD) of these dormancy-linked loci was high (GD= 0.66). High GD was observed among populations within each of the four groups. The blackhull group of populations, BH-D and BH-ND, showed the highest GD of 0.55 and 0.58, respectively. Genetic diversity between strawhull and blackhull red rice was higher than the GD among strawhull or blackhull ecotypes. The SH-ND group was most distant from BH-D (0.63) and BH-ND (0.60) group. These data reveal the evolutionary divergence of red rice populations with respect to dormancy. Markers associated with the dormant accessions maybe unique, and can be used for study of dormancy gene expression. STS genotyping experiment identified a total of 40 single nucleotide polymorphisms (SNPs) across the 20 loci for the seventeen accessions of blackhull red rice used in this study. Ten out of 20 loci are polymorphic and the average pairwise, per-site nucleotide sequence diversity (π) and polymorphism (θ) estimates are highest between the "early" and "intermediate" maturing group (0.00180 and 0.00173); "tall" and "short" height group (0.00169 and 0.00162); and between those collected from "central" and "northeast" zones (0.00130 and 0.00135). The highest sequence divergence estimates (K-distances) were observed between the "late" and "intermediate" maturing group (0.00150), "short" and "intermediate" height group (0.00197), and the "northeast" and "southeast" zone group (0.00148). Overall, the nucleotide sequence diversity estimates in blackhull red rice accessions are higher versus sequence variation in these same loci within strawhull red rice accessions. Further analyses of divergence population genetics in red rice are in progress that will utilize 28 additional STS loci and will entail population structure and phylogeographic model-fitting by incorporating genus-wide sampling of the same loci. Relating population evolution to cropping practices and other agroecological factors will determine if there is tendency for certain ecotypes to proliferate in certain environments and will allow targeted red rice management strategies.

EFFECT OF PREEMERGENCE HERBICIDES ON SPRING DEAD SPOT RECOVERY IN BERMUDAGRASS FAIRWAYS. **L.L. Beck*, T. Cooper, C. Straw, G.M. Henry; Texas Tech University, Lubbock, TX (17)**

ABSTRACT

Turfgrass managers often make preemergence herbicide applications in early spring for annual grass and broadleaf weed control in bermudagrass fairways. This may coincide with the appearance of spring dead spot (SDS) disease. Utilization of certain preemergence herbicides may delay bermudagrass recovery from SDS and further contribute to a weakened turfgrass system. Therefore, field trials were conducted at Hillcrest Country Club in Lubbock, TX during the fall of 2010 to examine SDS recovery of a bermudagrass fairway in response to preemergence herbicide applications. Plots measuring 1.5 m^2 were arranged in a randomized complete block design with four replications of treatments. Preemergence herbicides were applied on March 15, 2011 to a bermudagrass fairway exhibiting symptoms of SDS disease. Treatments were applied with a CO_2 backpack sprayer equipped with XR8003VS nozzles calibrated to deliver 304 L ha^{-1} at 276 kPa and consisted of prodiamine at 0.73 kg ai ha^{-1}, pendimethalin at 2.5 kg ai ha^{-1}, oryzalin at 1.68 kg ai ha^{-1}, dithiopyr at 0.56 kg ai ha^{-1}, oxadiazon at 3.4 kg ai ha^{-1}, indaziflam at 0.035 kg ai ha^{-1}, and dimethenamid at 1.68 kg ai ha^{-1}. An untreated check was included for comparison. All treatments received a sequential application on June 15, 2011. Treatments were watered in following application with 0.6 cm of water. Visual ratings of %SDS disease cover were recorded every two weeks until bermudagrass recovered completely in the untreated check plots. SDS cover was converted to %SDS recovery by comparing back to initial ratings. Data were subjected to analysis of variance (ANOVA) and means were separated using Fisher's Protected LSD at the 0.05 significance level. All treatments exhibited less SDS recovery compared to the untreated check except oxadiazon 14 weeks after initial treatment (WAIT). On June 21, 2011 (14 WAIT) the untreated check exhibited 46% SDS recovery while oxadiazon exhibited 55% SDS recovery. SDS recovery was 33% for pendimethalin, 25% for dimethenamid, 23% for prodiamine, 21% for oryzalin, 19% for dithiopyr, and 15% for indaziflam 14 WAIT. This trial will be replicated over time.

EFFECT OF NAPHTHALENE ACETIC ACID ON RHIZOME BUD ACTIVATION AND HERBICIDE EFFICACY IN COGONGRASS (*IMPERATA CYLINDRICA)* CONTROL. **M.Y. Mohammed*; Assistant Research Scientist, College Station, TX (18)**

ABSTRACT

Cogongrass is a perennial grass and one of the most noxious weeds found in many Asian countries and southeastern United States. Apical dominance from the rhizome tips and/or mother plant is the main reason that rhizome buds remain dormant, although environmental factors are also important. As actively growing plants are more sensitive to herbicides than dormant plants (Ashton 1959), this study aimed to investigate whether the use of NAA would increase and/or expand the active sinks within the plant and consequently breaks the rhizome bud dormancy in cogongrass, and enhance herbicide efficacy by using optimal NAA concentrations with sub-lethal doses of systematic herbicides in cogongrass control. The application of NAA one week before glyphosate and fluazifop-butyl reduced bud viability up to 9.5% and 15.0%, respectively, compared to the control of 70.3%. Simultaneous application of the herbicide and NAA reduced bud viability up to 40.5% and 36.7 %, respectively; applying NAA one week after glyphosate and fluazifop-butyl also reduced bud viability by 38.3% and 43.0%, respectively. The percentage of viable buds increased significantly after NAA alone was applied, suggesting that NAA may release dormancy in buds, making them viable. These changes in the pattern of source-sink relationship, stimulated the growth and directed assimilates and herbicides to the rhizomes and consequently killed the rhizomes and the buds. These findings indicate that using the lowest lethal dose (3000 mg l^{-1} of glyphosate or 1500 mg l^{-1} of fluazifop-butyl) one week after the application of 800 mg l^{-1} NAA on cogongrass may reduce bud viability or may totally kill the buds.

***POA ANNUA* CONTROL IN SEASHORE PASPALUM WITH PRONAMIDE.**

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ABSTRACT

Annual bluegrass is a troublesome weed in turf management and there is currently no effective postemergence herbicide labeled for use in seashore paspalum. Field and greenhouse experiments were conducted to evaluate seashore paspalum tolerance to pronamide and other herbicides for annual bluegrass control. In field experiments, turf injury never exceeded 7% from pronamide applied at dormancy, 50% greenup, or complete greenup of seashore paspalum in spring. Annual bluegrass control from pronamide was initially similar across timings and averaged 67, 90, and 98% control from 0.84, 1.68, and 3.36 kg a.i. ha^{-1}, respectively, after 6 wks. In greenhouse experiments, the aforementioned pronamide rates caused less than 10% injury on seashore paspalum. Seashore paspalum injury in the greenhouse was excessive (>20%) from atrazine, bispyribac-sodium, and trifloxysulfuron and moderate (7 to 20%) from foramsulfuron, rimsulfuron and ethofumesate. Seashore paspalum seedhead count reductions by 4 WAT were good to excellent (87 to 98%) from atrazine, bispyribac-sodium, rimsulfuron, and trifloxysulfuron and poor (<70%) from ethofumesate, foramsulfuron, and pronamide. By 4 WAT, seashore paspalum clippings were reduced 0 to 39% from pronamide while atrazine, bispyribac-sodium, and trifloxysulfuron reduced clippings by 54 to 69% from the untreated and ethofumesate, foramsulfuron, and rimsulfuron reduced clippings by 27 to 39%.

IMAGE RECRUITMENT FOR COMMON AND TROUBLESOME WEEDS ON WEEDIMAGES.ORG.

T.M. Webster[1], J.H. LaForest[2], R.D. Wallace*[2], K. Douce[2]; [1]USDA-ARS, Tifton, GA, [2]University of Georgia, Tifton, GA (20)

ABSTRACT

In 2010, the Center for Invasive Species andEcosystem Health in cooperation with the Weed Science Society of America launched the WeedImages.org website. This website was designed to be a source of quality, high resolution images of weeds and weed control/management practices. The website was created with oversight and cooperation from WSSA members to meet the needs of weed scientists. This cooperation creates a companion site to the other Bugwood Image sites including www.ForestryImages.org, www.IPMImages.org, www.Invasive.org, and www.InsectImages.org. As with all content in the BugwoodImage Database, images are categorized by current scientific names while maintaining links to synonymous taxonomy and alternative common names. Images are also assigned a descriptor (i.e. flower, fruit, foliage, etc.), commodity it which it is featured, and location to allow users to quickly filter images to find the image best suited to what they are trying to illustrate. All images are freely available for use in non-commercial, educational publications as long as the images are properly cited. Any commercial image use requests are forwarded to the photographer to handle as they wish. The system also has Photographer profile to view a photographers' information and images, Organizational pages to see all images from an organization, an online image uploader to contribute new photos, and a review system to allow photographers to request changes in image information. The profiles offer the photographers and organizations a chance to promote themselves or their programs. The statistics provided by Bugwood allows the users to find out how and where their images are being used, as well as how frequently they are viewed and downloaded. Several new tools have been developed to target the recruitment of images and make images available for direct use in other applications. The Image Recruiter is used by a variety of networks and groups to call attention to species to be featured in upcoming projects. The owner of the project can select their preferred set of images from all images of that species. Currently, in the database photographers can view current projects and know what species still require images to fully illustrate the species. After a project owner selects the images for their project, those images may be requested or used directly from the Bugwood servers via media RSS feed. As more organizations use this service, a list is created of species without images that are desired overall, in addition to their individual lists.

EVALUATION OF MANAGEMENT OPTIONS FOR CONTROL OF CHINESE SILVERGRASS (*MISCANTHUS SINENSIS*).

J. Omielan*[1], D. Gumm[2], W. Witt[1]; [1]University of Kentucky, Lexington, KY, [2]Kentucky Transportation Cabinet, Jackson, KY (21)

ABSTRACT

Chinese silvergrass is a tall non-native bunchgrass that is widespread in the eastern and southern parts of the United States. *Miscanthus sinensis* has become established along roadsides in the eastern regions of Kentucky. These infestations are a concern due to line of sight issues, potential for fire, and mowing costs. Selective control of roadside weeds is a goal that can be attained by choice of herbicides, timing of application, and in combination with mowing. This study evaluated the timing of herbicide application and sequential herbicide applications on mowed and unmowed Chinese silvergrass stands. The pair of trials were established in 2010 on a roadside in eastern Kentucky. The following products (active ingredients) were evaluated: Arsenal (imazapyr), Roundup Pro (glyphosate), Envoy (clethodim), and Fusion (fluazifop + fenoxaprop). The efficacy of Roundup Pro and Roundup + Arsenal treatments applied once in summer or fall (flowering) and sequentially in summer and fall were evaluated. Envoy and Fusion treatments applied once or twice (4 weeks after first treatment) were also evaluated. In the unmowed trial, in late spring 2011, all the treatments with Roundup alone and in combination with Arsenal provided at least 90% control while the twice applied Fusion and Envoy treatments had 47 to 58% control. In the mowed trial, one year after first application, the twice and fall applied treatments with Roundup alone and in combination with Arsenal provided >90% control while the twice applied Fusion and Envoy treatments had 40 to 60% control.

RESPONSE OF MISCANTHUS TO TILLAGE AND HERBICIDES FOR TRANSITION OUT OF BIOFUEL PRODUCTION. **R.K. Bethke*, S.F. Enloe; Auburn University, Auburn, AL (22)**

ABSTRACT

Bioenergy crops such as *Miscanthus* spp. will likely persist for many years in production fields. However, rotation to other crops will eventually be required. The best methods for rotating out of Miscanthus have yet to be determined. Producers will likely want to use tillage and herbicides as a means of Miscanthus control as they transition into a new crop. However, the very large semi-woody root crowns observed on Miscanthus may make certain operations more difficult. Additionally, tillage and herbicides often interact when controlling perennial weeds or crops. Different tillage types fragment perennial root systems and may affect herbicide control. Our objective was to evaluate the response of Miscanthus to various tillage and herbicide treatments. Experiments were conducted in Notasulga, AL in 2011. Two fields of well-established 2-3 year old *Miscanthus* x *giganteus* and *Miscanthus sinensis* mix were selected for trial. Tillage treatments included no-till, repeated disking, moldboard plow followed by repeated disking, repeated disking followed by chisel plow and glyphosate followed by repeated disking. Tillage was conducted in strips perpendicular to miscanthus rows. Soybeans were planted into the plots after all tillage events were completed. Herbicide treatments were applied after planting and included no herbicide, glyphosate, imazamox and glyphosate + imazethapyr. Data were collected in each plot at each stage of the trial and included Miscanthus height, clump width and number, and visual percent control. Statistics were analyzed using PROC MIXED and PROC GLIMMIX programs in SAS 9.2. The best treatments were any type of tillage followed by glyphosate + imazethapyr. This combination of herbicides also did well to control other problem weeds found that were negatively affecting soybean growth. The best tillage treatment was the glyphosate followed by repeated disking. Based on one year of research, tillage is an effective means to control 2-3 year old Miscanthus. Multiple passes of intensive tillage, the addition of herbicides and follow up during subsequent years are likely required for complete eradication.

GLYPHOSATE-RESISTANT WATERHEMP (*AMARANTHUS TUBERCULATUS*) CONFIRMED IN OKLAHOMA. **J. Armstrong*; Oklahoma State University, Stillwater, OK (23)**

ABSTRACT

Glyphosate-resistant weeds continue to increase in prevalence and geographic distribution each year. In recent years, Oklahoma soybean producers have noticed a decline in waterhemp (*Amaranthus tuberculatus*) control with glyphosate. To address this concern, seed samples from fields with populations of suspected glyphosate-resistant waterhemp were collected during 2010 and 2011. Dose-response studies were conducted in the greenhouse to determine the level of resistance in these populations by calculating the glyphosate dose required to reduce biomass by 50% (GR_{50}). The five resistant populations tested had GR_{50} values ranging from 2.7- to 15.5-fold greater than a known-susceptible population, indicating varying levels of resistance. These results confirm the presence of a second glyphosate-resistant weed in Oklahoma (glyphosate-resistant marestail (*Conyza canadensis*) was previously confirmed in 2009). Though the sampling in this study was limited to four counties in north-central and eastern Oklahoma, it is very likely that populations of glyphosate-resistant waterhemp can be found in other soybean producing areas of the state.

COMBINATIONS OF DIMETHENAMID AND PENDIMETHALIN FOR LARGE CRABGRASS CONTROL IN BERMUDAGRASS. **L.L. Beck*, C. Straw, T. Cooper, G.M. Henry; Texas Tech University, Lubbock, TX (24)**

ABSTRACT

Field experiments were conducted at Lake Ridge Country Club in Lubbock, TX in the summer of 2011 to quantify the efficacy of dimethenamid and pendimethalin combinations for the preemergence control of large crabgrass. Studies were located on a common bermudagrass lawn with a history of large crabgrass pressure cut to a height of 3.8 cm. Plots measured 1.5 x 1.5 m and were arranged in a randomized complete block design with four replications. Treatments were applied using a CO_2 backpack sprayer equipped with XR11025VS or XR8005VS nozzle tips and calibrated to deliver 234 or 468 L ha^{-1}, respectively, at 221 kPa. Treatments were initiated on April 21, 2011 and consisted of pendimethalin at 2.23 kg ai ha^{-1} followed by (fb) dimethenamid at 1.68 kg ai ha^{-1} (June 2, 2011), dimethenamid at 1.68 kg ai ha^{-1} fb dimethenamid (June 2, 2011), dimethenamid at 1.1 kg ai ha^{-1} fb dimethenamid (June 2, 2011 + July 14, 2011), pendimethalin + dimethenamid at 3.92 kg ai ha^{-1} fb pendimethalin + dimethenamid (June 2, 2011), pendimethalin + dimethenamid at 7.85 kg ai ha^{-1} fb pendimethalin + dimethenamid (June 2, 2011), quinclorac at 1.38 kg ai ha^{-1} + dimethenamid at 1.68 kg ai ha^{-1} (June 2, 2011), and prodiamine at 1.1 kg ai ha^{-1} fb prodiamine (June 2, 2011). An untreated control was included for comparison. Visual estimates of percent large crabgrass cover and bermudagrass phytotoxicity were taken on a weekly basis starting June 2 and ending September 14, 2011. Data were subjected to analysis of variance (ANOVA) and means were separated using Fisher's Protected LSD at the 0.05 significance level. Bermudagrass phytotoxicity was only observed for pendimethalin + dimethenamid (7.85 kg ai ha^{-1}) and quinclorac + dimethenamid treatments (4 to 9%) following application. Bermudagrass took 2 to 3 weeks to recover from injury. All treatments exhibited ≤ 5% large crabgrass cover 84 DAIT regardless of treatment, while untreated check plots exhibited 72% crabgrass cover. Large crabgrass cover increased to 11% in plots treated with 2 or 3 applications of dimethenamid 100 DAIT. Large crabgrass cover increased further to 15% in plots treated with 2 or 3 applications of dimethenamid 128 DAIT, while all other treatments exhibited ≤ 4% cover. Large crabgrass cover increased further to 16 to 18% for plots treated with 2 or 3 applications of dimethenamid 144 DAIT. Pendimethalin + dimethenamid (3.92 and 7.85 kg ai ha^{-1}), quinclorac + dimethenamid, and prodiamine treatments exhibited 3 to 6% crabgrass cover 144 DAIT, while pendimethalin followed by (fb) dimethenamid exhibited 0% cover 144 DAIT. Dimethenamid applied alone does not provide adequate preemergence control of large crabgrass when compared to other preemergence chemistries. However, used in conjunction with pendimethalin, dimethenamid can provide season-long crabgrass control. Pendimethalin + dimethenamid at the lower rate (3.92 kg ai ha^{-1}) provided equivalent crabgrass control to prodiamine without phytotoxicity. Increasing the rate to 7.85 kg ai ha^{-1} may cause bermudagrass phytotoxicity and does not increase control compared to the lower rate (3.92 kg ai ha^{-1}).

PERENNIAL RYEGRASS OVERSEEDING TOLERANCE TO RESIDUAL INDAZIFLAM ACTIVITY.

T. Cooper*[1], C. Straw[1], L.L. Beck[1], G.M. Henry[1], P. McCullough[2]; [1]Texas Tech University, Lubbock, TX, [2]University of Georgia, Griffin, GA (25)

ABSTRACT

Research was conducted from March to November 2011 on a common bermudagrass (*Cynodon dactylon* L.) golf course fairway at Reese Golf Course (Lubbock, TX) and a 'Tifway 419' hybrid bermudagrass (*C. dactylon* x. *C. transvaalensis* Burtt-Davey) fairway at Lake Ridge Country Club (Lubbock, TX). Soil at Reese Golf Course was Mobeetie fine sandy loam (Coarse-loamy, mixed, superactive, thermic Aridic Haplustepts) with a pH of 7.8 and 1.2% organic matter. At Lake Ridge Country Club soil was a Brownfield sandy clay loam (Loamy, mixed, superactive, thermic Arenic Aridic Paleustalfs) with a pH of 7.9 and 1.7% organic matter. Both sites were mowed at ~6 mm with clippings returned. Plots measured 1.5 x 1.5 m and were arranged in a randomized complete block design with four replications. Treatments at each location included indaziflam at 35, 52.5, and 70 g ai ha^{-1}, indaziflam at 50 g ai ha^{-1} followed by (fb) indaziflam at 35 g ai ha^{-1}, and prodiamine at 729 g ai ha^{-1}. An untreated check was included for comparison. Treatments were applied with a CO_2 powered boom sprayer calibrated to deliver 304 L ha^{-1} using 8003 flat-fan nozzles. Initial applications were made on March 11, 2011 with treatments requiring a sequential application applied on April 22, 2011. Soil temperature averaged ~13 C when treatments were applied at each location. The entire experimental area was overseeded with perennial ryegrass at 392 kg ha^{-1} on 17 October 2011. This date was 30 weeks after initial herbicide treatment. 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 across the site using a cyclone spreader. Perennial ryegrass cover was evaluated visually on a weekly basis during November 2011. These dates corresponded to 235, 241, 248, and 257 days after initial herbicide treatment (DAIT). All data were subjected to analysis of variance and means were separated using Fisher's protected LSD test at the 0.05 significance level. No significant location-by-treatment interactions were detected in perennial ryegrass cover data; thus, data from each location were combined. Applications of indaziflam at 70 and 52.5 g ha^{-1} yielded ≤ 15% perennial ryegrass cover 241 DAIT compared to 72% for the untreated check. By 257 DAIT, perennial ryegrass cover on plots treated with indaziflam at 52.5 and 70 g ha^{-1} measured 37 to 48% compared to 88% for the untreated check. However, perennial ryegrass cover following applications of indaziflam at 35 g ha^{-1} did not differ from the untreated check on any evaluation date. Perennial ryegrass cover following applications of indaziflam at 35 g ha^{-1} measured 65% at 241 DAIT and 84% 257 DAIT. Perennial ryegrass cover on plots treated with prodiamine at 546 g ha^{-1} did not differ from the untreated control on any evaluation date as well.

POSTEMERGENCE CONTROL OF LARGE AND SMOOTH CRABGRASS WITH SP25052.

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ABSTRACT

Field trials were conducted at Texas Tech University in Lubbock, TX and the University of Tennessee in Knoxville, TN for the control of large crabgrass and smooth crabgrass, respectively, with SP25052. Studies were conducted on mature crabgrass infestations present in common bermudagrass roughs cut to a height of 3.8 cm. Plots measured 1.5 x 1.5 m and were arranged in a randomized complete block design with four replications. Treatments were applied using a CO_2 backpack sprayer equipped with XR8002 or XR8004 nozzle tips and calibrated to deliver 281 L ha^{-1} at 124 kPa and 375 L ha^{-1} at 221 kPa, respectively. Treatments were initiated on June 6, 2011 in TN and consisted of SP25052 (127 g ai ha^{-1}) + MSO (0.5% v/v) + AMS (2% w/v). Treatments were initiated on June 14, 2011 in TX and consisted of SP25052 (127 g ai ha^{-1}), SP25052 (127 g ai ha^{-1}) + MSO (0.5% v/v), SP25052 (127 g ai ha^{-1}) + MSO (0.5% v/v) + AMS (2% w/v), SP25052 (127 g ai ha^{-1}) + NIS (0.5% v/v) + AMS (2% w/v), and quinclorac (841 g ai ha^{-1}) + MSO (0.58% v/v). An untreated control was added for comparison. Sequential applications of all treatments were made four weeks after initial treatment (WAIT). Visual estimates of percent large and smooth crabgrass control and bermudagrass phytotoxicity were recorded 1, 2, 4, 5, 6, 8, and 12 WAIT. Data were subjected to analysis of variance (ANOVA) and means were separated using Fisher's Protected LSD at the 0.05 significance level. In TX, bermudagrass phytotoxicity was greatest (4 to 6%) 1 WAIT of SP25052 + MSO + AMS and SP25052 + NIS. Bermudagrass phytotoxicity was greatest (5 to 11%) 1 week after sequential applications of SP25052 + MSO + AMS, SP25052 + NIS, and quinclorac + MSO. Large crabgrass control was greatest 4 WAIT with quinclorac + MSO (93%). The greatest large crabgrass control 4 WAIT with SP25052 treatments was exhibited by SP25052 + MSO + AMS (44%) and SP25052 + MSO (35%). Similar control was exhibited by SP25052 + MSO + AMS (45%) on smooth crabgrass in TN 4 WAIT. Excellent large crabgrass control (95%) was still evident in TX with quinclorac + MSO 8 WAIT. The greatest large crabgrass control 8 WAIT with SP25052 treatments was exhibited by SP25052 + MSO + AMS (58%) and SP25052 + NIS + AMS (47%). Smooth crabgrass control increased to 83% in response to SP25052 + MSO + AMS 8 WAIT in TN. Long-term large crabgrass control (12 WAIT) was greatest with quinclorac + MSO (96%). The greatest long-term control (12 WAIT) for SP25052 treatments was exhibited by SP25052 + MSO + AMS (44%). All other SP25052 treatments exhibited 13 to 19% large crabgrass control 12 WAIT. No SP25052 treatments exhibited long-term large crabgrass control similar to quinclorac + MSO. However, SP25052 + MSO + AMS treatments in TN maintained higher levels of smooth crabgrass control (73%) 12 WAIT.

WEEDS ON MISSISSIPPI ROADSIDES: A STATEWIDE SURVEY OF SPECIES. **V.L. Maddox*[1], J.D. Byrd[2]; [1]Mississippi State University, Mississippi State, MS, [2]Mississippi State University, Mississippi State University, MS (27)**

ABSTRACT

Vegetation is a significant safety and management responsibility for departments of transportation. Still, it is not well understood. In recent years early detection and rapid response of invasive species has become increasingly important. Only about 20 percent of departments of transportation have taken statewide inventories of invasive species and far less have took surveys of all species that occur on state roadsides. A better understanding of weed occurrences and their ecology could greatly assist with management efforts. The purpose of this study was to conduct a species survey on roadsides managed by the Mississippi Department of Transportation during 2011. Survey locations were broke down into ten physiographic regions in which 10 cross-section transects were established. Species data was collected in eight plots along each transect. For each plot (800 plots total), all species and their percent cover was recorded. Over 360 plant species were identified during the study, including both native and exotic species. Exotic species accounted for about 24 percent of the species. Tishomingo hills had the highest while the Mississippi delta had the lowest species diversity. In addition, species diversity was highest along roadside margins as opposed to plots closer to pavement. Bermudagrass (*Cynodon dactylon*) and bahiagrass (*Paspalum notatum*) had the highest mean cover statewide at 16.1 and 13.1 percent, respectively. As expected, most species correlations were negative. However, there appears to be positive correlations between at least one exotic, legume (Fabaceae) species and non-legume species that are more common near pavement. Given the magnitude of this study, this presentation only covers an overview of the data and implications regarding weed management are still being investigated.

APPLICATION TIMING INFLUENCES INDAZIFLAM EFFICACY FOR ANNUAL BLUEGRASS CONTROL. **C. Waltz*[1], J.B. Workman[2], P. McCullough[2]; [1]The University of Georgia, Griffin, GA, [2]University of Georgia, Griffin, GA (28)**

ABSTRACT

Annual bluegrass (*Poa annua*) is a winter annual weed that reduces turfgrass uniformity through differences in leaf color and unsightly seedhead production. Indaziflam (Specticle) is a new preemergence herbicide chemistry for annual bluegrass control with potential activity for use at various application timings in fall. The objective of this study was to evaluate indaziflam application timing for annual bluegrass control in bermudagrass. A study was conducted at the University of Georgia Griffin Campus to evaluate indaziflam control of annual bluegrass using different application timings and rates. Indaziflam was applied at two rates of 0.035 and 0.052 kg ai/ha at PRE and POST timings. The PRE timing was September 20, and the POST timings were October 18 and November 17, 2010, respectively. All indaziflam rates applied on the September and October timings provided excellent annual bluegrass control (90% or greater) throughout the spring. Indaziflam at these two timings were comparable to two applications of prodiamine and, prodiamine + foramsulfuron, and prodiamine + glyphosate when applied later in the fall and there were no significant differences between percent green-up. Although control was not acceptable, it should be noted that the high rate of indaziflam applied during the late-fall (November 17) gave up to 71% control into mid-spring.

THE IMPACT OF WEED DENSITY ON POLLINATION IN CORN. **M.K. Williams*[1], R. Heiniger[2], D. Jordan[2], W.J. Everman[2]; [1]North Carolina State Univesity, Sanford, NC, [2]North Carolina State University, Raleigh, NC (30)**

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 (rows spaced 8 inches apart on 36-inch 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 herbicide resistant trait (HRT) and the appropriate herbicide used in these hybrids 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 2011 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. Glufosinate-resistant (LibertyLink®) and glyphosate-resistant (Roundup Ready®) hybrids were planted in single rows or twin rows (8-inch spacing on 36-inch centers) in mid April. Within each HRT 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 HRT, herbicide program, and planting pattern was not significant for common ragweed population, visible control, or any of the measurements associated with corn. The interaction of HRT and herbicide program also was not significant for weed population or control and corn growth. These data suggest that under conditions of this experiment and with common ragweed, twin row planting patterns offer no advantage to single row patterns when the total corn population per unit area is the same. Also, lack of an interaction of HRT and herbicide program suggests that both glufosinate and glyphosate are equally effective when applied in their appropriate herbicide-resistant hybrid for this weed. Although the main effect of HRT was significant for several parameters, HRT did not react with other treatment factors in most instances. Factors associated with these hybrids other than HRT could have contributed to these differences. All herbicide programs that included a POST herbicide were more effective in controlling common ragweed than *S*-metolachlor alone. Corn yield was improved in all but one instance when POST herbicides were applied, but few differences in ear characteristics were noted when comparing among herbicide programs. Correlations among common ragweed density or visible control and corn grain yield and nubbin ears were noted. A higher density of common ragweed decreased yield, increased the number of nubbin ears, and the number of days to silk emergence. This response was not unexpected as interference from weeds often decreases grain yield, and establishment of shorter ears with fewer grains would be a possible mechanism of yield reduction. Also, delayed development of ears as reflected in delayed emergence of silks is consistent with weed interference with corn. In the future, herbicide programs will be designed to provide a broader range of common ragweed densities to better establish correlations.

PAINT BY NUMBERS; FILLING THE GAPS IN INVASIVE SPECIES MAPPING DATA. **R.D. Wallace*, C.T. Bargeron, K. Rawlins, D.J. Moorhead; University of Georgia, Tifton, GA (31)**

ABSTRACT

In 2005, the University of Georgia's Center for Invasive Species and Ecosystem Health (The Center) began the development of a web-based Early Detection and Distribution Mapping System (EDDMapS) to accurately map distribution of invasive plants across the United States. The purpose of EDDMapS is to discover, and accurately map, the existing range and leading edge of invasive species range while documenting vital information about the species and habitat. EDDMapS also serves as an information sharing system linking data from various state, federal and non-governmental entities. EDDMapS has been supported over the past six years by state (Florida and Alaska) or regional projects from the USDA Forest Service, U.S. Fish and Wildlife Service and National Park Service. The Center has worked with the USDA NRCS PLANTS database and the Biota of North America Program to obtain county distribution data for 1200 invasive plants across the entire United States based on literature and herbarium records. The nationwide distribution data in EDDMapS is still incomplete with most of the records focused on the Southeastern United States and Alaska. With recent funding from the U. S. Forest Service, The Center is working with USDA Forest Service Forest Health Protection to recruit data nationwide. The primary focus of the project is mapping invasive species distribution, with a secondary focus on mapping biological agent releases. There are several goals to be completed within the project year: 1) Identify and recruit invasive plant distribution datasets 2) Update EDDMapS with increased filtering and searching options 3) Create online EDDMapS Manual with data dictionary and data collection standards and protocols and 4) Produce a gap analysis report. Specific tasks within each of those goals will aid in realizing those goals. To nationally recruit data, specific datasets have been targeted for quality and quantity of data including FIA - Forest Inventory and Analysis Program, FACTS - Forest Service Activity Tracking System, IPANE – Invasive Plant Atlas of New England, and NAPIS - National Agricultural Pest Information System (Federal Noxious Weeds). The Center will also work with Invasive Plant Coordinators from other agencies to integrate their internal invasive plant databases into EDDMapS. Advanced query tools are being built to give users more refined search options for viewing and downloading data. Providing contributors with protocols for collecting and supplying data will ensure that data that is entered is high quality and standardized. Building a gap report will allow The Center and the Forest Service to analyze where data has not been collected or doesn't exist. Accomplishing these goals will allow EDDMapS to provide a better experience to users and contributors.

RESPONSE OF COGONGRASS GENOTYPES TO GLYPHOSATE UNDER FIELD AND GREENHOUSE CONDITIONS.

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ABSTRACT

A field study was conducted from spring 2007 through fall 2010 at the Brewton Agricultural Research Unit of Auburn University, to evaluate a potential cogongrass genotype response to soil fertility and glyphosate treatment. The experimental site had been a long–term soil fertility study since 1929. The long–term fertility treatments consisted of six rates of nitrogen, three rates of phosphorus and five rates of potassium. Six cogongrass genotypes included selections from Auburn, AL, Florida, Mobile, AL, Louisiana, the horticultural cultivar 'Red Baron', and a "B genotype" from AL. The experimental design was RCB with a split plot-strip block treatment restriction. Fertility treatments were main-plots (30'x 10'), genotypes were subplots (10'x 5'), and glyphosate treatment was the sub-subplot (5'x 5'). Genotypes were planted in two blocks (A and B) in March 2007 and two blocks (C and D) in 2008. Glyphosate (4 lb/acre) was applied as a strip treatment with an ATV mounted boom sprayer at 20 gallons per acre in October 2008 to blocks A and B and in 2009 to blocks C and D. Measurements were made 24 months after planting on rhizome and shoot dry weight, maximum live rhizome depth and total nonstructural carbohydrate (%TNC) content. Data on percent live-cogongrass cover reduction was also recorded 8 and 12 month after glyphosate treatment. Statistical analysis was done using Proc GLIMMIX in SAS with PDIFF option for treatment separation. Additionally, two runs of a greenhouse experiment were conducted from 2009 through 2010 at the Plant Science Research Center (PSRC) greenhouse of Auburn University, Auburn, AL, to evaluate a dose response relationship using six different rates of glyphosate across the six cogongrass genotypes. The experiment was established in a completely randomized design with five replications. Glyphosate was applied inside a spray chamber at 0.5, 1.0, 2.0, 3.0, 4.0 and 8.0 lb/a at 20 gpa to about 140 days old cogongrass. Rhizomes were harvested 100 days after glyphosate treatment and dry weight was recorded. Proc NLMIXED was used on the greenhouse rhizome dry weight data to fit a three parameter model to generate dose response curves. The results from field research indicated no effect of phosphorus rates, a linear decrease in rhizome and shoot dry weight with increase in nitrogen rates, and an increase with increase in potassium. Cogongrass genotypes differed for %TNC content and maximum live-rhizome depth. Red Baron genotype recorded a significantly lower rhizome and shoot dry weight, live-rhizome depth and % TNC content than other five cogongrass genotypes. These results indicate that cogongrass did not benefit by increased nitrogen and phosphorus fertilization but did respond positively to increased potassium with respect to rhizome and shoot dry weight. Maximum live-rhizome depth and % TNC were unaffected by nitrogen, phosphorus and potassium. Glyphosate resulted in a uniform decrease in cogongrass cover in all the biotypes but all of them recovered at least 20% growth a year after treatment. There was some indication of differential recovery among genotypes with the Auburn genotype recovering much faster than others. Greenhouse research also indicated a differential response of cogongrass genotypes to different glyphosate rates. Dose response curves revealed significant differences in the LD_{90} for cogongrass genotypes. The LD_{90} was 1.7 lb/a for Auburn and Mobile, approximately 1 lb/a for Louisiana, Florida and B genotypes and 4.8 lb/a for Red Baron.

STUDIES ON THE MODE OF INHERITANCE OF QUINCLORAC RESISTANCE IN BARNYARDGRASS.

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ABSTRACT

Barnyardgrass is the sixth most important herbicide-resistant weed worldwide. In rice production systems of the Mississippi Delta region, quinclorac-resistant barnyardgrass has been a serious issue. The first incidence of quinclorac-resistant barnyardgrass was confirmed in Arkansas rice in 1999. Currently, barnyardgrass populations resistant to quinclorac have been widespread in this region. Knowledge of the genetics of herbicide resistance in weed populations is valuable for devising suitable management practices. In particular, the mode of inheritance of resistance alleles plays an important role in the rapidity of resistance evolution and spread. Experiments were conducted in the greenhouse at the Agricultural Experimental Station, Fayetteville, AR, to understand the mode of inheritance of quinclorac resistance in a resistant (R) barnyardgrass population collected from eastern Arkansas. The susceptible (S) population was also collected from a rice production field in this region. The R and S populations were subjected to a dose-response analysis to understand the relative level of resistance in R populations. The R populations were used as male parents for crossing, which occurred naturally under field conditions. The F_1 progeny was sprayed with quinclorac at 682 g ai ha^{-1}, a dose that killed all S plants, which was determined using the dose-response analysis. Twelve F_1 survivors (i.e., successful crosses) were selected and grown in individual pots under normal growing conditions, and up on panicle initiation the plants were covered individually using polythene mesh bags to facilitate self-pollination. Up on maturity, the F_2 seeds were collected, scarified, and seedlings (150 each) were established in 50-well trays. The R and S parents were also included for comparison. At the 2- to 3-leaf stage, F_2 seedlings were sprayed with quinclorac at 682 g ai ha^{-1}. Phenotypic observations were carried out at 21 days after application. The F_2 progeny comprised of two different phenotypes, S and R, with no intermediate phenotype, suggesting that resistance is conferred by completely dominant gene(s). The chi-square analysis of the F_2 segregants confirmed that resistance is conferred by a single gene. Thus, quinclorac resistance in the barnyardgrass population used in the experiment was conferred by a single, completely dominant gene with Mendelian pattern of inheritance. The results will be useful for parameterizing quinclorac-resistance simulation model for barnyardgrass.

MANAGEMENT OF CHINESE TALLOW WITH BROADCAST HERBICIDE APPLICATIONS.

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ABSTRACT

Chinese tallow (Sapium sebiferum) is an invasive tree occupying millions of acres along the Gulf Coast from the Carolinas to Texas. Field studies were conducted in Brazoria Co., TX, in 2009 and 2010 to evaluate both experimental and labeled herbicides for Chinese tallow control. Ten treatments consisting of various herbicides were applied in 2009 to 6 ft. tall Chinese tallow trees. At 12 and 24 months after treatment, GrazonNext combined with Tordon 22k (2.6 + 2.0 pts/acre) was the highest performing and most economical treatment, providing 93% control at a chemical cost of $34 per acre. Similarly efficacious treatments (75-93% control) had $20 to $50 higher chemical costs per acre. In 2010, experimental and labeled herbicides were applied to 8 ft. tall Chinese tallow. One year after treatment, the highest level of control was provided by MAT28 at 4 oz ai/acre (92%), which was not significantly greater than that provided by MAT28 + Remedy (2.0 + 4.0 oz ai/acre). This combination did not differ from 1 or 2 oz. ai/acre of MAT28 applied alone. Interestingly, MAT28 at 1 oz ai/acre provided significantly better control than MAT28 combined with metsulfuron and MAT28 at 1 oz ai/acre + Remedy at 2 oz ai/acre. Finally, Grazon P+D applied at 3 qt/acre provided the same level of control as MAT28 alone at 1 and 2 oz ai/acre and MAT28 plus Remedy (2 + 4 oz ai/acre). Annual evaluations will continue on these trials.

ONION WEED CONTROL WITH POST-DIRECTED APPLICATIONS OF PELARGONIC ACID. **C.L. Webber*[1], J.W. Shrefler[2], L.P. Brandenberger[3]; [1]USDA, ARS, Lane, OK, [2]Oklahoma State University, Lane, OK, [3]Oklahoma State University, Stillwater, OK (35)**

ABSTRACT

Organic onion producers need appropriate herbicides that can effectively provide post-emergent weed control. Research was conducted in southeast Oklahoma (Atoka County, Lane, OK) to determine the impact of a potential organic herbicide on weed control efficacy, crop injury, and yields. The experiment included 5 weed control treatments (1 herbicide applied at 3 rates) with sequential applications separated by 8 days, plus an untreated weedy-check and an untreated weed-free check) with 6 replications. The herbicide, Scythe® (57% pelargonic acid), was applied at 3, 6, and 9% v/v at 40 gpa. Intermediate day, sweet onion, cv. 'Candy', were transplanted on April 5, 2010 into 2 rows per 6 ft-wide raised beds. Each plot consisted of two onion rows per 10 ft length of bed. Weed control (total, evening primrose, smooth crabgrass, and yellow nutsedge) increased as the rate of Scythe® increased from 3 to 9% v/v. Initial, 1 day after initial treatment (DAIT), control for the total, evening primrose, and smooth crabgrass ratings were similar, but the smooth crabgrass control quickly dropped off after 1 DAIT. Injury increased as the rate of Scythe® increased with a spike in injury following the sequential application at 8 DAIT. All Scythe® treatments produced significantly less marketable onions and weight/acre. Although onion injury was reduced compared to previous research with the over-the-top broadcast applications of potential organic herbicides, the onion yields in this study were totally unacceptable due to the lack of weed control and crop injury. Further research should combine the use of corn gluten meal or mustard meal as preemergence herbicides combined with between row applications of post-emergence organic herbicides.

WEED MANAGEMENT SYSTEMS IN SWEET CORN. **M. Miller*, P.J. Dittmar; University of Florida, Gainesville, FL (36)**

ABSTRACT

Studies were conducted to integrate a postemergence herbicide into a weed management system, which utilizes *S*-metolachlor preemerergence. Treatments included a weedfree control, weedy control, *S*-metolachlor alone, and *S*-metolachlor followed by a postemergence herbicide. The POST herbicides included carfentrazone at 8.9 g/ha, clopyralid at 8.9 g/ha, fluthiacet at 4.9 and 7.3 g/ha, halosulfuron at 39.9 g/ha, and mesotrione at 106.3 g/ha. Sweet corn 'Fantastic' (*Zea mays* L.) was planted March 30, 2011 at the Plant Science Research and Education Center in Citra, FL. *S*-metolachlor PRE was applied at 2 days after planting (DAP) and POST treatments were applied 28 DAP. Predominate weed species were yellow nutsedge (*Cyperus esculentus* L.), common lambsquarters (*Chenopodium album* L.), and goosegrass [*Eleusine indica* (L.) Gaertn.]. Sweet corn was harvested by hand on June 6 (68 DAP). Yellow nutsedge control at 33 DAP was greatest with fluthiacet at 7.3 g/ha (81%) and was similar to halosulfuron (76%). At 33 DAP, halosulfuron (88%) had the greatest yellow nutsedge control and was similar to fluthiacet at 7.3 g/ha (74%) and carfentrazone (55%); these three treatments were greater than *S*-metolachlor alone. Mesotrione had similar yellow nutsedge control (35% and 25% at 33 and 40 DAP) to the weedy control (0%). Common lambsquarters control (40 to 93%) was greater in all herbicide treatments compared to the weedy control. At 33 DAP, common lambsquarters control was greatest with fluthiacet at 7.3 g/ha (86%) and was similar to clopyralid (64%) and fluthiacet at 4.9 g/ha (73%). Halosulfuron (45 and 43%) and mesotrione (50 and 51%) provided common lamsquarters control similar to *S*-metolachlor alone (55 and 25%) at 33 and 40 DAP. Goosegrass control was greatest with carfentrazone (95%) and fluthiacet at 7.3 g/ha (65%). At 40 DAP, halosulfuron (40%) and clopyralid (33%) provided less goosegrass control than the other POST herbicides (76 to 90%) and was similar to *S*-metolachlor alone. Yield was similar among weedfree control and all herbicide treatments ranging 10766 to 24008 kg/ha.

ALS-RESISTANT RYEGRASS CONTROL IN NE TEXAS WHEAT. **C.A. Jones*; Texas A&M Commerce, Commerce, TX (37)**

ABSTRACT

Ryegrass is the most important pest in wheat in northeast Texas. The local ryegrass has been described as being ALS resistant before. Recently producers have complained about reduced control with ACC'ace herbicides. Research was initiated in Commerce, TX to determine if ryegrass was tolerant of these herbicides. Axial and Hoelon were applied at 0, ½, 1, 2, and 4X rates of the labled applied rates to a standard Gulf variety and a feral variety collected from a local producer's field. It was noted that the local ryegass was controlled significantly less than the standard Gulf ryegrass with the ACC'ase herbicides.

COMPARISON OF THE VOLATILITY OF VARIOUS AUXIN HERBICIDES WHEN APPLIED UNDER FIELD CONDITIONS. **A.N. Eytcheson*[1], J.T. Irby[1], D.B. Reynolds[1], L.C. Walton[2], D.T. Ellis[3], R.A. Haygood[4], J.S. Richburg[5]; [1]Mississippi State University, Mississippi State, MS, [2]Dow AgroSciences, Tupelo, MS, [3]Dow AgroSciences, Greenville, MS, [4]Dow AgroSciences, Germantown, TN, [5]Dow AgroSciences, Dothan, AL (38)**

ABSTRACT

Auxin mimicking herbicides have been used for over 40 years to control broadleaf weeds in monocotyledonous crops. Volatilization and vapor drift to sensitive crops has been an issue with auxin herbicides. Salt formulations of 2,4-D are considered to be relatively nonvolatile compared to ester formulations. The volatility of herbicides is important when herbicide vapor causes economic losses to sensitive crops. Soybeans and cotton are two of the most sensitive row crops to auxin herbicides. With the development of auxin herbicide tolerant crops, minimal volatility of auxin herbicides is vital to prevent injury to non-tolerant auxin sensitive crops. In 2011, Dow AgroSciences developed a new quaternary ammonium salt formulation of 2,4-D. GF-2726 is a combination of this new salt with glyphosate and may provide researchers and producers with a new lower volatile formulation of 2,4-D. In 2011, an experiment was conducted at the Black Belt Research Station in Brooksville, MS. A 4.57 by 1.52 m dome was placed in the middle 16.76 m of a plot containing a row each of cotton and soybeans. Herbicide treatments included 2,4-D ester + Durango® DMA® (glyphosate) (2.131 kg ae/ha + 2.242 kg ae/ha), 2,4-D amine + Durango® DMA® (2.242 kg ae/ha + 2.242 kg ae/ha), GF-2726 (4.374 kg ae/ha), dicamba DGA + Durango® DMA® (1.121 kg ae/ha + 2.242 kg ae/ha), and an untreated. Each treatment was applied to 4 flats filled with soil, wet to field capacity, placed between a row of cotton and soybeans in the center of the dome and the plastic sheeting was placed over the dome frame. The treated flats of soil and the plastic sheeting were removed 24 hours after application. Visual injury was recorded for cotton and soybeans on a per foot basis in both directions from the treated area. All treatments had injury in the treated soil area and vapor drift injury outside the dome treated area; however, GF-2726 had less injury than all other treatments. When comparing the formulations of 2,4-D, GF-2726 had less injury on soybeans and cotton than the amine salt and the ester formulations. Within the dome area, GF-2726 had less injury than all other treatments, with respect to cotton and soybean. GF-2726 exhibited less volatility when compared to the other auxin herbicides 2,4-D ester, 2,4-D amine salt, and dicamba DGA.

HACK AND SQUIRT APPLICATION OF HERBICIDES FOR RUSSIAN OLIVE *(ELAEAGNUS ANGUSTIFOLIA L.)* CONTROL.

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ABSTRACT

Field trials were conducted on Russian olive (*Elaeagnus angustifolia* L.) trees testing herbicide efficacy for use in hack and squirt applications. Trees were hacked with a hand held hatchet at a rate of one hack per 3 inches of trunk diameter and 1 ml of herbicide was applied per hack using a syringe. Treatments included aminocyclopyrachlor (DPX-MAT 28 SL), imazapyr (Habitat), glyphosate (Rodeo), aminopyralid (Milestone), triclopyr amine (Garlon 3A), Milestone VM+ (10:1 triclopyr amine + aminopyralid), and a 50:50 aminocyclopyrachlor + triclopyr amine mixture. The experiment was designed as an 8(treatments) by 2 (sites) in a factorial design arranged as a RCB with eight replications (1 tree per replicate) and conducted at two sites to be repeated in space (Nunn, Colorado and Wellington, Colorado). Visual assessments of control were made 1 year after treatment (YAT) based on a 0 to 100% visual percent control scale for necrosis. Data were transformed to a log scale and subjected to analysis of variance and means separated by LSD ($\alpha = 0.05$). We concluded that aminocyclopyrachlor was an effective herbicide for use in hack and squirt applications achieving 91% control of Russian olive trees 1 YAT. This level of control was comparable to both industry standards glyphosate and imazapyr (94% and 98%, respectively). A 50:50 mixture of aminocyclopyrachlor and triclopyr amine resulted in 98% control of Russianolive trees 1YAT. Aminopyralid containing products (e.g. Milestone and Milestone VM+) offered less percent control (84% and 89%, respectively), than aminocyclopyrachlor. Triclopyr amine had the lowest percent control when applied alone at both field sites (77%).

MISSISSIPPI STATE-WIDE SURVEY OF HERBICIDE RESISTANCE IN PALMER AMARANTH.

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ABSTRACT

Glyphosate-resistant (GR) Palmer amaranth (*Amaranthus palmeri* S. Wats.) was first documented in Macon County, Georgia in 2005. Since then GR Palmer amaranth has been documented across many Southeastern and Midsouth states, including Mississippi. Many of these populations also exhibit resistance to other herbicide modes-of-action like the acetolactate synthase (ALS)-inhibiting herbicides, such as pyrithiobac, further limiting control options. GR Palmer amaranth in Mississippi was originally documented in 2008. A weed resistance survey conducted in 2009 on Palmer amaranth populations collected from across the 17-county Mississippi Delta region in the northwest Mississippi confirmed presence of at least 1 GR population in 9 counties. In 2010, the glyphosate resistance survey was expanded state-wide covering the rest of the 65 counties in Mississippi. In addition, response of Palmer amaranth populations (from both the 2009 and 2010 collections, representing all counties in Mississippi) to pyrithiobac (both POST and PRE), trifluralin (PPI), and flumioxazin (PRE) was evaluated. GR Palmer amaranth was detected in 16 counties in 2011, bringing the spread to a total of 25 counties in Mississippi. Resistance to pyrithiobac (PRE and/or POST) was confirmed in 27 counties. Multiple resistance to glyphosate and pyrithiobac was established in at least one Palmer amaranth population each from 13 counties in 2011. None of the Palmer amaranth populations tested exhibited resistance to trifluralin and/or flumioxazin. vijay.nandula@ars.usda.gov

DISSIPATION OF ATRAZINE AND METRIBUZIN IN HIGH ORGANIC MATTER SOILS.

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ABSTRACT

Triazine herbicides are extensively used to provide residual control of many broadleaf weeds and certain grasses in sugarcane. However, there are reports of reduced residual weed control with atrazine as a result of enhanced degradation in sugarcane fields. A field study was conducted near Belle Glade, FL in 2011 to compare dissipation of atrazine and metribuzin on high organic matter soil in the Everglades Agricultural Area (EAA) in south Florida. Atrazine and metribuzin were applied at 2, 4, and 8 lb ai/A and 0.5, 1.0, and 2.0 lb ai/A, respectively. Soil samples were collected at 7, 14, 21, 28, 35, 49, and 56 days after treatment (DAT) from the top 4 inches. The herbicides were extracted from the soil with toluene and water and analyzed on GC/MS and HPLC, respectively to determine the total amount of herbicide in the soil and the readily bioavailable fraction of the herbicides in the soil, respectively. Atrazine dissipated rapidly at all rates with an average half-life between 2 to 3 days. Atrazine appeared to be bioavailable at 7 DAT, but by 14 DAT there was no detectable atrazine in the 2 and 4 lb ai/A rate. In contrast, metribuzin dissipated more slowly than atrazine with an average half-life of 27 to 29 days. Metribuzin was more bioavailable than atrazine particularly at the 1 and 2 lb ai/A rate. Consequently, metribuzin may be a viable alternative for weed control in high organic soils in the EAA exhibiting rapid degradation of atrazine and concomitant loss of residual weed control. Additional studies will be conducted to corroborate these results.

SOUTHERN WATERGRASS (*HYDROCHLOA*) MANAGEMENT IN BERMUDAGRASS ATHLETIC TURFGRASS. **R.E. Strahan*, J. Beasley, S. Borst; LSU AgCenter, Baton Rouge, LA (42)**

ABSTRACT

Southern watergrass (*Hydrochloa*) is a pale green perennial grassy weed that normally infests aquatic areas. However, in recent years southern watergrass has become more of a problem on irrigated or poorly drained bermudagrass athletic fields, especially around irrigation heads. The weed's yellowish color and texture are clearly visible and create a considerable reduction in the overall visual quality of the sports field. Once established, southern watergrass has shown a tolerance for drought and low mowing and the pale color is not masked with increasing levels of nitrogen fertilizer. Turf managers have reported very poor results with common grass killing herbicides such as MSMA, diclofop and others. Complete renovation and field grading would eliminate the conditions that favor watergrass infestations but the current poor economic situation has the reduced the ability of smaller universities and sports complexes to renovate fields. The following research was initiated to screen several herbicides with grass activity to evaluate their potential as an option for managing this growing weed problem. A field study was conducted in 2010 at the Southeastern Louisiana University (SLU) soccer practice field. The soccer field lacked adequate drainage and had a very high level of southern watergrass naturally infesting the common bermudagrass turf. Herbicides evaluated included MSMA, atrazine, simazine, trifloxysulfuron, iodosulfuron+thiencarbazone+dicamba, foramsulfuron, rimsulfuron, flazasulfuron, metsulfuron, diclofop, and quinclorac. The herbicides were evaluated at their highest labeled rates. Herbicides were applied with a CO_2 pressurized backpack sprayer equipped with 11003 XR flat fan nozzles that delivered 30 GPA at 23 psi. The area was mowed weekly and the height was maintained at 2 inches. Plot size was 4 ft x 10 ft. The test plots had a uniform stand of southern watergrass with an average mix of 75% southern watergrass and 25% common bermudagrass. Visual ratings of percent weed control and turf injury data were collected at two week intervals. The experiment was conducted as a randomized complete block with 4 replications. Data were subjected to analysis of variance (P=0.05) and means were separated using Fisher's LSD. MSMA, simazine, and atrazine provided 25%, 35% and 40% control respectively, 2 weeks after treatment (WAT). However, by 4 WAT, the southern watergrass had recovered and very little damage could be observed from these herbicides. Trifloxysulfuron, iodosulfuron+thiencarbazone+dicamba, foramsulfuron, rimsulfuron, metsulfuron, and flazasulfuron provided less than 10% control in the study. Southern watergrass control with diclofop and quinclorac did not exceed 25% for the duration of the study. By 6 WAT, all herbicides evaluated were similar to the untreated check.

EFFECT OF SEED TREATMENT, INSECT INFESTATION, AND HERBICIDE PROGRAM ON COTTON GROWTH, DEVELOPMENT, AND YIELD. **K. Ford*[1], D.M. Dodds[2], A. Catchot[2]; [1]Mississippi State University, Stoneville, MS, [2]Mississippi State University, Mississippi State, MS (43)**

ABSTRACT

Seed treatments have become increasingly common in cotton production over the past decade. However, it is not uncommon for growers in the Mid-South to treat cotton with a foliar insecticide for thrips control even when a seed treatment has been used. In addition, in an effort to increase efficiency, growers will often tank-mix a foliar insecticide for thrips control with a broad spectrum non-selective herbicide such as glyphosate as well as a residual herbicide such as s-metolachlor. However, given the widespread infestation of glyphosate-resistant Palmer amaranth in the Mid-South, growers have been forced to utilize herbicides other than glyphosate for weed control. Utilization of glufosinate for Palmer amaranth control has increased substantially over the past two years. As such, 'PHY 375 WRF' cotton was planted on 21% of the total acreage in the Mid-South in 2011 due in part to variety performance as well as the added benefit of being able to broadcast apply glufosinate postemergence. However, no data exists on the effect of glufosinate application to Widestrke™ cotton when tank-mixed with insecticides and residual herbicides. Therefore, the objective of this research was to evaluate the interaction between variety, seed treatment (and subsequent thrip infestation), and pesticide program on cotton growth, development, and yield. This study was conducted in 2011 at the R.R. Foil Plant Science Research Center near Starkville, MS. 'PHY 375 WRF' and 'FM 1773 LLB2' cotton were planted on 05 May 2011. Plots were two-97 cm rows wide by 12.2 meters in length. Seed treatments applied to each variety included: trifloxystrobin + triadimenol + metalaxyl (Trilex Advanced) at 14 g ai /45 kg seed and trifloxystrobin + triadimenol + metalaxyl (Trilex Advanced) at 14 g ai /45 kg seed + Imidacloprid (Gaucho 600F) at 227 g ai/45 kg seed. The following pesticides were applied on 02 June 2011 to each variety and seed treatment combination: dicrotophos (Bidrin 8) at 22 g ai/ha; glufosinate (Ignite 280 SL) at 594 g ai/ha; s-metolachlor (Dual Magnum) at 1419 g ai/ha; dicrotophos + glufosinate; dicrotophos + s-metolachlor; glufosinate + s-metolachlor; and dicrotophos + glufosinate + s-metolachlor. Pesticides were applied with a tractor-mounted compressed-air sprayer using hollow cone spray tips. Five plants per plot were harvested immediately prior to pesticide application and thrip counts were made from these plants. Plant heights, total nodes, thrips injury, and yield data were collected. Data was subjected to analysis of variance using the PROC Mixed procedure in SAS 9.2 and means were separated using Fisher's Protected LSD at $p = 0.05$. Regardless of variety, cotton seed treated with Trilex Advanced only had an average 2.7 times more immature thrips per five plants that seed treated with Gaucho + Trilex Advanced. Treating 'PHY 375 WRF' with any pesticide significantly reduced plant height three weeks after treatment. However, pesticide application did not reduce plant height of 'FM 1773 LLB2' three weeks after treatment. Untreated plants from both varieties had an average of two more nodes than plants treated with Ignite + Dual Magnum or Bidrin three weeks after treatment. Pesticide application had no effect on end of season plant height of 'FM 1773 LLB2'; however application of Ignite + Bidrin and Ignite + Dual Magnum significantly reduced the number of total nodes of 'PHY 375 WRF' at the end of the season. Pooled over seed treatment and pesticide program, 'PHY 375 WRF' yielded significantly more than 'FM 1773 LLB2'. In addition, cotton seed treated with Gaucho + Trilex Advanced yielded significantly higher than cotton seed treated with Trilex Advanced only. In conclusion, it is very difficult to completely quantify the effects of complex biological interactions on cotton growth, development, and yield. In general, tank-mixing pesticides can have a negative impact on plant height during and at the end of the growing season. In addition, cotton yields can be reduced following tank-mix application of multiple pesticides. Additional research is needed to further quantify the effect variety, seed treatment, and pesticide program on cotton growth, development, and yield.

EFFICACY OF METAMIFOP FOR THE POSTEMERGENCE CONTROL OF BERMUDAGRASS.

T. Cooper*, C. Straw, L.L. Beck, G.M. Henry; Texas Tech University, Lubbock, TX (44)

ABSTRACT

Experiments were conducted at the Plant and Soil Science greenhouse facility in Lubbock, TX. 'Riviera' hybrid bermudagrass and 'Savannah' common bermudagrass were seeded at 244 kg ha^{-1} into 10.2 cm square pots containing a soilless potting media on August 26, 2011. Pots were allowed to mature in the greenhouse over a three month period. Prior to herbicide application bermudagrass was mowed to 0.6 cm with hand-held grass shearers. Treatments were arranged in a randomized complete block design with five replications. Herbicides were applied with a CO_2 backpack sprayer equipped with XR8004VS nozzles calibrated to deliver 375 L ha^{-1} at 221 kPa. Herbicide treatments were applied on December 1, 2011 and consisted of metamifop at 200, 300, 400, and 500 g ai ha^{-1}. A sequential application of each treatment was made on December 22, 2011. An untreated check was included for comparison. Visual ratings of percent bermudagrass control was recorded weekly on a scale of 0 (no control) to 100% (completely dead bermudagrass). Pots were cut to 0.6 cm after three weeks of growth (prior to sequential treatments), biomass was dried, and weighed. This procedure was conducted again three weeks after sequential treatments. Data were subjected to analysis of variance (ANOVA) (P = 0.05) with sums of squares partitioned to reflect a split plot treatment structure. Bermudagrass cultivar was considered the main plot and metamifop rate was considered the subplot. Where main plot effects were significant, regressions were used to explain the relationship of measured responses to metamifop treatments. Effect of metamifop treatments were separated using Fisher's Protected LSD test at P = 0.05. The non-treated check pots exhibited 0% control and 0.56 to 0.8 g of biomass 3 WAIT, regardless of cultivar. Metamifop at 300 to 500 g ai ha^{-1} exhibited 96 to 100% bermudagrass control 3 WAIT, regardless of cultivar. Bermudagrass subjected to those same treatments only exhibited 0.01 to 0.03 g of biomass 3 WAIT, regardless of cultivar. The 200 g ai ha^{-1} rate of metamifop exhibited only 8% control of 'Savannah' bermudagrass with 0.67 g of biomass collected, while 'Riviera' was controlled 36% with 0.36 g of biomass collected. Sequential applications of metamifop at 300 to 500 g ai ha^{-1} completely controlled bermudagrass (100%) 6 WAIT, while a sequential application at 200 g ai ha^{-1} only controlled bermudagrass 6 to 17% 6 WAIT, regardless of cultivar.

PREEMERGENCE RESCUEGRASS CONTROL WITH INDAZIFLAM AND FLUMIOXAZIN IN BERMUDAGRASS. **C. Straw*, L.L. Beck, T. Cooper, G.M. Henry; Texas Tech University, Lubbock, TX (45)**

ABSTRACT

Field experiments were conducted at Lake Ridge Country Club in Lubbock, TX in the summer of 2011 to quantify the efficacy of indaziflam and flumioxazin for the preemergence control of rescuegrass. Studies were located on a common bermudagrass rough with a history of rescuegrass pressure cut to a height of 3.8 cm. Plots measured 1.5 x 1.5 m and were arranged in a randomized complete block design with four replications. The indaziflam trial was applied using a CO_2 backpack sprayer equipped with XR8003VS nozzle tips and calibrated to deliver 305 L ha^{-1} at 276 kPa. Treatments were initiated on September 1, 2011 and consisted of indaziflam at 35, 53, and 70 g ai ha^{-1}; and prodiamine at 546 g ai ha^{-1}. The flumioxazin trial was applied using XR8003VS nozzle tips calibrated to deliver 281 L ha^{-1} at 221 kPa. Treatments were applied on September 1, October 1, November 1, or December 1, 2011 and consisted of flumioxazin at 0.43 kg ai ha^{-1} and flumioxazin at 0.43 kg ai ha^{-1} + metsulfuron at 0.042 kg ai ha^{-1} (November app. only). Untreated check plots were included in both trials for comparison. Data from each trial were subjected to analysis of variance (ANOVA) and means were separated using Fisher's Protected LSD at the 0.05 significance level. Each trial was analyzed separately. In the indaziflam trial, all treatments exhibited 100% rescuegrass control 1 month after initial treatment (MAIT). Rescuegrass control with indaziflam at 70 g ai ha^{-1} remained at 100% 3 MAIT, while control with indaziflam at 35 g ai ha^{-1} decreased to 93% followed by (fb) indaziflam at 53 g ai ha^{-1} (89%). Prodiamine treatments exhibited 95% rescuegrass control 3 MAIT. In the flumioxazin trial, bermudagrass exhibited 31% and 35% phytotoxicity 2 weeks after applications made in September and October, respectively. Phytotoxicity was reduced ($\leq$ 4%) 4 weeks after either application timing. Flumioxazin applications made in November and December only exhibited $\leq$ 4% phytotoxicity following either application. Rescuegrass control (12/28/2011) was highest in response to flumioxazin applications made in October (92%) fb September (82%) fb November (54%) fb December (40%). Reduced efficacy of flumioxazin applied in November and December may be due to the fact that rescuegrass had already germinated in mid-October. The tank-mixture of flumioxazin + metsulfuron enhanced control of November applications (83%).

ESTABLISHMENT OF A LONG-TERM STUDY DESIGNED TO DETERMINE WEED POPULATION DYNAMICS IN DICAMBA-TOLERANT COTTON. **D.L. Jordan[1], A.C. York[1], W.J. Everman[1], S. Bollman[2], and J. Soteres[2]; [1]North Carolina State University, Raleigh, NC, [2]Monsanto Company, St. Louis, MO (46)**

ABSTRACT

Cotton with traits 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 farmers, consultants, and scientists from universities and industry in formulating sustainable practices for weed management in cotton. Therefore, 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. The experiment was established in North Carolina at the Upper Coastal Plain Research Station near Rocky Mount in two fields with different histories of cropping systems, weed management programs, weed populations, and soil characteristics in conventionally-prepared seedbeds during 2011. 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 only, glyphosate plus dicamba, and ALS-inhibiting herbicides. Data recorded in 2011 included weed diversity and density by collecting soil cores from each plot immediately after planting but before application of preemergence herbicides. Samples were stored at room temperature in opened zip lock 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 (referred to as "grow out method"). Three weeks after establishment, weed seedlings were identified and treated with glyphosate at 2,520 g ae/ha (a rate three times the manufacturer's suggested use rate) to determine the frequency of glyphosate resistance in Palmer amaranth. 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. The frequency of Palmer amaranth surviving glyphosate application was also determined based on the percentage of surviving plants 2 weeks after application. 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. 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% when pooled over all plots in both fields. Weeds other than Palmer amaranth were controlled completely with all herbicide programs by the end of the season with the exception of the program containing acetolactate synthase (ALS)-inhibiting herbicides. Major differences in Palmer amaranth populations in late August were noted among herbicide programs containing Roundup WeatherMAX®. Total postemergence (POST) programs including Roundup WeatherMAX® only, as well as the program with ALS-inhibiting herbicides, had the highest Palmer amaranth populations. Higher populations of Palmer amaranth with these treatments resulted from selection pressure on Palmer amaranth by multiple applications of Roundup WeatherMAX® and presence of ALS-resistant populations present in both fields. Palmer amaranth populations were similar in late August following Direx® plus Prowl® PRE followed by Roundup WeatherMAX® POST or WeatherMAX® plus Clarity® POST and the total POST program of Roundup WeatherMAX® plus Clarity®. The two programs reducing Palmer amaranth populations the most were Direx® plus Prowl® PRE followed by Roundup WeatherMAX® plus Clarity® POST and the program with Warrant® included with Roundup WeatherMAX® plus Clarity®. Additionally, border areas with PhytoGen® Widestrike® cotton treated with total POST programs of Roundup WeatherMAX® followed by Ignite® followed by Roundup WeatherMAX also had low populations of Palmer amaranth. Results from research during 2011 are not surprising. Including Clarity® POST, a herbicide with a MOA different than the MOA of Roundup WeatherMAX®, was effective in reducing the number of glyphosate-resistant Palmer amaranth plants by the end of the season. Additionally, residual herbicides with a MOA different from glyphosate (Direx® plus Prowl® PRE and Warrant® POST) also contributed to reductions in Palmer amaranth populations by the end of the season. Over the course of the next 3 years, the value of comprehensive management programs with several MOAs, including Clarity®, will be documented with respect to Palmer amaranth management in cotton.

PALMER AMARANTH MANAGEMENT IN PEANUT IN NORTH CAROLINA. **D. Jordan*, D. Johnson; North Carolina State University, Raleigh, NC (47)**

ABSTRACT

Palmer amaranth has become perhaps the most challenging weed to manage in southern row crops in the United States. Peanut is especially vulnerable to Palmer amaranth because of the low growth habit of peanut, digging requirement, and prominence of resistance to acetolactate synthase (ALS)-inhibiting herbicides. Developing new herbicide programs to control Palmer amaranth and refining traditional strategies are important for peanut growers and their advisors. Research was conducted during 2011 to compare herbicide programs to manage Palmer amaranth at the Upper Coastal Plain Research Station on a Goldsboro fine sandy loam soil. The cultivar Bailey was planted in late May in conventionally-prepared raised beds spaced 36 inches apart at a seeding rate designed to achieve an in-row population of 4-5 plants/ft. Peanut was planted into a dry seedbed and irrigated 5 days after planting with approximately 0.8 inches of water using a traveling gun irrigation system. Preemergence (PRE) herbicides were applied immediately after planting and prior to irrigation using a backpack sprayer calibrated to deliver 15 gpa at 31 psi using regular flat fan nozzles. Palmer amaranth was 3 to 4 inches in height when herbicides were applied POST. Herbicide treatments included both PRE and postemergence (EPOST or POST) applications. Visible estimates of percent Palmer amaranth control and peanut injury (0 to 100% scale) were recorded at various intervals during the season. Pod yield was determined in two of the three experiments. Data were subjected to ANOVA and means separated using Fisher's Protected LSD at $p \leq 0.05$. As expected, Dual Magnum plus either Valor SX or Strongarm outperformed Dual Magnum alone. The decrease in control over the season noted for Strongarm most likely reflects resistance to ALS-inhibiting herbicides within this population. The Valor SX rate (2 oz/acre) in this experiment rarely controls weeds for the entire season even when activated well. In a second experiment, co-applied herbicides did not adversely affect control of emerged Palmer amaranth early in the season by Cobra while in some cases control increased slightly. By late season, control ranged from 65 to 81%. While peanut injury ranged from 33 to 46% at 6 days after treatment, injury decreased to no more than 16% by 14 days after treatment. Complete control of Palmer amaranth for the entire season generally would not be expected with a total POST program including one application of Cobra even with residual herbicides are included. Control from PRE treatments ranged from 73 to 100% prior to EPOST applications. One week after EPOST applications control was at least 96% with all treatments except Prowl (67%) or Dual Magnum (74%) only. By July 1, control was at least 95% with all herbicide programs that included EPOST or POST applications or sequential applications (EPOST and POST). Although control by Prowl and Dual Magnum decreased to 39% and 59%, respectively, control by Warrant was 83%. Similarly, by mid August Palmer amaranth control by all programs that included EPOST or POST treatments and combinations of EPOST and POST as well as programs with Valor SX PRE was at least 92%. Warrant alone was more effective than either Dual Magnum or Prowl alone. Peanut injury with PRE applications of Dual Magnum, Prowl, and Warrant was 0 to 5% on June 15 while injury from these herbicides applied with Valor SX ranged from 10 to 30% with the least amount of injury observed from Dual Magnum plus Valor SX. In contrast, greater injury with Gramoxone Inteon plus Warrant was noted compared with Gramoxone Inteon plus Warrant by June 23. Peanut yield was generally higher when PRE herbicide programs contained Valor SX or when EPOST or POST herbicides were applied. However, considerable variation in yields was noted in the experiment. Results from these experiments provide information on possible herbicide options to control Palmer amaranth in peanut. POST applications of PPO-inhibiting herbicides performed well in these experiments and reflected timely applications. Also, PRE herbicide performed well due in part to planting procedure. Peanut was planted in dry soil and irrigated to ensure emergence after PRE herbicides were applied. Under conditions when either limited rainfall occurs or irrigation is not available, performance of PRE herbicides most likely would be less than results reported here. Also, efficacy of Cobra most likely would be lower than reported here if Palmer amaranth was larger in size.

PEANUT RESPONSE TO DIURON. **E.P. Prostko*, S. Culpepper; University of Georgia, Tifton, GA (48)**

ABSTRACT

Diuron use in cotton has increased due to the presence of glyphosate-resistant Palmer amaranth. It is common for growers to make two applications per year (at-planting and layby). A total of 56-64 oz/A/year of Diuron 4L is typically used. Higher rates, increased application frequency, and later lay-by applications have caused some concern for growers who rotate peanut with cotton. The general perception is that peanut plants are sensitive to diuron. The objective of this research was to evaluate the tolerance of runner market-type peanut to preemergence (PRE) applications of diuron. Field trials were conducted at the University of Georgia Ponder Research Farm in Ty Ty, Georgia in 2010 and 2011. The peanut cultivar 'Georgia-06G' was planted in early May and grown under weed-free conditions. Soil was a Tifton sand with < 1.3% OM and 95% sand. Diuron 4L was applied PRE at various rates including 0, 0.5, 1, 2, 4, 8, 16, and 32 oz/A. Within 2 days of application, 0.5" of irrigation was applied to the test area. Within 10 days of application, the test area received a combined total of 1.5-1.9" of rainfall/irrigation. Treatments were replicated 3 times. Herbicides were applied with a CO_2-pressurized backpack sprayer calibrated to deliver 15 GPA using 11002DG nozzle tips. Data were subjected to ANOVA and means separated using Fisher's Protected LSD Test (P= 0.10). Significant visual crop injury symptoms were not observed from any PRE treatment of diuron. Peanut plant density and yield were not influenced by any PRE treatment of diuron. Based upon these results, it is unlikely that diuron applied in cotton will negatively influence the yield of runner market-type peanut the following year. These results also suggest that the current rotation restriction for peanut following an application of diuron may be too prohibitive.

EVALUATION OF WIDESTRIKE COTTON INJURY FROM EARLY SEASON HERBICIDE X INSECTICIDE TANK MIXES. **S.J. Steckel*, S. Stewart, L.E. Steckel; University of Tennessee, Jackson, TN (49)**

ABSTRACT

This study was conducted in 2010 and 2011 at the West Tennessee Research and Education Center in Jackson, TN. The objective of this research was to evaluate the tolerance of Phytogen® 375 WRF (WideStrike®) cotton to Ignite® or Sequence® alone or when tank mixed with various insecticides in the presence of thrips. There were significant differences in visual injury between herbicides and also between insecticides in 2010, but not in 2011. Ignite delayed crop maturity in 2010 but did not delay maturity in 2011. Total yield was reduced by application of Ignite but not by insecticide treatment in 2010. Herbicide treatment did not affect yield in 2011 but insecticide application increased yield (P = 0.0165). There was no interaction between herbicide and insecticide on total yield in 2010 or 2011. These data show that maturity can be delayed and yield decreased by an early season Ignite or Ignite + insecticide application to WideStrike cotton that is already stressed by thrips.

INTRODUCTION

Glyphosate-resistant (GR) Palmer amaranth, also known as Palmer pigweed, is dramatically changing the way Tennessee cotton producers must manage their crop. Prior to the appearance of GR pigweed, growers would often apply glyphosate and s-metolachlor, typically in the form of Sequence. GR pigweed is forcing producers to try alternative weed control measures. One method is the use of the broadcast application of Ignite (glufosinate) to WideStrike cotton varieties. WideStrike cotton varieties have tolerance to Ignite and were planted on 63% of Tennessee cotton acres in 2010 and approximately 70% in 2011. Ignite is efficacious in controlling Palmer pigweed.

Applications of Ignite on WideStrike cotton can cause crop injury, primarily in the form of leaf burn. This injury has rarely been shown to cause yield loss. However, early applications of Ignite may often be co-applied with insecticides for thrips control. These include products such as dimethoate, acephate or dicrotophos (Bidrin®). The effect of insecticides tank mixed with Ignite is unknown, but they could potentially worsen the injurious effects of herbicides.

MATERIALS AND METHODS

The trial was conducted at the West Tennessee Research and Education Center in Jackson, TN to assess the tolerance of Phytogen® 375 WRF (WideStrike) cotton to early season herbicide x insecticide tank mixes. Phytogen 375 WRF without Temik or an insecticide seed treatment was planted no-till on May 14, 2010 and May 10, 2011. Individual plots were four rows (38 inch centers) x 30 feet. Treatments were replicated four times in a 2 (herbicide) x 3 (insecticide) factorial design. All agronomic practices such as fertilization, seeding rates and control of non-target insects followed University of Tennessee Extension recommendations.

Foliar treatments were applied June 1, 2010 and May 30, 2011 to two-leaf cotton. Applications were made using a high-clearance sprayer calibrated to deliver 8 GPA at 40 PSI through TeeJet 80015 flat fan nozzles (2 per row). There was significant thrips injury to plants at the time of application. Visual crop injury was evaluated June 3 of both years using a 0 – 100 scale with 0 = no injury and 100 = plant death. Yield data were collected on September 16 and October 1, 2010 and September 23, 2011 by harvesting the center two rows of each plot. Data were subjected to Factorial ANOVA and means were separated using a protected LSD ($P < 0.05$).

RESULTS AND DISCUSSION

Ignite caused 25% more visual injury compared with Sequence in 2010 ($P < 0.0001$) but there were no differences in visual injury in 2011 (P = 0.2796). Dimethoate caused 3 – 4% more visual injury compared with the other insecticides in 2010 (P = 0.0356), but insecticide had no effect on leaf burn in 2011 (P = 0.8098). All insecticide treatments similarly reduced immature thrips numbers and injury ($P < 0.05$, data not shown).

Compared with Sequence, Ignite delayed crop maturity in 2010, resulting in a greater percentage of the crop being harvested during the second picking (data not shown). However, there were no observed effects of herbicide treatment on crop maturity in 2011. In 2010, treatment with Ignite decreased total seed cotton yield compared with Sequence but not in 2011 (Table 1, Fig. 3). Insecticide treatment had no effect on total seed cotton yield in 2010, but Bidrin and acephate increased yield in 2011 (Table 1). There was no significant interaction between herbicide and insecticide treatment on total yield in 2010 or 2011.

Table 1. Effects of herbicide and insecticide treatments on seed cotton weights in 2010 and 2011.

Main Effect	**Treatment**	**Year 2010 (lbs/acre)**	**Year 2011 (lbs/acre)**
Herbicide	Sequence	4733 a	3085 a
	Ignite	4160 b	3174 b
		P = 0.0007, LSD = 299	*P = 0.3496, LSD = 193*
	Untreated	4648 a	2885 a
Insecticide			
	Dimethoate	4230 a	3068 ab
	Bidrin	4361 a	3286 b
	Acephate	4549 a	3280 b
		P = 0.1969, LSD – 423	*P = 0.0165, LSD = 273*

Herbicide x insecticide interactions were not significant (2010: P = 0.7009, LSD = 598; 2011: P = 0.1456, LSD = 387).

SUMMARY

These data show that maturity can be delayed and yield decreased by an early season Ignite or Ignite + insecticide application to WideStrike cotton that is already stressed by thrips. Cotton producers must weigh this risk against potential yield loss from GR weeds.

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TOLERANCE OF STS SOYBEAN TO REDUCED RATE APPLICATION OF GRASP, LONDAX, PERMIT, AND REGIMENT. **D.K. Miller*, M.S. Mathews; LSU AgCenter, St. Joseph, LA (50)**

ABSTRACT

A field study was conducted in 2011 to determine the tolerance of STS soybean to reduced rate PRE and POST application of commonly used sulfonylurea rice herbicides. 'Pioneer STS 95M50' soybean was planted on May 6. Soil was a silt loam with pH 5.8. Treatments included a factorial arrangement of herbicides: (1x rate) Permit (1 oz/A), Londax (1 oz/A), Regiment (0.6 oz/A), or Grasp (2.3 oz/A); herbicide rate: 0x rate, ½ x rate, ¼ x rate, or 1/8 x rate; and application timing: PRE or V2-V3. Parameters measured included visual crop injury 17 and 28 d after treatment, crop height 17 and 28 DAT, and yield. At 17 d after POST application (DAT), Regiment applied at ½, ¼, or 1/8 x rate resulted in 43, 70, and 33% visual injury, respectively. Grasp applied at ½ x rate resulted in 15% visual injury, while no other herbicide or rate resulted in visual injury. At 28 DAT, Regiment applied at ½, ¼, or 1/8 x rate resulted in 85, 64, and 21% visual injury, respectively. The only other treatment resulting in injury was Grasp applied at the ½ x rate, which resulted in 16% visual injury. At 17 DAT, height reduction was not observed for Permit or Londax. Regiment reduced soybean height 32, 27, and 12% at the ½, ¼, and 1/8x rates, respectively. At 28 DAT, height was not reduced with Londax and only 4% with Permit at the ½ x rate. Regiment reduced height 32, 21, and 8% at the ½, ¼, and 1/8 x rates, respectively. Grasp resulted in a 7% height reduction at the ½ x rate only. When compared to the 0 rate (54 bu/A), yield was reduced to 30, 37, and 48 bu/A at the ½, ¼, and 1/8 x rates, respectively, for Regiment. All other herbicides resulted in equal yield to the 0 rate.

HENBIT (*LAMIUM AMPLEXICAULE*) MANAGEMENT WITH FALL-APPLIED HERBICIDES. **D. Stephenson*, R.L. Landry; LSU AgCenter, Alexandria, LA (51)**

ABSTRACT

Fields infested with winter annual weeds are becoming a consistent problem for producers in Louisiana. Typically, numerous weed species are present; however, henbit (*Lamium amplexicaule*) has become the most problematic winter annual weed to manage prior to planting crops in the spring. To address this issue, research was conducted at the LSU AgCenter Dean Lee Research and Extension Center near Alexandria, LA in 2009/2010 to investigate fall-applied herbicide treatments for control of fall- and spring-emerged henbit. Treatments included glyphosate (860 g ha^{-1}), rimsulfuron (22 g ha^{-1}) plus glyphosate, chlorimuron (24 g ha^{-1}):tribenuron (24 g ha^{-1}) plus glyphosate, oxyfluorfen (280 g ha^{-1}) plus glyphosate, and flumioxazin (72 g ha^{-1}) plus glyphosate. Treatments were applied on December 16, 2009. At time of treatment, henbit height and density was 4-cm and 320 m^{2-1}. Visual henbit control was recorded 15, 30, 60, and 90 d after treatment (DAT). Oxyfluorfen plus glyphosate and flumioxazin plus glyphosate provided 79 and 70% henbit control, respectively, 15 DAT. All other treatments provided 55% or less control 15 DAT. Increased control 15 DAT by oxyfluorfen and flumioxazin may be attributed to greater observed necrosis. All treatments provided at least 84% or greater 30 DAT. At the 60 DAT rating, all treatments provided 98-99% control. Excellent control 60 DAT may indicate that henbit had not begun a spring emergence. Henbit control 90 DAT was 98-99% when rimsulfuron or chlorimuron:tribenuron, both with glyphosate, were applied. Flumioxazin or oxyfluorfen plus glyphosate controlled henbit 74 and 48%, respectively, 90 DAT. Increased control 90 DAT with rimsulfuron and chlorimuron:tribenuron may be due to increased control of spring-emerged henbit. At the experiment site, soil pH was 8.0. Chlorimuron persistence is increased in high pH soils, which may be the reason chlorimuron:tribenuron provided excellent residual control of henbit. However, soil pH does not influence rimsulfuron persistence. Oxyfluorfen and flumioxazin provided greater initial control of henbit, but rimsulfuron and chlorimuron:tribenuron provided excellent control of fall- and spring-emerged henbit. However, the effect of soil pH on chlorimuron activity influences crop rotational decisions, thus possibly precluding it as a choice for fall applications in some areas. Due to the little influence on crop rotation decisions, rimsulfuron plus glyphosate may provide the best potential for management of henbit.

GLYPHOSATE-RESISTANT PALMER AMARANTH MANAGEMENT SYSTEMS IN DICAMBA-TOLERANT SOYBEAN IN THE SOUTHEAST. **A.C. York*[1], A.J. Winslow[2], S. Seifert-Higgins[3]; [1]North Carolina State University, Raleigh, NC, [2]Monsanto Co., Smithfield, NC, [3]Monsanto Company, St. Louis, MO** **(52)**

ABSTRACT

Monsanto Company is developing soybean resistant to dicamba and glyphosate. Field trials were conducted in Mt. Olive, NC in 2010 and 2011 and in Micro, NC in 2011 to determine how this new technology might assist growers in managing glyphosate-resistant Palmer amaranth (AMAPA). Both locations were heavily infested with a mixture of glyphosate-susceptible and -resistant AMAPA. Treatments in 2010 included a factorial arrangement of no PRE herbicide or Valor® SX (flumioxazin) at 2 oz/A PRE and the following POST 1 options: Roundup® PowerMAX (glyphosate potassium salt) at 22 fl oz/A; Roundup plus Warrant™ (acetochlor) at 3 pt/A; Roundup plus Clarity® (dicamba diglycolamine salt) at 1 pt/A; and Roundup plus Clarity plus Warrant. All treatments included a POST 2 application of Roundup at 22 fl oz. Treatments in 2011 included various combinations of Clarity at 1 or 2 pt/A PRE or Valor at 2 oz/A PRE followed by Clarity at 1 pt/A plus Roundup 22 fl oz/A, Clarity plus Roundup plus Warrant, Roundup plus Warrant plus Flexstar® (fomesafen sodium salt) at 10 fl oz/A, and Clarity plus Roundup plus Warrant plus Flexstar. Comparison treatments included Valor at 2 oz/A or Boundary® (s-metolachlor plus metribuzin) at 1.25 pt/A followed by Roundup plus Flexstar 1 pt/A POST 1 and Roundup POST 2. POST herbicides were targeted to weeds 3 to 4 inches tall. POST 1 and POST 2 herbicides were applied 28 and 41 days and 15 and 27 days after planting in 2010 and 2011, respectively, at Mt. Olive and 17 and 28 days after planting at Micro. Soybean, still under USDA regulated status, was destroyed 26 days after POST 2 in 2010 and 10 days after POST 2 at Micro in 2011. The Mt. Olive location in 2011 was rated through 70 days after POST 2. The transgenic soybean was very tolerant of dicamba. No injury was observed with any treatment in 2010 or at Micro in 2011. Injury was noted at Mt. Olive in 2011 only with treatments that included Flexstar in the POST 1 application. Averaged over treatments, Flexstar injured soybean 11% 12 days after the POST 1 application, but injury had dissipated to only 3% by 10 days after POST 2 application. In 2010, Roundup alone, applied twice, controlled AMAPA 61% 26 days after POST 2, reflecting the mixed population of glyphosate-susceptible and -resistant biotypes. Valor PRE increased control to 87%. Warrant in the POST 1 application did not affect control, likely due to very limited rainfall after application. Clarity in the POST 1 application increased control to at least 90% in the absence of Valor and 96% in systems with Valor. Prior to POST 1 application in 2011, dicamba PRE at 0.5 and 1.0 lb/acre controlled AMAPA at Micro 74 to 83%, similar to control by flumioxazin. At Mt. Olive, control by dicamba at 0.5 lb (42%) was similar to control by flumioxazin (49%) and greater than control by metolachlor plus metribuzin (30%). Control by dicamba at 1.0 lb (68%) exceeded control by flumioxazin. After POST herbicide application, control in systems with dicamba PRE was similar to that in systems with flumioxazin PRE. Acetochlor included in POST 1 applications increased AMAPA control at Mt. Olive 12 and 13% at 29 and 70 days after POST 2 and 15% at 10 days after POST 2 at Micro. A second application of acetochlor, with POST 2 herbicides, did not further increase control. At Mt. Olive, control by most Clarity-based systems in 2011 exceeded control by the commercial standards of Boundary or Valor PRE followed by Roundup plus Flexstar POST 1 and Roundup POST 2. The following four systems controlled AMAPA 99 to 100% 70 days after POST 2 application: 1) Clarity PRE followed by Clarity plus Roundup plus Warrant at POST 1 and POST 2; 2) Valor PRE followed by Clarity plus Roundup POST 1 and POST 2; 3) Valor PRE followed by Clarity plus Roundup plus Warrant POST 1 and Clarity plus Roundup POST 2; and 4) Valor PRE followed by Clarity plus Roundup plus Warrant at POST 1 and POST 2. The same four systems controlled Palmer amaranth 95 to 100% 10 days after POST 2 at Micro. The trials demonstrate that Clarity, whose use will be enabled with dicamba/glyphosate tolerant soybean, can improve control of glyphosate-resistant AMAPA relative to the options that exist with currently available technologies. Additionally, use of Clarity can reduce selection pressure for AMAPA resistance to PPO-inhibiting herbicides which are now widely used to control glyphosate-resistant AMAPA.

SALVAGE LARGE CRABGRASS (*DIGITARIA SANGUINALIS*) CONTROL OPTIONS IN BERMUDAGRASS ATHLETIC TURFGRASS. **R.E. Strahan*, J. Beasley, S. Borst; LSU AgCenter, Baton Rouge, LA (53)**

ABSTRACT

In the past, it has not been unusual for turfgrass managers to get complaisant and allow weeds such as large crabgrass (*Digitaria sanguinalis*) to mature to the point of seed head production before treating. Turf managers could successfully apply several repeated applications of MSMA eventually destroying mature large crabgrass. With the loss of MSMA turfgrass managers could have a more difficult and expensive time managing escaped weeds like large crabgrass. The following research evaluates several herbicides and herbicide combinations for salvage large crabgrass control in athletic fields. A field study was conducted in 2011 in Baton Rouge, LA in a common bermudagrass turf area with a very heavy natural population of large crabgrass (average 4 plants/foot^2). The study was initiated July 10. No preemergence herbicides were applied in the area and weeds were treated when approximately 50% of the large crabgrass was producing seed heads. Herbicides evaluated in single and sequential applications included MSMA @ 2 lb ai/A, Drive XLR8 @ 0.75 lb ai/A, Drive 75 DF @ 0.75 lb ai, Celsius @ 0.15, and Katana @ 0.05 lb ai/A. Sequential applications of MSMA occurred 1 week after the initial treatment (WAI), whereas sequential Celsius, Katana, and Drive formulations were applied 2 WAI. Additionally, single applications of tankmixes of Drive XLR8 @ + Katana, Drive XLR8 + Celsius and Celsius + Katana were also evaluated. Herbicides were applied with a CO_2 pressurized backpack sprayer equipped with 11003 XR flat fan nozzles that delivered 30 GPA at 23 psi. The area was mowed as needed and the height was maintained at 2 inches. Plot size was 6 ft x 10 ft. The area did not receive irrigation. Visual ratings of percent weed control and turf injury data were collected weekly. The experiment was conducted as a randomized complete block with 3 replications. Data were subjected to analysis of variance (P=0.05) and means were separated using Fisher's LSD. Two applications of MSMA were most effective as a salvage treatment controlling approximately 90% of the large crabgrass 6 weeks after the initial treatment (WAI). Two applications of Drive XLR8 were significantly better than two applications of Drive 75 DF (73% control versus 35% control). Celsius + Drive XLR8 and Katana + Drive XLR8 provided similar levels of control (63% and 57%) but did not perform better than sequential applications of Drive XLR8. Sequential applications of Celsius, Katana, and single applications of the tankmix of Celsius+Katana all gave similar large crabgrass control (45%, 45%, and 40%, respectively). Single applications of Katana and Celsius were very ineffective on the mature crabgrass (<15%) by 6 WAI. Results of this study indicate that successful control of escaped large crabgrass will be less effective without MSMA. Two applications of Drive XLR8 may be the most effective available option when compared with other herbicides that have large crabgrass activity.

CARRYOVER POTENTIAL OF IMAZOSULFURON TO SOYBEAN. **S.S. Rana*[1], J.K. Norsworthy[1], D.b. Johnson[1], P. Devkota[1], C.E. Starkey[1], B. Scott[2]; [1]University of Arkansas, Fayetteville, AR, [2]University of Arkansas, Lonoke, AR (54)**

ABSTRACT

In the southern United States, soybean is often grown in rotation with rice; therefore, herbicides used in rice have the potential to injure soybean via carryover. Halosulfuron is the current standard of sulfonylurea herbicides used in rice at a field use rate of 52 g ai ha^{-1}. Imazosulfuron is a newer sulfonylurea herbicide that was recently labeled for use in Arkansas rice at a maximum use rate of 336 g ha^{-1}. Field trials were conducted under a weed-free environment to evaluate the response of soybean to imazosulfuron and halosulfuron applied PRE (tolerance study) and to determine the potential for imazosulfuron applied to rice to injure soybean grown in rotation the following year (rotation study). The tolerance study was conducted at Fayetteville (pH=5.9) and Marianna (pH=7.9), AR, and the rotation study was conducted at Pine Tree (pH=8.3) and Keiser (pH=7.1), AR. Imazosulfuron and halosulfuron were applied PRE at 1/256, 1/128, 1/64, 1/32, 1/16, 1/8, and 1/4 times (X) their respective labeled rates for the tolerance study. For the rotation study, imazosulfuron rates were 112, 224, 336, 448, and 672 g ha^{-1}. Soybean was not injured by PRE-applied imazosulfuron or halosulfuron regardless of herbicide rate, and yield was comparable with that of the non-treated control. Soybean injury increased with increasing imazosulfuron rates applied to rice the previous year. Soybean injury at Keiser was ≤3%; whereas at Pine Tree, soybean injury was ≤13%. Soybean recovered from the injury over time. In both experiments and at both locations, stand count (plants m^{-2}) at 5 WAP, plant height at 5 WAP and at the end of growing season, and yield were comparable to the non-treated control. Results of both tolerance and rotation studies indicate that imazosulfuron can injure soybean via carryover on high pH soils (≥8.0); however, soybean can recover from the injury over time to yield comparable to the non-treated control.

EFFECT OF WEED REMOVAL TIME ON CORN YIELD AS AFFECTED BY NITROGEN SOURCE AND RATE. **A.M. Knight*, J.D. Hinton, W.J. Everman; North Carolina State University, Raleigh, NC (55)**

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 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 location, nitrogen source, and weed removal height effects were observed for corn yield. 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. The interaction between location and source of nitrogen is due to the difference in soil types at the two research stations with Clayton having a lighter, sandier soil which is better known for leaching and Rocky Mount having a heavier soil with greater clay content. The increased corn yield corresponding with an increase in applied nitrogen is expected, as nitrogen is an essential nutrient in corn production and is partially due to the increase in Nitrogen Uptake Efficiency with greater nitrogen rates applied.

EFFECTIVENESS OF SOYBEAN BURNDOWN PROGRAMS FOR HORSEWEED MANAGEMENT.

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(56)

ABSTRACT

Two field studies were conducted in the spring/summer of 2011 at the NC State research stations in Clayton, NC and Rocky Mount, NC to evaluate the effectiveness of burndown programs for horseweed (*Conyza Canadensis*) management in soybeans. Since the first reported case of glyphosate resistant (GR) horseweed in the US in 2000 in Delaware, 19 states have reported GR resistant horseweed, including North Carolina in 2003. It is essential to develop and use new programs to control GR weeds because current methods provide inconsistent control and horseweed growth characteristics enable rapid proliferation and spread. Treatment combinations at burndown consisted of glyphosate at 840 g a.e. ha^{-1} alone and in combination with the following: 2,4-D Ester at 540 g a.e. ha^{-1}, saflufenacil at 25 g a.i. ha^{-1}, saflufenacil at 37.5 g a.i. ha^{-1}, saflufenacil at 25 g a.i. ha^{-1} + 2,4-D at 540 g a.e. ha^{-1}, saflufenacil at 25 g a.i. ha^{-1} + glufosinate at 600 g a.i. ha^{-1}, saflufenacil at 25 g a.i. ha^{-1} + imazaquin at 140 g a.i. ha^{-1}, saflufenacil at 25 g a.i. ha^{-1} + dimethanamid-p at 220 g a.i. ha^{-1}, saflufenacil at 25 g a.i. ha^{-1} + pendimethalin at 1380 g a.i. ha^{-1}, sulfentrazone at 85 g a.i. ha^{-1} + cloransulam-methyl at 11 g a.i. ha^{-1}, and flumioxazin at 71 g a.i. ha^{-1} + 2,4-D ester at 540 g a.e. ha^{-1}. All treatments received a post application of glyphosate at 840 g a.e. ha^{-1}. Methylated seed oil and ammonium sulfate were added to all saflufenacil and flumioxazin containing treatments. Nonionic surfactant and ammonium sulfate were added to all other treatments. Fields were rated for percent control of horseweed at 14 and 28 days after burndown. Horseweed control was greatest where saflufenacil was applied in combinations in addition to glyphosate. Control was less than 80% at Rocky Mount and less than 50% at Clayton with a single application of glyphosate, indicating a resistant population was present. Additionally, the standard treatment for most of North Carolina, 2,4-D + flumioxazin + glyphosate, failed to provide acceptable control around the state and in these studies.

PALMER AMARANTH CONTROL WITH SEQUENTIAL APPLICATIONS OF HERBICIDES IN LIBERTYLINK SOYBEAN. **A. Hoffner*, D. Jordan, A.C. York, W.J. Everman; North Carolina State University, Raleigh, NC (57)**

ABSTRACT

Development of glyphosate-resistance in Palmer amaranth has increased the need to develop comprehensive herbicide programs that include multiple modes of action (MOA). Sequential applications, either as preemergence (PRE) followed by postemergence (POST) applications or multiple POST applications after soybean and weeds have emerged, can be effective in controlling weeds, especially glyphosate-resistant Palmer amaranth. Residual herbicides can play a major role in protecting yield from early season weed interference and increases the diversity of MOA as a resistance-management tool. Timely applications of glufosinate in LibertyLink® soybean following PRE herbicides can be effective in managing Palmer amaranth. However, the interaction of PRE herbicide program and single and sequential applications of glufosinate are not clearly defined, and comparing programs across multiple environments will help develop and refine Cooperative Extension recommendations. The experiment was conducted at Rocky Mount during 2010 and 2011. Treatments consisted of various herbicides either alone or followed by glufosinate (Ignite 280) POST. PRE herbicides included no PRE herbicide, Valor SX (flumioxazin) at 2 oz./acre, Authority First (sulfentrazone plus cloransulam) at 4 oz./acre, Prefix (S-metolachlor plus fomesafen) at 2 pt./acre, Valor XLT (flumioxazin plus chlorimuron) at 3 oz./acre, Reflex (fomesafen) at 1 pt./acre, and Dual II Magnum (S-metolachlor) at 1 pt./acre. Single applications of Ignite 280 included 36 oz./acre. Sequential applications included 22 oz./acre followed by 22 oz./acre. Visible estimates of percent Palmer amaranth control were determined three times during the growing season using a scale of 0 to 100%, where 0 = no control and 100 = complete control. Soybean yield was also recorded. Palmer amaranth control and soybean yield were influenced by the interaction of year by PRE herbicide by POST herbicide. In 2010, main effects of PRE and POST herbicides were significant but the interaction of these factors was not significant. In contrast, during 2011, the interaction of these factors was significant for Palmer amaranth control and soybean yield. Irrespective of POST herbicide treatment, Valor SX and Valor XLT applied PRE controlled Palmer amaranth 93% to 98% compared with 66 to 80% control by Authority First, Prefix, and Reflex during 2010. Sequential applications of Ignite 280 were more effective than a single application of Ignite 280, although applying Ignite 280 was more effective than PRE herbicides alone. Dual II Magnum controlled Palmer amaranth only 55%. However, differences in yield did not always reflect differences in control. Differences in control among PRE herbicides were also noted during 2011 in absence of POST herbicides. All PRE herbicides in absence of Ignite 280 controlled Palmer amaranth 90 to 100% with the exception of Authority First (80%) and Dual II Magnum (76%). Single and sequential applications of Ignite 280 controlled Palmer amaranth at least 91% when following any PRE herbicide during 2011. The sequential application of Ignite 280 in absence of PRE herbicides controlled Palmer amaranth 81%. Difference in soybean yield were noted among treatments for PRE herbicides in absence of Ignite 280; however, no differences were noted when Ignite 280 was applied following a PRE herbicide. Results from these experiments reinforce other research showing the consistent value of sequential applications of PRE and POST herbicides in controlling Palmer amaranth.

PEANUT RESPONSE TO SUB-LETHAL RATES OF GLUFOSINATE APPLIED AT THREE TIMINGS.

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ABSTRACT

Glufosinate (Ignite 280) is registered for weed control in corn, cotton, and soybean and has become increasingly important due to development of herbicide-resistant weed biotypes. Many crops, including peanut, are not tolerant of glyphosate or glufosinate and concern over off-site movement onto peanut and other non-tolerant crops exists. Concern also exists over improper mixing and accidental application. Several researchers have evaluated peanut response to glufosinate. The influence of timing of injury on yield response of runner market type peanut has been reported previously. However, response of Virginia market type peanut to glufosinate applied at different growth stages of peanut has not been reported. Therefore, the objectives of this research were to determine yield response of the Virginia market type peanut cultivar 'Phillips' to glufosinate applied at various rates and timings and to establish the relationship between visible injury and peanut yield. Research was conducted during 2011 in North Carolina at the Peanut Belt Research Station near Lewiston-Woodville and the Upper Coastal Plain Research Station near Rocky Mount. Plot size was two rows by 30 feet in conventionally-prepared seedbeds. Treatments consisted of glufosinate (Ignite 280) at 0, 41, 82, 164, 325, and 650 g ai/ha applied 30, 60, and 90 days after planting (DAP) corresponding to V3-V5, R1, and R6 growth stages. Glufosinate was applied in 15 gpa using 8002 regular flat fan nozzles at 31 psi. Visible estimates of percent injury were recorded 3 wks after treatment using a scale of 0 to 100%. In addition to pod yield, pod samples were collected to determine market grade factors including percentages of extra large kernels, fancy pods, and total sound mature kernels. Data were subjected to ANOVA and regression procedures to determine the relationship of visible injury and pod yield with glufosinate rate. Correlations of visible injury and pod yield also were determined. Although some variation was observed, the highest level of injury was noted when glufosinate was applied in early June or early August compared with notably less visible injury when applied in early July. However, the higher injury noted during the early July-timing did not translate into the greatest reduction in peanut yield. Even though visible injury at the early August timing did not exceed that of the early June and early July ratings, pod yield was the lowest when applied in early August. While visible injury and pod yield were highly correlated ($p \leq 0.0001$, R2 = -0.717 to -0.921) irrespective of application timing, injury later in the season was the most detrimental to yield. Peanut is often able to compensate for injury during vegetative growth while injury from applications during pod fill and maturation are often of more concern. These data suggest that peanut yield is most susceptible to glufosinate injury late in the season when peanut has less time to recover. However, the exact mechanism of yield loss associated with damage late in the season was beyond the scope of this experiment, and variation in response to timing of injury has been documented.

WEED CONTROL WITH TANK MIX OF SAFLUFENACIL AND SETHOXYDIM IN FLORIDA CITRUS.

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ABSTRACT

Herbicides are an important component of weed control methods in perennial, high value crops including citrus in Florida. Saflufenacil (Treevix) is a new post-emergence herbicide registered for broadleaf weed control in citrus. Saflufenacil has no grass activity; therefore, it should be tank mixed with a broad spectrum herbicide such as glyphosate (Roundup) or graminicide such as sethoxydim (Poast Plus) for broad spectrum weed control program in citrus. Field experiments were conducted in citrus groves in Polk and Orange County, FL in 2011 to evaluate the efficacy of saflufenacil applied alone or in a tank mix with sethoxydim and glyphosate or pendimethalin for broad spectrum weed control. Visual control ratings were taken at 15, 30, 45 and 60 days after treatment (DAT) and broadleaf and grass weeds biomass were taken at 60 DAT. Saflufenacil applied alone at 0.05 kg ai ha^{-1} resulted in 82 and 89% control of Brazil pusley (*Richardia brasiliensis* Moq.) and puncture vine (*Tribulus terrestris* L.), respectively at 15 DAT at Polk County, FL; while little less control of Brazil pusley and tropical dayflower (*Commelina benghalensis* L.) was observed at Orange County site, but control of grass weeds was almost zero at both the sites. Sethoxydim applied alone at 0.315 kg ai ha^{-1} resulted in 89 and 79% control of guineagrass (*Panicum maximum* Jacq.) and johnsongrass (*Sorghum halepense* L.) at Polk and Orange County site, respectively. Control of both, broadleaf and grass weeds at 15 DAT was excellent with tank mix treatments when herbicides were applied at recommended rates at both the sites. Tank mixing saflufenacil (0.05 kg ai ha^{-1}) with sethoxydim (0.315 kg ai ha^{-1}) provided about 70% control of Brazil pusley, puncture vine and guineagrass at Polk County site, and similar control was observed for Brazil pusley, tropical dayflower and johnsongrass at Orange County site at 30 DAT, but control was reduced to < 60% at 60 DAT. Increasing rate of pendimethalin as a tank mix partner did not improve weed control. The most effective treatment was the combination of saflufenacil, sethoxydim and glyphosate that provided > 90% control of all broadleaf and grass weeds at 15 DAT and > 70% control at 60 DAT. There was a difference in weed biomass among treatments. The lowest broadleaf and grass weed biomass was recorded in a tank mix treatment that included saflufenacil, sethoxydim and glyphosate at both the sites. It is concluded that weed control spectrum can be expanded by tank mixing saflufenacil with sethoxydim, and the addition of glyphosate or pendimethalin would improve weed control in Florida citrus.

COMPARISON OF CURRENT PREEMERGENCE HERBICIDE OPTIONS FOR WEED CONTROL IN CITRUS. **M. Singh*, A.M. Ramirez, A.J. Jhala; University of Florida, Lake Alfred, FL (60)**

ABSTRACT

The United States is the second largest producer of citrus in the world and majority of citrus in the USA is produced in Florida. In Florida citrus groves, weeds are primarily controlled with application of herbicides. Indaziflam (Alion), a pre-emergence, alkylazine herbicide is recently registered for broad spectrum weed control in Florida citrus. Field experiments were conducted in citrus groves at Winter Garden and Ft. Pierce, FL to compare weed control efficacy of indaziflam with five pre-emergence herbicides commonly used in citrus. A total of six treatments were compared including indaziflam at 6.5 oz ac^{-1}, simazine (Princep 4L) at 4 qt ac^{-1}, bromacil + diuron (Krovar) at 4lb ac^{-1}, norflurazon (Solicam) at 3 lb ac^{-1} plus simazine at 3lb ac^{-1}, and pendimethalin (Prowl H_2O) plus diuron (Karmex) at 7 pt and 3 lb ac^{-1}, respectively and an untreated control. Visual weed control ratings were taken from 15 to 90 days after treatment (DAT). The major weeds at Winter garden, FL were dogfennel (*Eupatorium capillifolium* (Lam) Small.), purple nutsedge (*Cyperus rotundus* L.), cudweed (*Gamochaeta pensylvanica* (Willd.) Cabrera), and common ragweed (*Ambrosia artemisiifolia* L.); while at the Ft. Pierce site major weeds were southern crabgrass (*Digitaria ciliaris* (Retz.) Koeler.), crowfoot grass (*Dactyloctenium aegyptium* (L.)Willd. ex Asch. & Schweinf.), spurges (*Euphorbia* spp.), and phaseybean (*Macroptilum lathyroides* (L.) Urb.). There was excellent weed control in all treatments in both sites until 30 DAT, beyond which weed control started to decline. Among the herbicide treatments at the Winter Garden site, indaziflam gave the highest control of all weeds until 90 DAT. At the Ft. Pierce site, the herbicide treatment that gave the highest weed control at 90 DAT vary by weed species; for example indaziflam controlled crowfoot grass (99%) while bromacil + diuron, norflurazon plus simazine and pendimethalin plus diuron gave 99% control of spurge. Overall results suggested that indaziflam was very effective in providing residual weed control in citrus and it was better or comparable with the other preemergence herbicides options described in this study.

CHARACTERIZATION OF SELECTED BARNYARDGRASS POPULATIONS TO ALS HERBICIDES .

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ABSTRACT

Barnyardgrass is the most important weed of rice in Arkansas. Recently, imazethapyr-resistant barnyardgrass biotypes have been collected from Arkansas (AR1 and AR2) and Mississippi (MS1). These biotypes have also evolved cross resistance to other acetolactate synthase (ALS) -inhibiting herbicides. Control of AR1, AR2, and MS1 was 57, 6, and 83%, respectively, with imazethapyr at 70 g ai ha^{-1}; 59, 6, and 86%, respectively, with imazamox at 35 g ai ha^{-1}; 26, 51 and 22%, respectively, with penoxsulam at 35 g ai ha^{-1}; and 15, 98, and 16%, respectively, with bispyribac-sodium at 30 g ai ha^{-1}. In contrast, control of the susceptible biotype was $\geq$98% with each herbicide. After the confirmation of cross-resistance to various ALS-inhibiting herbicides, a study was conducted to characterize the level of cross-resistance to ALS-inhibiting herbicides in these biotypes from Arkansas and Mississippi. Lethal dose of bispyribac-sodium, imazamox, and penoxsulam required to kill 50% (LD_{50}) and 90% (LD_{90}) of plants of each biotype was calculated using probit analyses. Dose response studies revealed that AR1, AR2, and MS1 biotypes were >94-, >94-, and 3.3-times, respectively, more resistant to imazamox; >94-, 30-, and 9.4-times, respectively, more resistant to penoxsulam; and 15-, 0.9-, and 7.2-times, respectively, more resistant to bispyribac-sodium compared to susceptible biotypes based on LD_{50} values. To kill 90% plants of AR1 and AR2 biotypes, $\geq$32-times the field application rates of imazamox and penoxsulam (35 g ha^{-1} for both herbicides), and 4.2- and 0.4-times, respectively, the field application rates of bispyribac-sodium (22.5 g ha^{-1}), respectively, were needed. Bispyribac-sodium, imazamox, and penoxsulam dose required to kill 90% of MS1 plants was 3.6-, 2.1-, and 8.8-times the field application rates, respectively. In general, all biotypes have evolved varying level of cross resistance to bispyribac-sodium, imazamox, and penoxsulam, except AR2, which has evolved cross resistance to imazamox and penoxsulam, but is sensitive to bispyribac-sodium even at half times the field application rate.

AN EVALUATION OF PLANT GROWTH REGULATOR USAGE ON 'EMPIRE' ZOYSIAGRASS AND 'PATRIOT' BERMUDAGRASS.

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ABSTRACT

The objective of this study was to compare and contrast the efficacy of mepiquat chloride, mepiquat pentaborate, and trinexapac-ethyl on growth regulation of 'Empire' zoysiagrass and 'Patriot' bermudagrass. The study was conducted from 24 June to 22 July 2011, The University of Tennessee at Martin turfgrass research site. Experimental design was a randomized complete block with three replications. Plot size was 3 m2. Turf was mowed three times weekly at 2.3 cm, and irrigated to maintain a well-watered status. Mepiquat chloride (MC), mepiquat pentaborate (MP), and trinexapac-ethyl (TE) were applied alone at each of the following rates: 0.40, 0.80, and 1.60 L/ha. Treatments were applied with a CO2 backpack sprayer calibrated to deliver 187 L/ha. A single application was made on June 24, and turf quality, turf injury, and clipping yield were evaluated 3, 7, 14, 21, and 28 days after application (DAA). Turf quality was rated visually on a scale from 1 to 9, where 1 = brown turf and 9 = dark green turf with < 7 being unacceptable. Turf injury was visually assessed on a scale of 0 to 100% with > 30% being unacceptable. Data was analyzed using ANOVA, and means were compared using Fisher's protected LSD (α=0.05). For bermudagrass, turf quality was unacceptable 7 and 14 DAA by TE alone. All other treatments were ≥7 for all rating dates. Turf quality for zoysiagrass was unacceptable 7 and 14 DAA by TE at 0.80 L/ha and 7, 14, 21, and 28 DAA by TE at 1.60 L/ha. All other treatments were ≥7 for all rating dates. Injury was greatest, 14 DAA, with TE alone for both turfgrass species. Injury ranged from 7 to 12% for bermudagrass and 2 to 17% for zoysiagrass. A clipping yield reduction was undetected in bermudagrass for all treatments at all rating dates compared to the untreated check. Clipping yield reductions were detected for zoysiagrass 14 DAA by MP at 0.40 and 0.80 L/ha and all rating dates 14 DAA with TE. Yields were reduced 18% with MP and from 35 to 68% with TE compared to the untreated check.

COMPARISONS OF FIRE-ZONE AND MSO WITH SAFLUFENACIL FOR SPRING BURNDOWN WEED CONTROL. **Laura K. Hinrichs*, Robert E. Mack and Johnnie R. Roberts; Helena Products Group, Memphis, TN 38120**

ABSTRACT

Broadleaf weed control was assessed from burndown applications of Sharpen® Herbicide (340 g / L saflufenacil), Hoss® Ultra (480 g / L glyphosate) and Ammonium Sulfate (AMS) when combined with either Methylated Seed Oil (MSO) or Fire-Zone™ for broadleaf weed control. Treatments were replicated three times and set up as a randomized complete block study in nine trials over a two year period. Weed species evaluated consisted of Kochia (*Kochia scoparia*), Russian thistle (*Salsola kali ruthenica*), Ivyleaf morningglory (*Ipomoea hederacea*), Velvetleaf (*Abutilon theophrasti*), Glyphosate-resistant Marestail (*Conyza canadensis*), Common lambsquarters (*Chenopodium album*), Henbit (*Lamium amplexicaule*), Mouse-ear chickweed (*Cerastium fontanum vulgare*), Cutleaf eveningprimrose (*Oenothera laciniata*), Carpetweed (*Mollugo verticillata*), Pitted morningglory (*Ipomoea pandurata*), Bigroot morningglory (*Ipomoea pandurata*) and Sickle pod (*Cassia obtusifolia*). Observations for efficacy were visually evaluated beginning approximately 7 DAT and continued through 24 DAT. All locations compared treatments to untreated check plots. Sharpen, Hoss Ultra and AMS combined with Fire-Zone at 1% v/v controlled various broadleaf weed species more effectively than when combined with MSO at 1% v/v and provided a quicker weed control response. Fire-Zone is a unique blend of methylated seed oils and surfactants designed exclusively for burndown applications. It provides a faster weed killing response, works well under adverse conditions and disperses well in cold water. Fire-Zone cannot be used over the top of crops.

WEED CONTROL PROGRAMS IN GAT SOYBEAN.

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ABSTRACT

Weed management programs are an essential component of soybean production. A field study was conducted in 2011 at the Lon Mann Agricultural Experiment Station in Marianna, AR, to evaluate herbicide programs in transgenic experimental soybean (glyphosate/ALS tolerance). Soybean was planted (9 seed/foot-row) on June 7, 2011, on beds with 38-inch row spacing. The experimental site had a natural population of Palmer amaranth (*Amaranthus palmeri*), pitted morningglory (*Ipomoea lacunosa*), and barnyardgrass (*Echinochloa crus-galli*). The experiment was designed as a randomized complete block with five treatments and four replications. Plots were 13 ft wide (four rows) by 25 ft long with 5-ft alleys between replications. Each treated plot received application at 21 days preplant (PPL); preemergence (PRE); and postemergence (POST) at 2- to 4-inch weeds. PPL, PRE, and POST applications were made on May 17, June 7, and June 29, respectively. All herbicide rates were in lb ai/A except for glyphosate (Roundup PowerMax = RPM), which was lb ae/A. POST applications had 1% Agri-Dex. Treatments were: 1) Classic (chlorimuron) at 0.0143 + Express (tribenuron) at 0.00425 + RPM at 0.77 + 2,4-D ester at 1 (PPL) followed by (fb) Diligent (chlorimuron + rimsulfuron + flumioxazin) at 0.095 + Gramoxone Inteon (paraquat) at 0.75 (PRE) fb RPM + Prefix (*S*-metolachlor + fomesafen) at 1.32 (POST); 2) Classic + Express + RPM + 2,4-D ester (PPL) fb Diligent + Gramoxone Inteon (PRE) fb RPM + Synchrony XP (chlorimuron + thifensulfuron) at 0.0133 + Prefix (POST); 3) RPM + 2,4-D ester (PPL) fb Boundary (*S*-metolachlor + metribuzin) at 1.02 + Gramoxone Inteon (PRE) fb RPM + Prefix (POST); 4) RPM + 2,4-D ester (PPL) fb Valor (flumioxazin) at 0.064 + Gramoxone Inteon (PRE) fb RPM + Prefix (POST); and 5) untreated check. All treatments provided >95% control of Palmer amaranth 6 wk after POST application except treatment 3 (83%). Percentage pitted morningglory control was significantly higher from treatment 1 and 2 than treatment 3 and 4. Treatments 1, 2, 3, and 4 provided 98, 100, 84, and 89% control 6 wk after POST application, respectively. All treatments provided 100% control of barnyardgrass except treatment 3 (97%). No soybean injury was observed during the growing season.

EFFICACY OF POST RICE HERBICIDES ON TEXASWEED (*CAPERONIA PALUSTRIS*) IS AFFECTED BY FLOOD DEPTH. **R.K. Godara*[1], J.T. Copes[2], B.J. Williams[3]; [1]LSU Agricultural Center, saint Joseph, LA, [2]LSU Agricultural Center, Saint Joseph, LA, [3]LSU Agricultural Center, Winnsboro, LA (65)**

ABSTRACT

Texasweed [*Caperonia palustris* (L.) St. Hil. CNPPA] is an annual broadleaf plant belonging to the Euphorbiaceae family and is an emerging problem in southern U.S. rice fields. A study was conducted in the fall of 2011 to evaluate the effect of flood depth on efficacy of POST rice-herbicides on Texasweed. The experiment was conducted using potted plants and was run two times. The two runs were started on May 13 and August 08, respectively. Three replications were used for each run. For each run, the treatments were five flood depths: 0, 10, 15, 20, and 30 cm and fourteen POST herbicide treatments: nontreated, bispyribac-sodium @ 29 g ai ha^{-1}, bispyribac-sodium @ 29 g ai ha^{-1} plus halosulfuron-methyl @ 26 g ai ha^{-1}, bispyribac-sodium @ 29 g ai ha^{-1} plus bensulfuron-methyl @ 33 g ai ha^{-1}, penoxsulam @ 40 g ai ha^{-1}, penoxsulam @ 40 g ai ha^{-1} plus halosulfuron-methyl @ 26 g ai ha^{-1}, penoxsulam @ 40 g ai ha^{-1} plus bensulfuron-methyl @ 33 g ai ha^{-1}, propanil @ 4.5 kg ai ha^{-1}, propanil @ 4.5 kg ai ha^{-1} plus halosulfuron-methyl @ 26 g ai ha^{-1}, propanil 4.5 kg ai ha^{-1} plus bensulfuron-methyl @ 33 g ai ha^{-1}, bensulfuron-methyl @ 44 g ai ha^{-1}, triclopyr @ 290 g ai ha^{-1}, penoxsulam @ 35 g ai ha^{-1} plus triclopyr @ 210 g ai ha^{-1}, carfentrazone-ethyl @ 17.5 g ai ha^{-1}. Flooding conditions were created by placing potted plants in 1.3 m by 0.7 m by 0.7 m polyvinyl chloride troughs. Treatments were applied to three- to six-leaf stage Texasweed plants. Texasweed control data recorded at 14, 28 and 42 days after treatment (DAT) and Texasweed dry weight data recorded at 42 DAT were subjected to ANOVA. Fixed effects were tested at 5% significance level. There was a significant interaction between flood depth and herbicide treatments in the first run. In the first run, bispyribac-sodium tank mix with bensulfuron provided highest Texasweed control at all observation dates. Propanil plus bensulfuron tank mix was the second best treatment. Under all flood depths, treatments containing either bispyribac-sodium or propanil were superior to treatments containing penoxsulam. Texasweed control with penoxsulam, triclopyr, penoxsulam plus triclopyr and carfentrazone-ethyl increased with increasing flood depth. However, maximum Texasweed control in these treatments ranged between 57 to 73%. In 10-cm flood, propanil containing treatments performed better than bispyribac-sodium containing treatments. However, opposite was true in 15-cm or deeper floods. For the second run, flood depth and herbicide interaction was not significant. Here, both flood depth and herbicide treatments had a significant effect. Texasweed control significantly increased under flooded conditions. However, there was no difference between 15-cm and higher flood depths. At 42 DAT, averaged across flood depths, bispyribac-sodium @ 29 g ha^{-1}, penoxsulam @ 40 g ha^{-1}, and propanil @ 4.5 kg ha^{-1} provided 88, 54, and 66% Texasweed control. Tank mixing bensulfuron-methyl @ 33 g ha^{-1} or halosulfuron-methyl @ 26 g ha^{-1} with either bispyribac-sodium @ 29 g ha^{-1}, penoxsulam @ 40 g ha^{-1} or propanil @ 4.5 kg ha^{-1} had no affect. Effect of flood depth and herbicides on Texasweed dry weight and control at other observation dates was similar to Texasweed control at 42 DAT. As the two runs of the experiment were done in May and August, difference in weather conditions may have affected the results of the two runs. Further research is required to to study this aspect.

GLYPHOSATE-RESISTANT PALMER AMARANTH MANAGEMENT IN SOYBEANS WITH PYROXASULFONE.

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ABSTRACT

Glyphosate tolerant crops have been on the market place since the late 90's and today have become very predominant in row crop production. Due to the wide spread use of this technology the problem of resistant weed biotypes has become a very large problem in the area of weed management. Herbicide resistance is the genetically inherited ability that allows for certain biotypes of weeds to survive after being exposed to a normal rate of a certain herbicide that would normally kill a susceptible biotype. In the case of glyphosate resistance, action needs to be taken now to develop new plans of action to manage these resistant biotypes. The main goal of these studies is to observe the effects of pyroxasulfone on glyphosate resistant palmer amaranth. These studies were conducted in two separate locations near Carthage, NC in June 2011. Pyroxasulfone, a predominately preemergence herbicide, was sprayed in preemergence on the test plots and then rated based on percent control of Palmer amaranth as well as any possible stunting and/or crop injury that could have happen because of pyroxasulfone. In the first study the herbicides used were pyroxasulfone at 1.5 and 2 oz/ A, glyphosate 22 fl oz/ A, saflufenacil 1 fl oz/ A, flumioxazin 2 oz/ A, acetochlor 1.25 qt/ A, S- metolachlor 2 pt/ A, ammonium sulfate was added to all the treatments as well at 17 lb/ 100 gal. In the second study the folling chemicals were used pyroxasulfone at 1.5, 2, and 4 oz/ A, saflufencacil and dimethenamid 5 fl oz/ A, saflufenacil 1 fl oz/ A, flumioxazin 2 oz/ A, S- metolachor 1 pt/ A, 32 fl oz/ A, sulfentrazone and cloransulam 3 oz/ A. Initial control of palmer amaranth with pyroxasulfone was seen to be 95-100% with significant residual effects of the herbicide seen till 21 days after application. In regards to injury and/or stunting seen on the crop was not significant. More research is needed to further understand the effects and importance of pyroxasulfone on glyphosate resistant palmer amaranth.

SAFETY AND EFFICACY OF MESOTRIONE ON LONGLEAF PINE (*PINUS PALUSTRIS*) SEEDLINGS.

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ABSTRACT

Over the past decade in the Southeast, there has been an increase in the amount of acreage planted in Longleaf pine (Pinus palustris L.). Longleaf pine generally establish better when planted from tubes, as apposed to bare root. Unfortunately, little information is available on weed control when pines are grown this way. Several weeds can be very difficult to control, and one of the most difficult is spurge (Chamaesyce spp.). Preliminary research by the author has indicated that Mesotrione (Callisto®), a relatively new herbicide for agronomic crops, has safety to a wide array of ornamental conifer species at many stages of growth. Mesotrione is currently not labeled for weed control in tube grown longleaf pine. An experiment was designed to evaluate mesotrione for spurge control and longleaf pine safety. GoalTender® was used as the industry standard. No significant visual longleaf pine injury was evident by 19 WAT. By 19 WAT, all herbicides tested had acceptable levels of pine seedling counts even though significant differences among herbicide treatments were evident. No significant differences in spurge seedling counts were present by 19 WAT with all herbicides tested.

CORN WEED MANAGEMENT UTILIZING PREEMERGENCE FOUNDATION PROGRAMS.

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ABSTRACT

Successful weed control is essential for economical corn production in North Carolina. Preplant or preemergence applications are important for ensuring that the corn has the initial competitive advantage over highly competitive weeds. The need for preemergence (PRE) programs as resistance management tools for glyphosate-resistant Palmer Amaranth (*Amaranthus palmeri*) heighten the need to investigate weed management programs based on new herbicides. Four field studies were conducted in 2011 in two North Carolina locations (Rocky Mount and Clayton) to evaluate the efficacy of various PRE programs to control several weed species and to assess the tolerance of corn to these programs. Glyphosate-resistant field corn was planted on May 3. The first study was focused on PRE applications of dimethanamid-p + saflufenacil at 560 g a.i. ha^{-1}, dimethanamid-p + saflufenacil at 600 g a.i. ha^{-1} followed by dicamba + diflufenzapyr at 100 g a.i. ha^{-1}, saflufenacil at 65 g a.i. ha^{-1} + pendimethalin at 1330 g a.i. ha^{-1}, saflufenacil at 65 g a.i. ha^{-1} + dimethenamid-p + atrazine at 1930 g a.i. ha^{-1}, mesotrione + *S*-metolachlor + atrazine at 1300 g a.i. ha^{-1}, isoxaflutole + thiencarbazone-methyl at 265 g a.i. ha^{-1} + atrazine at 1120 g a.i. ha^{-1} and acetochlor + atrazine at 2530 g a.i. ha^{-1}. For the second study, PRE application of pyroxasulfone at 89, 119 and 149 g a.i. ha^{-1} was tested alone or associated with saflufenacil at 50 or 62 g a.i. ha^{-1} and compared to acetochlor + atrazine at 3370 g a.i. ha^{-1}. A postemergence application (POST) of glyphosate at 1060 g a.i. ha^{-1} was applied 12 days after the PRE. Weeds studied included ivyleaf morningglory (*Ipomoea hederacea*), pitted morningglory (*Ipomoea lacunosa*), Palmer amaranth, large crabgrass (*Digitaria sanguinalis*), common lambsquarters (*Chenopodium album*) and fall panicum (*Panicum dichotomiflorum*). Corn was also assessed for injury resulting either from stunting or chlorosis. For the first study, weed control was assessed 25 days after PRE treatment (DAT). Palmer amaranth and common lambsquarters control reached 100% with all treatments. Control of large crabgrass, pitted morningglory and fall panicum was greater than 90% for all treatments except saflufenacil + pendimethalin for which the reduced efficiency (65%) may have resulted due to poor activation of the herbicides. No significant injury, stunting or chlorosis was observed following any treatment. For the second study, pyroxasulfone at any application rate alone or mixed with saflufenacil showed excellent control of large crabgrass, fall panicum, ivyleaf morningglory or common lambsquarters at 12, 30 and 52 DAT. If these results were similar to those observed with acetochlor at 12 and 30 DAT, they were significantly higher at 52 DAT. All herbicides evaluated provided long term control of Palmer amaranth. At none of the 2 locations, all the treatments including pyroxasulfone showed a significant higher injury rate (average of 25%) 30 days after the application. In contrast, the rate was lower for the non-treated plants (5%) and for acetochlor (2%).

PALMER AMARANTH MANAGEMENT IN DICAMBA/GLUFOSINATE-TOLERANT COTTON IN THE TEXAS HIGH PLAINS. **W. Keeling*[1], J.L. Spradley[2], J.D. Reed[1], P.A. Dotray[2]; [1]Texas AgriLife Research, Lubbock, TX, [2]Texas Tech University, Lubbock, TX (69)**

ABSTRACT

Dicamba/glufosinate-ammonium tolerant (DGT) cotton combined with glyphosate tolerance could help improve control of many problem annual and perennial weeds compared to glyphosate alone. Weed species including horseweed, Russian thistle, kochia, morningglory, field bindweed, woollyleaf bursage, and Texas blueweed are not always effectively controlled with glyphosate alone, but dicamba and glufosinate may improve control. Management of newly emerging glyphosate-resistant Palmer amaranth populations should also improve if DGT cotton is available. The objectives of this study were 1) to evaluate dicamba applied preemergence (PRE) and postemergence (POST) alone or in combination with glufosinate or glyphosate for Palmer amaranth control in DGT cotton; 2) to compare Palmer amaranth control with dicamba-based treatments in DGT cotton to conventional weed management programs; and 3) determine cotton response and lint yields to dicamba and glufosinate applications in DGT cotton. Field trials conducted near Lubbock, TX in 2010 and 2011, compared dicamba (Clarity) applied PRE, early postemergence (EPOST) alone or in combination with glufosinate (Ignite) or glyphosate (Roundup PowerMax [RUPM]). These treatments were followed by (fb) Ignite, Ignite+Clarity, or RUPM as sequential mid-postemergence (MPOST) applications. All plots received a layby application of Direx+MSMA. Treatments were made using a CO_2-pressurized backpack sprayer calibrated to deliver 10 gallons per acre. A DGT cotton variety was planted on May 12 in 2010 and May 23 in 2011 on 40-inch rows. Plots 4 rows by 30 feet in length were replicated three 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 with weed counts. Clarity PRE controlled Palmer amaranth for 21 to 28 days after planting in 2010. Following Clarity PRE, Clarity or Ignite+Clarity EPOST controlled Palmer amaranth >90%. Without Clarity PRE, Palmer amaranth control ranged from 68 to 74% with these treatments. Ignite, Clarity, or Ignite+Clarity applied at delayed EPOST timings controlled Palmer amaranth 93 to 100% following Clarity PRE. When Ignite was applied as a sequential MPOST treatment, Clarity or Ignite+Clarity controlled Palmer amaranth 95 to 96% following Clarity PRE and 83 to 84% without Clarity PRE. Treatments that controlled Palmer amaranth >90% season-long included Clarity or Ignite+Clarity. When Clarity was applied PRE, control was similar when treatments were applied either EPOST or delayed EPOST. Sequential RUPM applications provided similar control. In 2011, due to lack of activating rainfall, little to no activity was observed with Clarity PRE. RUPM, Ignite+Clarity or RUPM+Clarity applied EPOST controlled Palmer amaranth 92 to 96%. Ignite+Clarity or RUPM+Clarity controlled Palmer amaranth >90% when application was made at the delayed-EPOST timing. Ignite controlled Palmer amaranth <50% applied EPOST and 30% when applied delayed-EPOST. Ignite+Clarity, RUPM+Clarity, or RUPM controlled Palmer amaranth >90% when applied as a sequential MPOST. Treatments that controlled Palmer amaranth >90% season-long included RUPM+Clarity, Ignite+Clarity and RUPM when a Direx+MSMA layby treatment was used. In either year, no injury from any herbicide treatment was observed.

VARIOUS RESIDUAL HERBICIDES FOR THE CONTROL OF PALMER AMARANTH IN SOYBEAN.

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ABSTRACT

Glyphosate-based herbicide systems revolutionized weed control by allowing total postemergence programs to be successful without the need for additional tillage and/or preemergence (PRE) herbicides. However, numerous weeds are now documented as being glyphosate-resistant (GR), and none can be more problematic in soybean (*Glycine max* [L.] Merr.) than Palmer amaranth (*Amaranthus palmeri* [S.] Wats.). Many extension and university weed scientists recommend residual PRE herbicides for the management of GR weeds, such as Palmer amaranth. The objective of this study was to identify residual herbicide options for the control of Palmer amaranth in soybean. Four locations were selected with known populations of GR Palmer amaranth. Weissinger was located near Greenville, MS, on a Commerce very fine sandy loam with a 0.9% OM; Flowers was located near Jonestown, MS, on a Dubbs very fine sandy loam with a 0.7% OM; DREC was located near Stoneville, MS, on a Tunica silty clay with a 2.2% OM; and 16th section was near Leland, MS, on a Newellton silty clay with a 1.5% OM. All treatments were applied with a tractor-mounted sprayer calibrated to deliver 15 gal/A through a TeeJet XR8002VS flat fan nozzle utilizing compressed air at 35 psi. All treatments included paraquat at 0.75 lb ai/A to remove existing vegetation. PRE treatments included a nontreated, sulfentrazone at 0.27 lb ai/A + chlorimuron at 0.034 lb ai/A, sulfentrazone at 0.16 lb ai/A + metribuzin at 0.24 lb ai/A, S-metolachlor at 1.3 lb ai/ + metribuzin at 0.31 lb ai/A, chlorimuron at 0.016 lb ai/A + tribenuron at 0.005 lb ai/A, metribuzin at 0.32 lb ai/A + chlorimuron 0.054 lb ai/A, S-metolachlor 1.24 lb ai/A, flumioxazin at 0.055 lb ai/A + chlorimuron at 0.017 lb ai/A + thifensulfuron at 0.005 lb ai/A, flumioxazin at 0.064 lb ai/A + pyroxasulfone at 0.08 lb ai/A, S-metolachlor at 1.09 lb ai/A + fomesafen at 0.24 lb ai/A, pendimethalin at 0.95 lb ai/A, metribuzin at 0.28 lb ai/A, flumioxazin at 0.064 lb ai/A, flumioxazin at 0.056 lb ai/A + chlorimuron at 0.019 lb ai/A, and pyroxasulfone at 0.08, 0.11 and 0.13 lb ai/A. Data were analyzed in SAS using the Proc Mixed procedure with location set as a random variable. Several treatments provided at least 92% control of Palmer amaranth 28 days after treatment (DAT) and included sulfentrazone + chlorimuron, sulfentrazone + metribuzin, metribuzin + chlorimuron, flumioxazin + chlorimuron + thifensulfuron, flumioxazin + pyroxasulfone, S-metolachlor + fomesafen, flumioxazin + chlorimuron, and pyroxasulfone at 0.11 and 0.13 lb ai/A but were not significantly better than S-metolachlor + metribuzin and pyroxasulfone at 0.08 lb ai/A at 88% control, respectively. Chlorimuron + tribenuron provided only 74% control of Palmer amaranth 28 DAT and was comparable to metribuzin at 80%. Flumioxazin provided only 85% of Palmer amaranth but was comparable to flumioxazin + chlorimuron and flumioxazin + pyroxasulfone at 92 and 94%, respectively. Herbicide combinations containing at least two mechanism-of-action (MOA) provided the most consistent levels of Palmer amaranth control. This stands in support of the recommendation of many weed scientists in encouraging the use of residual herbicides with at least two herbicide MOA both as a means of control and prevention of further development of resistance.

NON-FUMIGANT METHYL BROMIDE ALTERNATIVES FOR VEGETABLE PRODUCTION.

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ABSTRACT

The loss of methyl bromide requires alternative methods of weed control, generally with herbicides but crop injury is a concern due to a lack of efficacy information. Field studies in 2010 and 2001 at the Tifton Vegetable Park evaluated several herbicides for purple nutsedge control and pepper and cucumber tolerance as compared to MBr and the Georgia 3-way combination of Telone II, chloropicrin, and vapam. Herbicides were applied simultaneously with polyethylene mulch laying and included single and combination treatments of *s*-metolachlor, clomoazone, fomesafen, halosulfuron, and sulfentrazone. No single herbicide application provided acceptable purple nutsedge control as compared to MBr or the GA 3-way mixture. A combination of clomozone, *s*-metolachlor, and fomesafen or sulfentrazone were required to provide acceptable control (>80%). Cucumber was tolerant to combinations of clomazone, *s*-metolachlor with fomesafen, but not sulfentrazone. Sulfentrazone reduced cucumber yields in all treatments. Bell pepper early season injury also occurred with sulfentrazone alone and when used in combination with other herbicides. This translated into reduced yields in fruit number and mass throughout the season. Cucumber and pepper tolerance to sulfentrazone varied. While it provided good residual purple nutsedge control, the vegetable efficacy is a major concern. This translated into slow growth, height reductions, and decreased early yields. Combinations of clomazone, *s*-metolachlor, and halosulfuron provided acceptable weed control and did not cause season long pepper injury.

SOIL VERSUS FOLIAR APPLICATION OF METHIOZOLIN AND INDAZIFLAM FOR *POA ANNUA* CONTROL.

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ABSTRACT

Methiozolin is a new herbicide believed to inhibit cell wall biosynthesis. Methiozolin controls *Poa annua* through multiple, timely applications. Both foliar and root up-take have been suspected, but the best control is believed to be achieved through soil application. This evidence may indicate that root-absorption leads to better control. However, there is no published, peer-reviewed research on the matter. Greenhouse experiments were conducted to evaluate *Poa annua* control from POST applied soil-only, foliage-only, and soil + foliage, and from PRE applied methiozolin. Indaziflam (Specticle) inhibits cellulose biosynthsis and exhibits excellent *Poa annua* control when applied PRE, with some limited POST activity. Therefore, indaziflam was applied in the same manner as methiozolin for comparison. PRE and POST treatments included methiozolin at 1680 and 3360 g ai ha^{-1} and indaziflam at 175 and 350 g ai ha^{-1}. PRE, foliar-only, and foliar + soil treatments were applied over-the-top in a conventional manner using a moving-belt sprayer calibrated to deliver 280 L ha^{-1}. Foliar-only treatments were applied after covering the soil surface with perlite. The perlite was removed one day after treatment (DAT). Soil-only treatments were applied by calculating the amount of spray solution that would contact the soil surface. This amount of spray solution was diluted in 10 mL of water and applied to the soil avoiding foliar contact. PRE pots contained 8 *Poa annua* seeds each. Seeds were scattered on the soil surface and pressed into the soil surface to ensure adequate seed-to-soil contact but seeds were not buried. POST pots contained 5 plants that were approximately 5 to 6 tillers. Overhead irrigation was withheld for 3 DAT. Wickham sandy loam (pH 6.3) was used. Each treatment was replicated 4 times, and the experiment was repeated-in-time. Above ground biomass was harvested 25 DAT. POST applied treatments were harvested again 14 days later (39 DAT). Data were transformed to percent reduction relative to the nontreated (i.e. control) within POST and PRE application types, respectively. PRE and POST data were analyzed separately. Herbicide rate was not significant 25 DAT ($P = 0.33$) and but was significant 39 DAT ($P = 0.02$). Data are presented accordingly. Herbicide-by-application type interaction was significant for both POST evaluation dates. Therefore the interaction is discussed. Both rates of both herbicides applied PRE resulted in complete (100%) *Poa annua* control. Across all POST methiozolin treatments, foliar + soil resulted in the greatest control; foliar-only was better than soil-only at times. Across herbicide rates, methiozolin POST foliar + soil resulted in 35% 25 DAT and 69% 39 DAT. Foliar-only applied methiozolin resulted in better control compared to soil-only 39 DAT (51% compared to 7.2%, respectively). However, this distinction could not be made 25 DAT. Treatments were similar within indaziflam and resulted in ≤19 % control 25 DAT and ≤53% control 39 DAT. The higher methiozolin rate resulted in better control for foliar + soil and foliar-only 39 DAT, but no differences were observed between indaziflam rates. Methiozolin resulted in better POST *Poa annua* control than indaziflam, but neither herbicide resulted in complete control. Treatment of younger plants at lesser growth stages would likely result in better control; this is an area of future research. Soil-only applied methiozolin resulted in ≤12% reduction across rating dates. This finding is contrary to previous indications that soil application results in superior control relative to foliar application. This study was limited to a single application of methiozolin. Previous research indicates that multiple applications result in better *Poa annua* control.

HERBICIDE MIXTURE MAY INCREASE ACTIVITY OF NEWPATH ON RED RICE.

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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. Studies were established at the Louisiana State University AgCenter Rice Research Station and the Mississippi State University Delta Research and Extension Center to evaluate several herbicide mixtures and their impact on several weed species. Previous data indicates a potential for synergism between RiceBeaux, a pre-packaged mix of propanil and thiobencarb, and Newpath when mixed for control of red rice (*Oryza sativa* L.) and other weed species. Two studies were established to evaluate the potential synergism between RiceBeaux and Newpath or Beyond, and the components in RiceBeaux, propanil and thiobencarb, with Newpath or Beyond. RiceShot was used for propanil and Bolero was used for thiobencarb. The experimental design was a randomized complete block with four replications in an augmented two-factor factorial arrangement of treatments. A nontreated was added for comparison. In the first study, factor A consisted of Newpath at 0 and 4 oz/A. Factor B consisted of no mixture herbicide, RiceBeaux at 2 and 4 pt/A, RiceShot at 1.5 and 3 pt/A, and Bolero at 0.75 and 1.5 pt/A. The rates of RiceShot and Bolero are equivalent to the rates found in the pre-packaged mixture of RiceBeaux. In the second study Beyond at 0 and 5 oz/A was substituted for Newpath. In Louisiana at 21 DAT, the single application of Newpath controlled red rice and barnyardgrass 91 and 84%, respectively. The single applications of RiceBeaux, RiceShot, and Bolero resulted in less than 10% control of red rice, and less than 30% control of barnyardgrass at 21 DAT. However, RiceBeaux at 4 pt/A plus Newpath applied as a mixture controlled red rice and barnyardgrass 96 and 98%, respectively. Similar results were observed in the Beyond study. At 49 DAT, the single application of Newpath controlled red rice and barnyardgrass 93 and 78%, respectively. Single applications of RiceBeaux, RiceShot, and Bolero failed to control red rice and barnyardgrass above 10%. The addition of RiceBeaux at 2 and 4 pt/A with Newpath controlled red rice and barnyardgrass 91 to 97%. Similar results were observed with Beyond. Rice treated with the high rate of RiceBeaux plus Newpath yielded 7590 lb/A . However, no difference occurred with the single application of Newpath or when Newpath was mixed with RiceBeaux, RiceShot, or Bolero. In Mississippi, the same studies were conducted on two research areas at the Delta Research and Extension Center: one research area was infested with red rice and Amazon sprangletop, and the other research area was infested with barnyardgrass and browntop millet. At 7 DAT, the single application of Newpath controlled barnyardgrass and browntop millet 74 and 66%, respectively. The mixture of RiceBeaux at 4 pt/A plus Newpath controlled barnyardgrass and browntop millet 91 and 94%, respectively. The addition of RiceShot with Newpath had similar control, compared with RiceBeaux at the higher rate. The single application of Newpath controlled red rice and Amazon sprangletop 25 and 74%, respectively. The mixture of RiceBeaux at 4 pt/A plus Newpath at 4 oz/A controlled red rice and Amazon sprangletop 71 and 97%, respectively. Similar results were seen in the Beyond study. At 14 DAT, all herbicide mixtures controlled barnyardgrass 84 to 90%. The addition of RiceBeaux and RiceShot at either rate with Newpath controlled browntop millet 89 to 95%, compared with Newpath alone. Single application of Newpath at 4 oz/A and the mixture of Ricebeaux at 4 pt/A plus Newpath at 4 oz/A controlled red rice 73 and 83%, respectively. Similar results were seen with Beyond. All herbicide mixtures resulted in higher yields compared with Newpath alone. In the Beyond study, RiceBeaux was needed to increase yield over Beyond alone. A mixture of RiceBeaux at 4 pt/A plus Newpath at 4 oz/A indicated a synergistic response for control of red rice, barnyardgrass, Amazon sprangletop, and browntop millet. The increased weed control is a valuable response when used in the Clearfield system to help manage or reduce the development of herbicide resistant weeds.

STRATEGIES FOR INCORPORATING A RESIDUAL HERBICIDES INTO SOYBEAN WEED MANAGEMENT PROGRAMS. **J.T. Copes*[1], R.K. Godara[2], B.J. Williams[3], S. Laird[3]; [1]LSU Agricultural Center, Saint Joseph, LA, [2]LSU Agricultural Center, saint Joseph, LA, [3]LSU Agricultural Center, Winnsboro, LA (75)**

ABSTRACT

A field study was conducted in 2011 to evaluate the effect of time of residual herbicide application in a soybean weed control program. The experiment was a three-factor factorial experiment conducted in a randomized complete block design with four replications. Factor A (PP):glyphosate plus 2,4-D ester and glyphosate plus 2,4-D ester plus Canopy EX; Factor B (PRE): No-PRE, glyphosate, and glyphosate plus Envive; Factor C (POST): glyphosate fb gylphosate, glyphosate plus classic fb glyphoste, glyphosate fb glyphostae plus classic, and glyphosate fb glyphostae plus Prefix. Weed control data was recorded just before each application timing. Soybean yield was recorded using a small-plot combine and was adjusted to 13% moisture. Data were analyzed using ANOVA and fixed effects were tested at 5% significance level. There was a significant effect of all three timings. Treatment having Canopy EX at PP provided 10 to 20% greater prickly sida control than glyphosate plus 2,4-D treatment; however, a herbicide application at PRE was required to achieve >= 90% prickly sida control. Glyphosate plus classic or glyphosate plus Prefix applied EPOST provided higher prickly sida control (84%) than glyphosate alone (69%). Soybean yield was affected by PP and PRE treatments ($P < 0.001$); however, there was no interaction. Averaged across PRE and POST timings, glyphosate plus 2,4-D plus Canopy EX applied at PP resulted in 477 kg/ha yield increase compared to glyphosate plus 2,4-D treatment. Averaged across PP and POST treatments, glyphosate or glyphosate plus Envive applied at PRE provided approximately 1,197 kg/ha greater yield than No-PRE. Even though there were differences in prickly sida control between EPOST treatments, soybean yield was not affected by EPOST treatments.

HUSKIE: A NEW TOOL FOR WEED MANAGEMENT IN SORGHUM.

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ABSTRACT

Due to the lack of registration of new active ingredients in sorghum over the last 20+ years, producers must rely on a limited selection of herbicides for effective and economical weed control. Weed control is always stated as one of the major concerns producers have when growing sorghum. For this reason, one of the goals of the United Sorghum Checkoff Program is to have new broadleaf and grass weed control options utilized on 50% of the sorghum acreage by 2015. Currently, postemergence control of broadleaf weeds is primarily achieved by using 2,4-D or dicamba. Both of these herbicides can cause unacceptable injury to grain sorghum and drift onto nearby cotton fields can be devastating. Huskie, a combination of two active ingredients - bromoxynil and pyrasulfatole, was recently labeled for control of certain broadleaf weeds including Palmer amaranth and other *Amaranthus* species in wheat, barley, CRP, grass grown for seed, grain sorghum (grain and forage) and triticale. According to the Huskie label, applications should be made to grain sorghum between 3-leaf to 12 inches in height. Best results will be obtained when applications are made to actively growing weeds up to four inches in height. Huskie rates are 12.8 to 16 ounces per acre (oz/A) using 10+ gallons per acre (GPA). Two 16-oz/A applications may be made per year with at least 11 days between applications. Best weed control will be achieved with an integrated management approach (crop rotation, tillage, and herbicides). All weeds should be controlled prior to planting. The objective of this research was to evaluate sorghum response and Palmer amaranth control when Huskie is applied at several use rates and in various tank mix combinations. Field trials were conducted in the Texas High Plains in 2010 and 2011 at the Texas AgriLife Research Station at Halfway. Plots, 4 rows by 30 feet with three replications on 40-inch centers, were located under a center pivot irrigation system in a clay loam soil. Pioneer 85Y40-N281 was planted May 25, 2010 and May 26, 2011. Herbicide applications were broadcast applied using a CO_2-pressurized backpack sprayer containing TurboTee 110015 spray tips. Water was used as the carrier at 10 GPA. Preemergence treatments immediately followed planting. Postemergence applications for 2010 were Jun 17 (2 to 4 inch weeds) and Jun 21 (6 to 8 inch weeds). Applications in 2011 were made Jun 14 (2 to 6 inch weeds). Additional trials were conducted in 2009 and 2010 at the Texas AgriLife Research Station at Bushland (Texas Panhandle). Plots, 6 rows by 25 feet on 30-inch centers, were replicated three to four times. The soil type was a clay loam. Hybrid planted was NC+ 7C22. Herbicide applications were broadcast applied using a tractor mounted CO_2-pressurized sprayer containing TeeJet 110 XR flat fan spray tips calibrated to deliver 10 GPA. Applications were made to 3-, 9-, 15-, and 18-inch Palmer amaranth using different Huskie rates and "systems". At Halfway, TX in 2010, Huskie (13 or 16 oz) + Atrazine, Huskie + atrazine + 2,4-D, and Huskie + atrazine + Clarity effectively controlled 2- to 4-inch Palmer amaranth at least 97% 41 days after treatment (DAT) and 6- to 8-inch Palmer amaranth at least 96% 37 DAT. Sorghum injury was noted following all POST treatments, but Huskie-induced injury was no greater than 5% 37 to 41 DAT except when applied with 2,4-D. Grain sorghum yield following all treatments was greater than the non-treated control, but plots receiving Huskie + 2,4-D (both weed timings) or Clarity (2- to 4-inch weed timing) produced less yield than Huskie + atrazine. In 2011, all Huskie systems controlled Palmer amaranth at least 95% 14 DAT and 94% 21 DAT, but control decreased over time. No differences in yield were noted when compared to the non-treated control. At Bushland, Huskie at 10 oz/A or greater gave at least 82% control of 4-inch Palmer amaranth. The addition of 16 oz/A atrazine improved control to 100% 28 to 42 DAT. Adding dicamba to this mix did not improve Palmer amaranth control. Excellent control was achieved with 10 to 16 oz/A Huskie plus 16 oz/A atrazine on Palmer amaranth 9 inches or less in height. On larger weeds up to 18 inches in height, control was at least 80%. Sorghum tolerance to Huskie was excellent, although some leaf burn was observed for a few days after application. Sorghum yield was only reduced when high rates of Huskie were used in combination with dicamba when applied to sorghum in the boot stage of development.

SOYBEAN RESPONSE TO PREEMERGENCE AND POSTEMERGENCE ACETOCHLOR APPLICATIONS. **J.D. Hinton*, W.J. Everman; North Carolina State University, Raleigh, NC (77)**

ABSTRACT

2010 Monsanto launched an encapsulated formulation of acetochlor which was originally known as MON 63410 and changed to Warrant in 2011. This encapsulated formulation of acetochlor provides greater crop safety in soybeans and was designed to give pre-emergent control of weeds as well as assist in post-emergent weed control in ALS and glyphosate-resistant weeds. Acetochlor is in the chloroacetanilides class of herbicides. The mode of action (MOA) is enongase inhibition, and inhibition of geranylgeranyl pyrophosphate(GGPP) cyclisation enzymes. Two separate field trials were established in 2011 at the Upper Coast Plains Research Station near Rocky Mount, NC with one as no-till following corn and the second as conventional till following corn. For each trial the early planting date was May 4th and the late planting date was May 26th.The herbicides were sprayed at two dates and this consisted of the following treatments: Warrant PPL at 1.5 and3 qt/A, Warrant PRE at 1.5 and 3 qt/A, Valor SX PRE at 2 oz wt/A, Warrant POST at 1.5 and 3 qt/A, Roundup WeatherMax POST at 0.75 lb a.e./A. When comparing the two different trials, the early planting date in the no-till trial was the highest yielding, while in the conventional trial, the late planting date out-yielded the early planting date. Overall, encapsulated acetochlor showed that it had potential to be an asset to farmers combating resistant weed species in North Carolina row crop production. Of particular concern in soybean production is the overall lack of herbicides with diverse modes of action, and encapsulated acetochlor adds another alternative.

EFFECTIVENESS OF HERBICIDE PROGRAMS COMPARED TO METHYL BROMIDE FOR WEED CONTROL IN PLASTICULTURE BELL PEPPER

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ABSTRACT

The ban on methyl bromide (MeBr) incurs a huge economic loss in commercial bell pepper production. In the absence of appropriate MeBr alternatives, weeds are a serious concern for optimum bell pepper yield. In summer 2010 and 2011, a field study was conducted to evaluate the effectiveness of herbicide programs as MeBr alternatives for weed control in plasticulture bell pepper. The herbicide programs consisted of PRE-applied *S*-metolachlor at 1600 g ai/ha and imazosulfuron at 112, 224, and 336 g ai/ha. At 4 wk after transplant (WATP), each treatment was fb a POST-applied mixture of trifloxysulfuron and halosulfuron at 27 and 7.9 g ai/ha, respectively. In addition, MeBr plus chloropicrin (67 plus 33%, respectively) at 390 kg/ha, a hand-weeded check, and a weedy check were included for comparison. Crop injury and weed control were rated at 2, 4, 6, and 8 WATP. Marketable fruits were harvested, graded, and subjected to yield analysis. In addition, five soil core samples (7.5-cm diameter and 15-cm depth) were pulled from each plot to determine the viable yellow nutsedge tuber density. Bell pepper injury was 10% at 2 WATP from imazosulfuron at 336 g ai/ha. POST-applied herbicides injured bell pepper >13% at 6 WATP and crop injury was <8% at 8 WATP. PRE-applied treatments were less effective than MeBr for yellow nutsedge control. After POST application, yellow nutsedge control was 87% from *S*-metolachlor at 8 WATP, which was comparable to MeBr (91%). Likewise, Palmer amaranth and large crabgrass control were >91 and >80%, respectively, from PRE-applied *S*-metolachlor fb trifloxysulfuron plus halosulfuron POST, and control was similar to MeBr. *S*-metolachlor fb trifloxysulfuron plus halosulfuron POST yielded fancy (0.91 kg/m^2) and U.S. No. 1 (0.90 kg/m^2) grade bell pepper, comparable to MeBr. However, the U.S. No. 2 grade yield was lower than the yield from MeBr. Therefore, the total marketable bell pepper yield was lower from the *S*-metolachlor treatments (3.45 kg/ m^2) as compared to yield from MeBr (4.51 kg/m^2). PRE-applied imazosulfuron at the above rates fb POST-applied trifloxysulfuron plus halosulfuron were less effective than MeBr for weed control and bell pepper yield. The viable yellow nutsedge tuber density (no. of tuber/m^2) did not differ among treatments (<375 tuber/m^2) except for the non-treated check (807tuber/m^2). In conclusion, PRE-applied *S*-metolachlor fb by POST-applied trifloxysulfuron plus halosulfuron has potential as an alternative for MeBr for yellow nutsedge, Palmer amaranth, and large crabgrass control in plasticulture bell pepper.

EVALUATION OF FIERCE FOR CONTROLLING WEEDS IN LOUISIANA SOYBEAN.

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ABSTRACT

A field study was conducted in 2011 to evaluate weed control programs with Fierce in soybean in Louisiana. 'Miami 949 LL'' soybean was planted on April 26. Soil was a silt loam with pH 6.8. Treatments included Valor @ 2 oz/A, Valor XLT @ 3 oz/A, Fierce @ 3, 3.75, or 4.5 oz/A, Prefix @ 2.5 pt/A, and Authority MTZ @ 11 oz/A. Treatments were applied PRE immediately after planting. Parameters measured included visual crop injury and weed control 28 and 46 d after treatment (DAT), and yield. At 28 DAT, all treatments resulted in equal control of at least 79, 88, 98, 93, 100, 81, 96, 100, and 86% for hemp sesbania, sicklepod, entireleaf morningglory, pitted morningglory, redroot pigweed, barnyardgrass, goosegrass, large crabgrass, and broadleaf signalgrass, respectively. Injury was not observed for any treatment. At 46 DAT, sicklepod, entireleaf morningglory, pitted morningglory, redroot pigweed, goosegrass, large crabgrass, and broadleaf signalgrass were controlled at least 75, 94, 85, 98, 85, 94, and 78%, respectively, and equally by all treatments. Hemp sesbania was controlled 90% by Valor, Fierce @ 3.75 oz/A, and Authority MTZ, which was equal to control with Valor XLT (80%), and Fierce at 3 oz/A (79%), and greater than Fierce at 4.5 oz/A (65%) and Prefix (54%). Barnyardgrass was controlled 95% with Fierce at 4.5 oz/A, which was equal to all treatments except Valor (64%) and Prefix (71%). Yield for all treatments, however, was equivalent ranging from 23 to 31 bu/A.

***DIGITARIA INSULARIS* POPULATIONS RESISTANT TO GLYPHOSATE: GEOGRAPHICAL DISTRIBUTION AND LEVEL OF RESISTANCE IN BRAZIL.**

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ABSTRACT

Glyphosate resistant biotypes of *Digitaria insularis* have been selected in Brazil, however the distribution of these biotypes in the country and the control variability of the populations are not well studied. Therefore, the objective of this research was to test 10 populations of *Digitaria insularis* collected randomly from several agricultural areas in the country, with and without history of glyphosate application. Seeds of the susceptible population, called 12, were collected from an area in Piracicaba municipality, Sao Paulo State, Brazil, where no history of glyphosate occurred, and the resistant population was collected from the Municipality of Matão, state of Sao Paulo, called biotype 11, in an area of glyphosate history of application for more than 15 years. The other 10 populations were collected in Sao Paulo, Minas Gerais and Goias states. Dose response curves were built with the data and ratios R/S at 50, 80 and 90% control. Results indicated one biotype truly resistant (biotypes 1 and 11) collected in Sao Paulo, since de ratio R/S were 3,84; 9,44 and 15,98 for the biotype 1, for the control levels of 50%, 80% and 90%, respectively. The other 10 populations that were tested, the least R/S ratio was 0,64, for the biotype 2, collected in Iracemapolis county, Sao Paulo state and the higher, was 1,78 for the biotype 10, collected in Goiatuba- Goias state for 50% control; for the biotype 8, collected in Bom Jesus de Goias – Goias State, also for the control of 50%, was 1,44, respectively. It can be concluded from this research that 10% of the populations analyzed were resistant and that the susceptible populations have high variability in the degree of susceptibility to glyphosate.

CHEMICAL MANAGEMENT SYSTEMS FOR DIGITARIA INSULARIS RESISTANT TO GLYPHOSATE IN SOYBEAN IN BRASIL. **M. Nicolai*[1], R.F. Lopez-Ovejero[2], A. Ferreira[2], M.S. Melo[3], P.J. Christoffoleti[3]; [1]University of Sao Paulo, Piracicaba, Brazil, [2]Monsanto Brazil, Sao Paulo, Brazil, [3]University of Sao Paulo, Piracicaba, Brazil (81)**

ABSTRACT

Field observations of soybean production areas, indicates the selection of glyphosate resistant *Digitaria insularis* (Sourgrass) biotypes. Aiming to simulate chemical management systems for the glyphosate resistant *Digitaria insularis* biotypes, a field study was conduct in Colina municipality, São Paulo State, from november 2010 to march 2011. 20 chemical management compositions were tested, with different application timings and herbicides used. In grams of acid equivalent or active ingredient per hectare, the treatments were: Untreated check along the duration of the study; glyphosate 1440, 20 days before planting (DBP), glyphosate 960, 30 days after soybean emerging (DAE); glyphosate 1440, 20 DBP, glyphosate 720, 3 DBP, glyphosate 720 + haloxyfop 60, 30 DAE; glyphosate 1440 + haloxyfop 120, 20 DAE, glyphosate 720, 30 DAE; glyphosate 1440 + haloxyfop 120, 20 DBP, glyphosate 720, 3 DBP, glyphosate 960 + haloxyfop 60, 30 DAE; glyphosate 1440 + haloxyfop 120, 20 DBP; glyphosate 720, 3 DBP; glyphosate 960, 30 DAE; glyphosate 1440 + haloxyfop 96, 20 DBP; glyphosate 720 + haloxyfop 60, 3 DBP; glyphosate 960 + haloxyfop 60, 30 DAE; glyphosate 1440 + haloxyfop 96, 20 DBP; glyphosate 720 + haloxyfop 60, 3 DBP; glyphosate 960, 30 DAE; glyphosate 1440 + quizalofop-p-tefuryl 96, 20 DBP; glyphosate 720 + quizalofop-p-tefuryl 60, 3 DBP; glyphosate 960, 30 DAE; glyphosate 1440 + clethodim 192, 20 DBP; glyphosate 720 + clethodim 120, 3 DBP; glyphosate 960, 30 DAE; glyphosate 1440 + haloxyfop 120, 20 DBP; paraquat + diuron 600+200, 3 DBP; glyphosate 960 + haloxyfop 60, 30 DAE; glyphosate 1440 + haloxyfop 120, 20 DBP, paraquat + diuron a 600+200, 3 DBP, glyphosate 960, 30 DAE; glyphosate 1440 + haloxyfop 120, 20 DBP, ammonium-glufosinate 400, 3 DBP, glyphosate 960, 30 DAE; glyphosate 1440 + haloxyfop 96, 20 DBP, glyphosate 720 + haloxyfop 60 + s-metolachlor 1920, 3 DBP, glyphosate 720 + haloxyfop 60, 30 DAE; glyphosate 1440 + haloxyfop 96, 20 DBP, glyphosate 720 + haloxyfop 60 + s-metolachlor 1920, 3 DBP, glyphosate 720, 30 DAE; glyphosate 1440 + haloxyfop 96, 20 DBP, glyphosate 720 + haloxyfop 60 + alachlor 2400, 3 DBP, glyphosate 720, 30 DAE; glyphosate 1440 + haloxyfop 96, 20 DBP, glyphosate 720 + haloxyfop 60 + trifluralina 2400, 3 DBP, glyphosate 720, 30 DAE; glyphosate 1440 + haloxyfop 96, 20 DBP, glyphosate 720 + haloxyfop 60 + flumioxazina 60, 3 DBP, glyphosate 720, 30 DAE; glyphosate 1440 + haloxyfop 120, 20 DBP, paraquat + diuron a 600+200 + s-metolchlor 1920, 3 DBP, glyphosate 960 + haloxyfop 60, 30 DAE and glyphosate 1440 + haloxyfop 120, 20 DBP, paraquat + diuron a 600+200 + s-metolachlor 1920, 3 DBP, glyphosate 960, 30 DAE. Glyphosate resistant *Digitaria insularis* biotypes were proven to be present in the experimental area and different chemical management strategies were obtained for controlling sourgrass, with the only unviable treatment, the use of glyphosate by itself. Due to the different viable chemical management systems for glyphosate resistant *Digitaria insularis* found, it was possible to compose a list of herbicide use in a long-term, focusing on reducing the glyphosate resistant *Digitaria insularis* infestation and prevent the appearance of new herbicide resistances.

EVALUATION OF SYNERGY BETWEEN GYPHOSATE AND HALOXYFOP TO CONTROL DIGITARIA INSULARIS RESISTANT TO GLYPHOSATE IN THREE PHENOLOGICAL STAGES OF GROWTH.

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ABSTRACT

The appearance of glyphosate resistant *Digitaria insularis* biotypes in Brazil and the difficult management for this weed specie , have generated need for more information about chemical alternatives to control it. Therefore, the objective of this study was to evaluate the possibility synergy when using glyphosate and haloxyfop, focusing on *Digitaria insularis* control for different growth stages. The experiment was conducted in the greenhouse of the Crop Production department at ESALQ/USP, in Piracicaba-SP, using 1,1 L plastic pots filled with fertilized potmix, where glyphosate resistant and susceptible *Digitaria insularis* seeds were sown and allowed to grow until they reach the appropriate growth stage for spraying, which were 3 leaves, 1 tiller and 4 tillers stage. 3 dose-response curves were made, based on field rate recommendations for each herbicide and another for the tank mixture of both, providing the ED 50 e 90%. The effects on both biotypes were affected by the mixture of glyphosate + haloxyfop. At the 3 leaves stage, the mixture of glyphosate + haloxyfop was considered synergic for the resistant biotype. When *Digitaria insularis* plants were sprayed at 1 tiller stage, it had a synergysm for both biotypes and at the 4 tillers stage the effect was merely additive, for both biotypes. Still, the tank mixture of glyphosate + haloxyfop is a control alternative glyphosate resistant *Digitaria insularis* biotypes , at the 3 growth stages assessed.

GLYPHOSATE TOLERANCE MECHANISMS ON *PARIETARIA DEBILIS* G. FORST. D. I[1], P.J. Christoffoleti*[2], F. Gonzales-Torralva[3], M. Perreta[4], R. DePrado[3]; [1]IAL – CONICET & FCA – UNL, Esperanza, Argentina, [2]University of Sao Paulo, Piracicaba, Brazil, [3]Universidad de Cordoba, Cordoba, Spain, [4]IAL - CONICET & FCA - UNL, Esperanza, Argentina (83)

ABSTRACT

The selection pressure imparted by glyphosate will cause weed shifts attributable to the natural tolerance of a particular species to glyphosate or the evolution of glyphosate resistance within the weed population. Mechanisms by which weeds are naturally tolerant to glyphosate are not well defined, and research investigating these mechanisms is limited. *Parietaria debilis* is a weed found in glyphosate resistant soybean production systems, this species exhibits a high tolerance to glyphosate compared with others common sensible species. Dose response assay shows a glyphosate tolerance ratio [ED_{50} (*P. debilis*)/ED_{50} (*A. hybridus*)] of 6.6; and the shikimic acid accumulation shows 14.5 fold the concentration in leaves of a sensible species at 96 hours after glyphosate aplication, that confirm the herbicide tolerance and the inhibition of the EPSPs, respectively. Foliar retention assays shows less herbicide remained in leaves in *P.debilis* than in *A. hybridus*, 93% of applied ^{14}C glyphosate penetrates in *A. hybridus* at 96 HAT meanwhile *P. debilis* only absorb 55%, at same time the tolerant species translocation is 15% of absorbed ^{14}C glyphosate against 68 % of the sensible one. The mechanisms involved in *P. debilis* lack of sensitiveness found in this work are the minor foliar retention, lack of absorption and reduced translocation of herbicide.

TALL FESCUE TOLERANCE TO SPRING APPLICATIONS OF TOWER (DIMETHENAMID) AND FREEHAND (DIMETHENAMID + PENDIMETHALIN).

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ABSTRACT

Freehand (1.75G) contains dimethenamid (0.75%) and pendimethalin at (1%) and is being evaluated for potential use as a preemergence herbicide in turf. The objective of this field experiment was to investigate tolerance of a 'Talladega' tall fescue field established in fall 2010 to spring applications of Freehand in 2011. Treatments included Freehand at 0, 2.94, 3.92, 5.9, and 7.85 kg a.i./ha, Tower 6L (dimethenamid) at 1.68 and 3.36 kg a.i./ha, and Pendulum 3.8ME (pendimethalin) at 2.24 kg a.i./ha. All treatments were applied May 16 and again on June 28, 2011. Freehand injured tall fescue 11 to 34% by 6 weeks after initial treatments (WAIT) while all other treatments caused ≤15% injury. After the second application, tall fescue injury from Freehand ranged 19 to 50% by 10 WAIT but sequential applications of Pendulum and Tower caused <10% injury. Freehand rates >2.94 kg a.i./ha reduced turf quality on several dates from the untreated but Tower and Pendulum applied separately did not reduce quality.

PERFORMANCE OF RIMSULFURON + DRY MESOTRIONE + ISOXADIFEN IN SOUTHERN CORN TRIALS.

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ABSTRACT

A combination of rimsulfuron + mesotrione has been evaluated as a contact plus residual herbicide, with or without a tank-mix partner of glyphosate, on corn. The formulated product includes a safener, which will enable application under more diverse weather conditions, across more hybrids and with various adjuvants. The three way combination is formulated as a dry, water-dispersible granule and was tested postemergence at a rate of 0.3 oz ai per acre of rimsulfuron + 1.25 oz ai per acre of mesotrione. It can be applied after corn emergence, but before corn exhibits 7 or more collars or is taller than 20 inches. The herbicide was tested at 46 locations in 2011 and weed control and crop response was evaluated in one and two pass herbicide systems. Excellent control was achieved with the rimsulfuron + mesotrione treatments on most grass and broadleaf weeds including: velvetleaf, Palmer amaranth, waterhemp, common ragweed, common lambsquarters, barnyardgrass, giant foxtail, yellow foxtail, green foxtail, broadleaf signalgrass and large crabgrass without any significant injury to corn being observed. Full registration was received in the first quarter of 2011.

PERFORMANCE OF F9310 AND F9316 IN THE SOUTH PRE & POST CORN TRIALS IN 2010 AND 2011.

J.D. Johnson*[1], H.R. Mitchell[2], J.P. Reed[3], J.S. Wilson[4], T.W. Mize[5]; [1]FMC Corporation, Madison, MS, [2]FMC Corporation, Louisville, MS, [3]FMC Corporation, North Little Rock, AR, [4]FMC Corporation, Cary, NC, [5]FMC Corporation, Olathe, KS (166)

ABSTRACT

F9310 and F9316 are two new herbicides under development by FMC for preplant, preemergence and postemergence grass and broadleaf weed control in corn. F9310 is a combination of pyroxasulfone plus fluthiacet-methyl. F9316 combines pyroxasulfone, fluthiacet-methyl and atrazine. Field research trials have been conducted in the US in 2010 and 2011 to evaluate crop safety and weed control provided by these two herbicides as well as comparisons to other standard PRE and Post herbicides for corn. Trials were conducted primarily at university research locations as well as independent contract sites across the Corn Belt and southern corn growing areas. Applications included early preplant, preemergence and early postemergence timings across various soil types and geographic distribution of corn growing areas. Rates of F9310 included 113 to 151, 132 to 169, and 151 to 188 g ai/ha on course, medium and fine soils, respectively. Rates of F9316 ranged from 0.95 kg ai/ha to 1.58 kg/ha across all three soil classes. Visual evaluations crop response as well as both grass and broadleaf weed control were evaluated. Crop response was low across most trials. F9310 and F9316 demonstrated excellent crop safety across all trials with a maximum of 5% crop response with F9316 recorded in 1 trial out of 39 sites. F9310 did not show any crop response from preemergence applications. Crop response from postemergence applications was low, averaging 5% with both F9310 and F9316 as leaf speckling or spotting from the fluthiacet-methyl as reported at 7-30 DAT. Results at 3-6 weeks after treatment indicated excellent control of foxtail and panicum species and similar to other preemergence grass herbicides. Both F9310 and F9316 applied preemergence provided excellent control of several key broadleaf weed species including tall waterhemp, Palmer amaranth, common lambsquarters, and velvetleaf. F9316 provided greater overall control on common and giant ragweed, morningglories, kochia, velvetleaf, and greater consistency of control on waterhemp and common lambsquarters versus F9310. Both F9310 and F9316 provided excellent control of grass and broadleaf weeds when tank-mixed with glyphosate and applied postemergence. Control of foxtails, woolly cupgrass, waterhemp, Palmer amaranth, lambsquarters, and morningglories, and velvetleaf was 90% or greater at 15-30 DAT. Excellent residual of both F9310 and F9316 when applied postemergence was observed. Lower levels of control were observed with treatments of glyphosate alone during this same evaluation period due to new weed flushes. F9316 provided greater control of giant ragweed, kochia, waterhemp than F9310 during the same evaluation period. Both F9310 and F9316 have been shown to be effective grass and broadleaf tools for flexible weed management in corn. Further research to develop effective weed management programs incorporating these herbicides is needed.

ANTHEM™ AND ANTHEM ATZ™ - TWO NEW HERBICIDES FOR PRE-EMERGENCE AND POST-EMERGENCE CONTROL OF KEY BROADLEAF AND GRASS WEED PEST IN U.S. CORN AND SOYBEAN PRODUCTION.

J.S. Wilson*[1], H.R. Mitchell[2], J.D. Johnson[3], T.W. Mize[4], T. Martin[5], J.P. Reed[6]; [1]FMC Corporation, Cary, NC, [2]FMC Corporation, Louisville, MS, [3]FMC Corporation, Madison, MS, [4]FMC Corporation, Olathe, KS, [5]FMC Corporation, Philadelphia, PA, [6]FMC Corporation, North Little Rock, AR

(167)

ABSTRACT

Anthem is a new proprietary herbicide premix than contains pyroxasulfone and fluthiacet-methyl that provides growers a convenient and flexible product for pre-emergence and early post emergence grass and broadleaf weed control. Anthem is formulated as a 2.15 pound per gallon suspoemulsion liquid. Anthem will be labeled for both corn and soybean uses. Anthem ATZ is a new three way herbicide premix than contains pyroxasulfone, atrazine and fluthiacet-methyl that provide growers a convenient and flexible product for pre-emergence and early post emergence grass and broadleaf weed control. Anthem ATZ is formulated as a 4.5 pound per gallon suspoemulsion liquid. Anthem ATZ will be labeled for corn uses only. Both Anthem and Anthem ATZ offers growers several modes of action for control of weeds, including weeds resistant to glyphosate and many difficult to control species. Both products provide excellent crop safety when used at the recommended pre-emergence rates for the particular soil type or in post applications. Anthem uses rates will vary from 6-13 fluid ounces per acre and Anthem ATZ uses rates will vary from 1.5 to 4 pints per acre. Research trials conducted by FMC and University researchers has shown excellent grass and broadleaf weed control with both Anthem and Anthem ATZ.

NEW FIERCE HERBICIDE FOR WEED CONTROL IN FIELD CORN AND SOYBEANS. **J.R. Cranmer*[1], V.F. Carey[2], W.C. Odle[3], J.A. Pawlak[4], J. Smith[5]; [1]Valent USA Corporation, Cary, NC, [2]Valent USA Corporation, Olive Branch, MS, [3]Valent USA Corporation, Plano, TX, [4]Valent USA Corporation, Lansing, MI, [5]Valent USA Corporation, Peachtree City, GA (168)**

ABSTRACT

Fierce is a new herbicide being developed by Valent U.S.A. Corporation for use in soybean, minimum tillage field corn, and industrial vegetation management (IVM). Fierce is a premix of flumioxazin and pyroxasulfone at a ratio of 1:1.27 in a 76% WDG formulation. Fierce provides preemergence control of a variety of annual broadleaf and grass weeds with excellent safety to field corn and soybeans. Use rates vary depending on soil type with the suggested use rate for soybeans and field corn in the south being 3 oz/A. Data from 2011 demonstrated that Fierce gave excellent Palmer amaranth and common waterhemp control at 8 weeks after treatment (WAT). Other weeds that Fierce gave excellent control of included large crabgrass. Giant ragweed was not controlled. Fierce has two modes of action (Group 14 and Group 15). This; combined with the excellent control of resistant weed species such as palmer amaranth, common waterhemp, and marestail; will make Fierce an excellent resistance management took. Valent anticipates a field corn registration for Fierce in February 2012 and a soybean registration in 2012. A cotton registration is expected in the 2013, and a wheat registration is expected in 2013-2014.

UPDATE ON HPPD-RESISTANT WATERHEMP AND CONTROL OPTIONS IN CORN AND SOYBEAN.

V.K. Shivrain*[1], G.D. Vail[1], R. Jain[2]; [1]Syngenta, Greensboro, NC, [2]Syngenta, Vero Beach, FL (169)

ABSTRACT

Field studies were conducted on waterhemp (*A. tuberculatus, syn. rudis*) which is resistant to post-emergence HPPD inhibiting herbicides. Pre-emergence application of mesotrione alone and in combination with s-metolachlor and atrazine provided effective control. Also, s-metolachlor in combination with metribuzin and fomesafen applied pre-emergence controlled the waterhemp. Post- emergence herbicides including glyphosate, glufosinate, fomesafen and synthetic auxins provided effective control.

GLYPHOSATE/DICAMBA/GLUFOSINATE - MONSANTO'S THIRD GENERATION COTTON HERBICIDE TOLERANCE. **R.D. Voth*[1], S. Bollman[2], J. Kendig[3], M. Malven[3], S. Leclere[4]; [1]Monsanto Company, Chesterfield, MO, [2]Monsanto Company, St. Louis, MO, [3]Monsanto, St. Louis, MO, [4]Monsanto, Chesterfield, MO (170)**

ABSTRACT

The development of weed resistance to glyphosate and a number of other herbicides has increased the need for additional herbicide options for effective and sustainable weed control in cotton. One way of adding herbicide options is to engineer tolerance into cotton for herbicides that damage conventional varieties. Monsanto's third generation herbicide tolerant cotton product was created by adding tolerance to dicamba and glufosinate to existing glyphosate-tolerant Genuity® Roundup Ready® Flex cotton trait, resulting in tolerance to three effective post-emergence herbicides in a single product. A cotton variety was produced containing a single insert that encodes a mono-oxygenase enzyme that deactivates dicamba and a phosphinothricin N-acetyltransferase enzyme that deactivates glufosinate . Dicamba-glufosinate tolerant cotton was then combined with Genuity Roundup Ready Flex cotton through traditional breeding methods to produce a triple stack product. The dicamba-glufosinate tolerant technology will allow dicamba applications of up to 1 lb ae/a pre-emergence and multiple applications of up to 0.5 lb ae/a each in-crop from crop emergence to pre-harvest with a yearly total of up to 2 lb ae/a. Dicamba-glufosinate tolerant cotton will also allow glufosinate applications equivalent to those currently used on glufosinate tolerant cotton. In 2010 and 2011 a series of dicamba-glufosinate tolerant cotton field trials were conducted across the cotton belt to determine the benefits of dicamba and glufosinate as additional modes of action in cotton. Palmer pigweed (glyphosate resistant and susceptible) infested fields were used for these tests, though other weed species that existed were rated as well. Results on Palmer pigweed show that both dicamba and glufosinate are effective on this weed species when applications are made to weeds less than 4-inches tall. Efficacy is reduced as weeds increase in size, especially when greater than 6-8-inches tall. Tank mixtures of dicamba and glufosinate increased efficacy over either product alone. Either product alone was effective on morningglory and glufosinate was effective on small grasses. In the 2011 trials in which dicamba-glufosinate tolerant cotton was stacked with Genuity Roundup Ready Flex cotton results show that glyphosate has multiple benefits for control of grasses and other glyphosate-susceptible weeds in a sustainable weed control system. The benefits demonstrated in these trials show that effective weed control can be achieved when dicamba and glufosinate are included in a weed control system, even when glyphosate and other herbicide resistant weeds are present. In another 2011 testing program, various herbicide systems were evaluated where dicamba-glufosinate tolerant cotton was stacked with Genuity Roundup Ready Flex cotton. These trials included pre treatments of fomesafen, dicamba or a tank mix of both alongside on untreated control, and these were followed by various post combinations of glyphosate, dicamba, acetochlor and glufosinate. Results of these trials show that a number of herbicide combinations provided excellent broad-spectrum weed control throughout the season and the most consistent results were achieved when a pre-emergence residual herbicide was included in the program. Post-emergence glyphosate was required for consistent grass control. The results of this research demonstrate that dicamba-glufosinate tolerant technology adds weed control benefits by adding modes of action in the program and that effective and sustainable control of both herbicide resistant and non-resistant weeds can be achieved using a systems approach.

PERFORMANCE OF BROMOXYNIL PLUS PYRASULFATOLE IN TEXAS GRAIN SORGHUM.

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ABSTRACT

Broadleaf weed control in grain sorghum continues to be challenging with limited pesticide options available. Huskie, a combination of active ingredients bromoxynil and pyrasulfatole has been labeled for post emergence control of broadleaf weeds in wheat, barley, oats, rye, and triticale. In 2011, Huskie received federal registration for applications in grain sorghum. Huskie is a new herbicide tool for sorghum growers and contains both HPPD and PS II active ingredients. Fortunately, this herbicide combination also has the potential to control various groups of herbicide resistant weeds (triazine, ALS, and glyphosate). Huskie provides control of the toughest broadleaf weeds including Kochia, Russian thistle, Devil's Claw, puncturevine, Palmer amaranth, waterhemp and other pigweed species,. Some transitory leaf burn to grain sorghum has occurred following an application of Huskie. New growth is not affected and recovery is quick and complete. Huskie may be applied to actively growing sorghum between the 3 leaf stage of growth to a maximum height of 12 inches and use rates of 12.8 -16 ounces of Huskie per acre are recommended. Huskie is a relatively new herbicide combination that has the potential to provide effective postemergence weed control of problematic weeds in grain sorghum.

EFFICACY OF F9310 AND SULFENTRAZONE PREMIXES IN THE SOUTHERN SOYBEAN TRIALS IN 2011.

H.R. Mitchell*[1], J.D. Johnson[2], J.S. Wilson[3], T.W. Mize[4]; [1]FMC Corporation, Louisville, MS, [2]FMC Corporation, Madison, MS, [3]FMC Corporation, Cary, NC, [4]FMC Corporation, Olathe, KS (173)

ABSTRACT

Anthem™ (F9310) is a new herbicide under development by FMC Corporation. Anthem is a premix of pyroxasulfone plus fluthiacet-methyl and can be applied preplant, preemergence and postemergence for control of difficult to manage grass and broadleaf weeds in soybeans. Anthem will be formulated as a 2.15 pound per gallon suspoemulsion liquid. Anthem has been evaluated in private and university soybean weed management research programs during the past two years for its potential fit as a grass and broadleaf weed control herbicide in soybeans. Results presented herein are a compilation of experiments conducted in 2011 by private and university personnel with Anthem applied preemergence and early-postemergence at a rates ranging from 0.084 to 0.134 lb ai/A for crop tolerance, weed efficacy and subsequent effects on yield. Trials were conducted across various soil types and geographic locations of major soybean growing areas and comparisons were made against commercial standard preemergence and postemergence herbicides for soybeans. Anthem was evaluated at 0.134 lb ai/A applied preemergence, 0.1 lb ai/A applied postemergence, and 0.084 to 0.1 lb ai/A applied pre and/or postemergence in a treatment combination or an overlap system with an Authority® based herbicide applied preemergence. Visual evaluations included crop response at 14 and 28 days after crop emergence for preemergence applications and 7 and 21 days after postemergence applications. Weed control ratings for preemergence application were taken just prior to a glyphosate postemergence treatment. Excellent soybean tolerance was observed with Anthem. Preemergence applications of Anthem demonstrated excellent crop safety across all trials and was comparable to other standard preemerge herbicides. Crop response from postemergence applications was low and reported as minor leaf speckling likely associated with the fluthiacet-methyl. Soybean injury in the form of stand reduction or stunting was not observed. At 14 days after treatment (DAT), Anthem treated soybeans resulted in less than 5% discoloration / necrosis and recovered from the initial discoloration by 28 DAT. Anthem applied preemergence provided excellent control (> 90% at 14-28 DAT) of several grass weeds including barnyardgrass (*Echinochloa crus-galli*), broadleaf signalgrass (*Urochloa platyphylla*), large crabgrass (*Digitaria sanguinalis*), goosegrass (*Eleusine indica*) and giant foxtail (*Setaria faberi*). Anthem also provided control of several key broadleaf weed species including palmer amaranth (*Amaranthus palmeri*), red root pigweed (*Amaranthus retroflexus*), entireleaf morningglory (*Ipomoea hederacea*), common purslane (*Portulaca oleracea*), hemp sesbania (*Sesbania herbacea*), and velvetleaf (*Abutilon theophrasti*). Excellent grass and broadleaf control was also noted when tank-mixed with glyphosate and applied postemergence. These data support acceptable soybean tolerance to Anthem when applied preemergence or postemergence and effective residual grass and small seeded broadleaf weed control including glyphosate resistant palmer pigweed. A program approach that includes one of the Authority products in a tank-mix or sequential application provides additional broad spectrum broadleaf control utilizing multiple classes of chemistry for effective resistance management in a conventional or GMO soybean production system.

ITALIAN RYEGRASS (LOLIUM MULTIFLORUM) CONTROL WITH POWERFLEX® HL (PYROXSULAM) HERBICIDE IN SOUTHERN U.S. SOFT RED WINTER WHEAT.

L.C. Walton*[1], D.T. Ellis[2], L.B. Braxton[3], R.E. Gast[4], R.A. Haygood[5], J.S. Richburg[6]; [1]Dow AgroSciences, Tupelo, MS, [2]Dow AgroSciences, Greenville, MS, [3]Dow AgroSciences, Travelers Rest, SC, [4]Dow AgroSciences, Indianapolis, IN, [5]Dow AgroSciences, Germantown, TN, [6]Dow AgroSciences, Dothan, AL (174)

ABSTRACT

Pyroxsulam herbicide, a member of the trizolopyrimidine sulfonamide chemical family, is a post emergence grass and broadleaf herbicide developed by Dow AgroSciences for use in spring and winter wheat. It is a acetolactate synthase (ALS)-inhibitor herbicide and can be applied postemergence (fall or spring) to an actively growing crop from 3 leaf to tiller stage, when grass weeds are 2 leaf to 2 tiller stage and broadleaf weeds are 2 inches tall or 2 inches in diameter. It has both foliar and soil activity; however most of its herbicidal activity is through foliar uptake. Previous research has shown excellent activity on several grass and broadleaf species important in the global small grain markets. The current U.S. formulation, PowerFlex® (GF-1274), is selective in winter wheat (including durum), rye and triticale but not selective in barley, oats, rice, maize or broadleaf crops. PowerFlex® HL (GF-2468) is a new formulation of pyroxsulam being developed by Dow AgroSciences to replace GF-1274. PowerFlex® HL is formulated as a wettable dry granule (13.3% WDG) with a lower use rate of 2.0 oz product/A (0.016 lbs ai/A), as compared to the 3.5 oz product/A rate (same active rate) with the current formulation. Dow AgroSciences conducted research during 2010-2011 in the southern and southeastern United States to determine the efficacy of PowerFlex® HL on Italian Ryegrass (*Lolium perenne ssp. multiflorium*) compared to the current PowerFlex® (GF-1274) formulation and other commercial herbicides when applications were made in the fall or during the late winter/early spring after green-up of the wheat; and to determine the impact that Italian Ryegrass has upon soft red winter wheat yields. This research included 9 experiments with fall applications and 7 with spring applications during the fall of 2010 and late winter/early spring 2011 seasons, respectively. The experimental design was a randomized complete block with 3 or 4 replications. The plot size was approximately 6 ft. by 20 ft long. The targeted Italian Ryegrass stage of growth for the fall application was 1 to 4 inches with spring applied Italian Ryegrass stage of growth from 2 to 8 inches in height. Treatments were applied with either a CO2 backpack or small plot tractor sprayer calibrated to deliver 10 to 15 GPA. The data from these research indicates that PowerFlex® HL herbicide at 2.0 oz product/acre (0.016 lbs ai/A) will provide excellent control of non ALS resistant Italian Ryegrass with either a fall or spring applied application comparable to the current PowerFlex® (GF-1274) formulation and other commercial standards . Soft red winter wheat yields were correspondingly increased by 54 to 57% with either a fall or spring applied application of PowerFlex® vs the untreated weedy check. Winter wheat injury was minimal with all treatments and will not be discussed. PowerFlex is not registered for sale or use in all states. Contact your state pesticide regulatory agency to determine if a product is registered for sale or use in your state. Always read and follow label directions.

KIXOR HERBICIDE TECHNOLOGY AND ZIDUA HERBICIDE: WEED CONTROL INNOVATIONS FOR GLYPHOSATE RESISTANCE MANAGEMENT. **G. Stapleton*[1], C. Youmans[2]; [1]BASF, Dyersburg, TN, [2]BASF Corporation, Dyersburg, TN (175)**

ABSTRACT

Saflufenacil, the active ingredient found in Kixor herbicide technology was labelled for use as the trade names Sharpen® herbicide and Treevix® herbicide in the fall of 2009. Additionally, pre-mix herbicides Verdict® (saflufenacil + dimethenamid-P) and OpTill® (saflufenacil + imazethapyr) were registered for use in corn, soybean and soybean, respectively. Saflufenacil inhibits the protoporphyrinogen oxidase (PPO) enzyme and is a member of Herbicide Group 14. It is the only active ingredient in the pyrimidinedione family of herbicides found on the market. These Kixor herbicides provide fast and complete postemergence burndown control of over 70 major broadleaf weeds including acetolactate synthase, triazine and glyphosate resistant biotypes. Zidua, active ingredient pyroxasulfone, inhibits the growth of germinating small-seeded broadleaf weeds and annual grasses. It is primarily absorbed by the shoot and secondarily by the roots of weed seedlings. This Isoxazoline compound represents a new class of herbicide chemistry. It's mode of action is inhibition of "Very Long Chain Fatty Acids" (WSSA Group 15, HRAC K3). While not a new mode of action, Zidua represents a significant improvement within this important mode of action, delivering higher unit activity and spectrum of control. Trials were initiated in Memphis, Tennessee to evaluate herbicide systems in later planted soybeans for control of glyphosate resistant weeds including horseweed and Palmer amaranth. All preplant (PP) burndown systems that included Verdict herbicide provided complete postemergence control of all broadleaf weeds prior to planting. Verdict 5 oz/A + glyphosate 1 qt/A + methylated seed oil (MSO) adjuvant 1% v/v applied 14 days preplant (DPP) fb Zidua 2.5 oz/A PRE provided virtually complete control of horseweed and Palmer amaranth, 99% and 98%, respectively, 28 days after the PRE treatment. In a large scale strip replicated soybean field trial glyphosate @ 1 qt/A + Verdict @ 5 oz/A + Zidua @ 2 oz/A 7 DPP fb Prefix @ 1 qt/A POST outyielded a comparative weed control program of glyphosate @ 1 qt/A + 2,4-D @ 1 qt/A 7 DPP fb Prefix @ 1 qt/A POST by 18 bu/A (43.9% increase).

LEADOFF FOR BURNDOWN WEED CONTROL IN THE SOUTHERN U.S.

M.T. Edwards*[1], H.A. Flanigan[2], R.M. Edmund[3], J. Smith[4]; [1]E. I. DuPont, Pierre Part, LA, [2]DuPont, Greenwood, IN, [3]E. I. DuPont, Little Rock, AR, [4]E. I. DuPont, Madison, MS (176)

ABSTRACT

DuPont™ LeadOff™ contains the two active ingredients rimsulfuron and thifensulfuron to broaden grass and broadleaf contact activity. These active ingredients provide better, more consistent control of many grass and broadleaf weeds, including certain glyphosate tolerant and -resistant weeds, even under cool conditions. Testing has shown the product can be applied fall, winter or spring when the ground is fit to spray. It should not be applied to frozen ground. LeadOff™ can be applied by ground (broadcast or band) or aerial application. LeadOff™ herbicide has been tested as an early preplant application for fields to be planted to corn (0 days preplant), cotton or soybeans (30 days preplant). In Fourteen field trials conducted in 2011, LeadOff™ was used at 1.5 ounces per acre. It provided burndown plus residual control of grasses and broadleaf weeds. Key weeds that were controlled included Shepherd's purse, Bittercress, Chickweed, Swinecress, Marestail / Horseweed, Carolina Geranium, Henbit, Cutleaf Eveningprimrose, Buttercup, Curly dock, Sowthistle, Purslane speedwell, Italian Ryegrass and Annual bluegrass. LeadOff™ can be tank mixed with appropriate burndown herbicides such as glyphosate, glufosinate, paraquat, 2,4-D LVE, or dicamba to broaden the weed control spectrum and have shown no compatibility or antagonism issues with these tank-mix partners, even under cooler late winter/early spring temperatures. 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.

MANAGEMENT OPTIONS FOR HERBICIDE-RESISTANT BARNYARDGRASS (*ECHINOCHLOA CRUS-GALLI*) IN RICE.

. J.R. Meier*[1], K.L. Smith[1], J.K. Norsworthy[2], B. Scott[3], J.A. Bullington[1], R.C. Doherty[1]; [1]University of Arkansas, Monticello, AR, [2]University of Arkansas, Fayetteville, AR, [3]University of Arkansas, Lonoke, AR (214)

ABSTRACT

Rice producers are dependent upon herbicides for control of weeds in rice, especially barnyardgrass. However, repeated use of the same herbicide, or herbicides with the same mode of action, has led to the selection and buildup of herbicide-resistant barnyardgrass populations. In Arkansas, barnyardgrass has developed resistance to propanil, quinclorac, clomazone, penoxsulam, and imazethapyr. Some biotypes have even developed cross-resistance to propanil and quinclorac. Trials were conducted in 2010 and 2011 at the Southeast Research and Extension Center, near Rohwer, AR, to examine barnyardgrass control with various herbicide combinations that excluded different modes of action to simulate resistance. Barnyardgrass control 2 weeks after permanent flood was near 100% with all herbicide combinations. Even though two applications of imazethapyr provided 90 to 100% control of barnyardgrass, the addition of another herbicide with a different mode of action can assist with control and reduce the potential for resistance. By rotating herbicides with different modes of action, producers can still effectively control barnyardgrass as exhibiting resistance to only one or two modes of action; however, resistance to multiple modes of action can create exceptional challenges in the absence of introduction of new modes of action into this market.

RESPONSE OF ELEPHANTGRASS TO POSTEMERGENCE HERBICIDES. **D.C. Odero*, R.A. Gilbert; University of Florida, Belle Glade, FL (215)**

ABSTRACT

Perennial grasses that produce lignocellulosic biomass are generating much interest as sources of biomass for energy production. Elephantgrass, also called nappiergrass has been proposed as an appropriate bioenergy feedstock for lignocellulosic ethanol or direct combustion in South Florida. However, elephantgrass has been reported as having a high invasive potential in Florida where it is also listed as a noxious weed. To limit future invasion of elephantgrass escapes in sugarcane and vegetables in South Florida, currently labeled POST grass herbicides were evaluated for its management. The response of elephantgrass to glyphosate (used for spot treatments), clethodim and sethoxydim (used in vegetables), and asulam and trifloxysulfuron (used in sugarcane) were determined using dose response curves. Herbicides were applied at rates ranging from 52.5 to 3360 g ha^{-1} glyphosate, 17.5 to 1120 g ha^{-1} clethodim, 19.7 to 1260 g ha^{-1} sethoxydim, 230 to 14800 g ha^{-1} asulam, and 1 and 64 g ha^{-1} trifloxysulfuron. Log-logistic models were used to determine the herbicide dose required to produce 90% control (ED_{90}). The ED_{90} values for elephantgrass control based on visual estimation were 448, 127, 489, 19050, and 91 g ha^{-1} of glyphosate, clethodim, sethoxydim, asulam, and trifloxysulfuron, respectively at 21 d after treatment (DAT). The doses required to provide 90% shoot growth reduction (GR_{90}) at 21 DAT were 477, 262, 381, 12330, and 94 g ha^{-1} of glyphosate, clethodim, sethoxydim, asulam, and trifloxysulfuron, respectively. The probability of elephantgrass resprouting 35 d following herbicide application decreased with increasing rates of glyphosate, clethodim, sethoxydim, asulam, and trifloxysulfuron. The GR_{90} values for root dry weight were 570, 257, 432, 16919, and 183 g ha^{-1} of glyphosate, clethodim, sethoxydim, asulam, and trifloxysulfuron, respectively. These results suggest that glyphosate, clethodim, and sethoxydim will provide acceptable control of newly established elephantgrass at currently labeled use rates. However, elephantgrass was tolerant to asulam and trifloxysulfuron at currently labeled use rates implying that control of escaped elephantgrass will be difficult.

EVALUATION OF HPPD-INHIBITORS APPLIED ALONE OR IN COMBINATION WITH ATRAZINE FOR MANAGEMENT OF EASTERN BLACK NIGHTSHADE (*SOLANUM PTYCANTHUM*). .

K.M. Vollmer*, H.P. Wilson, T.E. Hines; Virginia Tech, Painter, VA (216)

ABSTRACT

Eastern black nightshade (*Solanum ptycanthum* Dunal) is a problem in several crops on Virginia's Eastern Shore including corn, soybean, and tomato. Most growers on the Eastern Shore utilize no-till practices in corn and soybean which rely heavily on herbicides for weed control, in particular glyphosate and certain ALS-inhibiting herbicides. Applications of these herbicides have varying effects against nightshade, therefore, alternative chemistries were evaluated. In the summer of 2010 a postemergence trial was established to evaluate the effectiveness of various HPPD inhibitors alone or in combinations with atrazine for eastern black nightshade management in a corn field in Eastville, VA. Plots were 2 m x 6 m and consisted of 4 replications per treatment. In 2011 a complimentary greenhouse study was established to further evaluate herbicide effects on individual plants. The following HPPD-inhibiting herbicides were applied alone or in mixtures with atrazine (561g ai ha^{-1}): topramezone (18 g ai ha^{-1}), tembotrione (92 g ai ha^{-1}), tembotrione (92 g ai ha^{-1}) + thiencarbazone (22 g ai ha^{-1}), and mesotrione (105 g ai ha^{-1}). MSO (1.0% v/v) and UAN (1.25% v/v) were added to all treatments. In 2010 ratings for % control were visually estimated at1, 2, and 3 weeks after treatment (WAT). In 2011 plants were rated for % injury at 1, 2, 3, 4, and 5 WAT then harvested to obtain dry weights. In both studies rate of plant death was expedited by the addition of atrazine to the HPPD inhibitors. In both studies all 4 HPPD-inhibiting herbicides mixed with atrazine provided 90-99% injury/control by 3 WAT. Results for the HPPD-inhibitors applied alone varied in 2011 as only mesotrione showed less than 70% injury 5 WAT and higher post harvest dry weights compared to the other herbicides. In this study 3 out of 4 of the aforementioned herbicides alone can be used as an alternative to glyphosate or ALS herbicides to control eastern black nightshade in corn or other tolerant crops; however, control by HPPD-inhibitors was faster when atrazine was added.

PALMER AMARANTH MANAGEMENT IN DICAMBA/GLUFOSINATE TOLERANT COTTON.

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ABSTRACT

Glyphosate-resistant Palmer amaranth (AMAPA) is a major problem in the Southeast and Mid-South cotton regions. Monsanto Company is developing cotton resistant to dicamba, glufosinate, and glyphosate; this cotton is currently under USDA regulated status. Field trials were conducted in 2010 and 2011 on loamy sand soils in Wayne County, NC and Macon County, GA to determine how this new technology might assist growers in managing glyphosate-resistant AMAPA. Both locations were heavily infested with AMAPA, with Macon County having entirely glyphosate-resistant AMAPA while Wayne County had a mixture of glyphosate-resistant and -susceptible AMAPA. Treatments were built around a glufosinate-only system of glufosinate ammonium salt (Ignite® 280) at 0.53 lb ai/acre applied early postemergence (EPOST) and mid-postemergence (MPOST) followed by a directed lay-by application of diuron (Direx®) + MSMA at 1.0 + 2.0 lb ai/acre. Expansions on this basic system included various combinations where dicamba diglycolamine salt (Clarity®) at 0.5 lb ai/acre was applied preemergence (PRE) or mixed with glufosinate EPOST or EPOST and MPOST, or where dicamba replaced glufosinate EPOST. Other treatments included glyphosate potassium salt (Roundup® PowerMAX) at 0.75 lb ae/acre + dicamba replacing glufosinate or glufosinate + dicamba EPOST, MPOST, or both. Additional treatments were dicamba PRE followed by glufosinate or glufosinate + dicamba delayed early postemergence (DEPOST) and diuron + MSMA lay-by. Comparison treatments included the following: glyphosate EPOST and MPOST (glyphosate-only program); pendimethalin (Prowl® H2O) + fomesafen (Reflex®) PRE at 1 + 0.25 lb ai/acre, pyrithiobac (Staple® LX) EPOST at 0.0625 lb ai/A, and fluometuron (Cotoran®) + MSMA at 1 + 2 lb ai/acre directed at MPOST (conventional herbicide program); and diuron + fomesafen PRE at 0.5 + 0.25 lb/acre followed by acetochlor (Warrant®) at 1.125 lb ai/acre + glyphosate EPOST and MPOST (Roundup Ready® Flex standard program). Each comparison treatment included diuron + MSMA lay-by. EPOST was at 1- to 2-leaf cotton and 4-inch AMAPA; DEPOST was at 3- to 7-leaf cotton and 5- to 7-inch AMAPA; MPOST was at 7- to 9-leaf cotton; and lay-by was at 10- to 13-node cotton. AMAPA control at time of EPOST at 3 of 4 locations was similar with dicamba (83 to 98%), pendimethalin + fomesafen (72 to 97%), and diuron + fomesafen (75 to 99%) applied PRE. At the fourth location with 1.5 inches of rain 1 day after PRE, control by dicamba, pendimethalin + fomesafen, and diuron + fomesafen was 35, 88, and 98%, respectively. Late-season AMAPA control by glufosinate EPOST and LPOST followed by diuron + MSMA lay-by was 94 to 97% in North Carolina and 80 to 87% in Georgia. Dicamba PRE or mixed with glufosinate EPOST increased control, with dicamba once in a system being as effective as twice. Glufosinate systems with one or more dicamba applications controlled AMAPA 93 to 100% late in the season. There was a trend for greater cotton yield with dicamba PRE, likely reflecting reduced early season competition. Late-season AMAPA control and cotton yield were greater with glufosinate + dicamba systems than with the conventional herbicide or Roundup Ready Flex standard programs. The glyphosate-only program was a complete failure. Dicamba + glyphosate could replace one dicamba + glufosinate application; this could be of value in fields with heavy grass pressure. Dicamba PRE with glyphosate + dicamba EPOST and MPOST also was excellent. Treatments with glufosinate DEPOST were much less effective than systems with glufosinate EPOST. Dicamba mixed with glufosinate DEPOST increased late-season control 30 to 70%, but control was still inadequate in systems with DEPOST applications. No crop response was noted with dicamba PRE or with dicamba + glufosinate or dicamba + glyphosate EPOST. At one of four locations, glufosinate alone or mixed with dicamba applied MPOST caused minor foliar necrosis. There was no evidence this affected yield. These trials showed that excellent control of glyphosate-resistant AMAPA can be obtained with systems based upon glufosinate plus dicamba and that such systems are more effective than those based upon currently available technology. Cotton resistant to dicamba and glufosinate should, therefore, benefit growers in control of glyphosate-resistant AMAPA. Additionally, dicamba included in glufosinate-based systems should help delay selection for glufosinate resistance.

GLYPHOSATE-RESISTANT PALMER AMARANTH MANAGEMENT IN NO-TILL SOYBEANS. **T. Besancon*[1], R.E. Paynter[2], J.D. Hinton[3], W.J. Everman[3]; [1]NCSU, RALEIGH, NC, [2]NCSU, Raleigh, NC, [3]North Carolina State University, Raleigh, NC (218)**

ABSTRACT

Field experiments were conducted in 2011 to evaluate preemergence (PRE), postemergence (POST) activity, and phytotoxicity of different herbicide programs on glyphosate-resistant (GR) Palmer amaranth (*Amaranthus palmeri*). Trials included potential the new herbicides encapsulated acetochlor and flumioxazin+pyroxasulfone. 'AG5605' soybean was planted on May 31, 2011 on a cooperator farm near Pinetops, NC. PRE applied treatments included flumioxazin at 71 g a.i. ha^{-1}, acetochlor at 1260 g a.i. ha^{-1}, flumioxazin + acetochlor, sulfentrazone at 140 g a.i. ha^{-1} + metribuzin at 210 g a.i. ha^{-1}, metribuzin at 420 g a.i. ha^{-1}, flumioxazin + pyroxasulfone, and glyphosate at 840 g a.i. ha^{-1}. These PRE treatments were followed by POST application of either glyphosate at 840 g a.i. ha^{-1} + fomesafen 330 g a.i. ha^{-1}, glyphosate + acetochlor at 1260 g a.i. ha^{-1}, or glyphosate + fomesafen + acetochlor. Parameter measurements included Palmer Amaranth control and soybean phytotoxicity at 14, 28, and 48 days after PRE treatment (DAPRE). Results showed that a PRE application of sulfentrazone + metribuzin, metribuzin, flumioxazin + acetochlor, flumioxazin, and flumioxazin + pyroxasulfone provided greater than 90% control of GR Palmer amaranth at 14 DAPRE. In a predominantly GR population of Palmer amaranth, glyphosate efficacy was less than or equal to 10%. Following the POST application, observations at 28 and 48 DAT showed the need of a tank-mix partner with POST activity as glyphosate applied with acetochlor resulted in less than or equal to 72% control of Palmer amaranth. Additionally, where fomesafen was applied with glyphosate, late season control of Palmer amaranth was greater than or equal to 98%. This field trial demonstrates the importance of multiple herbicide options to control Palmer amaranth as early as possible. Any POST applications should include an herbicide with POST activity where the PRE application failed to control at least 90% of Palmer amaranth.

GLYPHOSATE-RESISTANT PALMER AMARANTH CONTROL IN DICAMBA TOLERANT SOYBEAN SYSTEM IN THE MIDSOUTH. **L.E. Steckel*[1], T.W. Eubank[2], J.W. Weirich[3], B. Scott[4], R.F. Montgomery[5]; [1]University of Tennessee, Jackson, TN, [2]Mississippi State University, Stoneville, MS, [3]University of Missouri, Portageville, MO, [4]University of Arkansas, Lonoke, AR, [5]Monsanto Comapny, Union City, TN (219)**

ABSTRACT

With the continued development of new glyphosate-resistant (GR) weed species and spread of current GR weed species, new weed management technology is clearly needed. Monsanto is developing a new herbicide trait stack that will provide soybean the tolerance to both dicamba and glyphosate herbicides. Research was conducted in Germantown, TN, Stoneville, MS, New Port, AR, Pine Bluff, AR and Portageville, MO in 2011 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 110015 flat fan nozzles calibrated to apply 15 GPA at a pressure of 40 psi. Treatments consisted of either dicamba or Valor® applied pre-emergence. The rate of dicamba was either 16 or 32 oz/A while the Valor® was applied at 2 oz/A. Post treatments consisted of either Roundup PowerMax® (32 oz/A), Warrant® herbicide (48 oz/A), Flexstar® (16 oz/A), dicamba (16 oz/A) or all combinations of these products applied to 3 to 4" Palmer. 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, 28 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 32 oz/A rate of dicamba was not as consistent as Valor® in residual Palmer amaranth control but data suggests a trend for increased residual control when the16 and 32 oz/A rates were compared . Valor® applied pre emergence followed by dicamba plus Roundup PowerMax® on 4" Palmer provided very good control (97%). This was much better than the Palmer pigweed control with Valor® applied Pre emergence followed by Flexstar® and Roundup PowerMax® (80%). Though 80% control can sound good, in Mid-South fields today, Palmer amaranth populations are so high that control less than 90% will often be a crop failure. 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. 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.

POSTEMERGENCE EFFICACY OF DICAMBA ON GLYPHOSATE RESISTANT PALMER AMARANTH.

. C.B. Edwards*[1], T.W. Eubank[2], D.R. Shaw[3], J.W. Weirich[4], L.E. Steckel[5]; [1]Mississippi State University, Starkville,MS, MS, [2]Mississippi State University, Stoneville, MS, [3]Mississippi State University, Starkville, Ms, MS, [4]University of Missouri, Portageville, MO, [5]University of Tennessee, Jackson, TN (220)

ABSTRACT

Due to widespread development of glyphosate-resistant (GR) Palmer amaranth across the state of Mississippi, as well as other states, producers are searching for alternative weed control options. Dicamba-tolerant soybean (DTS) could offer an alternative mechanism of control for Palmer amaranth. The DTS system will provide producers the option of applying dicamba as an additional herbicide mechanism of action in-season to control Palmer amaranth and other broadleaf weeds. As the commercialization of DTS nears, dicamba efficacy on Palmer amaranth must be evaluated to determine the most effective means of using this technology. The objective of the study was to determine the most efficacious dicamba rates and timings applied postemergence for the control of GR Palmer amaranth. Research was conducted on two locations with known populations of GR Palmer amaranth in 2011. Treatments included four rates of dicamba at 0, 0.28, 0.56, and 1.1 kg ae/ha. All were evaluated with and without the addition of 0.84 kg ae/ha glyphosate. These treatments were applied to Palmer amaranth at weed heights of 5, 10, and 15 cm. Visual ratings were made for each treatment at 7, 14, 21, and 28 days after treatment (DAT). In addition to visual ratings, plant counts and biomass samples were taken 28 DAT. Biomass samples were dried for 7 days at 66C before taking weight measurements. Glyphosate alone gave only 44, 24, and 19% control of 5, 10, and 15 cm GR Palmer amaranth, respectively 28 DAT. The addition of dicamba at 1.1 kg/ha resulted in 99, 95, and 91% control of 5, 10, and 15 cm GR Palmer amaranth, respectively whereas dicamba at 0.56 kg/ha provided 97, 86, and 77% control, respectively and dicamba at 0.28 kg/ha gave 94, 74, and 62% control, respectively. Results from plant counts indicate a reduction in plants/m^2 for all dicamba treatments and timings with the exception of the 10-cm application timing which was likely due to environmental conditions. Plant reductions of 78% were observed with 1.1 kg/ha when compared to the glyphosate alone treatment. Results from biomass samples also indicate a significant reduction in plant biomass with all dicamba treatments and timings. Biomass was reduced by 98% with 1.1 kg/ha when compared to the glyphosate alone treatment. It is the authors understanding that the standard postemergence rate for dicamba will be 0.56 kg/ha when used with DTS technology. Results from this study support the importance of application timing to target small weeds as control of Palmer amaranth declined significantly as plant height increased.

GLYPHOSATE-RESISTANT PALMER AMARANTH CONTROL WITH SEQUENTIAL APPLICATIONS OF DICAMBA.

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ABSTRACT

Field trials were conducted in 2011 at seven locations at Kenly, NC, Batesville, SC, Portageville, MO (two sites), Greenville, MS, Pine Bluff, AR, and Newport, AR to determine the effects of the timing of sequential dicamba applications on the control of mixed populations of glyphosate-resistant and glyphosate-susceptible Palmer amaranth (*Amaranthus palmeri*). Initial applications of 0.5 lb ea/A dicamba or 0.5 lb/A dicamba plus 0.75 lb ae/A glyphosate were made to Palmer amaranth that averaged either 3" or 9" in height. Sequential applications of 0.5 lb/A dicamba or 0.5 lb/A dicamba plus 0.75 lb/A glyphosate were made 4, 7, and 14 days after the initial application (DAA). Single applications of 0.5 lb/A dicamba and 0.5 lb/A dicamba plus 0.75 lb/A glyphosate were included for comparison to the sequential treatments. Visual control of Palmer amaranth was determined approximately 14 DAA. When applied to 3" plants, all sequential applications of dicamba provided 90 to 92% control, regardless of absence or presence of glyphosate as a tank-mix partner. Palmer amaranth control was reduced when the initial dicamba applications were made to 9" tall plants. When applied without any sequential dicamba application, the initial application of dicamba alone provided 79% control of 3" Palmer amaranth, but only 71% control of 9" Palmer amaranth. The addition of glyphosate increased control of Palmer amaranth only at the 9" application timing. When applied to 9" plants, sequential applications of dicamba plus glyphosate provided from 81 to 85% control, while sequential applications of dicamba alone provided from 79 to 82% control. Single applications of dicamba provided 71% control and 74% when glyphosate was added as tank mix. Overall, results from these experiments revealed that early application timings and sequential applications of dicamba combined with glyphosate resulted in the highest levels of Palmer amaranth control at 14 DAA. No significant differences in the level of Palmer amaranth control was observed between sequential applications at 4, 7, or 14 DAA.

COMPARISON OF GLUFOSINATE AND FOMESAFEN FOR POSTEMERGENCE PALMER AMARANTH CONTROL.

C.E. Starkey*[1], J.K. Norsworthy[1], D.b. Johnson[1], P. Devkota[1], A.L. Lewis[2]; [1]University of Arkansas, Fayetteville, AR, [2]University Of Arkansas, Fayetteville, AR (222)

ABSTRACT

Glyphosate-resistant (GR) Palmer amaranth (*Amaranthus palmeri*) is a serious problem for Arkansas producers. Postemergence control of Palmer amaranth is difficult if the weed is also resistant to *acetolactate synthase*-inhibiting herbicides. At the University of Arkansas experiment station in Fayetteville, AR in 2010, an experiment was conducted to evaluate control options for large GR-Palmer amaranth. The experiment compared high rates of Ignite (36 and 43 oz/acre) to Flexstar GT (4.5 pints/acre) for postemergence Palmer amaranth control. Five different weed sizes (6, 12, 18, 24, and 30") were treated with the three herbicides to provide a 3x5 factorial design that was rated 2-4 weeks after treatment. The high rates of Ignite and Flexstar GT provided effective control of six-inch Palmer amaranth. When Palmer amaranth reached 12 inches, Flexstar GT provided significantly less control than both rates of Ignite. When Palmer amaranth was 18 inches or larger, no herbicide provided adequate (>90%) control.

USE OF RESIDUAL HERBICIDES IN LIBERTY LINK SOYBEAN FOR CONTROLLING GLYPHOSATE-RESISTANT PALMER AMARANTH. **D.B. Johnson*[1], J.K. Norsworthy[1], B. Scott[2], C.E. Starkey[1], J.F. Smith[3]; [1]University of Arkansas, Fayetteville, AR, [2]University of Arkansas, Lonoke, AR, [3]Bayer CropScience, Cabot, AR (223)**

ABSTRACT

Glyphosate-resistant Palmer amaranth is the biggest problem facing soybean producers in the Midsouth. Use of glufosinate-resistant soybean cultivars has helped manage glyphosate-resistant Palmer amaranth; however, glufosinate alone is not recommended because use of a single herbicide intensely selects for resistance. Experiments were conducted in the summer of 2011 at the Northeast Research and Extension Center in Keiser, AR with the objective being to evaluate early- and late-season control of glyphosate-resistant Palmer amaranth with residual herbicides in glufosinate (Ignite 280)- based programs. Residual herbicides evaluated in these studies included: S-metolachlor (Dual II Magnum), flumioxazin (Valor), pyroxasulfone (Zidua), trifluarlin (Treflan), S-metolachlor + fomesafen (Prefix), chlorimuron + thifensulfuron + flumioxazin (Envive), and S-metolachlor + metribuzin (Boundary). All residual herbicides were applied at rates appropriate for a clay soil. Herbicide programs were single or sequential applications of Ignite applied alone or in combination with a residual herbicide, single or sequential applications of Ignite following a preplant incorporated (PPI) or preemergence (PRE) application of a residual herbicide, or Ignite applied alone or in combination with a residual herbicide following a PRE residual herbicide. Visual weed control and crop injury ratings were taken weekly throughout the growing season. Crop injury was minimal. Programs that consisted of a residual herbicide applied PRE or postemergence (POST) in combination with Ignite provided more consistent control of glyphosate-resistant Palmer amaranth (≥ 92%) than Ignite applied alone (≤ 87%). However, programs consisting of Treflan applied PPI followed by (fb) Ignite were not as effective (86%), due to the lack of sufficient incorporation on the clay soil. Therefore, effective residual herbicides must be applied both PRE and POST in combination with Ignite to provide consistent Palmer amaranth control.

HERBICIDE SCREENING FOR ARKANSAS DICLOFOP-RESISTANT ITALIAN RYEGRASS CONTROL IN WHEAT. **M.T. Bararpour*, L. Oliver, J.K. Norsworthy; University of Arkansas, Fayetteville, AR (224)**

ABSTRACT

Since the early 1960s, wheat has been the most important small grain crop in Arkansas. Resistance in Italian ryegrass (*Lolium perenne* var. *multiflorum*) is an economically important example of herbicide resistance in world agriculture, and Hoelon (diclofop)-resistant Italian ryegrass is the number one weed problem in Arkansas wheat. A field study was conducted in 2010-2011 at Fayetteville, AR, to evaluate the efficacy of herbicides available to Arkansas producers for controlling diclofop-resistant Italian ryegrass. Plots were 7 ft wide by 20 ft long with 5-ft alleys between replications. Wheat (Beretta cultivar) was planted on November 1, 2010, and harvested on June 24, 2011. The plot area contained a uniform, natural infestation (30 plants/ft^2) of diclofop-resistant Italian ryegrass. The experiment was designed as a randomized complete block with 29 treatments and four replications. All herbicide rates were in lb ai/A. Herbicides used (either alone, in tank-mix combinations, or followed by (fb) the same or different herbicides) in this experiment were: 1) Axiom (flufenacet + metribuzin) at 0.17, 0.255, 0.34, and 0.425; 2) Osprey (mesosulfuron) at 0.0067 and 0.0134; 3) Axial XL (pinoxaden) at 0.0538; 4) Sencor (metribuzin) at 0.25; 5) Atlantis (mesosulfuron + iodosulfuron + mefenpyr) at 0.0483 and 0.0551; 6) Finesse (chlorsulfuron + metsulfuron) at 0.012; 7) Prowl H2O (pendimethalin) at 2; 8) Spartan (sulfentrazone) at 0.125; and 9) Zidua (pyroxasulfone) at 0.12. Application timings were: A) preemergence (PRE); B) spiking; C) 1-2 leaf wheat; D) 2-3 leaf wheat; E) 3-4 leaf ryegrass; F) 4-5 leaf ryegrass; G) 1-2 tiller ryegrass; H) 4-leaf to 2-tiller ryegrass; I) 2-tiller ryegrass; and J) 2-3 tiller wheat. Italian ryegrass control and wheat injury and yield were evaluated. Wheat injury was 4 and 0; 6 and 3; and 56 and 30% from the application of Zidua (PRE), Spartan (PRE), and Spartan at 4-5 leaf ryegrass at 5 and 15 weeks after emergence, respectively. A single application of Spartan at 0.125 PRE; Spartan at F timing; Atlantis (0.0483) at H timing; Axial XL (0.0538) at F timing; Axiom (0.34) at C timing; and Zidua (PRE) at 0.12 provided 19 and 58, 58, 89, 93, and 100% Italian ryegrass control and 24 and 36, 44, 66, 84, and 81 bu/A wheat yield, respectively. Italian ryegrass control was 98 and 99% and wheat yield was 83 and 85 bu/A from a single tank-mix application of Axiom (0.225) + Axial XL at C timing and from Axial XL + Zidua (0.08) at F timing, respectively. Two-shot application of Axiom (0.255) at C timing fb Osprey (0.0134) at H timing; Finesse at A timing fb Axial XL at G timing; and Sencor at D timing fb J timing provided 98, 93, and 97% Italian ryegrass control and 84, 85, and 79 bu/A wheat yield, respectively. The natural infestation of Arkansas diclofop-resistant Italian ryegrass interference reduced wheat yield 75%. In conclusion, Axiom, Osprey, Finesse, Zidua, and Sencor can be used to control diclofop-resistant Italian ryegrass and prevent associated wheat yield reduction.

FALL APPLICATIONS OF BOUNDARY® FOR CONTROL OF GLYPHOSATE-RESISTANT ITALIAN RYEGRASS.

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ABSTRACT

Glyphosate-resistant (GR) Italian ryegrass (*Lolium perenne* ssp. *multiflorum*) continues to spread across Mississippi and the southern U.S. Italian ryegrass can be very problematic for producers at planting and into the growing season. Spring-applied postemergence control options are typically limited to treatments of Select Max (clethodim) and/or Gramoxone Inteon (paraquat) which are often not entirely effective. However, previous research has shown the addition of a photosystem II (PSII) inhibiting herbicide, like Sencor (metribuzin), to Gramoxone Inteon can improve postemergence control of Italian ryegrass. Similarly, prior studies have demonstrated satisfactory control of Italian ryegrass with fall-applied chloroacetamides as well as PSII herbicides, but concerns over resistance development through over reliance on a single herbicide mechanism-of-action (MOA) have been raised. The objective of this study was to evaluate the addition of the PSII-inhibiting herbicide Sencor to Dual Magnum (*S*-metolachlor), as found in the product Boundary, for postemergence and residual control of Italian ryegrass. Studies were conducted in 2010-11 near Stoneville, MS, on a naturally occurring population of Italian ryegrass. Soil type was a Dundee silt loam with a pH of 6.4 and 0.9% OM. Plots were treated on November 1, 2010, when plants were approximately 2 inches in height. Treatments were applied in 15 gal A^{-1} using XR11002VS flat fan nozzles at 36 PSI. All treatments included 1% v/v crop oil concentrate. Visual control ratings were taken at 14, 30, 60 and 120 days after treatment (DAT). Treatments were arranged as a factorial in a randomized complete block design with the first factor being Gramoxone Inteon at 0, 0.5 and 0.75 lb ai A^{-1} and the second factor being residual herbicides which included Dual Magnum at 1.31 lb ai A^{-1}, Sencor at 0.31 lb ai A^{-1} and Boundary at 1.63 lb ai A^{-1}. Trials were repeated in space. No differences were observed between Gramoxone Inteon rates as Italian ryegrass plants were very small at application and effectively controlled. Sencor and Dual Magnum applied alone provided 87 and 91% control of Italian ryegrass 30 DAT, respectively. The combination of these herbicides in Boundary improved residual control of Italian ryegrass to 97% at 30 DAT. A similar trend was observed out to 120 DAT with Sencor and Dual Magnum applied alone providing 88 and 92% control, respectively, while Italian ryegrass control with Boundary was significantly higher at 99%. These studies suggest the addition of a PSII inhibiting herbicide like Sencor to Dual Magnum as found in the product Boundary can improve residual control of Italian ryegrass compared to either product applied alone. This stands in support of the recommendation of many weed scientists encouraging the use of multiple herbicide MOA as a means of improving control and managing resistance development.

SEQUENTIAL HERBICIDE PROGRAMS FOR CONTROL OF GLYPHOSATE-RESISTANT ITALIAN RYEGRASS. **J.A. Bond*, T.W. Eubank, R.C. Bond; Mississippi State University, Stoneville, MS (226)**

ABSTRACT

Glyphosate-resistant (GR) Italian ryegrass (*Lolium perenne* ssp. *multiflorum*) was first documented in the United States in regon 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 13 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. The major conclusions of research from 2005 through 2008 were (1) postemergence (POST) options in the spring are extremely limited and require at least two herbicide applications to approach complete control and (2) residual herbicides applied in the fall offer the best opportunity for controlling GR Italian ryegrass. More recently, the research emphases have transitioned to focus on programs for managing GR Italian ryegrass with control tactics utilized in the fall and spring. Research was conducted in 2010-11 near the Mississippi State University Delta Research and Extension Center in Stoneville to develop GR Italian ryegrass management programs that integrate fall residual and spring POST herbicides. Treatments were arranged as a three-factor factorial in a randomized complete block design with four replications, and the study was repeated in space. 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 1, 2010. Factor B was winter application and included no winter treatment or clethodim (0.094 lb ai/A) applied February 4, 2011. Factor C was spring application and included no spring treatment or paraquat (1 lb ai/A) applied February 23, 2011. Data collected included visual estimates of GR Italian ryegrass control at different intervals following each application and GR Italian ryegrass density following fall applications. Data were subjected to ANOVA and estimates of the least square means were used for mean separation. *S*-metolachlor controlled GR Italian ryegrass 90% prior to winter application. However, control from tillage treatment was only 42% at the same evaluation. One-pass programs controlled GR Italian ryegrass ≤83% by late-March. Programs utilizing only winter and/or spring applications controlled GR Italian ryegrass ≤85% by late-March. Efficacy of one-pass POST programs was improved when these applications were preceded by fall tillage. Fall tillage followed by clethodim followed by paraquat controlled GR Italian ryegrass similar to programs containing *S*-metolachlor followed by one POST application. Following fall tillage, both clethodim and paraquat were required as POST treatments. Following *S*-metolachlor application, control of GR Italian ryegrass was optimized with a single POST treatment. GR Italian ryegrass control was reduced in programs that did not include a fall treatment. A minimum of two herbicide applications were required for >90% control of GR Italian ryegrass.

A SURVEY OF ARKANSAS' RYEGRASS POPULATIONS. **J.W. Dickson*[1], B. Scott[1], N.R. Burgos[2], R.A. Salas[2]; [1]University of Arkansas, Lonoke, AR, [2]University of Arkansas, Fayetteville, AR (227)**

ABSTRACT

In the spring of 2009, a comprehensive sampling of Italian ryegrass (*Lolium perenne* ssp. m*ultiflorum*) populations in Arkansas was begun. Ryegrass samples from field sites were collected from a maximum 40 ft^2 area at a given location. Field history and global positioning system (GPS) coordinates were recorded for most samples. A total of 202 samples from 21 counties in Arkansas have been obtained from various sources, including commercially available ryegrass sources. Some of the population sites were randomly sampled, while other sites were harvested following herbicide failures. All samples were grown in a greenhouse near Lonoke, AR and treated with Roundup WeatherMAX (glyphosate) at 22 oz/A, Hoelon (diclofop) at 43 oz/A plus crop oil concentrate at 1% v/v, Axial XL (pinoxaden) at 16.4 oz/A, and PowerFlex (pyroxsulam) at 3.5 oz/A plus crop oil concentrate at 1% v/v. All treatments were applied to 3- to 4-leaf ryegrass. Twenty-seven of the samples received were reported to have survived a glyphosate application in the field in the spring of 2009. These 27 samples were treated with Roundup WeatherMAX at 22 oz/A and 44 oz/A applied to 3- to 4-leaf and 3- to 4-tiller ryegrass. These samples were also treated with Hoelon, Axial, and PowerFlex as described above. Of these 202 samples, 45 are resistant to glyphosate, 192 are resistant to diclofop, 23 are resistant to pinoxaden, and 126 are resistant to pyroxsulam. Three population samples were resistant to all four herbicides tested.

GLUFOSINATE RATE AND TIMING FOR CONTROL OF GLYPHOSATE-RESISTANT JOHNSONGRASS (*SORGHUM HALEPENSE*) IN GLUFOSINATE-RESISTANT SOYBEAN (*GLYCINE MAX*). **R.L. Landry*, D. Stephenson; LSU AgCenter, Alexandria, LA (252)**

ABSTRACT

Johnsongrass has been called the world's worst weed. The use of glyphosate in glyphosate-resistant (GR) crops became an excellent tool for controlling johnsongrass. However, GR johnsongrass was documented in Louisiana in 2011. As a consequence, research was initiated to develop control programs for GR johnsongrass. Research was conducted at the LSU AgCenter Dean Lee Research and Extension Center near Alexandria, LA in 2011 to investigate glufosinate application rates and timings for control of GR johnsongrass in glufosinate-resistant soybean. The experimental design was a 3 x 2 x 2 factorial arranged in a randomized complete block with four replications. Factors consisted of glufosinate applied at 0.5, 0.6, and 0.7 kg ha^{-1} applied to 46 cm GR johnsongrass, sequential applications of glufosinate at 0.5 or 0.6 kg ha^{-1} applied 3 or 4 wk following the initial application. Data collected included visual johnsongrass control 7, 14, 21, and 28 d after treatment (DAT) and soybean yield. Analysis indicated no differences in glufosinate rate for either the initial application (46 cm johnsongrass) or the sequential applications. However, the main effect application timing was significant all at all rating dates. Johnsongrass control 7, 14, 21, 28 DAT and at soybean harvest was 10, 11, 24, 26, and 23% greater, respectively, following the sequential application 4 wk after the initial treatment as compared to the 3 wk sequential application. Soybean treated with 4 wk sequential applications of glufosinate yielded 540 kg ha^{-1} more than the 3 wk sequential application. Preliminary results indicate that sequential applications of glufosinate will control GR johnsongrass in glufosinate-resistant soybean, but the sequential application should be applied 4 wk following the initial application. Research will be repeated in 2012 to substantiate the observed results.

WEED MANAGEMENT WITH TEMBOTRIONE AND ISOXAFLUTOLE IN NORTH CAROLINA. **W.J. Everman*[1], M. Rosemond[2], J.D. Hinton[1], A.M. Knight[1]; [1]North Carolina State University, Raleigh, NC, [2]Bayer CropScience, Raleigh, NC (253)**

ABSTRACT

Palmer amaranth has become a driving force in weed management decisions in North Carolina due to widespread glyphosate and ALS-inhibitor resistance in the state. Growers are continually looking for options in primary crops as well as rotation options that allow for greater control. Recently tembotrione was introduced for weed management in corn in North Carolina; however, isoxaflutole currently is not labeled for use in North Carolina. Therefore, studies were initiated to investigate the effectiveness of tembotrione and isoxaflutole on various weeds and soils in North Carolina. Trials were conducted at the Central Crops Research Station near Clayton, NC, the Upper Coastal Plains Research Station near Rocky Mount, NC, and at the Tidewater Research Station near Plymouth, NC to provide a wide range of environmental conditions, weed species, and corn yield potential. Weed control varied by location with generally greater control eight weeks after planting on the sandier soils at Clayton and reduced control at the other locations. Large seeded broadleaf weeds such as morningglory species and large crabgrass had the lowest control ratings at eight to ten weeks after planting.

UTILITY OF PYROXASULFONE IN MID-SOUTH CORN AND SOYBEAN. **D. Stephenson*[1], D.K. Miller[2], J.A. Bond[3], R.L. Landry[1], M.S. Mathews[2]; [1]LSU AgCenter, Alexandria, LA, [2]LSU AgCenter, St. Joseph, LA, [3]Mississippi State University, Stoneville, MS (254)**

ABSTRACT

Research was conducted at the LSU AgCenter Dean Lee Research and Extension Center near Alexandria, LA, Northeast Research Station in St. Joseph, LA, and the Mississippi State University Delta Research and Extension Center in Stoneville, MS in 2010 to investigate crop safety and weed control with pyroxasulfone in two corn and two soybean experiments. The first corn experiment evaluated pyroxasulfone applied PRE (0.15 kg ha^{-1}) and/or POST (0.06 kg ha^{-1}) with or without atrazine (1.12 kg ha^{-1}). Glyphosate (0.86 kg ha^{-1}) was co-applied with all POST treatments. To evaluate pyroxasulfone co-applied with other PRE herbicides, a second corn experiment assessed pyroxasulfone (0.15 kg ha^{-1}) PRE, pyroxasulfone (0.12 kg ha^{-1}) plus saflufenacil (0.05 kg ha^{-1}) PRE, pyroxasulfone plus saflufenacil and dimethenamid-P (0.44 kg ha^{-1}) PRE, and pyroxasulfone (0.12 kg ha^{-1}) plus atrazine (1.7 kg ha^{-1}) and glyphosate (0.86 kg ha^{-1}) POST. The first soybean experiment evaluated soybean growth and yield where pyroxasulfone was applied PRE and POST to V3 soybean at 0.06, 0.12, 0.18, 0.24, and 0.3 kg ha^{-1}. Glyphosate (0.86 kg ha-1) was co-applied with pyroxasulfone POST treatments. The second soybean experiment evaluated pyroxasulfone (0.15 kg ha^{-1}) PRE followed by (fb) glyphosate (0.86 kg ha^{-1}) POST (V3 soybean), pyroxasulfone (0.12 kg ha^{-1}) plus saflufenacil (0.02 kg ha^{-1}) PRE fb glyphosate POST, pyroxasulfone (0.12 kg ha^{-1}) fb pyroxasulfone (0.06 kg ha^{-1}) plus glyphosate POST, and pyroxasulfone (0.15 kg ha^{-1}) fb pyroxasulfone (0.06 kg ha^{-1}) plus glyphosate POST to evaluate overall weed management. In the first corn experiment, no treatment injured corn. POST treatments containing pyroxasulfone provided 40-50% greater control of barnyardgrass and Palmer amaranth than atrazine plus glyphosate POST 28 d after the POST treatment. When pyroxasulfone, with or without atrazine, was applied PRE, the addition of a POST treatment did not increase barnyardgrass and Palmer amaranth control 28 d after the POST treatment. Pyroxasulfone plus atrazine and glyphosate POST provided similar control of Palmer amaranth (95%) to all other PRE fb POST treatments. All pyroxasulfone-containing treatments provided 80-99% control of browntop millet, hemp sesbania, sicklepod, and velvetleaf 28 d after the POST treatment. In the absence of a PRE treatment, corn treated with the co-application of pyroxasulfone, atrazine, and glyphosate provided similar yield to all other PRE fb POST treatments. In the second corn experiment, all treatments controlled barnyardgrass, Palmer amaranth, entireleaf morningglory, hemp sesbania, and sicklepod 96-99% 32 and 60 d after emergence. Corn yield was maximized following the co-application of pyroxasulfone, atrazine, and glyphosate POST. Soybean plant density, plant height, and soybean yield was not influenced by pyroxasulfone application timing or rate. Soybean injury following pyroxasulfone PRE ranged from 2-10% with injury increasing with rate 16 d after treatment. When applied POST, soybean injury was not influenced by rate with all treatments injuring soybean 19-23% 7 d after the POST treatment. However, no injury was observed 31 and 13 d after the PRE and POST treatments, respectively. In the second soybean experiment, all treatments controlled Palmer amaranth, redroot pigweed, entireleaf morningglory, hemp sesbania, and sicklepod 80-100% 28 d after the POST treatment and soybean yield was not affected by any treatment. Pyroxasulfone, either alone or in combination with atrazine and/or glyphosate, provided excellent control of numerous grass and broadleaf weeds. In soybean, pyroxasulfone was more injurious when applied POST, but injury was not observed 10-14 d after treatment. Similar to corn, numerous broadleaf weeds were controlled with all pyroxasulfone-containing treatments in soybean. Data indicates the utility of pyroxasulfone in a corn or soybean weed management program.

PYROXASULFONE FIT IN SOYBEAN AND CORN WEED CONTROL SYSTEMS. **J.A. Bullington*, K.L. Smith, J.R. Meier, R.C. Doherty; University of Arkansas, Monticello, AR (255)**

ABSTRACT

Pyroxasulfone is a new herbicide works by inhibiting the growth of germinating plants by absorbing into the roots and shoots of seedlings. Pyroxasulfone belongs to a new class of herbicides know as Isoxazolines. The mode of action of Pyroxasulfone is the inhibition of very long chain fatty acids (HRAC Group K3 / WSSA Group 15). Pyroxasulfone has a broad spectrum of weed control that includes many grasses and broad leaves; and also has extended residual control and flexibility to be applied as a fall burndown, spring burndown, a preplant, a pre-emergent (PRE), or early post-emergent (EPOST). Pyroxasulfone also provides an alternative to using ALS-, ACCace-, enolpyruvyl shikimate synthase-, or glutamine synthetase- inhibiting herbicides; making it a key component to herbicide resistance management. Corn and soybean trials were established at Rohwer, Arkansas on a Sharkey & Desha Silt Loam soil. A randomized complete block design with four replications was used in all trials. Applications were applied at 12 GPA with a CO_2 propelled sprayer. The first corn study compared pyroxasulfone at 3 rates in various tankmixes to atrazine and metolachlor tankmixes. Pyroxasulfone alone at all rates and in all combinations provided greater than 98% control of *Amaranthus Palmeri* (AMAPA) and greater than 95% control of *Echinochloa crus-galli* (ECHCG) at 55 days after application (DAA). At 140 DAA control of ECHCG had diminished , because no late season herbicides were applied, but AMAPA control remained above 83% in all treatments that contained at least 0.133 lb ai /A of pyroxasulfone. The second corn study compared 2 rates of pyroxasulfone + fluthiacet-methyl and various tankmixes or programs applied PRE and EPOST to several standard programs. Programs containing pyroxasulfone provided greater than 97% control of AMAPA and greater than 98% of ECHCG at 65 DAA. At 140 DAA all programs still controlled AMAPA above 87 % and ECHCG above 92%. No crop injury was observed in either of the corn trials. The first soybean trial compared pyroxasulfone applied PRE at 4 different rates to industry standard PRE treatments. The results of this trial showed 100% control of AMAPA and ECHCG and greater than 85% control of *Ipomoea spp.* (IPOSS) 120 DAA. A low level of crop injury was observed with 0.266 lb ai/A pyroxasulfone applied PRE, but had no effect on yield. The second soybean trial compared 2 rates of pyroxasulfone + fluthiacet-methyl in various tankmixes or programs applied PRE and EPOST to several industry standard programs. The results of this trial showed 100% control of AMAPA & ECHCG and greater than 92% control of IPOSS at 120 DAA with all treatments containing pyroxasulfone. A low level of crop injury was observed with 0.101 lb ai/A pyroxasulfone applied EPOST, but had no effect on yield. Pyroxasulfone is being registered in the US for use in corn (Zea mays), soybean (Glycine max), and wheat (Triticum aestivum) and in these studies has shown to be a valuable resource for resistant weed management by providing good control of Palmer amaranth and barnyardgrass. Based on current information, the herbicides containing pyroxasulfone will be available on a limited based in 2012 and on a full scale in 2013.

PYROXASULFONE AS A COMPONENT OF WEED MANAGEMENT PROGRAMS IN SOYBEAN AND CORN.

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ABSTRACT

Pyroxasulfone is a selective soil applied herbicide under development for residual control of grass and small seeded broadleaf weeds. Kumiai Chemical Industry Co., Ltd. and Ihara Chemical Industry Co., Ltd. have granted BASF the exclusive right to develop and commercialize solo herbicide products with pyroxasulfone for corn, soybeans, wheat and sunflower in the United States and Canada. A series of experiments were conducted in 2011 to evaluate the performance of pyroxasulfone as a component of weed control systems in corn and soybean. Pyroxasulfone was evaluated at a rate range of 119 – 179 g ai/ha and at various application timings including preplant, preemergence and early postemergence. Studies indicate that pyroxasulfone will provide an effective solution for many problematic weeds including *Setaria* spp. and glyphosate-resistant *Amaranthus* spp. Negligible corn and soybean injury has been observed from pyroxasulfone, regardless of application timing. Field trials indicate pyroxasulfone can provide a flexible weed management tool that consistently controls numerous grasses and small-seeded broadleaf weeds.

EVALUATION OF PYROXASULFONE IN CONVENTIONAL SOYBEAN FOR SEASON LONG WEED CONTROL.

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ABSTRACT

Glyphosate-resistant Palmer amaranth has become the most common and troublesome weed in multiple crops in the southeast US. Glyphosate is still used as a tool for other weeds however farmers have now become reliant on residual herbicides to maintain season long weed control. Pyroxasulfone could potentially be used to provide residual weed control of herbicide resistant weeds. However, there has been little information about pyroxasulfone for control of glyphosate resistant Palmer amaranth and other weeds in the southeast US. Experiments were conducted in 2010 and 2011, in fields infested with multiple weeds including glyphosate/ALS-resistant Palmer amaranth, to compare pyroxasulfone, *S*-metolachlor, flumioxazin, metribuzin, fomesafen, and glyphosate. Soybean (Asgrow DP7870 RR in 2010, Asgrow AG6931 in 2011) were conventionally planted and evaluated for injury, stand density, and yields. Weed control was based on evaluation of glyphosate/ALS-resistant Palmer amaranth, sicklepod, Florida beggarweed, smallflower morningglory, and wild poinsettia. There were no effects on soybean emergence for any PRE herbicide treatment. There was no significant soybean injury with pyroxasulfone at rates of 60 to 180 g ai/ha for PRE or POST application. For season long residual control of glyphosate/ALS-resistant Palmer amaranth, pyroxasulfone at 90 g ai/ha and greater were required for 87% and greater control. Pyroxasulfone plus flumioxazin at 90 and 71 g ai/ha PRE respectively, provided season long Palmer amaranth at 99%. Pyroxasulfone also controlled Florida beggarweed and smallflower moningglory. A combination of PRE and POST herbicide applications (glyphosate or fomesafen) were required for sicklepod and wild poinsettia control. Maximum yields required the combination of residual PRE and contact and residual POST herbicide applications. Successful soybean production in the southeast US will require crop rotation and use of multiple herbicide modes of action in order to minimize herbicide resistance.

EVALUATION OF DICAMBA-BASED HERBICIDE PROGRAMS IN DICAMBA-TOLERANT COTTON.

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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 ascertain effectiveness of dicamba-based herbicide programs for control of Palmer amaranth and other important broadleaf weeds and crop response of dicamba tolerant cotton. Field experiments were conducted at the Clemson University Edisto Research and Education Center located near Blackville, SC in 2011. 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 May 24, 2011 using a 4-row Almaco cone planter with a final seed spacing of 3 seed per row ft. Reflex (fomesafen) at 1.0 pt/A, Clarity (dicamba) at 1.0 pt/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 Clarity at 1.0 pt/A, Glyphosate at 22 oz/A, Ignite (glufosinate) at 29 oz/A, and Warrant (acetochlor) at 3.0 pt/A were applied postemergence (POST) [corresponds to 3 to 4 inch weed size at each application timing] with the same application parameters discussed above. Palmer amaranth and pitted morningglory percent visual control and percent visual cotton injury were measured 19 days after early-post (EP) and 35 days after the late-post (LP) applications. Cotton injury and weed control data were analyzed using ANOVA and means separated at the P=0.05 level. Reflex, Clarity, and Clarity + Reflex PRE provided excellent control of Palmer amaranth. Similarly, Glyphosate + Clarity, Ignite + Warrant, Glyphosate + Clarity + Warrant, and Ignite + Clarity EP provided 93 to 100% control of Palmer amaranth and pitted morningglory, regardless of the PRE program. In the no PRE treatments, Glyphosate + Clarity + Warrant EP provided 94% Palmer amaranth control compared to greater than 98% with Glyphosate + Clarity, Ignite + Warrant, and Ignite + Clarity EP. Pitted morningglory control was greater than 94% in the no PRE across all treatments. At the 35 days after LP application evaluation, all treatments provided 100% control of Palmer amaranth and pitted morningglory. In conclusion, Dicamba and Ignite-based PRE and EP herbicide programs provided good to excellent control of small Palmer amaranth and pitted morningglory. No significant cotton yield or in-season injury differences were observed. Dicamba and Ignite-based herbicide programs alone and in combination provided an effective alternative for small (3 to 5 inch) glyphosate- and ALS-resistant Palmer amaranth and other important broadleaf weeds in cotton. Future work includes testing Dicamba and Ignite-combinations on larger Palmer amaranth and other broadleaf weeds including sicklepod and small-flower morningglory.

THE EFFECT OF DRIFT RATES OF DICAMBA ON SPECTRAL REFLECTANCE, GROWTH, AND YIELD OF COTTON. **C.L. Smith*[1], J.T. Irby[1], D.B. Reynolds[1], L.M. Bruce[1], J.L. Willers[2]; [1]Mississippi State University, Mississippi State, MS, [2]USDA, Mississippi State, MS (259)**

ABSTRACT

Recent advancements in herbicide-resistant traits are trending toward crops resistant to growth-regulator herbicides such as 2,4-D and dicamba. Non-transgenic cotton is susceptible to dicamba drift that can occur from surrounding fields. The goal of this study was to evaluate simulated drift from dicamba on cotton by examining the resulting injury, aerial spectral imagery and resultant yield. Studies were conducted in 2010 and 2011 near both Starkville, MS and Brooksville, MS. The factorial experimental design had a main factor of application timing and a sub-factor of dicamba rate. The application timing was either made on "younger cotton" ranging from 4 to 10 nodes maturity or "older cotton" ranging from 10 to 16 nodes in maturity. For both application timings a 1X rate of dicamba (1.12 kg ai/ha) was made, as well as treatments including fractions of that rate. Treatments included a 1/4X rate (0.28 kg ai/ha), a 1/16X rate (0.07 kg ai/ha), a 1/64X rate (0.0175 kg ai/ha) and a 1/256X rate (0.004375 kg ai/ha). Data were subjected to ANOVA, separated by Fishers Protected LSD at α=0.05 and were pooled across timings and locations when possible. Simulated drift was easier to discern using NIR (near infrared) imagery compared to standard color imagery. Injury at either application timing was easier to identify with higher rates of dicamba; however, these data need additional spatial statistics to help isolate differences. Visual injury occurring on young cotton during the 1st week after application (WAA) was not different from injury on mature cotton during the 1st WAA. The 1X rate of dicamba caused less than 50% injury while the 1/256X rate indicated only 6% injury 1 WAA. Visual injury 3 WAA was more pronounced and severe on younger cotton due to the actively growing vegetation. However on more mature cotton, there was no statistical difference between injury from 1/256X, 1/64X, and 1/16X rates on 10-16 node cotton, with all three rates resulting in less than 30% injury. Seed cotton yield indicated a stair-step pattern as higher rates resulted in greater yield reductions when compared to the untreated controls. While visual injury was more evident on younger cotton, yield reductions were greater on mature cotton. The five site-years averaged 2230 kg/ha of seed cotton. Applications to the younger cotton resulted in yield reductions of 77, 54, 26, 28, and 19% for the 1X, 1/4X, 1/16X, 1/64X, and 1/256 X rates, respectively. Applications to the more mature cotton resulted in yield reductions of 95, 85, 62, 30, and 12% for the 1X, 1/4X, 1/16X, 1/64X, and 1/256 X rates, respectively. This study indicates significant yield loss can occur from dicamba regardless of growth stage. Significant yield loss was observed even when minimal visual or NIR symptomology was noted. These new weed control programs and technologies will require careful precautions, awareness and control to prevent damage and yield loss to susceptible crops.

EVALUATION OF WARRANT AS A COMPONENT IN A COTTON WEED CONTROL PROGRAM.

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ABSTRACT

With the adoption of glyphosate tolerant cropping systems, the usage of residual herbicides as part of a weed control program has declined. This has been a contributing factor to the development of resistance to glyphosate in many weed species. In an effort to manage existing resistant populations and sustain glyphosate tolerant cropping systems, herbicide programs that utilize multiple modes of action are being evaluated. In this type of herbicide program, residual herbicides that can be applied following crop emergence could be beneficial by adding an additional mode of action with residual performance to the postemergence (POST) weed control program. Warrant herbicide is an encapsulated form of acetochlor labeled for POST use in cotton and soybeans. However, limited data are available regarding the crop response to POST applications of this herbicide. Therefore, additional research is needed to evaluate the level of weed control obtained as well as crop safety from POST applications of Warrant. Experiments were conducted in 2011 at the Plant Science Research Center near Starkville, MS to evaluate crop safety and weed control performance of Warrant herbicide in a glyphosate tolerant cotton system. Treatments included Warrant at 204 g ai ha^{-1} applied early preemergence (EPRE), Warrant at 409 g ai ha^{-1} EPRE, Warrant at 409 g ai ha^{-1} + Reflex at 66 g ai ha^{-1} EPRE, Warrant at 204 g ai ha^{-1} EPRE followed by (fb) Warrant at 204 g ai ha^{-1}, Warrant at 204 g ai ha^{-1} EPRE fb Warrant at 204 g ai ha^{-1} fb Warrant at 204 g ai ha^{-1} POST, Dual Magnum (S-metolachlor) at 227 g ai ha^{-1} preemergence (PRE), Dual Magnum at 454 g ai ha^{-1} PRE, Warrant at 204 g ai ha^{-1} and Warrant at 408 g ai ha^{-1} + Cotoran (fluometuron) at 182 g ai ha^{-1} PRE. All treatments were applied in conjunction with glyphosate at 136 g ai ha^{-1}. All applications were made using a tractor mounted boom, propelled by compressed air at an application volume of 140 liters per hectare. Visual injury and weed control ratings were recorded 12, 16, and 30 days after (DA) PRE as well as 7, 14, 28 and 42 DA POST application timings. Rated weed species included barnyardgrass, tall waterhemp, and broadleaf signalgrass. Visual crop injury was not observed for any treatment. Warrant EPRE fb Warrant PRE fb Warrant POST and Warrant + Cotoran PRE had greater than 89% control of barnyardgrass, tall waterhemp and broadleaf signalgrass. Warrant + Reflex applied EPRE improved barnyardgrass control compared to Warrant applied EPRE alone at either rate. No benefit was observed for increasing the rate of Warrant from 204 g ai ha^{-1} to 408 g ai ha^{-1}, regardless of application timing. Excellent control of broadleaf signalgrass was observed for all treatments. No difference in seed cotton yield was observed. These data show that the use of Warrant has a potential fit in a glyphosate tolerant cotton weed control program.

EVALUATION OF CROP SAFETY AND WEED CONTROL PROGRAMS IN DICAMBA-TOLERANT COTTON.

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ABSTRACT

The development and spread of glyphosate-resistant Palmer amaranth and other weed species has forced growers and private industry alike to seek out alternative weed control methods. One alternative that holds promise in the future is dicamba tolerant crops. The gene that provides tolerance to dicamba in broadleaf agronomic crops was discovered by researchers at the University of Nebraska. These researchers isolated a soil bacteria located at a dicamba manufacturing plant that detoxifies dicamba. This gene is known as the dicamba monooxygenase (DMO) gene and has imparted tolerance to dicamba of up to 5 lb ai/ac in soybeans and up to 25 lbs ai/acre in tobacco (Behrens et. al.2007). Dicamba/glufosinate/glyphosate tolerant cotton is scheduled to be released in approximately 2016. Previous research evaluating efficacy of dicamba on Palmer amaranth is lacking. Data regarding dicamba/glufosinate/glyphosate tolerant cotton tolerance to POST applications of dicamba, glufosinate, glyphosate, and tank-mix combinations thereof is also lacking. Therefore, this research was conducted to evaluate cotton tolerance and glyphosate-resistant Palmer amaranth control following application of dicamba, glufosinate, and glyphosate alone and tank-mixed. Experiments were conducted in Robinsonville, MS; Marianna, AR; Macon County, GA; Mount Olive, NC; and Lake County, TN in 2011. Glyphosate-resistant Palmer amaranth was present at all locations. All plots were planted between May 20 and June 16, 2011. Plots were two or four rows wide and 20 – 30 feet in length with treatments replicated three or four times. All herbicide applications were made with a tractor-mounted compressed-air sprayer or a CO_2-powered backpack sprayer. Treatments are as follows: (1) glyphosate EPOST followed by (fb) glyphosate Mid-POST; (2) glufosinate EPOST fb glufosinate Mid-POST; (3) glufosinate + dicamba EPOST fb glufosinate Mid-POST; (4) glyphosate + dicamba EPOST fb glufosinate Mid-Post; (5) dicamba PRE fb glufosinate EPOST fb glufosinate Mid-POST; (6) dicamba PRE fb glyphosate + dicamba EPOST fb glufosinate Mid-POST; (7) dicamba PRE fb dicamba EPOST fb glufosinate Mid-Post; (8) dicamba PRE fb glufosinate + dicamba EPOST fb glufosinate + dicamba Mid-POST; (9) dicamba PRE fb glufosinate EPOST fb glyphosate + dicamba Mid-POST; (10) dicamba PRE fb glufosinate + dicamba EPOST fb glyphosate + dicamba Mid-POST; (11) dicamba PRE fb glyphosate + dicamba EPOST fb glyphosate + dicamba Mid-POST; (12) dicamba PRE fb glufosinate Delayed- EPOST; (13) dicamba PRE fb glufosinate + dicamba Delayed- EPOST; (14) dicamba PRE fb glyphosate + dicamba Delayed- EPOST. All treatments received diuron (1 lb ai/ac) + MSMA (2 lb ai/ac) at LAYBY. The following rates were used in all treatments: dicamba – 0.5 lb ai/ac; glufosinate - 0.53 lb ai/ac; and glyphosate – 0.75 lb ae/ac. Target Palmer amaranth heights at each application are as follows: EPOST: 2 – 4 inches in height; delayed EPOST: 6 – 9 inches in height; Mid-Post: 10 – 18 inches; LAYBY: 30 – 60 inches. Visual estimates of crop injury and weed control were collected three times during the growing season. The first visual estimates were collected when the delayed EPOST applications were made. Elapsed time between the EPOST and delayed EPOST applications varied with location ranged and from 2 – 17 days. Visual estimates of crop injury and weed control efficacy were also made when the Mid-POST applications were made. Elapsed time between Mid-Post applications and EPOST and delayed EPOST applications varied depending on location and ranged from 17 – 30 days and 9 – 17 days, respectively. Final estimates of crop injury and weed control efficacy were collected 10 days after LAYBY application. Data were subjected to analysis of variance using the PROC Mixed procedure in SAS 9.2. Means were separated using Fisher's Protected LSD at $p = 0.05$. Cotton injury following the EPOST treatment (data collected when delayed EPOST application made) was less than 5% for all treatments. Application of glufosinate EPOST with or without dicamba PRE resulted in less than 1.5% visual injury on cotton. Cotton injury following application of glufosinate + dicamba applied EPOST with or without dicamba PRE ranged from 3.5 – 4%. Control of glyphosate-resistant Palmer amaranth from EPOST applications was less than 55% with glyphosate alone. Dicamba alone EPOST provided 86% control of glyphosate-resistant Palmer amaranth. Application of glufosinate, glufosinate + dicamba, and glyphosate + dicamba EPOST following application of dicamba PRE provided 89 – 93% control of glyphosate-resistant Palmer amaranth. Cotton injury at the time Mid-POST applications were made was less than 2.5% for all treatments. Control of glyphosate-resistant Palmer amaranth with glufosinate + dicamba or glyphosate + dicamba applied EPOST or delayed EPOST ranged from 86 – 91% at the Mid-POST application timing. Application of dicamba or glufosinate EPOST provided 77 – 79% control of glyphosate-resistant Palmer amaranth at the time Mid-POST applications were made. Two weeks after LAYBY

application cotton injury was greatest (~11%) with the following treatments: dicamba PRE fb dicamba EPOST fb glufosinate Mid-Post or dicamba PRE fb glufosinate EPOST fb glyphosate + dicamba Mid-POST. Less than 1% cotton injury was observed two weeks after LAYBY with the following treatments:) dicamba PRE fb glufosinate Delayed- EPOST; dicamba PRE fb glufosinate + dicamba Delayed- EPOST; dicamba PRE fb glyphosate + dicamba Delayed- EPOST; and glyphosate EPOST fb glyphosate Mid-POST. Glyphosate-resistant Palmer amaranth control greater than 97% was observed two weeks after LAYBY application with the following treatments: glufosinate + dicamba EPOST fb glufosinate Mid-POST; glyphosate + dicamba EPOST fb glufosinate Mid-Post; dicamba PRE fb glufosinate EPOST fb glufosinate Mid-POST; dicamba PRE fb glyphosate + dicamba EPOST fb glufosinate Mid-POST; dicamba PRE fb glufosinate + dicamba EPOST fb glufosinate + dicamba Mid-POST; dicamba PRE fb glufosinate EPOST fb glyphosate + dicamba Mid-POST; dicamba PRE fb glufosinate + dicamba EPOST fb glyphosate + dicamba Mid-POST; dicamba PRE fb glyphosate + dicamba EPOST fb glyphosate + dicamba Mid-POST. Seed cotton yields were maximized at 1169 – 1735 lbs/ac following application of : dicamba PRE fb glufosinate EPOST fb glufosinate Mid-POST; dicamba PRE fb glufosinate EPOST fb glyphosate + dicamba Mid-POST; dicamba PRE fb glufosinate + dicamba EPOST fb glufosinate + dicamba Mid-POST. In conclusion, dicamba/glufosinate/glyphosate tolerant cotton demonstrated excellent tolerance to dicamba, glufosinate, and glyphosate alone and tank-mixed. Season-long control (>90%) of glyphosate-resistant Palmer amaranth required application of glufosinate, dicamba, or tank-mixes thereof in a timely manner (less than 6 – 8" in height). Although excellent control of glyphosate-resistant Palmer amaranth has been demonstrated with dicamba and glufosinate tank-mixes, residual herbicides will continue to be an integral part of a total weed management program.

Reference

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RICE CROP RESPONSE FROM PERMIT PLUS AND MALATHION MIXTURE. **E.P. Webster*[1], J.C. Fish[2], N.D. Fickett[1], E.L. Thevis[2]; [1]LSU AgCenter, Baton Rouge, LA, [2]Louisiana State University, Baton Rouge, LA (263)**

ABSTRACT

A study was established to evaluate the interaction of halosulfuron plus thifensulfuron-methyl, sold under the trade name Permit Plus, or halosulfuron, sold under the trade name Permit, when applied 24 hours after a malathion application to rice in the late boot growth stage. The study was conducted on a producer location near Lake Charles, Louisiana planted with Clearfield medium grain 'CL 261' rice. Halosulfuron has been used for several years as a salvage treatment in rice production to manage late emerging yellow nutsedge (*Cyperus esculentus* L.), rice flatsedge (*Cyperus iria* L.), hemp sesbania [*Sesbania herbacea* (P.Mill.) McVaugh], and Indian jointvetch (*Aeschynomene indica* L.). Halosulfuron applied as a salvage treatment may not control the target weeds, but the herbicide has been successful at reducing seed production. The study was established as a strip trial on a producer location near Lake Charles, Louisiana planted with Clearfield medium grain 'CL 261' rice. Each strip was approximately 180 m long by 3 m wide; individual strips were separate treatments. Each strip was equally divided into four sections to be treated as replications. Treatments were entered as a factorial. Factor A consisted of malathion at 1.12 kg ai/ha and no malathion. Factor B consisted of halosulfuron at 53 and 105 g ai/ha, halosulfuron plus thifensulfuron at 39 and 78 g ai/ha, and no halosulfuron or halosulfuron plus thifensulfuron. The initial application, factor A, of malathion was applied to rice in the late boot stage on July 18, 2011 and the halosulfuron plus thifensulfuron and halosulfuron were applied 24 hours later, on July 19, 2011. Panicle emergence was evaluated at 14 and 28 days after treatment (DAT). Height from the soil surface to the tip of the extended panicle at 21 DAT and at physiological maturity, rough rice yield, and harvest moisture was determined. Yield was adjusted to 12% moisture. At 14 DAT, panicle emergence was 60% with the nontreated rice. Panicle emergence was 40 to 50% with halosulfuron and halosulfuron plus thifensulfuron regardless of rate evaluated; however, following a malathion application panicle emergence was reduced to approximately 30% when rice was treated with halosulfuron and 10% with halosulfuron plus thifensulfuron. At physiological maturity rice treated with halosulfuron with or without malathion, halosulfuron plus thifensulfuron with no malathion, and the nontreated, had panicle emergence of 98 to 100% compared with 62 and 63% panicle emergence with rice treated with halosulfuron plus thifensulfuron at 39 and 78 g/ha following a malathion application. The nontreated rice had a yield of 6920 kg/ha with a harvest moisture of 17.8%. All rice treated with halosulfuron with or without malathion, or halosulfuron plus thifensulfuron without malathion, had harvest moistures of 17.2 to 17.5% and yields similar to the nontreated rice. However, halosulfuron plus thifensulfuron at 39 to 78 g/ha following malathion had harvest moisture of 18.9 and 19%, respectively, and reduced rice yield compared with the nontreated. This research indicates caution should be taken when applying halosulfuron plus thifensulfuron as a salvage treatment, and halosulfuron plus thifensulfuron in combination with a malathion application should be avoided.

POSTEMERGENCE CONTROL OF INDIAN JOINTVETCH AND HEMP SESBANIA IN RICE.

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ABSTRACT

Three studies were established in 2011 to evaluate several herbicides with postemergence activity for controlling Indian jointvetch (*Aeschynomene indica* L.) and hemp sesbania [*Sesbania herbacea* (P.Mill.) McVaugh] at the Louisiana State University Agricultural Center Rice Research Station near Crowley, Louisiana. Each study evaluated a single timing: early-postemergence (EPOST), mid-postemergence (MPOST), or late-postemergence (LPOST). The experimental design for all three studies was a randomized complete block with four replications. Clomazone at 0.34 kg ai/ha was applied preemergence to all treatments including the nontreated to control grasses. The treatments were: propanil at 3.4 kg ai/ha, halosulfuron at 39 g ai/ha, halosulfuron plus thifensulfuron at 44 g ai/ha, bensulfuron at 42 g ai/ha, orthosulfamuron at 70 g ai/ha, penoxsulam at 35 g ai/ha, quinclorac at 0.45 kg ai/ha, triclopyr at 0.28 kg ai/ha, carfentrazone at 18 g ai/ha, bispyribac at 28 g ai/ha, imazosulfuron at 0.16 kg ai/ha, saflufenacil at 50 g ai/ha, and quinclorac plus carfentrazone at 0.44 kg ai/ha. A crop oil concentrate was added to all herbicides except propanil and carfentrazone, at 1% v/v. A nontreated was added for comparison. Visual ratings were evaluated at 21 and 63 days after treatment (DAT) for the EPOST and the LPOST studies, and at 28 and 56 DAT for the MPOST study. Data were analyzed using an analysis of variances, which was followed by Tukey's test at α=0.05 to determine mean differences. EPOST study. At application, Indian jointvetch was 1- to 8-cm tall, in the cotyledon to four-leaf stage, and had a population of 25 to 30/m^2. The EPOST study had low populations of hemp sesbania and no data was collected. At 21 DAT, Indian jointvetch control was 90 to 98% with bispyribac, halosulfuron, halosulfuron plus thifensulfuron, orthosulfamuron, penoxsulam, imazosulfuron, saflufenacil, and quinclorac plus carfentrazone. All other herbicides evaluated controlled Indian jointvetch less than 90%. Similar results were observed at 63 DAT. Little to no herbicide injury occurred and no differences were observed for rice plant height. Rice yield was 9790 kg/ha from rice treated with halosulfuron plus thifensulfuron. Rice treated with all other herbicides except halosulfuron, propanil, and bispyribac had reduced yield. MPOST study. At application, Indian jointvetch and hemp sesbania were 8- to 13-cm tall with four- to six-leaves, and a population of five- to seven/m^2. At 28 DAT, all herbicides controlled hemp sesbania 90 to 98%, except carfentrazone with less than 50% control. This lack of control was due to lack of coverage on hemp sesbania. At 56 DAT, hemp sesbania control dropped below 90% when treated with propanil and triclopyr. Indian jointvetch control was 92 to 98% at both evaluation dates when treated with all herbicides, except propanil (78 and 83%), bensulfuron (40 and 50%), and carfentrazone (0%). Little to no injury or height differences was observed during the duration of the study. Rice treated with halosulfuron plus thifensulfuron yielded 9350 kg/ha. Rice treated with bensulfuron, quinclorac, saflufenacil, and the nontreated had reduced yield. The nontreated rice had a yield of 7490 kg/ha indicating low weed pressure and lack of weed competition in the study. LPOST study. At application, Indian jointvetch and hemp sesbania were 10- to 13-cm with five- to seven-leaf, and populations from three- to seven/m^2. At 21 DAT, all herbicides evaluated controlled hemp sesbania 94 to 98%, except bensulfuron (45%), carfentrazone (13%) and imazosulfuron (89%). At 63 DAT, the only herbicides that controlled hemp sesbania less than 90% were bensulfuron (35%), penoxsulam (83%), triclopyr (84%) and carfentrazone (0%). The reduced control from penoxsulam and triclopyr at the late rating was due to regrowth. Similar to the EPOST and MPOST studies propanil, bensulfuron and carfentrazone failed to control Indian jointvetch above 80%. Yellow nutsedge (*Cyperus esculentus* L.) infested the LPOST study, and the only herbicides that controlled yellow nutsedge above 90% for both evaluations were halosulfuron plus thifensulfuron (98 and 92%) and imazosulfuron (92 and 95%). Little to no injury occurred during the duration of the study. Some height differences occurred due to season long hemp sesbania, Indian jointvetch, and yellow nutsedge competition. Rice treated with halosulfuron plus thifensulfuron yielded 9400 kg/ha, and no yield difference occurred in rice treated with orthosulfamuron, bispyribac, imazosulfuron, and quinclorac plus carfentrazone. This research indicates several herbicides can be used to control hemp sesbania and Indian jointvetch. However, it is apparent based on control, injury, and yield that halosulfuron plus thifensulfuron was the most consistent herbicide in the three studies.

RICE RESPONSE TO FALL-APPLIED RESIDUAL HERBICIDES. **S.A. Shinkle*, J.A. Bond, T.W. Eubank; Mississippi State University, Stoneville, MS (265)**

ABSTRACT

Glyphosate-resistant (GR) Italian ryegrass (*Lolium perenne* ssp. *multiflorium*) was first documented in field crops in Washington County, Mississippi, in 2005. Thirteen 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. Research at the Delta Research and Extension Center in Stoneville, MS, has demonstrated that residual herbicides applied in the fall offer the best opportunity for controlling GR Italian ryegrass. Clomazone (Command), pyroxasulfone (Zidua), *S*-metolachlor (Dual Magnum), and trifluralin (Treflan) applied in the fall are the most effective fall residual herbicides for GR Italian ryegrass control. Problematically, pyroxasulfone, *S*-metolachlor, and trifluralin are not labeled for fall application prior to planting rice. Therefore, research was initiated at Stoneville, MS, in 2010-11 to determine the rice response to residual herbicides applied in the fall prior to planting. The study was designed as a randomized complete block with four replications and was repeated in space. Residual herbicides were applied at one-half, one, and two times (0.5-, 1-, and 2-X) the recommended rates for control of GR Italian ryegrass in Mississippi. Clomazone (0.42, 0.84, and 1.68 kg ai/ha), pyroxasulfone (0.082, 0.16, and 0.33 kg ai/ha), *S*-metolachlor (0.72, 1.42, and 2.83 kg ai/ha), and trifluralin (0.84, 1.68, and 3.36 kg ai/ha) were surface-applied in early November, 2010. Trifluralin treatments were incorporated with two passes in opposite directions with a tandem disk. A control that received no fall residual herbicide treatment was included for comparison. Plots were left undisturbed until rice was planted on May 16, 2011. Rice was managed throughout the growing season to optimize yield. Visual estimates of rice injury were recorded 7, 14, 21, and 28 days after rice emergence (DAE). Rice seedling density was determined at 14 DAE, and rice height was recorded at weekly intervals from emergence until flooding. The number of days to 50% heading was recorded as an indication of rice maturity. Plots were harvested and rice grain yields were adjusted to 12% moisture content. All data were subjected to ANOVA and means were separated using Duncan's multiple range test. All rates of pyroxasulfone, *S*-metolachlor, and trifluralin reduced rice seedling density compared with the control. Pyroxasulfone, *S*-metolachlor, and trifluralin applied at 1-X rates reduced rice seedling density 19 to 24%. Rice injury was visible 14 DAE for all herbicides and rates except clomazone. Pyroxasulfone injured rice more than other herbicides regardless of rate. Pyroxasulfone and *S*-metolachlor applied at 2-X rates reduced rice height 21 DAE compared with the control. All treatments except 0.5-X rate of *S*-metolachlor delayed maturity compared with the control. Pyroxasulfone and *S*-metolachlor applied at 2-X rates delayed maturity 5 days. Yields were not affected by clomazone or trifluralin. However, yields following other fall residual herbicide treatments varied across experiments. *S*-metolachlor applied at a 2-X rate reduced yield in one of two experiments while the 2-X rate of pyroxasulfone reduced yield in both experiments. The rice response to fall residual herbicide treatments was variable. Pyroxasulfone, *S*-metolachlor, and trifluralin applied at 1-X rates negatively influenced rice growth and development, but yield was not affected. Yield differences between the two experiments demonstrate the need for further evaluation of fall herbicide treatments in rice. Only clomazone should be utilized as a fall residual herbicide treatment targeting GR Italian ryegrass prior to planting rice.

EVALUATION OF DICAMBA IN SOYBEAN WEED CONTROL PROGRAMS. **M. Bauerle*, J.L. Griffin, J. Hardwick; LSU AgCenter, Baton Rouge, LA (266)**

ABSTRACT

Two studies were conducted in 2011 to evaluate weed control with Clarity applied PRE at 16 and 32 oz/A and Clarity applied POST at 16 oz/A. In the first study, dicamba-tolerant soybeans (DTS) were planted June 13. At 22 days after preemergence application (DAPRE), Clarity at 16 oz/A provided an average of 72% control of barnyardgrass, 28% control of hemp sesbania, 55% control of pigweed, and 57% control of prickly sida. When Clarity was applied at 32 oz/A, average control was 87% for barnyardgrass, 59% for hemp sesbania, and 79% for pigweed and prickly sida. In contrast, Valor at 2 oz/A provided an average of 92% barnyardgrass control, 33% hemp sesbania control, and 100% pigweed and prickly sida control. Prefix at 1.5 pt/A controlled barnyardgrass 96%, hemp sesbania 11%, pigweed 93%, and prickly sida 68%. Soybean injury was not observed for any of the herbicide treatments. Postemergence treatments were applied July 5 and included Clarity plus Roundup WeatherMax at 22 oz/A and Clarity plus Roundup plus Warrant at 3 pt/A, each following Clarity PRE; Roundup at 44 oz/A following Valor; Roundup plus Classic at 0.33 oz/A and Roundup plus Flexstar at 1.25 pt/A plus Warrant following Valor PRE; and Roundup following Prefix. Eight days after POST treatments were applied barnyardgrass was controlled 99 to 100%, pigweed was controlled 100%, and prickly sida was controlled 98 to 100%. For hemp sesbania, Roundup following Prefix provided significantly less control than all other treatments (60 vs. at least 89%). Soybean injury was 12% for Roundup plus Flexstar plus Warrant following Valor, but injury was no more than 6% for the other treatments. The second study was conducted in a non-crop area. On June 14, Clarity was applied preemergence at 16 and 32 oz/A along with the standard herbicide treatments of Valor SX at 2 oz/A, Valor XLT at 3 oz/A, Prefix at 2 pt/A, Dual Magnum at 1 pt/A, Warrant at 3 pt/A, Warrant 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 2.26 oz/A, and Canopy DF at 6 oz/A. For comparison, Clarity at 32 oz/A was applied with each of the standard herbicides. At 21 DAPRE, Clarity at 16 oz/A provided 92% control of barnyardgrass and around 40% control of hemp sesbania, pigweed, and prickly sida. Clarity at 32 oz/A provided 97% control of barnyardgrass, 73% control of hemp sesbania, and 85% control of pigweed and prickly sida. For barnyardgrass, the standard herbicides provided 95 to 100% control, and the addition of Clarity did not improve control. Hemp sesbania control 21 DAPRE with the standard herbicides ranged from 15 to 95% and control was improved when Clarity was applied with Prefix (33 to 76%), Dual Magnum (50 to 90%), Warrant (23 to 85%), Authority MTZ (43 to 92%), Zidua (15 to 72%), and Canopy DF (52 to 91%). For pigweed the standard herbicides provided 93 to 100% control 21 DAPRE, and the addition of Clarity did not improve control. For prickly sida, the standard herbicides provided 82 to 100% control, and addition of Clarity did not improve control. At 52 DAPRE, barnyardgrass control with the standard herbicides ranged from 63 to 94%. Control was improved when Clarity was applied with Valor XLT (63 to 92%) and Canopy DF (72 to 83%). For hemp sesbania 52 DAPRE, control with the standard herbicides ranged from 15 to 77%, and control was improved when Clarity was applied with Warrant (17 to 53%) and Zidua (15 to 58%). For pigweed, the standard herbicides provided 82 to 98% control 52 DAPRE, and the addition of Clarity did not improve control. When Clarity was applied PRE at 16 oz/A in the two studies, weed control 21 and 22 DAPRE averaged around 80% for barnyardgrass, 35% for hemp sesbania, and 50% for pigweed and prickly sida. Increasing the Clarity rate to 32 oz/A improved weed control to around 90% for barnyardgrass, 60% for hemp sesbania, and 80% for pigweed and prickly sida. The addition of Clarity improved weed control with several of the standard soil applied herbicides. Roundup plus Clarity POST provided broad spectrum weed control. Dicamba-tolerant soybeans exhibited excellent tolerance to Clarity applied at 32 oz/A PRE followed by 16 oz/A POST.

FUNGICIDE PROGRAMS AND HARVEST AID INTERACTIONS IN SOYBEANS. **J. Hardwick*, J.L. Griffin, M. Bauerle, J. Boudreaux, B. Padgett; LSU AgCenter, Baton Rouge, LA (267)**

ABSTRACT

Traditionally harvest aids have been used to desiccate weeds and improve crop quality and harvest efficiency. In recent years, harvest aids have become especially important to production of early-maturing soybean in Louisiana where delay in harvest attributed to green soybean stems and pods and leaf retention has been linked to insect and disease problems. A study was conducted over two years at the Ben Hur Research Station in Baton Rouge to determine the value of harvest aid when used in conjunction with an application of Headline plus Topsin M at R3 or no fungicide. Orthene plus Baythroid was applied twice to keep insects below threshold and to remove stinkbug as a factor in the study. Superimposed on the fungicide treatments was the harvest aid Gramoxone Inteon (paraquat) applied at 16 oz/A at R7 or no harvest aid. On the day of harvest, soybean plants in each plot were visually rated for leaf retention and incidence of green stems and green pods. Using combine-run soybean yield (not adjusted for moisture), gross return for yield was calculated assuming a price of $10.00 per bushel. Soybean seed samples collected from each plot were graded by personnel at Bunge Corporation. Using the "Soybean Discount Schedule" seed quality loss (deductions for moisture, foreign material, and seed damage) was determined. Gross return for yield minus deductions equaled net return. The increase in net return due to harvest aid application was calculated. When red banded stinkbugs were removed as a factor in the study, fungicide application significantly increased soybean leaf retention and numerically increased green stems and green pods. Fungicide application significantly increased seed damage and numerically increased seed moisture. Application of harvest aid following fungicide application significantly decreased leaf retention, incidence of green stems and green pods, and seed moisture and, numerically decreased foreign material and seed damage. Fungicide application numerically increased soybean yield and harvest aid numerically increased yield whether or not fungicide was applied. To maximize soybean seed quality and yield potential, an effective IPM program that includes insect control and disease management should be implemented. In this study application of fungicide was linked to increased soybean leaf retention and occurrence of green stems and pods along with greater seed moisture at harvest. These variables affected seed quality resulting in deductions for seed moisture, foreign material, and seed damage. Considering gross return for yield and seed quality deductions, use of harvest aid resulted in net return increases of $38.65/A when fungicide was not applied and $69.32/A when fungicide was applied. When comparing fungicide to no fungicide application, the use of harvest aid increased net return by $25.60/A. The value of Gramoxone harvest aid in IPM programs should include economic return as well as advantages in earlier harvest and improved harvest efficiency.

SELECTIVITY OF GLYPHOSATE AND HPPD INHIBITING HERBICIDES IN A NEW SOYBEAN EVENT.

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ABSTRACT

M.S. Technologies and Bayer CropScience are developing a new soybean event that is tolerant to both glyphosate and p-hydroxyphenyl pyruvate dioxygenase (HPPD) inhibitor 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.

WEED MANAGEMENT PROGRAMS FOR GLUFOSINATE-TOLERANT SOYBEANS.

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ABSTRACT

Herbicide resistant weeds are becoming a greater concern within field crops and specifically soybeans. Currently, one of the greatest weed problems in states such as North Carolina is Palmer amaranth (*Amaranthus palmeri*). Resistance to both 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 ALS resistance is underway and estimated to be approximately 75%. With these numbers, it is evident that other methods of control must be utilized and rotated in order to delay or prevent further resistance. For this reason, LibertyLink soybeans are of interest as well as herbicides that may work well with this system. Herbicide treatments in this study included, S-metalochlor + Sodium Salt of Fomesafen, Sulfentrazone + Chloransulam-methyl, Flumioxazin, Flumioxazin + Chlorimuron-ethyl, Sulfentrazone + Metribuzin, S-metalochlor + Metribuzin, Imazaquin, Glufosinate-ammonium, Glufosinate-ammonium + S-metalochlor + Sodium Salt of Fomesafen, Glufosinate-ammonium + S-Metalochlor, and Glufosinate-ammonium + Pyroxasulfone. LibertyLink soybeans were rated for the percentage of chlorosis, stunting, and injury as well as the percentage of control for large crabgrass (*Digitaria sanguinalis*), redroot pigweed (*Amaranthus retroflexus*), prickly sida (*Sida spinosa*), and ivyleaf morningglory (*Ipomoea hederacea*) after PRE herbicide application, and five weeks after an early POST herbicide treatment. In this study, all POST treatments resulted in injury which was greater than that observed following any PRE-treatments. However, injury was transient and no injury was observed at the time of the final rating. Large crabgrass control was greater than 90% with all treatments. Redroot pigweed control was 80% or greater with the Ignite + Dual II Magnum treatment having the least control at 80%. Prickly sida control was greater than 90% with all treatments. Ivyleaf morningglory control was greater than 90% for all treatments except Prefix and Valor which both provided 88% control. Although soybean yields were not shown to have significant differences, several treatments clearly showed greater yield due to improved weed control when compared to other treatments.

THE EFFECT OF BOOM TYPE AND 2,4-D FORMULATION ON DRIFT UNDER FIELD CONDITIONS.

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ABSTRACT

Non-transgenic cotton varieties are extremely sensitive to auxinic herbicide drift. With current industry efforts to develop dicamba and 2,4-D resistant cotton, off target drift of these herbicides is of concern. Dow AgroSciences developed a new herbicide product featuring Colex-DTM Technology which combines 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. Thus, two studies were performed to assess new advances in this technology to combat drift. In 2010, a study was performed to assess the effectiveness of a shielded sprayer to reduce 2,4-D drift, compared to a unshielded (open boom) sprayer. Weedar 64 (2,4-D amine) was applied at 1.12 kg ae/ha and tank mixed with Durango® DMA (glyphosate) at 1.12 kg ae/ha. Herbicides were applied to PhytoGen 485 WRF cotton with a WSW wind between 9.65 to 12.87 kmph. Yield data were collected at harvest to assess the impact of the herbicides in the treated area as well in the drift plume of each treatment. Highly injurious drift was detected 8 rows downwind from the shielded sprayer, and 16 rows away with the unshielded sprayer. Auxinic symptomology was detected at a maximum of 24 rows away from the application area for the shielded boom, and 64 rows away for the unshielded sprayer. In 2011, a study was performed to compare GF-2726 to 2,4-D amine tank-mixed with Durango at two different boom heights (45.72 and 91.44 cm above cotton) in a simulated drift environment with a west wind of ~ 9.65 kmph. GF-2726 contains glyphosate and 2,4-D choline, a new salt formulation of 2,4-D. The formulation has been reported to have a low volatility and a reduced drift potential compared to 2,4-D amine. The study was repeated at two geographic sites (Brooksville, Mississippi and Milan, Tennessee). Herbicides were applied at both sites in July to PhytoGen 375 WRF cotton at 130.53 l/ha and an application speed of ~ 9.65 kmph with either XR 11003 or XR 11004 tips in Tennessee and Mississippi, respectively. In Tennessee, data were collected using aerial imagery, with visual data collected 3, 7, 14, 21 and 42 days after application (DAA) for visual injury for each row downwind of the applications. Data were also collected 6 and 12 weeks after application (WAA) for visual % fruit loss. Data were collected in Mississippi using aerial imagery prior to application, 4 DAA, and 77DAA with visual data collected 28 and 42 DAA for evidence (yes/no) of epinasty, fruit loss or both. Yield data were also collected at harvest for both sites. Both sites showed that the GF-2726 applications at 45.72 and 91.44 cm above the crop appeared to have the best potential for reducing drift, with the lower boom height dispersing less than all other treatments. In Tennessee, visual observations concluded that at 42 DAA, epinasty and fruit loss was detected out to 4 or 5 rows away from the treated area for the 45.72 and 91.44 cm boom height applications of GF-2726, respectively. Epinasty and fruit loss was detected out 8 or 9 rows away from the application site 42 DAA for the 2,4-D amine + glyphosate applications at the 45.72 and 91.44 cm heights. In Mississippi, fruit loss was detectable 42 DAA up to 21 rows away from the site of application for both the 45.72 and 91.44 cm applications of GF-2726. Fruit loss and epinasty were detected 29 rows away from the site of application for both applications of the 2,4-D amine formulation tank mixed with glyphosate. Yield data from both locations indicated little injury response for all applications beyond the treated area. Affected areas were smaller where GF-2726 was applied when compared to 2,4-D amine + glyphosate at either boom height. Yields in the drift plumes were not significantly affected in 2011.

COMPARING VOLATILITY OF THREE FORMS OF 2,4-D WHEN APPLIED IN THE FIELD.

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ABSTRACT

Glyphosate-resistant Palmer amaranth is the greatest pest management threat to Georgia cotton production. To combat this pest, growers are using more tillage and more herbicides. Herbicide input costs have more than doubled with growers currently spending $62.50 per acre. Ninety-two percent of these growers are also hand weeding 52% of the crop at an average cost of $23.70 per hand weeded acre. Cotton producers desperately need more economically effective tools to manage glyphosate-resistant Palmer amaranth. Enlist[TM] cotton would provide cotton tolerant to topical applications of glyphosate, glufosinate, and/or 2,4-D. Weed management programs using mixtures of 2,4-D and glufosinate can effectively control glyphosate-resistant Palmer amaranth and reduce current herbicide costs. However, the concern for potential 2,4-D volatility damaging sensitive crops nearby could limit adoption. Therefore, research was conducted to compare volatility of 2,4-D when formulated as an Ester, Amine, or Choline salt. The experiment was conducted at the Sunbelt Agriculture Expo in Moultrie, GA during September 9-11, 2010 and again during August 30-September 2, 2011. Each formulation of 2,4-D at 2 lb ae/A plus glyphosate at 2 lb ae/A was applied on a 90 foot by 90 foot block with treated blocks being at least 800 feet apart. Treatments were applied to an 88% sand soil with 10 to 20% of the soil covered with plant debris. Maximum soil temperatures ranged from 99 to 113 F and the entire study area was irrigated the day prior to experiment initiation. Immediately after application, cotton plants grown off site in 8-inch diameter pots were placed along transects oriented in 8 directions (S, SW, W, NW, N, NE, E, SE) at distances of 5, 10, 20, 40, 80, and 160 feet from each treated block. Four cotton plants (5 to 7-lf) were placed at each direction-by-distance location and allowed to remain in-field for 48 hours before being removed. Four additional plants were placed at each location and were allowed to remain on-site for the first 24 hours after application. A third set of four plants were placed at each direction-by-distance from 24 hours after application through 48 hours after application. Additionally, two 40-inch tall by 48-inch wide by 12-feet long tunnels covered with plastic were placed over part of the treated areas for each 2,4-D formulation. For each tunnel, 10 cotton plants were present for the following: full 48 hours, the first 24 hours, or the second 24 hours. Once various time intervals expired, plants were removed from the experimental area and transported 35 miles to TyTy, Georgia, where they were placed under irrigation and allowed to grow. Visual injury, cotton heights, and nodes were measured; however, visual injury 21 to 27 day after treatment is reported. *Field Results:* When plants remained at the experimental site for the entire 48 hours and data was pooled over years and direction, the Ester formulation injured cotton 63, 57, 48, 29, 13, and 2% at distances of 5, 10, 20, 40, 80 and 160 feet, respectfully. Less than 2% visual injury was detected with the Amine formulation and only at the distances of 5 and 10 feet from the treated area. No visual injury was detected with the Choline formulation at any distance. For plants present during the first 24 hours after application only, the Ester formulation injured cotton 58, 55, 44, 24, 8, and 2% at distances of 5, 10, 20, 40, 80, and 160 feet, respectively. For plants brought into the experimental area 24 hours after initiation and allowed to remain at the site for the following 24 hours, the Ester formulation injured cotton 23, 18, 14, 7, 2, and 0% at distances of 5, 10, 20, 40, 80, and 160 feet, respectively. No visual injury was observed with the Amine or Choline formulation when plants remained at the site for only a single 24 hour period. Direction influenced injury observed by the Ester formulation each year. As expected, the amount of visual injury observed was greatest along transects in which the majority of winds were blowing for each day (range of 0 to11 mph each day and year). *Low Tunnel Results:* Maximum soil temperatures ranged from 125 to 135 F under tunnels each year. Averaged over years and tunnels, the Ester, Amine, and Choline formulations injured cotton plants remaining under the tunnels for 48 hours 76, 13, and 5%, respectfully. Plants present for the first 24 hours were injured 71, 4, and 2% by the Ester, Amine, and Choline formulations, respectively, while 47, 1, and 0% injury was observed for plants present during the second 24 hour period. *[TM]Enlist is a trademark of Dow AgroSciences LLC. Components of the Enlist Weed Control System have not received regulatory approvals; approvals are pending. The information presented is not an offer for sale. ©2012 Dow AgroSciences LLC.*

MEASUREMENT OF DICAMBA VOLATILITY UNDER FIELD CONDITIONS AND THE INFLUENCE OF APPLICATION TIME OF DAY.

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ABSTRACT

Off-target movement and injury to non-target plants can be a concern with certain agricultural pesticides. Off-target movement can occur through spray-particle drift or volatilization and subsequent movement of vapors from the sprayed area. Herbicidal products containing dicamba have been shown to have the potential to injure off-target plants through spray drift and possibly volatility. Part of the difficulty in determining if volatility is an issue is that it can easily be confounded with spray particle drift. Experiments in 2009[A] demonstrated that detection of vapor-phase dicamba in the field through air sampling was possible and that the formulation can affect the relative amount of volatile dicamba. These results also showed that when application was in the early morning, the highest amounts of dicamba were detected in the afternoon of the day of application rather than immediately after the application suggesting that ambient temperature is a significant factor in volatility. In 2010 additional field testing was done with the objective of determining the relationship between volatility, application timing and ambient temperature. Our research examined dicamba volatility under field conditions in three separate experiments. Field plots were 50 ft by 50 ft, with a 400-ft linear buffer between each main plot. NoTill RoundupReady® Soybeans had previously been planted in 30-inch rows at 45 lb seed per acre into plots with heavy plant residue. The soybeans were at the V2 to V3 growth stage at the time of dicamba application. All plots were treated with the diglycolamine (DGA) salt of dicamba (Clarity® herbicide) applied at 1.0 pound acid equivalent per acre. Treatments were applied in 20 gallons per acre of water carrier using a six-nozzle hand-held backpack sprayer equipped with 8002 flat fan nozzles operated at 40 psi. Applications were made in the early morning, mid-day and evening. After waiting approximately 10 minutes for all spray particles to settle, air samplers were placed inside the plot area to collect air samples and determine an average concentration of dicamba over time. Dicamba vapors were captured in polyurethane foam (PUF) at intervals of 0-6, 6-12, 12-24 and 24-48 hours after application. The samples were kept frozen until later analysis. Our methods successfully quantified dicamba with sensitivity to the parts per trillion levels. The amount of volatile dicamba detected in these field trials ranged from 3.5 - 42 ng/m^3 air cumulatively over the 48-hour periods. In general the least was detected from the evening application with higher amounts from the morning and mid-day applications. In the morning application the highest levels of detection were in the second six-hour sampling period (during the afternoon) and with the mid-day application the highest levels detected were during the first sampling period (during the afternoon). Significantly lower levels were detected in the first and second six-hour sampling periods from the evening application timing compared to either the morning or mid-day application. These data suggest that ambient temperature within the first 12 hours of application is a significant factor in the amount of volatile dicamba detected.

[A]Mueller, T.C., D. M. Haile, D. R. Wright. 2010. Measurement of dicamba volatility in the field. Proc. South. Weed Sci. Soc. Vol. 63.

FIELD EVALUATION OF VOLATILITY OF 2,4-D, DICAMBA, AND TRICLOPYR FORMULATIONS.

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ABSTRACT

Research was conducted in August and September over two years to compare volatility of herbicides using tomato and cotton as indicator crops. Herbicides included 2,4-D isooctyl ester (Weedone LV4 @ 1 and 2 lb ae/A); 2,4-D dimethylamine salt (Weedar 64 @ 1 and 2 lb ae/A); 2,4-D acid (Unison @ 1 and 2 lb ae/A); dicamba dimethylamine salt (Banvel @ 0.5 lb and 1 ae/A); dicamba diglycolamine salt (Clarity @ 0.5 and 1 lb ae/A); dicamba acid (Vision @ 0.5 and 1 lb ae/A); and triclopyr butoxyethyl ester (Garlon Ultra @ 1.5 and 3 lb ae/A). Herbicides were applied to a 6-foot wide area of bare soil in the center of 20 foot wide strips that had been tilled. For all experiments, rainfall of at least 0.5 inch was received within 9 days before application. Buffer areas with corn or tall-growing weeds were present between treated strips to reduce physical drift. For each experiment, herbicide application was initiated around 8:30 am and completed by 9:15 am. Forty five minutes after application, tomato and cotton plants in 6-inch pots were placed in the center of each treated strip. A ceramic tile was placed under each pot to avoid soil contact. Injury was determined using each of the following criteria: 1) leaf cupping, crinkle, droop; 2) leaf roll, strapping; 3) stem epinasty; and 4) stem swelling, cracking. Severity of injury for each criteria was based on a 0 to 5 scale with 0= no injury; 1= slight; 2= slight to moderate (producer concern); 3= moderate; 4= moderate to severe; and 5= severe. Injury ratings were made 1, 2, 7, and 14 days after treatment (DAT). To obtain total injury for the herbicide treatments, injury criteria were weighted as follows: leaf cupping, crinkle, droop = 2; leaf roll, strapping = 4; stem epinasty = 6; and stem swelling, cracking = 8. Assuming a maximum severity injury of 5 for all injury criteria and weighting the factors accordingly would result in total injury of 100%. Regardless of herbicide or rate, injury was greater for tomato than for cotton. Therefore, tomato and cotton were analyzed separately. For tomato, a highly significant herbicide effect was observed for all injury criteria and for total injury. Injury from 2,4-D averaged across rates and rating dates was greater for the ester compared with amine salt and acid formulations. Injury to tomato was numerically greater for all injury criteria for the amine salt compared with the acid formulation. Total injury for tomato was 38% for 2,4-D ester, 14% for 2,4-D amine salt, and 6% for 2,4-D acid compared with 51% for triclopyr ester. Injury from dicamba formulations, in most cases was numerically greater for all injury criteria for both dicamba amine salt formulations compared with the acid formulation. Total injury was 19 and 20% for amine salt formulations and 13% for the acid formulation. Stem swelling and cracking (0 to 5 scale) injury for tomato averaged across rating dates was 8 times greater for 2,4-D ester applied at the 2x rate compared with 1x. In contrast, stem swelling and cracking injury was not observed for either the amine salt or acid formulation applied at the 1x rate; at the 2x rate injury was 0.3 for 2,4-D amine and no injury was observed for 2,4-D acid. For cotton, a highly significant herbicide effect was observed for the leaf cupping, crinkle, droop injury criteria and for total injury. Total injury for 2,4-D averaged across herbicide rates and rating dates was 8% for the ester, 3% for the amine salt, and 1% for the acid formulation compared with 8% for triclopyr ester. Total injury for dicamba was 4% and 5% for amine salt formulations and 3% for the acid formulation. Averaged across rates, total injury with 2,4-D ester increased from 3% at 1 DAT to 13% at 14 DAT. For 2,4-D amine salt and acid formulations, total injury was not observed at 1 DAT but at 14 DAT injury was 5% for 2,4-D amine salt and 2% for 2,4-D acid. For dicamba, total injury increased from 2% at 1 DAT to 5 and 7% at 14 DAT for amine salt formulations and from 1% to 5% for the acid formulation. In this study there was tremendous variability among plants and total injury for amine salt and acid formulations of 2,4-D was no more than 14% for tomato and 3% for cotton. These factors contributed to difficulty in detecting significant differences. In addition for both tomato and cotton, there was no significant difference between the1x and 2x rates. The injury criteria developed and the weighting of injury criteria to determine total injury was beneficial in providing quantitative data. Although off-target movement of some herbicides can be attributed to volatility, off-target injury is most often the result of physical drift. It is critical that application technologies be developed to reduce physical off target movement of herbicides if new technologies based around use of 2,4-D and dicamba are to be successful.

THE DEVELOPMENT OF A GROUND-BASED SPECTRAL ACQUISITION SYSTEM TO EVALUATE OFF-TARGET HERBICIDE DEPOSITION.

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ABSTRACT

With the increased usage of transgenic herbicide technology cropping systems, off-target deposition of herbicides to sensitive crops continues to be of concern. When transgenic crops are planted within short distances of crops that do not contain the same transgenic technology, there is an increased chance for crop injury due to off-target movement of the herbicide. Assessment of such an event is difficult due to the large areas which can be affected. The availability of remotely sensed data can allow for a more accurate assessment of off-target deposition. One problem with the acquisition of remotely sensed data is the cost associated with data collection. Aerial imagery is a popular method for collection of remotely sensed data; however, this method can become quite expensive based on the type of imagery being collected. Therefore, it could be beneficial to acquire a ground-based method for collecting such information. Experiments were conducted at the Black Belt Branch Experiment Station in Brooksville, MS to evaluate the use of a ground-based spectral acquisition system to monitor instances of off-target herbicide deposition. Pioneer 31G97 corn seed was planted at 70,000 seeds per hectare in a field measuring 3.19 hectares in size. In order to simulate crop response to an off-target application incident, 6 treatments consisting of glufosinate rates of 0.59, 0.30, 0.15, 0.07, 0.04, and 0.02 kilograms of the active ingredient per hectare (kg ai/ha) were applied in addition to an untreated check to susceptible corn at the V6 growth stage. Applications were made in 7.7 by 30.5 meter plots using a tractor mounted boom with an application volume of 140 liters per hectare. Visual injury ratings were recorded 7, 14, and 28 days after application. Additional data collected included spectral signatures recorded using the Analytical Spectral Device's (ASD™) Fieldspec Pro handheld spectroradiometer and the SpecTIR™ airborne hyperspectral imagery as well as crop yields. Handheld hyperspectral data were recorded over a 14 day period with collection timings of 1, 4, 8, and 14 days after herbicide application, depending on the weather. Handheld spectroradiometer data were collected in conjunction with a Topcon HiPer Lite Plus real time kinematic (RTK) global positioning system (GPS) to ensure that each data point would have a fixed spatial information description. This system was mounted on a tractor and set to automatically collect an average from 10 signature readings each second as the machine moved through the field. Due to the expense of the SpecTIR™ airborne hyperspectral imager, a single image was collected 4 days after the glufosinate applications. At harvest, machine harvested yields were collected from the 2 center rows of each plot. Spectral data were analyzed using a multi classifier decision fusion method to determine classification accuracies of the different rates of glufosinate. Visual ratings showed significant crop injury for all rates of glufosinate applied to susceptible corn 7 days after application (DAA) with the exception of the lowest rate of 0.02 kg ai/ha, which corresponds to a 1/32X ratio of the labeled glufosinate rate. However, by 14 DAA, visual injury ratings showed that all rates were significantly greater than the untreated. The handheld spectral data collected from the ground-based spectral acquisition system provided an overall accuracy of 70.4% for correctly identifying spectral features associated with the 7 treatments in this study while data collected from the SpecTIR™ airborne hyperspectral imager provided an overall accuracy of 55%. Harvest data showed significant yield reductions only for the 2 highest glufosinate rates (1X and 1/2X). Additional research is needed to verify that injury quantified using the hyperspectral acquisition system is not being contaminated with agronomic effects such as nutrient or drought stress. These data show potential for utilizing a ground-based spectral acquisition system to differentiate between certain levels of herbicide damage which may occur in an off-target deposition situation. This can be of benefit due to the fact that a ground-based spectral acquisition system is more economical and efficient in terms of collecting data in a timely manner.

USE OF FURROW IRRIGATION TO ACTIVATE RESIDUAL HERBICIDES. **J.K. Norsworthy*[1], K.L. Smith[2], J.A. Bond[3], D.b. Johnson[1]; [1]University of Arkansas, Fayetteville, AR, [2]University of Arkansas, Monticello, AR, [3]Mississippi State University, Stoneville, MS (275)**

ABSTRACT

Cotton, soybean, and corn grown in the Midsouth, particularly Arkansas and Mississippi, are often furrow irrigated to enhance crop yield potential. The effectiveness of furrow irrigation and sprinkler irrigation on activation of residual herbicides for controlling Palmer amaranth was evaluated. Furrow irrigation trials were conducted at Keiser, AR on a clay soil, at Marianna, AR on a silt loam, and at Stoneville, MS on a sandy loam. Additionally, sprinkler irrigation trials were conducted at Keiser and Stoneville. In all trials, Reflex, Valor, Caparol, Direx, Cotoran, Aatrex, Sencor, Prowl H20, Laudis, Balance Flex, Callisto, Warrant, Zidua, and Dual Magnum were evaluated at rates appropriate for the soil type. In the furrow-irrigated trials, Palmer amaranth control was evaluated on top of the bed and in the furrow at approximately 20 and 200 feet from the polypide that was used for irrigation. All furrow-irrigated trials were irrigated once weekly beginning immediately after application unless a rainfall event of more than 1 inch occurred, at which time the irrigation scheduling was reset. A similar system was used in sprinkler-irrigated plots which received 1 inch of irrigation weekly. Herbicides generally became less effective sooner near the polypipe, likely as a result of soil movement with each furrow irrigation event. On the clay soil at Keiser, the furrow irrigation was effective in activating the herbicides on top of the bed, but as soils became increasingly coarse, such as in the trial at Stoneville, furrow irrigation was ineffective in wetting the top of the beds, in turn failing to fully activate the residual herbicides. Across soil types, sprinkler irrigation was more consistent in activating residual herbicides.

GRAMOXONE AND THE NEW WILLMAR 915 HOODS. J.C. Sanders*[1], L. Glasgow[2], B.W. Minton[3], H.H. McLean[4], J.C. Holloway[5], N. Duff[6]; [1]Syngenta, Greenwood, MS, [2]Syngenta Crop Protection, Greensboro, NC, [3]Syngenta, Cypress, TX, [4]Syngenta, Perry, GA, [5]Syngenta, Jackson, TN, [6]Willmar Fabrication, Clarksdale, MS (276)

ABSTRACT

The Willmar 915 Hooded Sprayer was developed specifically in response to the evolution of glyphosate-resistant Palmer amaranth that continues to spread across cotton growing areas. The new hoods were designed with a high degree of grower input, incorporating features of previous generations of hoods with additional features to make them more efficient and effective. The hoods have a sloped, open front and an open back with plastic curtains over the openings to prevent drift. The 915 hoods are designed to run on the ground, where earlier models were not. Hardened steel skids on the bottom edges of the hood extend out into gathering arms on either side that pull weeds into the hood opening. The 915 has three spray nozzles under the hood, arranged in separate planes to provide more complete coverage. A knockdown bar enhances spray coverage on taller weeds as they pass underneath the hood. Angled post-directed nozzles on the outside rear of the hood provide the option of applying a different herbicide mixture within the rows, while the hoods are used to spray the row middles. Gramoxone® SL is a highly efficacious herbicide that can be applied under the new 915 hoods for the postemergence (POST) control of Palmer amaranth (*Amaranthus palmeri*) and other annual weeds. Difficult to control weeds, such as Palmer amaranth, growing in a dense population are best controlled by Gramoxone SL at a rate of 1 qt/A, with the addition of 0.25% v/v non-ionic surfactant. In addition to flat fan nozzles and a ground speed less than 8 miles per hour, a spray volume of 10 GPA is recommended for optimal spray coverage. Residual herbicides such as Dual Magnum® or Caparol® can be tank-mixed with Gramoxone SL to provide preemergence (PRE) control of Palmer amaranth. When Gramoxone SL is tankmixed with a residual herbicide and applied under the new 915 hood, both emerged and subsequently-emerging Palmer amaranth can be controlled. Where the residual activity of PRE-applied herbicides decline and where weeds escape from a POST herbicide application, the grower will still manage Palmer amaranth with Gramoxone SL applied through the Willmar 915 hoods without concerns of losing the crop to poor harvest conditions. By controlling these escaped weeds, the replenishment of the seedbank for glyphosate-resistant Palmer amaranth will in turn be reduced.

EFFECTIVENESS OF LATE IN-CROP RESIDUAL HERBICIDES IN PROVIDING LATE-SEASON AND POST-HARVEST CONTROL OF PALMER AMARANTH. **D.B. Johnson*[1], J.K. Norsworthy[1], C.E. Starkey[1], M.J. Wilson[2], J.D. Devore[1]; [1]University of Arkansas, Fayetteville, AR, [2]university of arkansas, Fayetteville, AR (277)**

ABSTRACT

Glyphosate-resistant Palmer amaranth (*Amaranthus palmeri* S. Wats) is the most problematic weed in Southern U.S. crop production. Corn is commonly rotated with cotton and soybean throughout the South, which allows producers to use atrazine and other herbicide modes of action such as HPPD-inhibiting herbicides, which are not labeled in cotton or soybean. In the Southern U.S., corn is typically harvested in late July to early August allowing weeds to emerge and successfully produce seed before the first killing frost. Experiments were conducted at the University of Arkansas Research and Extension Center in Fayetteville, AR, and at the Northeast Research and Extension Center in Keiser, AR, to evaluate the efficacy and crop tolerance of late-season residual herbicides in providing post-harvest Palmer amaranth control. Residual herbicides evaluated in these studies consisted of Dual II Magnum (*S*-metolachlor) at 16 fl oz/A + Aatrex (atrazine) at 64 fl oz/A , and three HPPD-inhibiting herbicides Laudis (tembotrione + isoxadifen) at 3 fl oz/A, Capreno (thiencarbazone + tembotrione) at 3 fl oz/A, and Callisto (mesotrione) at 3 fl oz/A. Herbicide treatments were Ignite 280 (glufosinate) at 22 fl oz/A in combination with Aatrex plus Dual II Magnum; Ignite 280 in combination with an HPPD-inhibitor; Ignite 280 in combination with Aatrex, Dual II Magnum, and an HPPD-inhibitor; and Ignite 280 alone. All herbicide treatments were applied at V7-V8 corn using 18-inch drop nozzles. Visible weed control and crop injury ratings were taken weekly up to the first killing frost. Palmer amaranth density (plants/m^2) was taken after harvest, and seed heads were collected to determine seed production. Crop injury was undetectable with any herbicide treatment 2 weeks after treatment (WAT). Ignite applied alone and Ignite in combination with Laudis controlled Palmer amaranth ≤80% 9 weeks after harvest (WAH) while all other treatments provided ≥ 88% control. All treatments decreased Palmer amaranth density to ≤1.6 plants/m^2, compared to 4 plants/m^{2}in the untreated check (UTC). Reduction in the number of plants/m^2 also resulted in a reduction in seed production in the treated plots compared to the UTC, which produced >4.2 * 10^{10} seed/A. Ignite applied alone resulted in >1.5 *10^7 seed/A and all other treatments resulted ≤ 6.2 *10^7 seed/A. Therefore, late-season residual herbicides can be applied in combination with Ignite to provide late-season and post-harvest Palmer amaranth control and ultimately reduce the soil seed bank.

POSTEMERGENCE DALLISGRASS CONTROL WITH FALL APPLICATIONS OF SP25052. **G.M. Henry*[1], T. Cooper[1], A.J. Hephner[1], L.L. Beck[1], J.H. Rowland[2], G. Breeden[3], J. Brosnan[3]; [1]Texas Tech University, Lubbock, TX, [2]Bayer Environmental Science, Austin, TX, [3]University of Tennessee, Knoxville, TN (198)**

ABSTRACT

Field trials were conducted at Meadowbrook Golf Course in Lubbock, TX and Pecan Valley Golf Course in Fort Worth, TX during the fall of 2010 to evaluate the efficacy of SP25052 for the control of dallisgrass. Studies were conducted on mature dallisgrass infestations present in hybrid bermudagrass roughs cut to a height of 3.8 cm. Plots measured 1.5 x 1.5 m and were arranged in a randomized complete block design with four replications. Treatments were applied using a CO_2 backpack sprayer equipped with XR8004VS nozzle tips and calibrated to deliver 375 L ha^{-1} at 221 kPa. Treatments were initiated on September 27, 2010 or October 21, 2010 and consisted of single or sequential applications of SP25052 (93 or 137 g ai ha^{-1}) + MSO (0.5% v/v) + AMS (2% w/v). Sequential applications of foramsulfuron (106 g ai ha^{-1}), foramsulfuron (106 g ai ha^{-1}) + [dicamba + iodosulfuron + thiencarbazone (174 g ai ha^{-1})], and an untreated control were added for comparison. Visual estimates of percent dallisgrass cover and bermudagrass phytotoxicity were recorded every two weeks until early December. Dallisgrass regrowth (% cover) the following spring was recorded every two weeks until mid June. Percent dallisgrass cover was converted to percent dallisgrass control by comparing each plot to the cover recorded at initial herbicide application. Data were subjected to analysis of variance (ANOVA) and means were separated using Fisher's Protected LSD at the 0.05 significance level. Significant treatment-by-location interactions were detected for dallisgrass control data; thus, data from each location were analyzed and are presented separately. Single applications of SP25052 applied in October exhibited 37 to 66% dallisgrass control 37 weeks after initial treatment (WAIT), regardless of rate and location, while single applications of SP25052 applied in September exhibited 84 to 94% dallisgrass control 37 WAIT, regardless of rate and location. Sequential treatments of SP25052 in Lubbock, TX exhibited similar control (94 to 95%) to single applications of SP25052 at the high rate applied in September. However, sequential treatments of SP25052 in Fort Worth, TX only exhibited 54 to 70% dallisgrass control 37 WAIT. Sequential applications of foramsulfuron alone exhibited unacceptable dallisgrass control (57 to 58%) 37 WAIT, regardless of location. Foramsulfuron + dicamba + iodosulfuron + thiencarbazone exhibited 94% dallisgrass control in Lubbock, TX, but only 78% in Fort Worth, TX 37 WAIT. Results from this trial suggest that timing is critical when making applications of SP25052 for dallisgrass control in the fall. September applications provide excellent control of dallisgrass while waiting until October to make applications may result in poor control. The tank-mixing of foramsulfuron with dicamba + iodosulfuron + thiencarbazone also provides excellent dallisgrass control when initial applications are made in September.

FLUMIOXAZIN EFFICACY FOR CONTROLLING ANNUAL BLUEGRASS AND SMOOTH CRABGRASS IN BERMUDAGRASS. **P. McCullough*[1], B. Nutt[1], J. Chamberlin[2]; [1]University of Georgia, Griffin, GA, [2]Valent, GA (199)**

ABSTRACT

Flumioxazin is a new herbicide for turfgrass use with pre- and postemergence activity for controlling weeds in dormant bermudagrass. Field experiments were conducted from November 2010 to September 2011 in Griffin, GA to evaluate flumioxazin efficacy for controlling annual bluegrass, smooth crabgrass, and other weeds in dormant bermudagrass. In the first experiment, November treatments of flumioxazin at 0.21 and 0.42 kg a.i./ha provided 100% control of annual bluegrass. However, flumioxazin applications in December, January, February, or March were less effective on annual bluegrass as 0.21 kg/ha provided 20 to 55% control and 0.42 kg/ha provided 40 to 80% control. Flumioxazin provided 90 to 100% control of common dandelion and catsear dandelion when applied in November, December, or January but control was poor (<70%) when applied in February, March, or April. White clover control from flumioxazin at all timings was poor but parsley-piert and swinecress were effectively controlled (90 to 100%) in early winter months. In the second experiment, March flumioxazin applications at 0.28 and 0.42 kg/ha provided 80 to 90% postemergence control of annual bluegrass. Flumioxazin at 0.42 kg/ha in March provided good preemergence control (80 to 89%) of smooth crabgrass by September while flumioxazin followed by prodiamine treatments improved control to >90%. Flumioxazin treatments did not reduce bermudagrass greenup from the untreated.

TRIBUTE TOTAL - A NEW TURF HERBICIDE FROM BAYER. **B.R. Spesard*[1], M. Bradley[2], J.H. Hope[3], J. Michel[4], B.J. Monke[5], L. Mudge[6], D.F. Myers[2], H. Olsen[7], A. Parker[8], J.H. Rowland[9], D. Spak[8]; [1]Bayer CropScience, RTP, NC, [2]Bayer Environmental Science, RTP, NC, [3]Bayer Environmental Science, Mebane, NC, [4]Bayer Environmental Science, Orlando, FL, [5]Bayer Environmental Science, Overland Park, KS, [6]Bayer Environmental Science, Central, SC, [7]Bayer Environmental Science, Wildomar, CA, [8]Bayer Environmental Science, Clayton, NC, [9]Bayer Environmental Science, Austin, TX (200)**

ABSTRACT

A premix broad spectrum effective grassy weed and sedge control solution is not currently offered in the professional turfgrass marketplace. Turf managers must revert to tank mixing multiple products often resulting in ineffective control and/or poor turf tolerance. Tribute Total is a novel herbicide combination for the post-emergent control of annual & perennial grassy weeds, sedges and kyllingas, and for the removal of overseeded ryegrass, in commercial and residential common and improved bermudagrasses. Tribute Total also controls more than 60 different types of broadleaf weeds. An introduction to Tribute Total with emphasis on its performance against several key monocot and dicot weeds of commercial importance is reported here.

IMPRELIS: DOES IT HAVE APPLICATION IN FINE TURF? **F.H. Yelverton*[1], T. Gannon[2], L. Warren[3]; [1]N. C. State University, Raleigh, NC, [2]North Carolina State University, Raleigh, NC, [3]North Carolina State University, raleigh, NC (201)**

ABSTRACT

Imprelis (aminocyclopyrachlor (AMCP)) is a newly registered herbicide developed by DuPont Professional Products for use in fine turf. AMCP is a synthetic auxin belonging to the pyrimidine carboxylic acid family. Imprelis became commercially available in late 2010 and was widely used by professional turfgrass managers late 2010 and early 2011 for control of many common and troublesome broadleaf weed species in cool-season turf. During spring and summer of 2011 (beginning late-May), off-target injury was observed on many areas that had been treated with Imprelis. Several states reported injury, predominantly on conifer species, from Imprelis application. Although the damage may have spanned several states, it was not widespread across all affected states and the tree injury was inconsistent with some trees suffering greater damage than adjacent trees. DuPont Professional Products voluntarily suspended Imprelis sales mid-2011. Currently, it is thought Imprelis was responsible for the off-target injury that was observed although scientists and extension specialists are continuing to gather additional evidence and data. While other synthetic auxin herbicides are active at low concentrations on many species, this is the first incident of extensive off-target damage to trees and ornamentals. This Imprelis herbicide incident indicates certain facets of herbicide research, development and use patterns may change in the future as we continue to discover and develop highly active herbicides. This incident may also result in a new test or battery of tests required by EPA.

WEED CONTROL IN COOL-SEASON TURFGRASS WITH TOPRAMEZONE.

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ABSTRACT

Topramezone was registered for use in corn in July 2005. It is currently under evaluation for use in turfgrass. Topramezone inhibits HPPD and exhibits turfgrass tolerance and weed control that is similar to other HPPD inhibiting herbicides such as mesotrione and tembotrione. Studies were conducted in Blacksburg, VA in 2008 to evaluate various programs and application timings for smooth crabgrass and broadleaf weed control using topramezone compared to mesotrione. Six different field trials were conducted to evaluate topramezone at various rates, timings, and in various tank mixtures for cool-season turfgrass tolerance and weed control. The six field trials comprise three different studies that were each conducted at two sites. Topramezone was applied at rates between 13 and 100 g ai ha^{-1}. Mesotrione was applied at 230 or 280 g ai ha^{-1}. Tank mixtures of pendimethalin at 1680 g ai ha^{-1} plus topramezone and prodiamine at 730 g ai ha^{-1} plus mesotrione were also evaluated. Topramezone treatments included crop oil concentrate at 1% v/v and mesotrione treatments included nonionic surfactant at 0.25% v/v. All treatments were applied at 280 L ha^{-1} using Teejet flat fan 8004 nozzles at 262 kPa. Studies were all initiated on May 15 when crabgrass had one to three leaves. When applied once to 1- to 3-leaf smooth crabgrass, topramezone at 25 g ai ha^{-1} controlled smooth crabgrass 53% on average and more than mesotrione at 230 or 280 g ai ha^{-1} (7%) at four locations 118 to 121 days after initial treatment (DAIT). When topramezone and mesotrione were mixed with pendimethalin and prodiamine, respectively, 1- to 3-leaf crabgrass control increased to 93% with 25 g ha^{-1} topramezone and 78% with mesotrione. When applied to 2- to 3-tiller smooth crabgrass, a single treatment of topramezone at 13 g ha^{-1} controlled smooth crabgrass equivalent to 230 g ha^{-1} mesotrione. At 118 DAIT, topramezone at 25 g ha^{-1} controlled smooth crabgrass 72%, representing a 40% increase in control over mesotrione. Two applications of 25 g ha^{-1} topramezone controlled 2- to 3-tiller smooth crabgrass 90% 118 DAIT and more than two applications of 230 g ha^{-1} mesotrione, which controlled smooth crabgrass 65% on the same date. Similar results occurred when 5- to 7-tiller smooth crabgrass was treated compared to 2- to 3-tiller smooth crabgrass. Mesotrione did not control white clover or broadleaf plantain, while topramezone almost completely controlled white clover and controlled broadleaf plantain 60 to 90% 28 DAIT and 10 to 30% 78 DAIT. Topramezone controlled corn speedwell more than mesotrione on three of four rating dates. Topramezone at 25 g ha^{-1} was inferior to mesotrione for dandelion control. Topramezone appears to control several key weed species, often with single treatments. Topramezone, at the lowest rates evaluated, was equivalent or better than mesotrione for control of most weeds tested. These results indicate topramezone could be an important herbicide for the turfgrass industry.

EVALUATION OF SUREGUARD FOR PREEMERGENCE CRABGRASS CONTROL IN BERMUDAGRASS TURF. **R. Hubbard*, A.G. Estes, B. McCarty; Clemson University, Clemson, SC (203)**

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, four studies were conducted in upstate South Carolina to investigate the efficacy of Sureguard for preemergence control of smooth crabgrass (*Digitaria ischaemum*) in bermudagrass turf. Treatments were applied with a CO_2 backpack sprayer calibrated at 20 GPA, using 8003 flat fan spray nozzles. Treatments were replicated three times. Data was analyzed using ANOVA with means separated by LSD (α=0.05). Treatments for Study 2010a included: SureGuard at 12 oz/A (0.375 lb.ai/A) + non-ionic surfactant at 0.25 % V/V, applied Nov 4 and Dec 4, 2009 and Jan 6, Feb 4, Mar 3 and Apr 8, 2010. Treatments for Study 2010b included: SureGuard at 4 oz/A, 8 oz/A, and 12 oz/A, SpeedZone (2L) at 4 pt/A (1.00 lb ai/A), Barricade (prodiamine 4L) at 0.75 lb ai/A, and Roundup (glyphosate 4L) at 0.50 lb ai /A + Barricade at 0.75 lb ai/A. All applications of SureGuard included non-ionic surfactant at 0.25 % V/V. All treatments for Study 2010b were applied on Mar 3, 2010. Treatments for Study 2011a included: SureGuard at 6 oz/A and 12 oz/A, with each rate applied Nov 9 and Dec 10, 2010 and Jan 17, Feb 8, Mar 11 and Apr 13, 2011. All applications of SureGuard included non-ionic surfactant at 0.25 % V/V. An additional treatment of Roundup at 0.50 lb ai /A + Ronstar (oxadiazon 3.8L) at 2.0 lb ai/A was applied Feb 8, 2011. Treatments for Study 2011b included: SureGuard at 12 oz/A, Barricade at 1.50 lb ai/A, SureGuard at 12 oz/A followed by Barricade at 0.75 lb ai/A, SureGuard at 8 oz/A followed by Barricade at 0.75 lb ai/A, Barricade at 0.75 lb ai/A twice, and SureGuard at 12 oz/A + Barricade at 0.75 lb ai/A. All applications of SureGuard included non-ionic surfactant at 0.25 % V/V. Initial applications for Study 2010b were made on Mar 11, 2011, with subsequent applications on May 2, 2011 (8WAIT). Visual ratings for Study 2010a were Jun 8 and Oct 5 and Jun 8 and Oct 5 (216 and 335 DAI) for Study 2010b. Visual ratings for Study 2011a were Jun 10, Jul 20 and Sep 8 and Jun 10, Jul 20, Aug 17 and Sep 8 (91, 131, 159 and 181 DAI) for Study 2011b. Ratings for crabgrass control were based on a scale of 0-100%, with 100% representing complete control. November SureGuard applications burned pre-dormant bermudagrass, but did not delay greenup the following spring. SureGuard at 12 oz/A applied once during the months of Jan through Apr provided >90% preemergence crabgrass control through Jun. SureGuard at 12 oz/A applied once Mar or Apr provided >90% control through Oct. SureGuard at 6 oz/A applied once during the months of Feb through Apr provided >90% control through Jun. SureGuard at 6 oz/A applied once during the months of Jan through Apr provided > 70% control through Sep. SureGuard at 12 oz/A applied in Mar provided 100% preemergence crabgrass control thru Jun (216 DAI) and >80% control thru Oct (335 DAI). SureGuard at 8 oz/A applied in Mar provided >80% control thru Jun and >60% control thru Oct. SureGuard at 4 oz/A applied in Mar 3 provided essentially no subsequent preemergence crabgrass control. All treatments in Study 2011b provided 100% preemergence crabgrass control thru Jun (91 DAI) and ≥95% control thru Jul (131 DAI). All treatments provided >90% control thru Sep (181 DAI), except SureGuard at 8 oz/A followed by Barricade at 0.75 lb ai/A which provided 88% control and Barricade followed by Barricade at 0.75 lb ai/A which provided 81% control. Overall, SureGuard at >8 oz/A applied during winter months provided subsequent preemergence crabgrass control. 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.

PRE AND POSTEMERGENCE CONTROL OF DOVEWEED IN BERMUDAGRASS. **J.L. Atkinson*, B. McCarty, A.G. Estes; Clemson University, Clemson, SC (204)**

ABSTRACT

The purpose of this study was to evaluate various pre-emergence and post-emergence herbicides for control of doveweed (*Murdannia nudiflora*), a problematic weed of golf course roughs, fairways and tees that germinates much later in spring than traditional summer annual grassy weeds such as crabgrass and goosegrass. Several studies evaluated the efficacy of various herbicides for pre-emergence and post-emergence control. Study 1 included Specticle (Indaziflam) 7 oz/ac applied March 18, April 28, or May 11, 2011. All other treatments initiated on May 11, 2011 included Specticle 5 & 3.5 oz/ac, Specticle 3.5 oz/ac fb Specticle 3.5 oz/ac 12 WAIT, Specticle 5 oz/ac fb Specticle 2 oz/ac 12 WAIT, Specticle 3.5 oz/ac fb Specticle 3.5 oz/ac + Celsius (Thiencarbazone-methyl, Iodosulfuron-methyl-sodium, Dicamba) 4.9 oz/ac 12 WAIT, Tower (Dimethenamid) 32 oz/ac, Tower 32 oz/ac fb Tower 32 oz/ac 6 WAIT, Tower 32 oz/ac fb Tower 32 oz/ac + Celsius 4.9 oz/ac 6 WAIT, Tower 32 oz/ac fb Tower 32 oz/ac 6 WAIT fb Celsius 4.9 oz/ac 12 WAIT, Tower 32 oz/ac fb Specticle 3.5 oz/ac 6 WAIT, Ronstar (Oxadiazon) 3 lb ai/ac, Ronstar 3 lb ai/ac fb Specticle 3.5 oz/ac + Celsius 4.9 oz/ac 6 WAIT. Study 2 evaluated post-emergence herbicides for doveweed control and treatments included single applications of Celsius 4.9 oz/ac applied on June 15, July 13 and July 27 2011. Other treatments initiated on June 15 included Celsius 3.7 oz/ac fb Celsius 3.7 oz/ac 30 DAIT, and Trimec Classic (2,4-D, MCPP, Dicamba) 4 pt/ac. Remaining treatments initiated on July 27 included Celsius 4.9 oz/ac fb Celsius 4.9 oz/ac 30 DAIT, and Trimec Classic 4 pt/ac. Study 1 and Study 2 were conducted on irrigated golf course rough comprised of Tifway-419 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. In study 1, less than 40% control followed pre-emergence treatments applied during March or April regardless of rating date. Specticle 3.5 oz/ac applied May 18 fb Specticle 3.5 oz/ac 12 WAIT and Specticle 3.5 oz/ac applied May 18 fb Specticle 3.5 oz/ac + Celsius 4.9 oz/ac 12 WAIT provided ~95% control 26 WAIT (September 9 2011). In study 2, Trimec Classic demonstrated >80% control 8 WAIT. Celsius treatments applied on or after July 13 demonstrated statistically similar control regardless of rate 8 WAIT. No treatments demonstrated significant control 13 WAIT. Currently, for preemergence Doveweed control, Specticle at 3.5 oz/ac and Ronstar at 3 lb ai/ac provide ~12 weeks control while Tower at 32 oz/ac provides ~ 6 weeks control. Due to the later germination of Doveweed, treatments should not be initiated until early May in upstate SC. Postemergence control is provided with repeat applications of 3-way type herbicides. Another strategy is waiting until late June and applying a 3-way herbicide. Repeat this in 7 to 10 days and combine one of the before mentioned preemergence herbicide for extended control. 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.

DINITROANILINE RESISTANT GOOSEGRASS CONTROL WITH NEW PREEMERGENCE HERBICIDES IN TURF. **D. Gomez de Barreda*[1], P. McCullough[2]; [1]Polytechnic University of Valencia, Valencia, Spain, [2]University of Georgia, Griffin, GA (205)**

ABSTRACT

Goosegrass (*Eleusine indica* (L.) Gaertn.) is a problematic summer annual weed well adapted to turfgrass management. It has a rapid establishment and growth in spring and summer, it is a prolific seed producer and very common in stressed turf or compacted areas. The best program for goosegrass control is preemergence herbicide use rather than a postemergence control. Dinitroanilines (DNA) herbicides are widely used for goosegrass preemergence control but overuse has resulted in resistance issues throughout Southeast USA. Several new preemergence herbicides with different modes of action to that of DNAs are available with potential to control goosegrass in turf. An experiment was conducted from March to September 2011 in a golf course fairway with a long history of prodiamine use every year in spring (10 years). The following herbicides were applied with a CO_2 pressured sprayer delivering 374 L ha^{-1} to 1.5 x 3 m plots: dimethenamid at 1.68 or 1.68 + 1.68 kg a.i./ha, dithiopyr at 0.38 + 0.38 kg a.i./ha, indaziflam at 0.07 or 0.035 + 0.035 kg a.i./ha, oxadiazon at 4.5 or 2.25 + 2.25 kg a.i./ha, prodiamine at 0.72 + 0.72 kg a.i./ha and sulfentrazone at 0.38 or 0.38 + 0.38 kg a.i./ha. Experimental design was a randomized complete block design with four replications. Initial applications were made on March 8 and the sequential treatment was made after eight weeks. By 4 months after initial treatment, two applications of dimethenamid, indaziflam and oxadiazon provided >80% goosegrass control while sulfentrazone applied twice gave 60% control. Dithiopyr and prodiamine provided less than 19% goosegrass control on all dates. By September 19th, single and sequential applications of indaziflam and oxadiazon provided 86 to 90% control while dimethenamid applied twice only controlled goosegrass 70%. All other herbicides provided less than 60% control of DNA resistant goosegrass in September. Results suggest that single applications of indaziflam and oxadiazon or sequential applications of dimethenamid have potential to control DNA resistant goosegrass.

SULFENTRAZONE PLUS METSULFURON EVALUATIONS FOR VIRGINIA BUTTONWEED AND DOVEWEED CONTROL IN TURF. **T. Reed*, P. McCullough; University of Georgia, Griffin, GA (206)**

ABSTRACT

Blindside (66WDG) is a new combination herbicide containing sulfentrazone (60%) and metsulfuron (6%) with promising implications for controlling perennial broadleaf weeds in turfgrass. Field experiments were conducted from July to September 2011 in Griffin, GA to evaluate efficacy of single and sequential Blindside treatments for controlling Virginia buttonweed and doveweed in bermudagrass and tall fescue, respectively. In bermudagrass, single applications of Blindside from 0.19 to 0.3 kg a.i./ha provided poor control (<70%) of Virginia buttonweed but sequential applications provided 70 to 85% control after 8 weeks, comparable to Celsius 68WDG (thiencarbazone + iodosulfuron + dicamba) at 0.23 kg a.i./ha. In tall fescue, single and sequential Blindside applications provided <30% control of doveweed and injured turf by ≥70% after one month. Blindside provided >85% yellow nutsedge control. Overall, sequential treatments of Blindside have potential for effectively controlling Virginia buttonweed but appear to have limited activity on doveweed.

FLUCARBAZONE EVALUATION FOR SEASHORE PASPALUM SEEDHEAD CONTROL AND GROWTH REGULATION. **J. Yu*, P. McCullough; University of Georgia, Griffin, GA (207)**

ABSTRACT

Seashore pasplaum is a warm-season turfgrass used for golf greens, tees, fairways, and roughs but prolific seedhead production may reduce turf quality. A field study was conducted to investigate efficacy of flucarbazone alone or tank-mixed with trinexapac-ethyl on seashore paspalum injury, clipping reduction, and seedhead suppression. Treatments were the factorial combination of two trinexapac-ethyl rates and four herbicides. Flucarbazone was applied at 15, 30, or 60 g a.i. ha^{-1} and flazasulfuron was applied at 26 g a.i. ha^{-1} and both herbicides were tank-mixed with trinexapac-ethyl at 0 or 85 g a.i. ha^{-1} plus an untreated check. Treatments were applied every three weeks for a nine-week period beginning June 14, 2011. Flucarbazone alone at all three rates injured seashore paspalum less than 20% but tank-mixtures with trinexapac-ethyl often exacerbated injury. High flucarbazone at 30 to 60 g a.i. ha^{-1} alone provided greater than 90% seedhead control from sequential applications on most dates but trinexapac-ethyl did not improve control. Trinexapac-ethyl alone generally provided poor (<70%) seedhead control. Clipping reductions from the untreated for all flucarbazone rates were comparable to trinexapac-ethyl alone. Seashore paspalum injury, clipping reductions, and seedhead control from flucarbazone were comparable to flazasulfuron on most dates. Overall, flucarbazone appears to have potential for use as a plant growth regulator in seashore paspalum for seedhead control and clipping reductions.

GLYPHOSATE APPLICATION RATES REQUIRED FOR *POA ANNUA* CONTROL IN GLYPHOSATE TOLERANT PERENNIAL RYEGRASS CULTIVARS, *JS501* AND *REPLAY*.

C.M. Baldwin*, A.D. Brede; Jacklin Seed by Simplot, Post Falls, ID (208)

ABSTRACT

Trials were conducted to determine the glyphosate tolerance of 'JS501' and 'Replay' perennial ryegrass. A separate trial determined glyphosate rates required for effective *Poa annua* control. In the tolerance trial, Replay perennial ryegrass (*Lolium perenne* L.) was seeded on 5 May 2010 in Post Falls, ID at 390 kg ha^{-1}. Glyphosate (Departure) was applied on 15 September 2010 at 0, 0.29, 0.58, 1.16, 1.74, and 2.32 kg ae ha^{-1}. In the *Poa annua* control trial, one block of 'JS501' and a one block of 'Replay' perennial ryegrass (*Lolium perenne* L.) were seeded on 15 September 2008 in Post Falls, ID at 390 kg ha^{-1}. Glyphosate (Departure) rates were randomized within each cultivar block at 0, 0.15, 0.29, 0.44, and 0.58 kg ae ha^{-1}. Glyphosate applications were 17 June and 19 August 2009 and 25 June and 25 August 2010. For all trials, the existing stand of turfgrass was killed, leaving bare ground for seeding. Data collected for all trials included turfgrass color, percent leaf firing, and percent *Poa annua*. An application rate of 0.85kg ae ha^{-1} was required to cause 20% leaf firing. For *Poa annua* control, after four glyphosate applications over a 2-year period, a rate of 0.29 kg ae ha^{-1} or greater resulted in less than 10% *Poa annua*. Meanwhile, the 0.15 kg ae ha^{-1} application rate had approximately 28% *Poa annua*. Untreated plots had approximately 83% *Poa annua*. Discoloration was not noted for either perennial ryegrass cultivar at any point over the 2-year trial period. Based on the environmental conditions of each trial, results suggest recommended application rates should be 0.29 kg ae ha^{-1}. This rate is sufficient for *Poa annua* control and also provides protection in case a spray overlap occurs during an application.

PURPLE NUTSEDGE CONTROL IN BERMUDAGRASS TURF. **N.J. Gambrell*, A.G. Estes, B. McCarty; Clemson University, Clemson, SC (209)**

ABSTRACT

FMC Corp. is exploring the possibility of introducing several combination products in the turfgrass market for increased efficacy compared to stand along products. The purpose of the study was to determine the efficacy of combinations of sulfentrazon with other compounds for postemergence control of purple nutsedge. Purple nutsedge tends to be problematic in warm season grasses, spreading by producing tubers in chains, which are connected by rhizomes. For these and other reasons, purple nutsedge is considered to be the world's worst weed. A study with twelve treatments was used to evaluate the efficacy of sulfentrazon combination products along with industry standards. The study was initiated August 24, 2011 with rating dates on August 30, September 9, September 20, and October 20, 2011 at 6, 16, 27, and 57 days after treatment (DAT), respectively. Premix FMC treatments included: carfentrazone plus metsulfuron 66WDG @ 0.269, 0.384, and 0.412 lb ai/a; sulfentrazone plus metsulfuron 35WDG @ 0.049, and 0.068 lb ai/a; sulfentrazone plus carfentrazone 3.5SC @ 0.230 and 0.410 lb ai/a; Dismiss South 4L (sulfentrazone + imazathapyr) -@ 0.290 and 0.450 lb ai/a; Certainty 75DF (sulfosulfuron) @ 0.06 lb ai/a; Sedgehammer 75WGD (halosulfron-methyl) @ 0.06 lb ai/a; and, Monument 75DF (trifloxysulfuron-sodium) @ 0.03 lb ai/ac. All treatments were applied only once. The study was conducted near Clemson University in an irrigated, common bermudagrass field maintained at two inches and heavily infested with purple nutsedge. Applications were made using a CO©ü powered sprayer calibrated at 20 GPA. Three treatment replications were applied on 2x3 meter plots, using a randomized complete block design. Visual ratings evaluated percentage control of purple nutsedge. Ratings were based on a 0-100%, 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. Of the FMC experimental combination products, Carfentrazone plus metsulfuron @ 0.412 lb ai/a provided best control at 57 DAT (October 20, 2011), at 63%. Of the remaining treatments, Dismiss South @ 0.290 and 0.450 lb ai/a; Certainty @ 0.06 lb ai/a; Sedgehammer @ 0.06 lb. ai/a; and, Monument @ 0.03 lb ai/a provided ≥80% control at 57 DAT (October 20, 2011). Repeat applications and screening of additional products will be continued in the future for timing and control of Purple Nutsedge.

INDAZIFLAM FOR WEED CONTROL IN WARM-SEASON TURF. **T. Gannon*[1], F.H. Yelverton[2], L. Warren[3]; [1]North Carolina State University, Raleigh, NC, [2]N. C. State University, Raleigh, NC, [3]North Carolina State University, raleigh, NC (210)**

ABSTRACT

Annual bluegrass (*Poa annua* L.), smooth crabgrass (*Digitaria ischaemum* Schreb. Ex Muhl.) and goosegrass (*Eleusine indica* (L.) Gaertn.) are common annual grassy weeds in warm-season turf. Preemergence herbicides are often used for controlling these species; however, preemergence herbicides in established turf have predominantly been limited to two modes of action presenting several potential problems. Indaziflam is a newly registered herbicide by Bayer Environmental Science that offers preemergence control of many common and troublesome broadleaf and grassy weeds in turfgrass systems. Indaziflam is a member of the alkylazine herbicide class and inhibits cellulose biosynthesis offering an alternative to mitotis- and photosynthesis-inhibiting herbicides. Research was conducted to evaluate indaziflam for annual bluegrass, goosegrass, and smooth crabgrass control. Additional research evaluated the effect of March-applied indaziflam on subsequent fall-seeded perennial ryegrass. These data indicate single and sequential indaziflam applications (40 - 60 g ha^{-1}) applied early postemergent (September) provided > 70% annual bluegrass control while control obtained with postemergent applications (October) was not acceptable. Single and sequential applications of indaziflam (20 - 60 g ha^{-1}) provided 65 - 83% and 76 - 98%, respectively, season-long smooth crabgrass control. Similar results were observed with goosegrass. Further, March-applied indaziflam did not negatively affect subsequent fall-seeded perennial ryegrass. These data indicate indaziflam offers acceptable preemergence control of annual bluegrass, goosegrass and smooth crabgrass while giving turfgrass managers an alternative mode of action.

ANNUAL BLUEGRASS CONTROL WITH AMICARBAZONE IN CREEPING BENTGRASS FAIRWAYS. **R.S. Landry*[1], B. McCarty[2], A.G. Estes[2]; [1]M.S. Graduate Student, Clemson, SC, [2]Clemson University, Clemson, SC (211)**

ABSTRACT

Annual bluegrass (*Poa annua*) is a widely distributed seed producing winter annual with a tufted growth habit. Annual bluegrass and other *Poa* species have become difficult to control due, at least partially, to herbicide-resistant species and other environmental factors. The purpose of this research was to evaluate postemergence control of annual bluegrass biotypes in creeping bentgrass (*Agrostis stolonifera*) golf course fairways for two consecutive years, 2010 and 2011, using a herbicide being developed for the turfgrass market, Amicarbazone (Xonoerate70 DF). The studies were conducted on creeping bentgrass fairways at Wade Hampton Golf Course in Cashiers, N.C. Plot size for each treatment was 2m x 3m with 4 replications. Treatments for both years were applied using a CO_2 backpack sprayer calibrated at 20 GPA. In 2010, treatments included: Amicarbazone at 0.044 lbs ai/a applied April 22 followed by repeat treatments on 6, 12, 20 DAI (days after initial application), 0.0875 lbs ai/a applied April 22 and 20 DAI, 0.131 lbs ai/a applied April 22 and 20 DAI; bispyribac-sodium (Velocity 17.6 SG) at 0.022 lbs ai/a applied on April 22 followed by 12, 26, 40 DAI and sulfosulfuron (Certainty 75 WDG) at 0.012 lbs ai/a applied on April 22 fb 12 DAI. Treatment applications were repeated in 2011 similarly to the 2010 study beginning April 28, 2011 fb 5, 12, 20 DAI for Amicarabazone at 0.044 lbs ai/a; 0.0875 lbs ai/ac applied April 28 and 20 DAI, 0.131 lbs ai/ac applied April 28 fb 20 DAI, and bispyribac-sodium (Velocity 17.6 SG) at 0.022 lbs ai/a applied on April 28 followed by 12, 26, 40 DAI and sulfosulfuron (Certainty 75 WDG) at 0.012 lbs ai/a applied on April 28 fb 12 DAI. Visual ratings were taken on percent creeping bentgrass injury rated on a 0-100% scale with 0% representing no injury and 100% representing complete bentgrass damage. Percent annual bluegrass species control was rated on a 0-100%, with 100% percent representing total control. In addition, stand density was assessed on a 0-100% scale with 0% representing no green grass (turfgrass and/or *Poa* species) and 100% representing total stand density. In 2010, 20 DAI (days after initial application) ~65% turf stand injury resulted from amicarbazone (0.044 lbs ai/a) after 3 applications and sulfosulfuron after 2 applications. Injury decreased to ≤ 20%, 33 and 40 DAI for all three rates of amicarbazone. Injury from amicarbazone was more severe than bispyribac-sodium treatments at all rating dates, with the exception of 40 DAI. Amicarbazone reduced overall stand density ~45% more than Velocity and Certainty at 33 and 47 DAI. In 2011, 20 days after the last application, turf stand injury was ~40 % from amicarbazone (0.044 lbs ai/ac) after 3 applications and sulfosulfuron after 2 applications. Amicarbazone at 0.044 lbs ai/ac - 4x, 0.875 lbs ai/ac and 0.131 lbs ai/ac - 2x injured bentgrass ≥30% at 33 and 40 DAI. Amicarbazone provided more acceptable control (≥40%) than Velocity up to 47 DAI. At 82 DAI, amicarbazone was equal to Velocity in control. Overall, amicarbazone provided greater and faster control of *Poa* species than Velocity and Certainty. Future research should consist of amicarbazone at 0.5 oz/a applied 4 times and possibly different site location for lower rates of amicarbazone.

TIMING OF SPECTICLE FOR GOOSEGRASS CONTROL ON BERMUDAGRASS. **J.R. Gann*, B. McCarty; Clemson University, Clemson, SC (212)**

ABSTRACT

Goosegrass (*Eleusine indica* (L.) Gaertn.) is a difficult-to-control warm-season annual weed occurring in most regions of the country. Specticle (Indaziflam) is a relatively new product from Bayer Environmental Science that is effective for preemergence control of a variety of weeds. A field study was initiated in South Carolina in fall 2010 to evaluate multiple timings and rates of Specticle (Indaziflam) and Barricade (Prodiamine) for the preemergence control of goosegrass (*Eleusine indica* (L.) Gaertn.) in common bermudagrass (*Cynodon dactylon*) the following year. Treatments included Specticle at 52 g ai/ha applied Sept. 2010, Specticle at 52 g ai/ha applied April 2011, Specticle at 52 g ai/ha applied May 2011, Specticle at 52 g ai/ha applied Sept. 2010 fb 26 g ai/ha in May 2011, Specticle at 52 g ai/ha applied Sept. 2010 fb 35 g ai/ha in May 2011, Specticle at 52 g ai/ha applied Sept. 2010 fb 35 g ai/ha in April 2011, Specticle at 35 g ai/ha applied April 2011, Specticle at 35 g ai/ha applied May 2011, Barricade at 1 lb ai/a applied April 2011, and Barricade at 1 lb ai/a applied Sept. 2010. Visual ratings were taken at monthly intervals throughout the study. Percent goosegrass control was rated on a 0-100% scale with 0% representing no control and 100% being no goosegrass present. Experimental design was RCBD with 4 replications with individual plot size 2 x 3m. The study was located on a golf course fairway thus, maintained to its standards including a mowing height at 0.75 inch and irrigation applied to minimize turf stress. Two of the fall Specticle applications with initial rates at 52 g ai/ha controlled 98% or more goosegrass throughout the entire following growing season. Both treatments had sequential spring applications at 35 g ai/ha (one study on April 4th and one on May 31st). The two spring timings at 52 g ai/ha (one on April 4th and one on May 31st) provided $\geq$85% control throughout the season. Another spring application on April 4th at 35 g ai/ha provided 94% goosegrass conrol. A fall treatment without a second application as well as a fall application followed by a light application of 26 g ai/ha on May 31st provided early control in the growing season but failed to continue throughout the summer. Barricade applications at 1lb ai/a had no effect on goosegrass control. Overall, the fall treatments at 52g ai/ha followed by a spring application at 35 g ai/ha provided better and longer control than the 26 g ai/ha sequential spring application as well as the single fall application. The April applications at 35 g ai/ha and 52 g ai/ha proved much more effective than the May applications with the same rates. Significant goosegrass germination had probably occurred by the time of the May applications. Future research should include further investigations into various timings and rates for the effectiveness of preemergence control of goosegrass and other troublesome weeds compare with industry standards.

WINTER WEED CONTROL ON DORMANT BERMUDAGRASS WITH RIMSULFURON, PRODIAMINE, AND ISOXABEN TANK MIXTURES. **A.N. Smith*[1], S. Askew[1], J. Corbett[2]; [1]Virginia Tech, Blacksburg, VA, [2]Qualipro, Raleigh, NC (213)**

ABSTRACT

Winter weeds in dormant bermudagrass can have a significant effect on spring weed control programs, turf aesthesis, and bermudagrass green-up. Moreover, controlling winter weeds can be a problem in the southeastern US due to mild winters. Prodiamine, rimsulfuron, and isoxaben tank mixtures were measured for efficacy against annual bluegrass (*Poa annua*), common dandelion (*Taraxacum officinale*), common chickweed (*Stellaria media*), persian speedwell (*Veronica persica*), and parsley-piert (*Alchemilla microcorpa*). Two trials were initiated on October 28, 2010 in dormant bermudagrass in Blacksburg, VA. Prodiamine, rimsulfuron, and isoxaben were applied in varying tank mixtures at 1120g ai ha-1, 17.5g ai ha-1, and 840g ai ha-1, respectively. An additional simazine treatment at 1120 g ai ha-1 was also included as a comparison. All herbicide treatments were compared with a nontreated check. Weed cover and control were visually estimated. Weed counts were conducted with a 98 point grid on each plot. Bermudagrass green leaves were counted to assess the rate of postdormant bermudagrass growth ("greenup)" in spring. In March at 151 DAT, any mixture that contained rimsulfuron plus isoxaben or rimsulfuron plus prodiamine controlled all species 75 to 95% on Patriot bermudagrass and 83 to 99% on Riviera bermudagrass. Bermudagrass green leaf counts were negatively correlated to weed cover at both sites, suggesting treatments that controlled weeds increased bermudagrass spring greenup. Prodiamine alone and isoxaben alone both reduced cover of all weeds except common dandelion and annual bluegrass. Both common dandelion and annual bluegrass were already present when treatments were initiated. Rimsulfuron seemed to help control emerged weeds that prodiamine and isoxaben did not control, making the tank mixture more effective than either herbicide alone. These results suggest that the addition of rimsulfuron to prodiamine and isoxaben tank mixtures may increase winter weed control and contribute to faster bermudagrass green-up.

BRUSH MANAGEMENT WITH INDIVIDUAL PLANT TREATMENTS OF AMINOCYCLOPYRACHLOR.

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ABSTRACT

Invasive brush species pose a serious threat to native rangeland species in the western United States. As observed by scientists in this region, some invasive brush species have attributed to a reduction in native grasses and forbs, wildlife habitat, forage for wildlife and domestic animals, and water availability for animals and plants. Control measures for some of these brush species are either lacking or inadequate. Aminocyclopyrachlor is a new pyrimidine carboxylic acid herbicide being developed by DuPont™ Crop Protection as a weed and brush control product for use in pastures and rangelands. Initial testing of aminocyclopyrachlor indicates it controls a wider spectrum of broadleaf weeds, briars, vines, & brush, is faster acting, and has a wider application window than most currently used herbicides for these labeled areas. Trials were sprayed in 2009 and 2010 to evaluate the efficacy of aminocyclopyrachlor on various brush species when used in individual plant treatment (IPT) applications. Aminocyclopyrachlor applied alone or with triclopyr as high-volume foliar leaf sprays provided excellent mortality of a number of brush species including honey mesquite (*Prosopis glandulosa)*, huisache *(Acacia smallii)*, *Texas persimmon (Diospyros texana)*, and *agarito (Mahonia trifoliata)* when evaluated 1 and 2 years after treatment. Honey mesquite and huisache were also controlled with low-volume basal stem sprays and cut-stump applications of aminocyclopyrachlor.

INDIVIDUAL PLANT TREATMENT: METHODS AND PRODUCTS FOR SUPERIOR CONTROL OF BRUSH SPECIES.

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ABSTRACT

Individual plant treatments include low volume basal, cut surface or stump, and high volume foliar applications. This presentation describes these treatment methods, equipment and herbicide recommendations. A low volume basal bark treatment involves an oil and herbicide spray solution applied directly to the main stem or trunk. The mixture is applied directly to the stem of the tree covering an area 12 to 15 inches in height and down to the root collar, ensuring good coverage around the entire trunk or stem of the tree. This method of application is best used when the tree is 6 inches or less in diameter at the base. Remedy® Ultra and 70 to 80% v/v of basal oil is recommended for this treatment method. Sprayers must have oil-resistant seals, and a wand with a tip shut-off is recommended for basal bark application. The cut stump method of application is preferred when the base or trunk of the tree is larger than 6 inches in diameter. This application requires removal of the tree using a chain saw or other device and then treating the cut surface of the stump with the same mixture as described above. Remedy Ultra and 70 to 80% v/v of basal oil or Garlon® 3A and 50% v/v of water is recommended for this treatment method. The Remedy Ultra herbicide mix can be applied anytime after cutting; however, the Garlon 3A herbicide mix needs to be applied immediately after the tree is cut down. The Remedy Ultra oil based mix for the cut stump treatment is applied with the same equipment as the basal treatments. The water based treatment is normally applied with a squirt bottle. Low volume basal and cut stump treatments can be conducted any time of the year except when snow or water prevents spraying to the groundline. Foliar IPT applications are limited to times when plant foliage is fully expanded. Equipment for foliar IPT applications, which are water based sprays, can include a backpack, pump-up or other type sprayers. The spray mixture recommended for this type of application almost always includes a surfactant and dye. Herbicide mixes for IPT foliar application are very species specific and recommendations are best requested from local extension agents or industry representatives. Individual plant treatment can be an effective and efficient method of controlling brush species.

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BROADCAST APPLICATIONS OF AMINOCYCLOPYRACHLOR FOR THE MANAGEMENT OF MESQUITE AND HUISACHE IN RANGELAND AND PASTURES. **E.P. Castner*[1], C.R. Medlin[2], R. Rupp[3], C.D. Brister[4], S.J. Ellis[4], J.H. Meredith[5]; [1]DuPont Crop Protection, Weatherford, TX, [2]DuPont Crop Protection, Paradise, TX, [3]DuPont Crop Protection, Edmond, OK, [4]DuPont Crop Protection, Donna, TX, [5]E. I. DuPont, Memphis, TN (187)**

ABSTRACT

Aminocyclopyrachlor is a new herbicide from DuPont™ Crop Protection for the control of broadleaf weeds and brush in pasture and rangeland. Aminocyclopyrachlor has been tested under the DuPont research codes of DPX-MAT28 or DPX-KJM44 since 2005 and has been shown to control annual and perennial weeds as well as numerous brush species. Trials conducted in Texas have demonstrated control of key brush species including honey mesquite (*Prosopis glandulosa*) and huisache (*Acacia smallii*) with broadcast applications of aminocyclopyrachlor alone and in tank mixtures with other herbicides. Trials conducted in Texas, Oklahoma and New Mexico have also shown excellent control of key weed species including western ragweed (*Ambrosia cumanensis*), woolly croton (*Croton capitatus*), annual broomweed (*Amphiachyris dracunculoides*) and broom snakeweed (*Gutierrezia sarothrae*).

USE OF IMIDAZOLINONE HERBICIDES FOR WEED MANAGEMENT IN CLOVER FORAGES.

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ABSTRACT

Experiments were conducted to evaluate several species of clover tolerance to imidazilinone herbicides in 2010 and 2011. All treatments were applied with a backpack sprayer delivering 25 gallons per acre and the plot size averaged 10 by 20 ft. In addition, all treatments were applied with 0.25% non-ionic surfactant. The trials consisted of a fall study initiated on December 9, 2010 and two spring trials initiated on March 1, 2011 and March 16, 2011. The treatments in the Fall trial were 2 qt/A Butyrac 2EC, 4 or 6 fl oz/A Plateau 2L, 3 or 6 fl oz/A Pursuit 2L, or 6 fl oz/A Raptor 1L. In this experiment treatments were evaluated the following spring. At 67 days after treatment (DAT), injury to crimson clover from Plateau was very high with 68 to 75% injury observed. The low rate of Pursuit or Butyrac averaged 5% or less injury while 6 oz/A Pursuit or Raptor had 28% injury. Injury was fairly similar at the next rating date of 91 DAT but by 113 DAT injury was 13% or less with both rates of Pursuit, Raptor, or Butyrac. Injury from Plateau was 80 to 85%. By 130 DAT when crimson clover would be harvested injury was 0, 12, 10, 8, 80, and 88% from 3 oz/A Pursuit, 6 oz/A Pursuit, 2 qt/A Butyrac, and 4 and 6 oz/A Plateau, respectively. Tall fescue was controlled 82 to 92% with Plateau at 130 DAT. Pursuit or Raptor provided 40 to 60% control while Butyrac provided no control. Little barley control was best with 6 oz/A Plateau at 130 DAT with 100% control. The lower rate of Plateau, 6 oz/A Pursuit or Raptor provided similar control of 80 to 98% while 4 oz/A Pursuit and Butyrac provided 28 and 0%, respectively. Common Vetch was controlled 82 to 88% with Plateau. Pursuit or Raptor at 6 oz/A provided 45 and 58% control, respectively, while 4 oz/A Pursuit or Butyrac provided 20% or less. All treatments controlled bulbous buttercup 100% and both rates of Plateau and 6 oz/A Pursuit and Raptor provided 75 to 100% control of Carolina geranium. Butyrac controlled Carolina geranium less at 65%. The spring treatments were the same as the fall treatments except Pursuit was also applied at 9 oz/A. Additional treatments were Spartan 4L at 12 fl oz/A and a tank-mix of 2 qt/A Butyrac + 6 oz/A Pursuit. Spring trials were similar to the fall study in that initially clover injury was fairly high but lessened as clover reached maturity. In Spring Study 1, in a mixture of crimson, Persian, and hop clover Pursuit at 3 oz/A caused 22 to 25% injury from 14 to 48 DAT but by 59 DAT injury was only 10%. Pursuit at 6 oz/A had 32 to 42% injury through 48 DAT and at 59 DAT injury was 22% while 9 oz/A caused 32% injury at 59 DAT. Injury with Raptor and Butyrac was similar to 3 oz/A Pursuit. Plateau caused too much injury at 80 to 90% at 59 DAT and the injury from the tank-mix of Butyrac + Pursuit was similar to Pursuit alone. Spartan tended to cause the least injury of all. Also in Spring Study 1 mouseear chickweed control was 100% with all treatments except Butyrac where only 25% was observed. Common vetch control was best 59 DAT with Spartan at 80% followed by Butyrac or 6 oz/A Plateau with 52 to 58%. Pursuit at 3 oz/A, Raptor, and 4 oz/A Plateau had 22 to 38% control of common vetch and the tank-mix of Pursuit + Butyrac generally had less control than Butyrac alone. Several treatments had good control of Carolina geranium at 59 DAT. Butyrac, 6 oz/A Plateau, all rates of Pursuit, Raptor, and the tank-mix of Butyrac + Pursuit provided similar control of 78 to 90% while Spartan provided only 10% control. In Spring Study 2, white clover injury with the exception of 6 oz/A Plateau (45%) was no more than 20% with any treatment. At 33 DAT, 6 oz/A Plateau caused 85% injury while 4 oz/A Plateau and 9 oz/A Pursuit resulted in 40% injury. The least injury was from Butyrac or Spartan which had 5% injury and the others ranged between 10 and 35%. At 64 DAT, Plateau at 4 or 6 oz/A caused the greatest injury at 40 and 70%, respectively. Pursuit, Raptor, Butyrac, Spartan, and the tank-mix of Butyrac + Pursuit resulted in 15% or less injury. Height reduction of white clover at 64 DAT was 65% with 6 oz/A Plateau. All other treatments resulted in 17% or less height reduction. Tall fescue was controlled 70 to 75% with Plateau treatments at 64 DAT while Butyrac and Spartan did not provide any control. Raptor did provide more control of tall fescue than Pursuit with 60% compared to 35 to 45% with Pursuit treatments. Almost all treatments with the exception of Butyrac and Spartan reduced tall fescue seedhead formation. Plateau and Raptor reduced tall fescue seedheads 100% while Pursuit and the tank-mix of Butyrac and Pursuit reduced seedheads 75 to 85%. Height of tall fescue shoots measured at 64 DAT was not significantly reduced by Butyrac, all Pursuit treatments, Spartan or the tank-mix of Butyrac + Pursuit. Plateau and Raptor decreased shoot height 44 to 56%.

AMINOCYCLOPYRACHLOR USE IN PASTURES IN THE SOUTHERN U.S. **C. Alford*[1], M.T. Edwards[2], J.H. Meredith[3], R.W. Williams[4], R.M. Edmund[5]; [1]E. I. DuPont, Lakewood, CO, [2]E. I. DuPont, Pierre Part, LA, [3]E. I. DuPont, Memphis, TN, [4]E. I. DuPont, Raleigh, NC, [5]E. I. DuPont, Little Rock, AR (190)**

ABSTRACT

Weeds can reduce productivity and quality of pastures and rangeland by competing with grass for light and nutrients. This reduces carrying capacity and profitability for cattle producers. DuPont has been developing an exciting new class of auxin herbicide, aminocyclopyrachlor, for range, pasture and invasive weed control. In research trials conducted in pastures and rangeland across the United States since 2005, aminocyclopyrachlor has demonstrated excellent activity on a number of important pasture weed species such as thistles, ragweeds, broomweed, wolly croton, silverleaf nightshade, and ironweed.

NEW GRASS AND BROADLEAF WEED MANAGEMENT OPTIONS IN COASTAL BERMUDAGRASS PASTURES.

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ABSTRACT

Grass weeds interfere with pure pasture stands and hay drying and are generally not a health concern with the exception of johnsongrass. Broadleaf weeds can be numerous, noxious, toxic or prickly, thus preventing animal grazing. Pastora (nicosulfuron + metsulfuron) was registered in 2010 as a grass and broadleaf herbicide for 'Coastal' bermudagrass pastures. Perspective (aminocyclopyrachlor + chlorsulfuron) has a target registration date of 2013 and controls numerous broadleaf weeds. Research was conducted from 2009 – 2011 to evaluate efficacy of Pastora and Perspective applied at various timings for POST control of common and troublesome weeds in North Carolina 'Coastal' bermudagrass pastures. Pastora was evaluated on large crabgrass in Wake and Bladen County, goosegrass in Bladen County and Italian ryegrass in Sampson County. Rates tested were 1 and 1.5 oz/A. Adjuvants included a NIS (Induce) at 0.25% v/v or a COC (Agridex) at 1% v/v. Perspective was evaluated on numerous broadleaf weeds in the following counties; Wake, Alamance, Wayne, Bladen and Lenoir. Rates tested ranged from 1.19 to 4.76 oz/A. A NIS was included at 0.25% v/v. Bermudagrass growth response was recorded if any visible symptoms were observed. Treatments were replicated 4 times with plot sizes ranging from 6 x 15 ft to 8 x 25 ft. All treatments were applied at 20 gpa and 32 to 34 psi with a 4-nozzle, 18 in spacing boom containing XR 110002VS 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 stand reduction and chlorosis where 0 = no stand reduction or chlorosis and 100= complete stand reduction or chlorosis. In a Wake County location, 1 oz/A Pastora controlled large crabgrass 99 to 100% when treated 1 to 2 WA 1st cutting date of Jun 3, 2009. Winter weed and pasture stand removal along with good soil moisture allowed large crabgrass to germinate within days after harvest. Large crabgrass plants were 3 to 4 leaves and 1 to 2 inches tall at time of application. A Bladen County location was free of winter weeds, thus allowing large crabgrass to germinate much earlier in the season. 1 and 1.5 oz/A Pastora applied on Apr 21, 2009 controlled 1 to 3 leaf large crabgrass that was only 0.75 inch in height 79 and 96%, respectively through Sep 3. A sequential application on Jun 11 reduced bermudagrass growth 16% 2 WAT with complete recovery by 4 WAT. In 2010, 1 oz/A Pastora provided 91% goosegrass control in a Bladen County location when treated Jun 9 to plants that averaged 1 tiller and 4 inches in height. 1st cut was Jun 3 and this location had heavy winter weed problems that delayed goosegrass germination until harvest. Italian ryegrass was treated and evaluated in Sampson County from 2009 – 11. Pastora applied at 1 or 1.5 oz/A provided 90 to 100% control with any timing from Dec to Apr. Italian ryegrass size ranged from 4 to 12 inches at time of application. Perspective displayed excellent activity on numerous broadleaf weeds. 100% control was achieved on the following weeds: dichondra, curly dock, corn buttercup, hairy buttercup, corn speedwell, common dandelion, common chickweed, mouseear chickweed, black mustard, Carolina geranium, mugwort, horsenettle and ladysthumb. Hairy bittercress and dogfennel were controlled 98%. 80 to 85% control was achieved on sicklepod and wild radish. Unacceptable control was seen on trumpetcreeper (60%) and maypop passionflower (0%). In conclusion, 1 or 1.5 oz/A Pastora provided excellent (>90%) control of large crabgrass up to 4 leaves, goosegrass up to 1 tiller and Italian ryegrass up to 12 inches in height. 1 oz/A Pastora applied in Jun (1 WA cutting) caused temporary bermudagrass growth reduction and discoloration (16%) by 2 WAT with total recovery by 4 WAT. Timely applications of Perspective up to 2.5 oz/A provided excellent (>90%) control on the common and troublesome NC pasture broadleaf weeds tested except for wild radish (80%). Perspective provided total control of numerous broadleaf weeds not included in the SWSS pasture survey. 2.38 or 4.76 oz/A Perspective applied in Jun discolored bermudagrass 11 or 14%, respectively 2 WAT. Complete recovery occurred by 4 WAT. Pastora is and Perspective should be an excellent herbicide option for NC 'Coastal' bermudagrass pasture growers.

AMINOPYRALID PLUS GLYPHOSATE AS A TOOL FOR RENOVATION OF BLACKBERRY INFESTED PASTURES. **B. Kline*[1], P.L. Burch[2], V.F. Peterson[3], V.B. Langston[4], M.S. Smith[5]; [1]Dow AgroSciences, Duluth, GA, [2]DowAgroSciences, Christiansburg, VA, [3]DowAgroSciences, Mulino, OR, [4]Dow AgroSciences LLC, The Woodlands, TX, [5]DowAgroSciences, Indianapolis, IN (192)**

ABSTRACT

Remedy® Ultra and Remedy Ultra in mixtures with other herbicides provides effective blackberry (*Rubus* spp.) control, especially with repeated application over several years. Pasturegard® and combinations with Milestone® Herbicide (aminopyralid) provide blackberry control that is improved compared to Remedy® Ultra applied alone. Since the introduction of Chaparral™ Herbicide in 2009, field trials and operational experience demonstrated better blackberry control with this product than most previous offerings. Chaparral™ contains aminopyralid + metsulfuron. This product can be used in bermudagrass (Cynodon dactylon) pastures with excellent grass safety. Some tall fescue (Festuca arundinacea) suppression can be expected at higher rates of Chaparral™ but the tall fescue generally recovers. The metsulfuron in Chaparral™ can cause unacceptable injury to bahiagrass. In 2010 an experiment was conducted on a degraded pasture in North Georgia that was heavily infested with bush-type blackberry. Three treatments were applied: aminopyralid alone at 0.11 lbs ae/acre, aminopyralid at 0.11 lbs ae/acre + glyphosate at 1.0 lbs/acre, and glyphosate alone at at 1.0 lb/acre. The glyphosate (4 lb ae/gal) product used in this experiment was Accord® XRT II. Each treatment plot was 24 by 50 ft in size. A 16 ft wide strip was left non-treated between each plot. Spray solutions were applied at 25 gal/acre total volume through turbo fan nozzles on ATV-mounted boom. Applications occurred on October 16, 2010. Percent blackberry stem kill, percent bermudagrass and tall fescue cover were determined on August 23, 2011 or 311 days after treatment applications. Blackberry control with combinations of aminopyralid + glyphosate (4 lb ae/gal) was excellent and easily equivalent to any of the best current commercial offerings for blackberry control in pastures. This pasture where the experiment was conducted was dominated with bush-type blackberry. A mixed stand of tall fescue and coastal bermudagrass was present, but grasses were sparse because of competitive exclusion by blackberry. The combination treatment of aminopyralid at 0.11 lbs ae/acre + glyphosate at 1.0 lbs ae/acre released the bermudagrass from competition with the blackberry and enabled the recovery of a vigorous and healthy grass stand within 1 year after application. This approach is an economical new concept for blackberry control and pasture renovation for highly degraded bermuda pastures. Based on these results, this treatment option provides removal of blackberry and tall fescue and quick bermudagrass recovery following one application. Injury to bermuda is a risk with glyphosate in this tank mixture, but with late season timing, when bermuda is transitioning to dormancy, a mid to late October application should reduce this potential. Accord® XRT II and Rodeo® herbicides are both labeled for pasture renovation. Additional testing of this concept is suggested for bahiagrass pastures. Timing will be dependent on geographic location, when bahia is transitioning to dormancy. Mid to late October suggested for mid South; November to early December for Deep South, Central and South Florida. Chaparral™ is still a top choice for bermudagrass and tall fescue-dominated pastures for blackberry control and pasture renovation. Typically Chaparral™ should be used in pastures with moderate infestations of blackberry and herbaceous weeds and good quality grass stands; while Milestone + Accord XRT II would be reserved for severe infestations where grass stands are thin and conversion to Bermuda is the desired outcome. ™®Trademark of Dow AgroSciences LLC. Consult the label before purchase or use for full details. Always read and follow label directions.

PERFORMANCE OF NEW HERBICIDES AND FORMULATIONS ON BROADLEAF WEEDS IN PASTURES. **T.D. Israel*, W. Phillips, N. Rhodes; University of Tennessee, Knoxville, TN (193)**

ABSTRACT

Successful pastures are vital for cattle production in the United States. Broadleaf weeds can negatively impact pasture productivity and grazing efficiency and are often difficult and expensive to manage. Therefore, novel tools are needed to provide broad-spectrum and long-term control of troublesome weeds. Aminocyclopyrachlor (hereafter abbreviated as ACP), a new synthetic auxin herbicide, has been registered for use in non-cropland and right-of-way applications; registration in pastures is anticipated soon. Research was conducted in 2011 to evaluate the efficacy of aminocyclopyrachlor combinations on selected broadleaf weeds in pastures. All trials utilized naturally occurring populations of weeds in eastern Tennessee. Species studied included spiny amaranth (*Amaranthus spinosus*), tall ironweed (*Vernonia gigantea*), common ragweed (*Ambrosia artemisiifolia*), and blackberry (*Rubus* spp.). Experimental design was a randomized complete block with three replications, except for the blackberry trial, which was conducted using a strip test. All treatments included non-ionic surfactant at 0.25%. Visual control ratings were evaluated monthly on a 0-99% scale. ACP plus metsulfuron (1.11 + 0.17 oz ai/A) controlled spiny amaranth 89-95% at 90 DAT. ACP plus 2,4-D (1 + 7.6 oz ai/A) resulted in 82-92% control at 90 DAT while ACP plus triclopyr (1 + 2 oz ai/A) gave 80-83% control. For tall ironweed at 90 DAT, ACP plus metsulfuron (0.67 + 0.1 oz ai/A) and ACP plus 2,4-D (0.63 + 4.75 oz ai/A) resulted in 93 and 97% control, respectively. Those same treatments as well as ACP plus triclopyr (0.67 + 1.33 oz ai/A) applied to common ragweed resulted in $\geq$95% control at 90 DAT. For blackberry, ACP plus metsulfuron (1.78 + 0.27 oz ai/A) and ACP plus 2,4-D (2 + 15.2 oz ai/A) resulted in 85 and 92% control, respectively. The results indicate that ACP combinations at the lowest rates tested provided excellent seasonal control of tall ironweed and common ragweed. Higher rates may be necessary for acceptable spiny amaranth and blackberry control. The tall ironweed and blackberry trials will be evaluated one year after treatment to determine long-term control.

PASTURE WEED CONTOL WITH AMINOCYCLOPYRACHLOR. **A.G. Estes*, B. McCarty; Clemson University, Clemson, SC (194)**

ABSTRACT

Aminocyclopyrachlor is a new herbicide being developed by Dupont. It is a synthetic auxin herbicide that acts as a plant growth regulator. The herbicide is taken up by the stems, leaves, and roots and is translocated throughout the plant. Herbicide symptoms are typical of synthetic auxin inhibitors with bending and twisting of stems and leaves, stem thickening and leaf cupping, necrosis, and eventual death. The objective of the study was to evaluate the efficacy of Aminocyclopyrachlor for control of broadleaf weeds in pastures. The study was conducted in pastures and unimproved turf areas located in the Upstate of South Carolina. Plots size for each treatment measured 2.0m by 3.0m, replicated three times. Treatments were applied using a CO_2 backpack sprayer calibrated at 20 GPA. During the summer of 2011 five different studies were conducted evaluating Aminocyclopyrachlor for control of spiny amaranth, horsenettle, dogfennel, horseweed, and common ragweed. Visual control ratings were taken throughout the study. Percent control was rated on a 0 – 100% scale, where 0 representing no control and 100 representing complete control. In addition, bermudagrass, phytotoxicity was rated on 0 – 100% scale where 0 = no injury and 100 = dead turf. Future research at Clemson University will be to continue to evaluate Aminocyclopyrachlor for control of various weeds in pastures and rangeland situations. Investigate other herbicide combinations with Aminocyclopyrachlor for increased weed efficacy and weed spectrum.

FINE FESCUE VARIETAL RESPONSE TO GLYPHOSATE RATES. **S. Askew*, M.C. Cox; Virginia Tech, Blacksburg, VA (195)**

ABSTRACT

As the current economic turn down affects golf budgets, more scrutiny is placed on managed turf areas to reduce fertility and mowing costs. Nonmow areas, or secondary roughs, are a cost effective and visually appealing approach to maintaining out-of-play areas on the golf course. Fine fescues are typically used for these areas because they are shorter than other grasses and tend to allow golfers to find and advance errant shots. A unique set of weeds exist in nonmow situations and weed control programs are lacking. Some fine fescues have demonstrated tolerance to glyphosate in past research, and glyphosate would be a valuable tool for controlling various perennial grass weeds in nonmow areas. More information is needed to determine which fine fescue varieties are more tolerant to glyphosate and how glyphosate rates affect visual quality and seedhead production of fine fescues. The objective of this study was to evaluate glyphosate at 0.6, 0.8, and 1.4 kg ai ha^{-1} for effects on visual quality, NDVI, and seedhead production of 56 fine fescue varieties. Glyphosate was applied at 0.6, 0.8, and 1.4 kg ai ha^{-1} with an 18 inch wide sprayer on May 16, 2011. The 56 fine fescue varieties were comprised of 1 sheep fescue, 3 slender creeping fescues, 12 hard fescues, 13 chewings fescues, and 27 strong creeping fescues. All plots were mowed in April approximately 5 weeks prior to treatment and not mowed again for the duration of the study. Glyphosate injured fine fescue most at 1 month after treatment. At this timing, 22, 9, and 2 varieties maintained acceptable quality when treated with 0.6, 0.8, and 1.4 kg ai ha^{-1} glyphosate, respectively. Of the 22 varieties that maintained acceptable quality 1 month after 0.6 kg ai ha^{-1} glyphosate, 12 were hard fescues, 8 were strong creeping, 1 was a slender creeping, and 1 was a sheep fescue. The following 7 hard fescue and 1 sheep fescue varieties maintained acceptable quality 1 month after 0.8 kg ai ha^{-1} glyphosate: SPM, Pick HF#2, Berkshire, Quatro, IS-FL 28, Scaldis, SRX 3K, Oxford, and Heron. Only Quatro sheep fescue and Oxford hard fescue maintained acceptable quality 1 month after glyphosate at 1.4 kg ai ha^{-1}. When not treated with glyphosate, the following 9 hard fescues and 5 strong creeping fine fescue varieties had seedheads on 25% of plots or less: Predator, SPM, A0163Rel, C-SMX, Pick HF#2, Berkshire, DLF-RCM, IS-FRR30, IS-FL 28, SR 3000, Oxford, DP 77-9360, DP 77-9579, and Heron. When not treated with glyphosate, the following 12 chewings fescues, 2 strong creeping fescues, and 1 slender creeping fescue had seedheads on 70% or more of plot area: 7 Seas, ACF 174, Jamestown 5, ACF 188, LongFellow II, IS-FRC17, BUR 4601, SRX 51G, SRX 55R, Ambassador, DP 77-9885, DP 77-9886, PST-4TZ, Musica, and Navigator. When treated with 0.6 kg ai ha^{-1} glyphosate, seedhead coverage was less than 6% regardless of variety and seedheads were not produced by any variety when treated with the two higher glyphosate rates. These data suggest chewings fescues produce the most seedheads while hard fescues and sheep fescues have better glyphosate tolerance.

THE INFLUENCE OF COHORT AGE AND CLIPPING ON HERBICIDE EFFICACY OF KEY WEEDS FOUND IN BERMUDAGRASS HAYFIELDS. **S.F. Enloe*, G.R. Wehtje; Auburn University, Auburn, AL (196)**

ABSTRACT

Bermudagrass hay production systems in the southeastern United States often use a tight harvest schedule every 28 days throughout the growing season. In these systems, summer annual grass weed control is often accomplished with a nicosulfuron plus metsulfuron herbicide treatment during a narrow five to seven day window following hay cuttings. This short period after cutting is when annual grasses may already be actively growing but before bermudagrass commences rapid growth. While this treatment timing with nicosulfuron plus metsulfuron works well for many annual grass weeds, certain species such as large crabgrass (*Digitaria sanguinalis*) are not consistently controlled. Since large crabgrass germination occurs throughout most of the growing season, there may be multiple cohorts actively growing in the field during the herbicide treatment window following hay cutting. For many species of annual weeds, herbicide susceptibility is often linked to plant age, with smaller, younger weeds being more easily controlled. Therefore, the objective of this study was to evaluate the influence of cohort age on weed response to clipping and herbicide treatment. A greenhouse study was conducted at Auburn University during the summer of 2011 and was repeated three times. Three weed species were selected for study and included large crabgrass (*Digitaria sanguinalis*), green foxtail (*Setaria viridis*), and barnyardgrass (*Echinochloa crus-galli*). Sixteen replicate pots of each species were planted every seven days for five weeks. Seven days after the last planting, eight pots of each species from each planting timing were clipped to a height of five cm. At five days after clipping, a nicosulfuron plus metsulfuron plus NIS (0.4 + 0.1 kg/ha +0.25%v/v) treatment was applied to one half of the clipped pots and one half of the unclipped pots from each planting timing. All pots were allowed to grow for 21 days after herbicide treatment and were then harvested, oven dried at 65 C for 72 hours and weighed. Data was analyzed by species using the linear mixed-effects model fit by REML in R v.2.14. For crabgrass, increasing cohort age significantly decreased percent control when plants were clipped and sprayed. However, this was not the case for either green foxtail or barnyardgrass as cohort age did not influence percent control when plants were clipped and sprayed. For these species, increasing cohort age significantly increased percent control for the clipping only treatment as plants approached flowering. Additionally, increasing cohort age decreased percent control for the herbicide only treatment, which is characteristic for many annual weedy species. These results do indicate that cohort age may be important for herbicidal efficacy on certain species following clipping. However, it was not important for all species.

IMPACTS OF MACARTNEY ROSE ON PASTURE FORAGE PRODUCTION AND UTILIZATION.

S.F. Enloe*[1], B. Kline[2], R.K. Bethke[1], J.S. Aulakh[1]; [1]Auburn University, Auburn, AL, [2]Dow AgroSciences, Duluth, GA (197)

ABSTRACT

Macartney rose (*Rosa bracteata*) is an aggressive clump forming rose that infests pastures across the southeastern United States but is most prevalent on prairie soils. Similar to other thorny shrubs, clumps of Macartney rose appear to reduce both forage production and forage utilization as cattle often avoid grazing near it. However, these aspects have never been clearly quantified. Given that Macartney rose is very difficult to control, a better understanding of the interaction between Macartney rose and forage production and utilization would help farmers in improving pasture management decisions. Therefore, our objective was to determine how Macartney rose influences both forage production and utilization by cattle. A study was conducted near Eutaw, Alabama in 2011 in a bahiagrass pasture infested with Macartney rose. Four treatment plot types were selected for the study with a minimum of five replicate plots per treatment. These included rose present with grazing, rose present without grazing, rose absent with grazing, and rose absent without grazing. For the rose present plots, small, uniform Macartney rose clumps with a mean height of 41 cm and mean spreading runner length of 53 cm were selected and plots were centered on each rose clump. Although Macartney rose clumps may attain a much greater size, smaller clumps were selected since forage grasses were observed to be growing up to the base of the rose stems and shading exclusion of grasses had not yet occurred. Grazing was excluded from the no grazing treatment plots with 120 cm by 120 cm exclosures that were constructed of a PVC frame enclosed with heavy duty wire panel sides and a top. Grazing exclosures were placed across appropriate plots on March 16, 2011 and removed on August 22, 2011. The pasture was continuously grazed by cattle for the duration of the study. At the time of exclosure removal, a 0.25 square meter quadrat was clipped from the center of each plot. Forage grasses were separated from Macartney rose, oven dried at 65C for 72 hours and weighed. Analysis of variance indicated a strong interaction between grazing and Macartney rose. Forage utilization was 70% by cattle when Macartney rose was not present but was only 26% when Macartney rose was present. Rose biomass did not significantly differ between grazed or ungrazed plots and rose alone did not significantly influence grass biomass. These results indicate that even small Macartney rose plants are capable of strongly influencing cattle grazing and forage utilization. Additional studies will be conducted in 2012 to build upon this work.

PALMER AMARANTH (*AMARANTHUS PALMERI*) AND THE SOIL SEEDBANK. **T.M. Webster*[1], L. Sosnoskie[2], S. Culpepper[2]; [1]USDA-ARS, Tifton, GA, [2]University of Georgia, Tifton, GA (90)**

ABSTRACT

A greater understanding of the factors that regulate weed seed return to and persistence in the soil seedbank is needed for the management of difficult to control herbicide resistant weeds. Studies were conducted in Tifton, GA to evaluate the longevity of buried Palmer amaranth seeds and estimate the potential post-dispersal herbivory of seeds. Palmer amaranth seeds from glyphosate-resistant and glyphosate-susceptible populations were buried in nylon bags at four depths ranging from 1 to 40 cm in for intervals ranging between 0 to 36 months, after which the bags were exhumed and seeds evaluated for viability. There were no detectable differences in seed viability between Palmer amaranth populations, but there was a significant burial time by burial depth interaction. Palmer amaranth seed viability for each of the burial depths declined over time and was described by exponential decay regression models. Seed viability at the initiation of the study was ≥96%; after 6 months of burial, viability declined to 65 to 78%. As burial depth increased, so did Palmer amaranth seed viability. By 36 months, seed viability ranged from 9% (1 cm depth) to 22% (40 cm depth). To evaluate potential herbivory, seed traps with three levels of exclusion were constructed: 1) no-exclusion, 2) rodent exclusion, and 3) large arthropod exclusion. Each seed trap contained 100 Palmer amaranth seeds and were deployed for seven day intervals for 27 sample times. There were seasonal differences in seed recovery and differences among type of seed trap exclusion, but no interactions. Seed recovery was lower in the summer and early autumn and higher in the late winter and early spring, which may reflect the seasonal fluctuations in herbivore populations and/or the availability of other food sources. Seed recovery was greatest (44%) from the most restrictive traps, which only allowed access to small arthropods, such as fire ants. Traps that excluded rodents, but allowed access by small and large arthropods, had 34% seed recovery. In the non-exclusion traps, only 25% of seed were recovered, with evidence of rodent activity around these traps. Despite the physically small seed size, Palmer amaranth is targeted for removal from seed traps by seed herbivores, which could signify a reduction in the overall population density. In order to be successful, Palmer amaranth management programs will need to reduce soil seedbank population densities. Future studies need to address factors that enhance the depletion of the soil seedbank and evaluate how these interact with other weed control practices.

TABANONE, A NEW PHYTOTOXIC CONSTITUENT FROM COGONGRASS (*IMPERATA CYLINDRICA*).

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ABSTRACT

Cogongrass [*Imperata cylindrica* (L.) Beauv.] is a troublesome, invasive weedy species with reported allelopathic properties. The phytotoxicity of different constituents isolated from roots and aerial parts of this species was evaluated on *Lactuca sativa* and *Agrostis stolonifera*. No significant phytotoxic activity was detected in the methylene chloride, methanol, or water extracts when tested at 1.0 mg ml^{-1}. However, the total essential oil extract of cogongrass aerial parts was active. Bioactivity-guided fractionation of this extract using silica gel column chromatography led to the identification of megastigmatrienone, 3,5,5-trimethyl-4-butenylidene-2-cyclohexen-1-one (also called tabanone), as a mixture of four stereoisomers responsible for most of the activity. Tabanone inhibited growth of frond area of *Lemna paucicostata*, root growth of *Allium cepa*, and fresh weight gain of *Lactuca sativa* with I_{50} values of 0.094, 3.6, and 6.5 mM, respectively. The target site of tabanone is not known, but its mode of action results in rapid loss of membrane integrity and subsequent reduction in the rate of photosynthetic electron flow.

PHYSIOLOGICAL RESPONSE OF COTTON TO PALMER AMARANTH COMPETITION. **S. Berger*, J. Ferrell, D. Rowland; University of Florida, Gainesville, FL (92)**

ABSTRACT

Palmer amaranth (*Amaranthus palmeri*) is one of the most troublesome weeds in the southeast. A single plant left in a row of cotton (*Gossypium hirsutum*) has been documented to reduce cotton lint yields by 10-30%. Previous studies in other crops have found light to be the most important factor in Palmer amaranth-crop competition. However, water is thought to be the main factor driving competition in the sandy soils of the southeast. Relative soil water content and stomatal conductance were measured during the 2011 cotton growing season to determine the impact of Palmer amaranth on soil available water. Differences in soil relative water content were observed at a depth of 30 cm when Palmer amaranth reached 30 cm in height. This trend continued as Palmer amaranth plants reached >100 cm and soil water differences were found up to 100cm in depth. In addition to water availability relative to soil depth, water deficit at various distances away from the Palmer amaranth plant was also tested. To do this, stomatal conductance of cotton was measured 90 DAP with a leaf porometer at distances of 0 to 1000 cm away from the Palmer amaranth plant. Palmer amaranth plants were greater than 200cm in height. It was observed that stomatal conductance was reduced by 37.8 to 22.1% ranging from 0 to 200 cm away from a single Palmer amaranth plant, respectively. These studies indicate that water is indeed an important factor driving competition between Palmer amaranth and cotton in Florida. Future studies will focus on more in-depth photosynthetic measurements to evaluate the zone of influence Palmer amaranth has on cotton.

POLLEN-MEDIATED GENE FLOW IN BARNYARDGRASS. **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, Monticello, AR, [3]University of Warwick, Warwick, England (93)**

ABSTRACT

Gene flow, the transfer of alleles from one population to another, has implications for the management of herbicide-resistant weeds. Gene flow can occur in weed populations though the movement of pollen and seed/vegetative propagules. Such processes can introduce new resistance alleles and spread already existing resistance. Barnyardgrass is an important herbicide-resistant weed in Midsouth rice production systems, but the extent of pollen-mediated gene flow is not known for this species. An experiment was conducted in summer 2010 at the Agricultural Experimental Station, Fayetteville, AR, to quantify pollen-mediate gene flow in barnyardgrass. Quinclorac resistance was used as the marker for assessing gene flow. Quinclorac resistance in the barnyardgrass population used in the study was conferred by a single, completely dominant gene with Mendelian pattern of inheritance. The resistant population (RR) was used as pollen donor (male) and a known susceptible (rr) population as pollen recipient (female). The RR and rr populations were established in a greenhouse, and at the time of tillering, seedlings were transplanted to 5-gallon buckets (four seedlings each) containing potting soil. At panicle initiation, the male and female populations were transported to the experimental field. The experiment was implemented using a Nelder-wheel design consisting of eight directions. The male population (15 buckets) was placed at the center of the wheel, and the female parents were placed at nine different distances from the center: 0.5, 1, 2, 3, 5, 10, 20, 35, and 50 m. Therefore, 72 buckets were used for the eight different distances. The barnyardgrass plants were watered and fertilized as required. A weather station was installed in the experimental site to record weather parameters, including wind direction, wind speed, air temperature, and relative humidity. Upon maturity, inflorescences were harvested four times at weekly intervals. The seeds were subsequently scarified and planted in trays in the greenhouse. About 5,200 seeds (90% germination) were planted from each harvest, which allowed the detection of gene flow at levels as low as 0.1% with 99% confidence. At the 2- to 3-leaf stage, seedlings were sprayed with a 2X field rate of quinclorac (1120 g ai ha^{-1}) and a week later, survivors were sprayed with a 10X rate of quinclorac (this population was resistant up to a 36X field rate) . Seedling survival was documented at 21 days after the first application. Gene flow was quantified as the number of surviving seedlings out of the total seedlings emerged. Gene flow was observed for a short-distance of up to 10 m, except for one event at 20 m. Gene flow declined with distance with an average frequency of 3% at 0.5 m, although frequencies of up to about 10% were observed at this distance. The direction at which gene flow occurred to the farthest distance (20 m) corresponded to a high wind event (~18 kmph). The number of wind events did not correlate with gene flow, because wind speed was more important. Air temperature and relative humidity influenced gene flow, perhaps via their effect on pollen viability and wind borneness. Overall, long-distance, pollen-mediated transfer of herbicide resistance is less likely in barnyardgrass, but even at these levels pollen-mediated gene flow can aid the expansion of a resistance patch and favor the immigration of resistance alleles from fields within close proximity to one another. The findings are valuable for parameterizing the herbicide resistance simulation models for barnyardgrass, currently being developed in our research group.

RESISTANCE TO ALS-INHIBITING HERBICIDES IN BARNYARDGRASS. **D.S. Riar*[1], J.K. Norsworthy[1], V. Srivastava[2]; [1]University of Arkansas, Fayetteville, AR, [2]university of arkansas, Fayetteville, AR (94)**

ABSTRACT

Barnyardgrass biotypes from Arkansas (AR1 and AR2) and Mississippi (MS1) have evolved cross resistance to several acetolactate synthase (ALS) -inhibiting herbicides, including bispyribac-sodium, imazamox, imazethapyr, and penoxsulam. Dose response studies revealed that AR1, AR2, and MS1 biotypes were >94-, >94-, and 3.3-times, respectively, more resistant to imazamox; >94-, 30-, and 9.4-times, respectively, more resistant to penoxsulam; and 15-, 0.9-, and 7.2-times, respectively, more resistant to bispyribac-sodium. Studies were conducted to evaluate if increased herbicide metabolism by cytochrome P450 monooxygenase or mutation in ALS gene were the mechanism of resistance to various ALS-inhibiting herbicides in these biotypes. Malathion inhibits the activity of cytochrome P450 monooxygenase, an enzyme known to metabolize various herbicides. Addition of malathion at 1000 g ai ha^{-1} to field application rate of penoxsulam (35 g ai ha^{-1}) in comparison to penoxsulam applied alone reduced dry weight of AR1, AR2, and MS1 biotypes by 40, 94, and 96%. Addition of malathion to field application rate of imazethapyr (105 g ai ha^{-1}) did not affect dry weight of any resistant biotype, but increased mortality of MS1 biotype. Addition of malathion to field application rate of bispyribac-sodium (30 g ai ha^{-1}) had no effect on dry weight, but increased mortality of AR1 and MS1 biotypes to 100% compared to 70 and 85% mortality of AR1 and MS1 biotypes, respectively, by bispyribac-sodium at 30 g ha^{-1} applied alone. The ALS gene sequence alignment of AR1, AR2, MS1, and susceptible biotypes revealed that a mutation in the conserved region of ALS gene of AR1 and AR2 biotypes resulted in the substitution of $alanine_{122}$ to valine and threonine, respectively. However, no mutation was detected in the MS1 biotype. Mutation at $alanine_{122}$ is known to confer high level of resistance to imidazolinone herbicides, as was observed in AR1 and AR2 biotypes. Low level of resistance to bispyribac-sodium in AR1 and MS1, and to imazamox and penoxsulam in MS1 is probably due to the increased metabolism of herbicides in resistant biotypes by cytochrome P450 monooxygenase. These studies show that multiple mechanisms of resistance are involved in imparting cross resistance to ALS-inhibiting herbicides in these resistant barnyardgrass biotypes.

TRANSLOCATION OF PARAQUAT IN PALMER AMARANTH FROM A WIPER APPLICATION.

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ABSTRACT

Glyphosate-resistant (GR) Palmer amaranth is the most serious weed issue in Georgia. Many growers must rely on rescue treatments to control glyphosate-resistant Palmer amaranth to at least prevent more seed rain in the field for subsequent seasons. One option is to apply paraquat as a wiper application in a 50% solution. Most studies that have examined paraquat translocation have used a broadcast rate of a 1% solution. Field studies have indicated that paraquat seems to translocate within Palmer amaranth when applied as a wipe in a 50% solution. Studies were examined to determine the level of translocation of paraquat in a wiper application at 1, 10, and 50% concentration. Paraquat wiped on the leaf at 1 and 10% solution did not translocate much further than the treated leaf. However, a 50% paraquat solution wiped on the leaf displayed acropetal and basiptel movement within Palmer amaranth. These data explain why wiper applications of paraquat provide control of Palmer amaranth.

RESPONSE OF A TALL WATERHEMP (*AMARANTHUS TUBERCULATUS)* BIOTYPE TO HPPD-INHIBITING HERBICIDES.

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ABSTRACT

Research trials were conducted from 2009 to 2011 to evaluate the response of a biotype of tall waterhemp to HPPD-inhibiting herbicides found in Henry County, IA in 2009 that showed variable response to mesotrione when applied postemergence. Field research conducted in 2010 demonstrated that the tall waterhemp population was resistant to post applied HPPD-inhibiting herbicides used in seed corn production such as mesotrione, tembotrione, and topramezone as well as to atrazine. Greater than label rates were used in the field trial to evaluate the degree of resistance at the field level to HPPD herbicides. At twice the label rate, visual tall waterhemp control ranged from 33% to 68% for the HPPD herbicides and was less than 10 percent for atrazine when evaluated 30 days after treatment. Label rates of fomesafen controlled this tall waterhemp in the field. Research trials were conducted in the same field in 2011 to evaluate the response of the tall waterhemp biotype resistant to foliar applied HPPD herbicides to soil-applied HPPD herbicides. Isoxaflutole and mesotrione did not give commercially acceptable control (< 80%) at label rates. Atrazine applied PRE also did not control either biotype of tall waterhemp.

GENETIC DIVERGENCE OF HERBICIDE-RESISTANT AND -SUSCEPTIBLE *Sorghum Halepense* POPULATIONS.

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ABSTRACT

Glyphosate is the most widely used herbicide for nonselective control of weeds in noncrop and agricultural lands. This has led to the widespread evolution of glyphosate resistance in the C4 perennial johnsongrass. The evolution of glyphosate-resistant johnsongrass is a serious economic threat to crop production in general as about 90% of crop lands are planted with glyphosate-resistant crops, cotton, corn, and soybean, which results in intensive use of glyphosate herbicide in the majority of crop acres. Johnsongrass populations in some cotton and soybean fields in Louisiana were no longer controlled by glyphosate. It is not certain whether these populations evolved separately or spread by movement of plant materials. This knowledge may ultimately lead to better containment of this problem. This project aimed to evaluate the genetic relationships among glyphosate-resistant johnsongrass populations using microsatellite markers. It is hypothesized that rhizomatous, glyphosate-resistant johnsongrass in the field produces glyphosate-resistant offspring and that glyphosate-resistant johnsongrass does not belong to the same genotype as the susceptible wild-type. Rhizome and seed samples were collected from different locations in Rapides Parish, Louisiana. Thirty three accessions collected from twelve fields were used in this experiment. Seeds were planted in the greenhouse and leaf tissues of two offsprings per accession were collected for DNA fingerprinting. The seedlings were allowed to regrow and sprayed with glyphosate to evaluate whether each plant was resistant or susceptible. DNA was extracted from leaf tissues and PCR-amplified using 6 simple sequence repeat (SSR) primers. PCR products were separated on polyacrylamide gel, the amplified DNA fragments were scored (1 or 0) using CrossChecker, and the binary data was analyzed using Popgen software. The overall genetic diversity (GD) was high with a value of 0.914, indicating high levels of genetic variation among all the johnsongrass accessions. Comparisons among fields revealed that the highest GD (0.923) was between fields 3 and 4 and between fields 3 and 7 (GD = 0.922). The lowest GD (0.842) was observed between fields 1 and 8. Fields 3 and 4 had the highest intrapopulation genetic diversity with GD values of 0.731 and 0.735, respectively, while field 7 showed the lowest genetic diversity (GD= 0.596). Unweighted pair-group method cluster analysis showed seven major clusters. In six of the seven clusters, the susceptible(S) plants outnumbered resistant (R) ones; cluster 6 consisted of equal numbers of R and S accessions. Fields LA1, LA3, LA4, LA6, LA7, and LA15 had both R and S plants. Plants from fields LA3, LA4, LA6, LA7, LA8, LA11, LA12, LA16 appeared in more than one genotypic clusters. Field LA8 was used as the susceptible standard. Plants from LA8 were found in different clusters, including clusters 1, 2, 3, 5, and 7. Plants from fields LA7, LA4, LA3, and LA1 were also found in the same cluster as plants from field LA8. Fields LA7 and LA4 are located closest to LA8. Plants from field LA4 were most often found in the same clusters as plants from LA8, indicating that the clustering was roughly related to geographic location. The separation of plants from some fields into different clusters indicated intermixing of genotypes or movement of genotypes from one location to another. This data needs to be substantiated by analyzing additional SSR markers.

PERPENDICULAR CULTIVATION FOR WEED CONTROL IN ORGANIC PEANUT? **W.C. Johnson III*; USDA-ARS, Tifton, GA (241)**

ABSTRACT

Weed control in organic peanut is based on intensive cultivation. Despite the proven effectiveness of this system, weeds present in-row remain difficult to control. Peanut seed are large, seeded approximately 6 cm deep, and have the growing point below the soil surface for several days after emergence. These attributes allow peanut to tolerate aggressive cultivation with the tine weeder from seeding through full-emergence. In an attempt to improve in-row weed control, trials were conducted to determine if early-season cultivation perpendicular to row direction using a tine weeder is a feasible strategy to manage weeds in organic peanut production. Irrigated field trials were conducted in Tifton, GA to evaluate combinations of parallel cultivation (cultivation in the same direction of the rows), perpendicular cultivation (cultivation perpendicular to row direction), and banded applications of herbicides derived from natural products that can be used in certified organic crop production. Weed control results were inconsistent among weed species. Parallel cultivation with the tine weeder tended to be more effective than parallel cultivation with sweeps, particularly for the grassy weed Texas millet. Perpendicular cultivation slightly improved overall weed control and peanut yield, but this benefit did not supplement superior weed control from parallel cultivation with the tine weeder. Perpendicular cultivation with narrow, small-scale equipment used in research trials and small-scale organic farms creates multiple tire tracks across the rows, mashes peanut seedlings, and reduces stand. This appears to have lessened the weed control benefits of perpendicular cultivation by creating voids in the peanut stand that allowed subsequent weed emergence.

EVOLUTION OF THE USE OF RYE MULCHES IN ORGANIC SOYBEAN PRODUCTION. **S. Reberg-Horton*[1], M. Wells[1], A.N. Smith[2], G.T. Place[1]; [1]North Carolina State University, Raleigh, NC, [2]Virginia Tech, Blacksburg, VA (242)**

ABSTRACT

Current weed management practices in organic soybeans rely heavily on cultivation. Rye mulches have been investigated in multiple states as a means of replacing spring tillage before soybeans. Experiments in North Carolina have focused on developing recommendations for the management of the cover crop, timing of cover crop kill and planting, additional weed control practices, along with more basic research into how the system affects crop-weed competitive outcomes. Data from multiple studies suggest that 9,000 kg ha^{-1} of rye dry matter is needed for reliable weed control. This level of production is possible in most years and with most cultivars, but in unusually cold or wet winters, either auxiliary weed control is needed or a reversion to complete tillage and cultivation. The mechanism for weed control in this system is dependent on a multitude of factors including shading, allelopathy, and nitrogen immobilization. The potential role of immobilization is receiving renewed interest as an explanation for poor weed growth when some weeds emerge above the mulch but fail to thrive. Future work is needed on whether farmer management of soil amendments affects the level of immobilization that is achievable and therefore the level of weed control. Other organic soybean practices also need to be reevaluated in the context of the system with reductions in row spacing and alterations in population as possible first questions.

CHARACTERIZATION OF WATER-SOLUBLE ALLELOCHEMICALS EXTRACTED FROM *Crotalaria juncea* USING BIOASSAYS AND HPLC/MS.

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ABSTRACT

Natural products with allelopathic properties have potential utilities for weed management in organic and sustainable crop production. The objective of this study was to characterize the nature and properties of allelochemicals in sunn hemp (*Crotalaria juncea*) accessions. In a bioassay for radical growth inhibition, water eluates of leaves, stem and seeds contained the inhibitory potential. All of 14 accessions of sunn hemp originating from U.S., India, Brazil, South Africa, Pakistan and Nigeria were found to have water-soluble allelochemicals in leaves, suggesting that the presence of allelochemicals is widely distributed in this species. The highest level of inhibitory potential was found in accession IN-86. Further characterization of IN-86 leaf eluate indicated that the inhibitory compound(s) was/were not soluble in chloroform. However, stability to 10 minutes of boiling, resistance to 1N HCl, and binding and elution from AG1(OH^-) ion exchange resin were observed. C18 HPLC/UV/ESI-MS analysis of leaf eluates of IN-86 showed the presence of a compound of m/z of 148, consistent with the spectrum for hydroxynorleucine, an allelopathic compound previously reported in seeds of *C. juncea*. Our results set the stage for feasibility studies to develop weed control strategies using allelochemicals derived from sunn hemp biomass of select genotypes. Funding support from the USDA SARE grant (LS08-205) to C.A.C is acknowledged.

COVER CROP RESIDUE AND ORGANIC MULCHES PROVIDE WEED CONTROL DURING LIMITED-INPUT NO-TILL COLLARD PRODUCTION.

A.J. Price*[1], M.J. Mulvaney[2], C.W. Wood[3]; [1]USDA-ARS, Auburn, AL, [2]Virginia Tech, Blacksburg, VA, [3]Auburn University, Auburn, AL (244)

ABSTRACT

Limited input producers may adopt no-till production if sufficient weed suppression can be achieved. High-biomass producing cover crops used in conjunction with organic mulches may provide sufficient weed control in no-till vegetable production. Our objective was to quantify weed suppression from a forage soybean [*Glycine max* (L.) Merr.] cv. Derry summer cover crop and three types of organic mulches applied after collard (*Brassica oleracea* L.) planting. Forage soybean residue did not suppress weeds, but mulches were generally effective. Broadleaf and sedge weeds decreased in population densityover the three-year period, but grass weed management remained problematic until three years after conversion to no-till. Grass suppression was greater when mulches were applied after the first year. Collard yield, averaging 17,863 kg ha−1, was not affected by any cover crop or mulch treatment. Mulching with mimosa (*Albizia julibrissin* Durazz.), lespedeza [*Lespedeza cuneata* (Dum. Cours.) G. Don] and wheat (*Triticum aestivum* L.) straw at 6.7 Mg ha−1 provided a reasonable level of grass weed control under continuous no-till. Although collard crop yields were not affected by application of various organic residues in the first three years of the no-till system, application of organic residues should improve soil quality over time.

RESPONSE OF CITRON MELON (*CITRULLUS LANATUS VAR CITROIDES*) TO POSTEMERGENCE HERBICIDES. **A.M. Ramirez*, A.J. Jhala, M. Singh; University of Florida, Lake Alfred, FL (245)**

ABSTRACT

Citron melon (*Citrullus lanatus* var *citroides*) is an annual monoecious succulent vine commonly found in citrus, cotton and peanut fields. There is limited information on the control of citron melon and the efficacy of new and commonly used postemergence herbicides. Greenhouse studies were conducted at the Lake Alfred, FL in 2011 to determine the response of citron melon to postemergence herbicides applied at two growth stages. Treatments consisted of 18 postemergence herbicides applied to 2- and 6-leaf stage citron melon. Visual control ratings were taken at 7and 14 days after treatment (DAT) and biomass were measured at 14 DAT. Results showed that at 7DAT citron melon at 2- and 6-leaf stage were excellently controlled with glyphosate at 1.25 kg ha^{-1}, glufosinate ammonium at 0.98 kg ha^{-1} , saflufenacil at 0.04 kg ha^{-1} , paraquat at 0.57 kg ha^{-1}, and flumioxazin at 0.82 kg ha^{-1}; while carfentrazon at 0.014 kg ha^{-1} , imazapic at 0.07 kg ha^{-1}, pyrithiobac-sodium at 1.72 kg ha^{-1} , trifloxysulfuron-sodium at 0.006 kg ha^{-1}, flazasulfuron at 0.03 kg ha^{-1}, 2,4-D + glyphosate at 0.39 + 0.28 kg ha^{-1} and rimsulfuron at 0.03 kg ha^{-1}, excellently controlled citron melon at 2-leaf stage but not at 6-leaf stage. Similar trend in citron melon control was observed at 14 DAT. Other herbicides such as mesotrione at 0.105 kg ha^{-1}, 2,4-D at 0.56 kg ha^{-1} and imazapic 0.07 kg ha^{-1} gave < 65% control while bentazon at 0.84 kg ha^{-1} and halosulfuron-methyl at 0.03 kg ha^{-1} did not adequately controlled citron melon at both leaf stages since control was ≤ 30%. Biomass of citron melon at 14 DAT was significantly reduced (> 50%) in all herbicide treatments except with bentazon at 0.84 kg ha^{-1} and halosulfuron-methyl at 0.03 kg ha^{-1} applied to 2- and 6-leaf stage citron melon, and dicamba at 0.28 kg ha^{-1}, mesotrione at 0.105 kg ha^{-1}, imazapic at 0.07 kg ha^{-1} and rimsulfuron at 0.026 kg ha^{-1} applied to 6-leaf stage citron melon. The results of this study indicated that citron melon can be adequately controlled by postemergence herbicides if applied at the early stage of growth.

EVALUATION OF CROP TOLERANCE AND WEED CONTROL WITH FOMESAFEN IN LOUISIANA SWEET POTATO.

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ABSTRACT

A field study was conducted in 2011 to evaluate weed control and crop tolerance with fomesafen applied in sweet potato. Treatments included a factorial arrangement of herbicides: Reflex at 1.5 pt/A, Dual Magnum at 1.33 pt/A, or Prefix at 2.5 pt/A; and application timing: pre- or post-transplant. Soil type was a silt loam with pH 5.8. Parameters measured included visual crop injury and weed control at 16 and 45 d after planting (DAP). At 16 DAP), averaged across application timing, entireleaf morningglory, barnyardgrass, cutleaf groundcherry, yellow nutsedge, smooth pigweed, and carpetweed were controlled at least 98, 99, 91, 99, 98, and 98%, respectively, and equal among all herbicides. When averaged across herbicides, control of above mentioned weeds with the exception of grouncherry was similar regardless of application timing. Cutleaf groundcherry control was greatest when applied post-transplant (88 vs. 99%). Injury was no greater than 8% when averaged across application timings and 5% when averaged across herbicides, with no differences noted among treatments. Results were similar at 45 DAP with at least 100, 99, 58, 88, 91, 99, and 78% control noted for barnyardgrass, entireleaf morningglory, cutleaf groundcherry, smooth pigweed, carpetweed, yellow nutsedge, and purple nutsedge, respectively, and differences not noted among herbicides. Again cutleaf groundcherry was the only weed to result in difference in control when applied post transplant (87 vs. 43%). Sweet potato yield was equal among all herbicide treatments ranging from 134 to 178 bu/A. Yield was greatest when treatments were applied post-transplant (221 vs. 96 bu/A).

POTENTIAL WEED CONTROL OPTIONS FOR USE IN SWEETPOTATO PRODUCTION. .

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ABSTRACT

Weed control is an important issue in sweetpotato (*Ipomoea batatas)*, since there only a limited number of herbicides labeled for use in this crop. Fomesafen (Reflex) is typically used as a post-emergence broadleaf herbicide, but it does have residual activity. In 2011, field trials were conducted at two locations (Pontotoc, Mississippi and Raleigh, North Carolina) to evaluate the potential use of Reflex in sweetpotato production. At the North Carolina location the experimental design was a randomized complete block (RCB) with 3 replications. Plots were 3.33 X 20 ft. containing one 40-inch row. Covington sweetpotato slips were transplanted and treatments were applied on June 6, 2011. At the Mississippi location 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 22, 2011. Treatments in both trials included, Reflex at 0.18, 0.25, 0.32, 0.38, 0.5, and 0.75 lb ai/A applied pre-transplant (PRE); Reflex 0.25 PRE f/b *S*-metolachlor (Dual Magnum) post-transplant (POST) 0.95 lb ai/A; Dual Magnum at 0.76 lb ai/A POST; a weed-free check, and an untreated weedy check. Ratings were made throughout the growing season for yellow nutsedge (*Cyperus esculentus* L.), and redroot pigweed (*Amaranthus retroflexus* L.) control at the Mississippi location. Crop tolerance (injury) was rated at both locations. A graminicide was applied mid-season for grass control at both locations. Sweetpotatoes were harvested on October 4 and October 6 for the North Carolina and Mississippi locations, 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. In Mississippi, injury to foliage with 0.75 lb ai/A Reflex was greater than 0.18 lb ai/A Reflex, but was less than 8% for all treatments at 2 weeks after transplanting (WAT). Injury was not different in North Carolina. Weed control ratings were only observed in Mississippi. At 2 WAT, yellow nutsedge control was 91% with 0.75 lb ai/A Reflex, which was greater than all other rates. At 5 WAT, control was 85% with 0.75 lb ai/A Reflex, which was not different than 0.5 lb ai/A Reflex. Redroot pigweed control was at least 99% with all Reflex treatments at 2 WAT and at least 96% at 5 WAT, except for 0.18 lb ai/A Reflex. US No.1 grade yield ranged from 20 to 476 boxes/A in Mississippi and 196 to 495 boxes/A in North Carolina. There was a quadratic response between rate of Reflex and US No.1 grade yield at both locations. The maximum rate to ensure crop safety was 0.42 lb ai/A Reflex in North Carolina and 0.49 lb ai/A Reflex in Mississippi based on estimated values derived from regression model analyses.

WEED MANAGEMENT PROGRAMS FOR HIGHBUSH BLUEBERRY (*VACCINIUM CORYMBOSUM*).

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ABSTRACT

Field studies were conducted in 2011 at a commercial blueberry farm in Burgaw, NC to determine the effect of herbicide-based weed management programs on weed control and southern highbush blueberry crop tolerance. The objectives of two studies were to evaluate newly registered blueberry herbicides and to determine their role in reducing grower reliance upon Velpar (hexazinone). The first study consisted of March-applied (prebloom) Velpar (1 or 2 qt/A), Dual Magnum (*S*-metolachlor) (0.67 or 1.33 qt/A), or Chateau (flumioxazin) (6 oz/A) alone and tank mixes of Velpar plus Dual Magnum and Chateau plus Dual Magnum. Additional treatments consisted of the tank mixes followed by (fb) a post-harvest (July) application of Chateau (6 oz/A). The second study consisted of March-applied Velpar (1 or 2 qt/A), Chateau (6 or 12 oz/A), Callisto (mesotrione) (3 oz/A), or Sandea (halosulfuron) (0.75 oz/A) alone and tank mixes of Velpar plus Chateau, Velpar plus Callisto, Chateau plus Callisto, or Velpar plus Sandea. Additional treatments consisted of the tank mixes followed by a post-harvest application of Chateau (6 oz/A). Weedy and weed-free checks were included for purposes of comparison. All herbicide applications were tank mixed with Rely (2 qt/A) to kill emerged weed vegetation. Data collected included crop tolerance and weed control in mid-April, mid-July, and mid-August on a scale of 0 (no crop injury or no weed control) to 100% (crop death or complete weed control) and percent bareground. Blueberries were harvested in June. Predominant weed species were Carolina redroot (*Lachnanthes caroliana*); needleleaf rosette grass (*Dichanthelium aciculare*), known by NC blueberry growers as angelgrass or panicgrass; and Maryland meadowbeauty (*Rhexia mariana*). Weed control was highly variable due, in part, to the clumped distribution of the weeds throughout the fields. A lack of activating rainfall following prebloom herbicide applications may have also have contributed to a reduction in weed control. Treatment effects were greatest in the first of two studies. In mid-April percent bareground ranged from 63 to 90%. Treatments containing Chateau provided acceptable (87 to 100%) Carolina redroot control through harvest and into August. Treatments receiving Dual Magnum alone also provided acceptable (85 to 97%) Carolina redroot control through harvest. When tank-mixed with Velpar, Dual Magnum at 1.33 qt/A provided greater Carolina redroot control (80 to 83%) than at 0.67qt/A (42 to 67%). Plots receiving Dual Magnum plus Chateau prebloom fb Chateau postharvest controlled Carolina redroot 97 to 100%. Needleleaf rosette grass control was 70 to 83% for plots receiving Dual Magnum plus Chateau. Plots receiving Dual Magnum plus Chateau prebloom fb Chateau postharavest controlled needleleaf rosette grass 100% in mid-August. Needleleaf rosette grass control in all other treatments was highly variable and ranged from 63 to 87%. Plots receiving Dual Magnum plus Chateau prebloom fb Chateau postharvest had 98% bareground in mid-August. The only crop injury observed was foliar burning of leaves on low hanging blueberry branches that were contacted with Rely glufosinate) during herbicide application. Low-hanging branches are typically removed during scheduled pruning and would not negatively impact the blueberry bush. Blueberry fruit yield and quality were not influenced by treatment.

POST EMERGENT BITTERCRESS CONTROL WITH ISOXABEN CONTAINING PRODUCTS.

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ABSTRACT

Hairy bittercress, *Cardamine hirsuta*, is one of the most troublesome weeds in plant container production. Weed control is achieved primarily through the use of preemergent herbicides. Isoxaben is one of the most successful, selective preemergent herbicides in the market today. Isoxaben containing products such as Gallery® (isoxaben) and Snapshot ® (isoxaben + trifluralin) are industry leaders for use in container and field grown ornamental production. In addition to broad spectrum preemergent weed control, isoxaben applied as Gallery DF also provides early post-emergent bittercress control. Research was conducted to determine if 3 different isoxaben containing products and Dimension® could provide commercially acceptable early post-emergent bittercress control, and the impact of bittercress growth stage on post-emergent control. Dimension 2 EW [0.5 lbs active ingredient per acre (ai/A)], Gallery 75DF (0.66 and 1.0 lbs ai/A), Dow XR (0.66 and 1.0 lbs ai/A) and Showcase (5 lbs ai/A) were applied post-emergent to bittercress (*Cardamine hirsuta*) at 2 to 4, 6 to 8 and 10 to 12 leaf stage. Planting dates were staggered to achieve desired growth stages. Liquid spray applications were applied to dry foliage and granules to moistened foliage. Bittercress grown under shade received 0.5 inches of irrigation by overhead impact sprinklers daily. Bittercress control was assessed 1, 2, 3, and 4 weeks after treatment (WAT) and fresh weights were determined 30 days after treatment. Gallery, Dow XR, Showcase and Dimension at all rates provided acceptable control of bittercress treated at the 2 to 4 leaf stage. Showcase provided the greatest bittercress control 1 WAT. Treatments containing greater than 0.5 lb ai/A of isoxaben provided control superior to Showcase when applied to bittercress at 6 to 8 and 10 to 12 leaf stages. Bittercress at the 10 to 12 leaf stage had begun to bloom and control from isoxaben-containing products at rates below 1.0 lb ai/A was not acceptable. Treatments containing 1.0 lbs ai/A of isoxaben provided commercially acceptable post-emergent bittercress control through 12 leaf stage.

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EVALUATION OF HERBICIDE PROGRAMS FOR NUTSEDGE CONTROL IN PLASTICULTURE TOMATO. **A.W. MacRae*; University of Florida/IFAS, Wimauma, FL (250)**

ABSTRACT

With the phase out of methyl bromide, research on alternatives has shown a reduced level of pest control including that of *Cyperus* sp. While the use of fallow cultural programs can help alleviate this loss of control, the use of herbicides within the cropping season will also be required. The objective of this study was to determine the best combination of preemergent herbicides for control of nutsedge in plasticulture tomato. Studies were conducted in spring and summer of 2011 to evaluate the best combinations of the three commercially available herbicides fomesafen (F) (0.25 lb ai/A), imazosulfuron (I) (0.3 lb ai/A), and S-metolachlor (M) (0.95 lb ai/A). A randomized complete block design trial with 4 replications with the crop being produced using accepted commercial production practices in Florida. Treatments included fomesafen at 0.25 lb ai/A, imazosulfuron at 0.3 lb ai/A, and S-metolachlor 0.95 lb ai/A applied alone and in combination with each other (F, I, M, F+I, F+M, I+M, F+I+M) and a non-treated control. Plots were fumigated with 1,3-dichloropropene plus chloropicrin (40:60 ratio) at 250 lbs/A. Herbicide treatments were applied to the pre-formed bed just prior to laying the plastic mulch. Plant height, nutsedge shoot emergence, and tomato yield data were collected. The nutsedge stand consisted of 80 purple nutsedge (*Cyperus rotundus*). There were no differences among treatments for tomato plant height. Fomesafen and imazosulfuron alone had similar nutsedge counts to the non-treated control. IDR, DR, IR, ID, and D provided 75 to 63% control of nutsedge species and were similar to each other. All treatments produced greater marketable fruit number and fruit weight than the non-treated control.

PREEMERGENCE HERBICIDES FOR WILD RADISH CONTROL IN RYE GRASS COVER CROPS BETWEEN WATERMELON ROWS. **P.J. Dittmar*[1], R.C. Hochmuth[2]; [1]University of Florida, Gainesville, FL, [2]University of Florida, Live Oak, FL (251)**

ABSTRACT

Watermelon farmers plant ryegrass between rows and require a posttransplant herbicide to control the ryegrass and emerged weeds. However, the rye and weeds are too tall and herbicide injury occurs in the watermelon. The objective of the study was the use of an 30.5 cm band of preemergent and paraquat along the shoulder bed. Treatments included a nontreated control, paraquat alone (0.57 kg/ha), and paraquat (0.57 kg/ha) tank mixed with a preemergence herbicide. Preemergence herbicides tank mixed with paraquat (0.57 g/ha) were fomesafen at 0.23 and 0.72 kb/ha, flumioxazin 0.07 and 0.14 kg/ha, *S*-metolachlor at 0.11 and 0.17 kg/ha, and terbacil at 0.11, 0.17, and 0.43 kg/ha. Rye and wild radish control were visually rated (0%=no control, 100%=complete control) at 10 and 18 days after application (DAA). At 10 DAA, the tank mix of a PRE and paraquat increased wild radish control (70-100%) compared to paraquat alone (43%). The wild radish had begun to regrow from the rosette and new wild radish began to emerge. Volunteer red clay pea control was not different among treatments. The farmer applied paraquat and halosulfuron to the field at 18 DAA. The farmer's herbicide application did not control the larger wild radish in the nontreated and paraquat alone plots. The use of a preemergent band will allow farmers to move nozzles away from the bed or lower the nozzles during the posttransplant herbicide application resulting in reduced watermelon injury.

PREEMERGENCE WEED CONTROL FOR CABLE BARRIER SYSTEMS USING SELECTED HERBICIDE TREATMENT COMBINATIONS. **D. Montgomery*, C.C. Evans, D. Martin; Oklahoma State University, Stillwater, OK (99)**

ABSTRACT

A research study was conducted at the Cimarron Valley Research Station in Perkins, Oklahoma during 2011 to evaluate the effectiveness of several herbicide treatments for long-term preemergence control of summer and winter annual weeds. This study is an initial screening for developing a safe long-term residual weed control program for cable barrier systems. All preemergence treatments included glyphosate at 0.98 lb.a.i./A to control existing winter annual weeds. Treatments were applied on 10 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 61, 92, 124, 153, 183, 215, and 244 days-after-application (DAA) for percent weed control as compared to paired checks and untreated plots. The study area received approximately 0.47 inches of rainfall within 10 DAA, however, it should be noted this study was conducted under severe drought conditions with no supplemental irrigation which limited available moisture for herbicide activity. Treatments including diuron alone, diruon + Oust Extra, Gallery + Oust Extra, indaziflam + Oust Extra, Plainview, Streamline + Oust XP, and Perspective + Oust XP produced and sustained excellent season-long control of large crabgrass *(Digitaria sanguinalis)*. The level of control ranged from 91-99% and was sustained through the final 215 DAA evaluations. Treatments of Oust Extra alone, Milestone VM + Oust Extra, and indaziflam alone produced moderate to good levels of large crabgrass up to 124 DAA, however, control fell to unacceptable levels by late summer and early fall. Treatments of prodiamine and pendimethalin produced poor to moderate levels of large crabgrass control and likely failed because of the dry conditions that could not sustain the activity of these dinitroaniline herbicides. Palmer amaranth (*Amaranthus palmeri)* control results were very similar to those of large crabgrass. Treatments including diuron alone, diruon + Oust Extra, Gallery + Oust Extra, Milestone VM + Oust Extra, indaziflam + Oust Extra, Plainview, Streamline + Oust XP, and Perspective + Oust XP produced and sustained good to excellent season-long control of Palmer amaranth. The level of control ranged from 84-99% and was sustained through the final 215 DAA evaluations. The treatments of diuron + Oust Extra, Plainview, Streamline + Oust XP, and Perspective + Oust XP maintained near complete control of Palmer amaranth throughout the duration of this study. Treatments of Oust Extra alone produced moderate to good levels of Palmer amaranth control up to 124 DAA, however, control fell to unacceptable levels by late summer and early fall. Treatments of prodiamine and pendimethalin produced very poor Palmer amaranth control and likely failed because of the dry conditions that could not sustain the activity of these dinitroaniline herbicides. Preemergence control of annual ryegrass *(Lolium perenne)* was evaluated at 244 DAA. At that time all treatments, excluding Frequency, were producing 83-97% control of annual ryegrass. Preemergence control evaluations for sheperdspurse *(Capsella bursa-pastoris)* and hairy vetch were also collected at 244 DAA. Preemergence sheperdspurse and hairy vetch *(Vicia villosa)* control were very similar with respect to individual treatment results. All treatments, excluding Oust Extra alone, prodiamine, pendimethalin, Frequency, were producing good to excellent preemergence control of both species that ranged from 83-97%. Several treatments stood out as far as having the ability to provide long-term preemergence control of winter annual weeds resulting from applications made the previous winter/spring. This is a very desirable treatment characteristic that would help maintain a bare-ground area or control winter annual weeds in a bermudagrass cable barrier footprint. Treatments of diuron + Oust Extra, Gallery + Oust Extra, Plainview, Streamline + Oust XP, and Perspective + Oust XP showed very good potential at providing both short-term postemergence control and long-term preemergence control of winter annual broadleaf and grassy weeds.

BRUSH CONTROL IN THE SOUTHERN U.S. WITH AMINOCYCLOPYRACHLOR.

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ABSTRACT

DuPont Crop Protection is evaluating Aminocyclopyrachlor for brush control in the southern United States. Aminocyclopyrachlor is characterized by low use rates, low toxicity to humans and wildlife 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 133 trials in the southern states from 2006 – 2010 (12 States = Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, South Carolina, 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 currently sold under the brand names DuPont™ Streamline®, Perspective® and Viewpoint® – EPA registration Jan 2011. The following species appear to be sensitive to Aminocyclopyrachlor – Maple, Baccharis, Locust, Persimmon and Poplar. Species that are slightly more difficult to control include – Red Bud, Hickory and Privet. Species that appear to be difficult to control include – Sugarberry/Hackberry, Ash, Yaupon, Red Cedar, Sweet Gum and Red/White Oak species. 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 FOR BRUSH CONTROL.

J. Ferrell*[1], B.A. Sellers[2], M.W. Durham[1]; [1]University of Florida, Gainesville, FL, [2]University of Florida, Ona, FL (101)

ABSTRACT

Aminocyclopyrachlor (ACP) is a selective herbicide that is effective against a number of broadleaf weed species. Though not effective on most woody species when applied alone, it has been suggested that ACP will enhance the activity of other herbicides when applied to woody brush. Experiments were established in October 2010 and evaluated through October 2011. These experiments consisted of broadcast applications to laurel oak, basal applications to black cherry, and applications to freshly cut red maple stumps. In the foliar applications, ACP (3.25 oz ai/A) was applied with and without various standard herbicide combinations including: fosamine (2-4 lb ai/A), glyphosate (5.5 lb/A), and imazapyr (0.25 lb/A). The addition of fosamine to ACP did not provide more than 40% control of laurel oak; ACP alone provide 23%. The addition of 0.25 lb ai imazapyr improved control of laurel oak to 82%; the addition of glyphosate to this mix increased control to 88%, but was not significantly greater. For basal applications on black cherry, ACP at 5, 10, 15, and 20% v/v was mixed with an oil carrier. Trees ranged in size from 2 – 5 DBH, with the average being 4". For all ACP concentrations, % brownout of the tree canopy was less than 35% at 9 months after application. Corresponding applications of triclopyr ester (20% v/v) provided approximately 70% brownout. However, when ACP (2.5-10% v/v) was applied to freshly cut red maple stumps (ranging from 4 to 12" in diameter), no resprouting was observed 1 year after treatment. Likewise, no resprouting was observed from stumps treated with triclopyr ester (20% solution). These data suggest that ACP will likely need to be mixed with imazapyr or triclopyr to effectively control brush from a foliar or basal application. However, it appears that application to freshly cut stumps is highly effective at even low use rates.

GRASS SEEDHEAD AND GROWTH SUPPRESSION WITH AMINOPYRALID + METSULFURON FOR ROADSIDE ROW.

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ABSTRACT

Roadside vegetation is managed to improve roadway visibility, aesthetics, and safety. These objectives are often achieved by a combination of mowing and herbicide applications. Mowing is more costly than the use of herbicides, especially with recent increases in fuel prices and increased exposure of roadside workers to traffic hazards. In addition to weed control, grass height management is required because tall, overgrown vegetation can limit motorist visibility of roadside hazards or signage. Herbicides have been used as plant growth regulators (PGR's) to suppress grass growth of cool- and warm-season grasses on roadside rights-of-way. Trials were established in 2011 to determine effect of Opensight® (aminopyralid + metsulfuron) compared to Milestone® (aminopyralid) + Plateau (imazapic) on grass height and injury to desirable grasses in both warm season and cool season grass systems. In the southeast United States, roadsides are dominated by warm-season grasses, bahiagrass and bermudagrass. Bahiagrass requires frequent mowing and poses the greatest challenge to roadside managers. Bahiagrass height was significantly reduced by both Opensight and Plateau when compared to the bahiagrass in non-treated grass plots. Opensight at 2.5 oz/A and Milestone + Plateau at 4 + 3 fluid oz/A caused significant height reductions for a period of 10 weeks after application. Opensight and Plateau caused greater than 80% bahiagrass injury. Observations confirmed that treatments containing Plateau have the potential to cause yellowing, thinning and stunting in bermudagrass, which provides an opportunity for weed invasion. In the northeast and north central United States, roadsides are dominated by the cool-season grass, tall fescue, which poses management challenges for roadside managers, especially in the early growing season. Tall fescue height was significantly reduced by herbicide treatments when compared to tall fescue in the non-treated plots. Tall fescue injury was generally minimal with Opensight at 2.5 oz/A and Milestone + Plateau at 5 fl oz/A + 3 fl oz/A. When simulating application overlap by doubling those rates, foliage injury with the combination of Milestone + Plateau at 10 fl oz + 6 fl oz was slightly higher (25% visual injury) than Opensight at 5 oz (15% visual injury). Some minor tall fescue stand thinning was noted with Opensight and with Milestone + Plateau at all rates applied. Opensight and Milestone + Plateau provide managers of roadside rights-of-way vegetation with means to suppress growth of selected warm-and cool-season grasses for up to 10 weeks. These herbicides are a useful alternative to mechanical treatments and reduce mowing frequency. When treating areas in and around roadside or utility rights-of-way that are or will be grazed or planted to forage, important label precautions apply regarding harvesting hay from treated sites, using manure from animals grazing on treated areas or rotating the treated area to sensitive crops. See the product label for details. State restrictions on the sale and use of Opensight apply. Consult the label before purchase or use for full details. Always read and follow label directions.

AMINOCYCLOPYRACHLOR USE ON FLORIDA ROADSIDE TURF. M.W. Durham*[1], J. Ferrell[1], B.A. Sellers[2]; [1]University of Florida, Gainesville, FL, [2]University of Florida, Ona, FL (103)

ABSTRACT

Aminocyclopyrachlor (AMCP) is a synthetic auxin herbicide that is being positioned for weed control along rights-of-ways. AMCP is a highly effective herbicide, but has been shown to injure bahiagrass or bermudagrass turf when applied at high rates. Since many of these rights-of-ways will also receive plant growth regulators, such as imazapic, it is unknown if the addition of the AMCP will exacerbate the injury caused by the plant growth regulator. In 2011, experiments were conducted near Gainesville, FL to determine the injury potential of AMCP (0.94, 1.88, and 3.76 oz ai/a) and imazapic (0.5 and 1.0 oz ai/a) combinations on common bermudagrass (*Cynodon dactylon)*. Herbicides were applied with a CO_2 backpack sprayer at 20 gallons per acre and plot sizes were 6.6 feet by 10 feet. Visual ratings of % density reduction and % yellowing (chlorosis), and blade height, were taken at 1, 2,4, and 7 weeks after treatment (WAT). Initial bermudagrass yellowing was noted in all treated plots and ranged from 5% to 10%. At 2 WAT, the bermudagrass began showing a reduction in canopy density, an increase in yellowing in treated plots, but no height differences. Density reduction from AMCP alone ranged from -7% to -17%, imazapic treatments ranged from -10% to -15%, and all combination treatments ranged from -11% to -20%. Yellowing was higher in the high rate of AMCP and imazapic combinations (35% for both rates of imazapic) than in the imazapic alone treatments (20% and 25% respectively). All other treatments ranged from17% to 30%. By 4 WAT, the turf began to show an increase in density at the two lower rates of AMCP alone (> -5%) and in the combinations with imazapic (-7% to -17%). The high rate of AMCP (-25%), along with the two combination treatments with the high rate of AMCP (-22% to – 25%) showed a greater reduction in canopy density. The amount of yellowing continued to increase for all treatments except for the imazapic alone treatments (3% and 15% respectively). The two low rates of AMCP exhibited 20% yellowing while the high rate was at 48%. The combination treatment with the high rate of AMCP had up to 48% yellowing as well. By 7 WAT none of the treatments differed from the untreated in color. The high rate of AMCP and both of the imazapic combination treatments exhibited a -15% reduction in density. The two lower rates of AMCP and both rates of imazapic alone showed no reduction. The two lower AMCP rate combinations showed a decrease of -5% to -10%. By 11 WAT there was no visible difference between any of the treatments.

EVALUATION OF POST-EMERGENCE AMINOCYCLOPYRACHLOR BLEND COMBINATIONS FOR WEED CONTROL EFFICACY AND BERMUDAGRASS TOLERANCE ON OKLAHOMA ROADSIDES.

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ABSTRACT

Research was conducted on US-81, north of Pond Creek, Oklahoma in 2011 to evaluate the effectiveness of 11 herbicide treatments for weed control. .Research continues on aminocyclopyrachlor (DPX-MAT28) for possible use on highway systems. The objectives of this trial were to evaluate treatments for their effectiveness in controlling Palmer amaranth (*Amaranthus palmeri*), johnsongrass (*Sorghum halepense*) and large crabgrass (*Digitaria sanguinalis*) and to assess phytotoxicity on common bermudagrass (*Cynodon dactylon*). Treatment date was 7 June, 2011 using a CO2-pressurized sprayer delivering 30 gallons of water/A. Treatments were arranged in a randomized complete block design with three replications. Treatments were DPX-MAT28 (2.14 oz/A) + Telar XP (chlorsulfuron) at 0.57 oz/A, DPX-MAT28 (2.98 oz/A) + Telar XP (chlorsulfuron) at 0.79 oz/A, DPX-MAT28 (3.76 oz/A) + Telar XP at 1.0 oz/A, DPX-MAT28 (2.14 oz/A) + Escort XP (metsulfuron) at 0.58 oz/A, DPX-MAT28 (2.98 oz/A) + Escort XP at 0.78 oz/A, DPX-MAT28 (3.76 oz/A) + Escort XP at 1.0 oz/A, DPX-MAT28 (2.5 oz/A) + Oust XP (metsulfuron) 1.0 oz/A + Telar XP 0.5 oz/A + glyphosate (Roundup Pro Concentrate) 9.0 oz/A, DPX-MAT28 2.0 oz/A + Matrix (rimsulfuron) 2.0 oz/A, DPX-MAT28 3.0 oz/A + Matrix 3.0 oz/A, DPX-MAT28 4.0 oz/A + Matrix 4.0 oz/A and Milestone VM (aminopyralid) 7.44 oz/A + Escort XP 0.46 oz/A. All treatments included non-ionic surfactant at 0.25 percent V/V. Weed control was visually evaluated at 15, 30, 63, 91, and 121 days-after-application (DAA) comparing treated plots to non-treated checks. Bermudagrass injury ratings were also rated at these intervals. Growth conditions were adequate 30-45 DAA; however by 63 DAA the study site was under severe temperature and drought pressure. At 15 DAA there was little effect from treatments on common bermudagrass. Treatments containing glyphosate produced yellowing or growth suppression (18%) with all other treatments producing between 6-13% phytotoxicity. Palmer amaranth control was best with DPX-MAT28, Oust XP, and Telar XP + glyphosate at 76%. All other treatments were producing low (17-45%) to moderate levels (55-69%). Johnsongrass control ranged from 15-50%. DPX-MAT28 + Oust XP + Telar XP + glyphosate and DPX-MAT28 4.0 oz/A + Matrix 4.0 oz./A exhibited large crabgrass control of 50 and 58%, respectively. All other treatments produced control ranging from 10-28%. At 30 DAA there were little noticeable differences between treated and non-treated plots in terms of common bermudagrass growth and development.. The treatment including glyphosate continued good Palmer amaranth control at 85%. All other treatments ranged from 23-77% control. Treatments including higher rates of DPX-MAT28 combined with Escort XP + Matrix exhibited control levels of 72-77%. Treatments including the low DPX-MAT28 rates produced low control levels (23-47%). All treatments produced johnsongrass suppression in the range of 15-38%. Large crabgrass control was exhibited across all treatment however separation of drought/heat effect versus herbicidal effect was difficult. At 63 DAA the common bermudagrass had succumbed to drought and was near complete brownout (92-95%). Palmer amaranth control remained similar to levels of 30 DAA. Johnsongrass growth suppression had decreased for all treatments with most treatments similar to the untreated checks. By 63 DAA large crabgrass had died and control data was not taken. At 91 DAA common bermudagrass in all plots had made a complete recovery (100% greenup) due to cessation of drought/heat extremes. Some low-level growth suppression was suspected but data collection was not part of this study. At 91 DAA the Palmer amaranth that were not successfully controlled eventually resumed normal growth and seed-head development. The treatment including glyphosate continued acceptable control levels (80% or greater). All other treatments were showing decreased levels of Palmer amaranth control and were not in the acceptable range. No treatment effects were present on johnsongrass at either 91 or 121 DAA evaluations. At 121 DAA there appeared to be very low levels of common bermudagrass growth suppression (5-7%) in all DPX-MAT28 treatments as compared to the untreated checks. Regardless of whether chlorsulfuron, metsulfuron, or rimsulfuron was mixed with DPX-MAT28, common bermudagrass appeared tolerant of these products. Palmer amaranth that had not been killed was continuing to develop and produce seed-heads in all treatments. The treatment including glyphosate produced a final Palmer amaranth control level of 75%. Treatments that included the 2.98 or 3.76 oz/A rate of DPX-MAT28, combined with either Telar XP or Escort XP, produced 57-62% control. The highest rates of the aminocyclopyrachlor combination treatments produced moderate levels (40-75%) of post-emergent Palmer amaranth control and sustained the control throughout the length of the study. This level of control may hold promise for application to Oklahoma highways and use by the Oklahoma Department of Transportation (ODOT).

BAREGROUND WEED CONTROL WITH AMINOCYCLOPYRACHLOR BLENDS.

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ABSTRACT

DuPont™ Crop Protection has developed several Aminocyclopyrachlor product blends for bareground control of annual and perennial broadleaf weeds around tank farms, along rights-of-way and other non-crop sites. Aminocyclopyrachlor blended products registered for preemergence and postemergence use are DuPont™ Perspective® herbicide and DuPont™ Viewpoint® herbicide. EPA registration of another bareground blend product, DuPont™ Plainview™ herbicide, is pending. Data presented are from Dupont™ and university field trials conducted in the southern and western United States for the control of key weed species including kochia (*Kochia scoparia*), Russian thistle (*Salsola iberica*), field bindweed (*Convolvulus arvensis*), horseweed (*Conyza canadensis*), woollyleaf bursage (*Ambrosia grayi*), common ragweed (*Ambrosia artemisiifolia*) and Palmer amaranth (*Amaranthus palmeri*). 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.

HERBACEOUS WEED CONTROL IN FIRST-YEAR LOBLOLLY PINE PLANTINGS USING FLAZASULFURON. **A.W. Ezell*[1], J.L. Yeiser[2]; [1]Mississippi State University, Starkville, MS, [2]Stephen F Austin State University, Nacogdoches, TX (106)**

ABSTRACT

A total of 13 treatments were applied to recently planted loblolly pine seedlings on four sites (two each in Mississippi and Texas) fpr the purpose of evaluating flazasulfuron for herbaceous weed control efficacy. Each treatment was replicated four times at each site, and plots were evaluated for 150 days after treatment. Sites differed by weed complex and growing conditions. The sites in Texas suffered from the extreme drought of 2011 and treatment response was notably affected. In Mississippi, treatments with flazasulfuron were effective in controlling a wide spectrum of competing forbs and grasses. Combinations with imazapyr were most effective, and an optimal rate of flazasulfuron was noted. Results from all sites and treatments will be presented.

SITE PREPARATION IN MISSISSIPPI AND TEXAS WITH MAT28 AND LOW RATES OF KRENITE.

J.L. Yeiser*[1], A.W. Ezell[2], J. Grogan[3]; [1]Stephen F Austin State University, Nacogdoches, TX, [2]Mississippi State University, Starkville, MS, [3]Stephen F. Austin State University, Nacogdoches, TX (107)

ABSTRACT

The purpose of this study was to screen MAT28 (aminocyclopyrachlor) products in combination with lower use rates of Krenite (fosamine) for general brush and wildling pine control. One test site was near Broken Bow (McCurtain County), OK. This site was mid-slope in the Kiamichi Mountains where the soil was a sandy, gravelly loam. The stand was harvested and the site subsequently ripped in April 2008 before planting in December 2009. Treatment plots were 12-ft x 120-ft with the internal 10-ft x 100-ft being the evaluation plot. Woody species were separated into groups: mixed pine (loblolly>shortleaf pines); mixed red oak (water>southern red oaks); mixed white oak (white>post oaks); other (tupelo and hickory); and all (previous species groups plus black cherry, winged elm, red maple, Vaccinium species, and flowering dogwood). Treatments were established in a randomized complete block design with main effects, GPA (10 and 25), and herbicide treatments. Another test site was on the MSU School Forest (Winston County), south of Starkville, MS where the soil was a silt loam. The stand was harvested in August 2009. Treatments were assigned to a randomized complete design with separate locations for studies of 10 and 20 GPA located about 400 yards apart. Woody species in evaluation plots were separated into dominant groups: post oak, cherrybark oak, mixed red oak (water and willow oaks), and red maple. Herbicide was applied in Oklahoma on October 8, 2010 and in Mississippi on July 21, 2010 using a CO_2 backpack aerially simulator. In Oklahoma a single, 1/4TTJ08_VS nozzle (large droplets) and in Mississippi a KLC-9 nozzle was used. Herbicide treatments (oz prod/ac) include: 1) MAT28+Escort XP (Streamline)+Krenite (7.5+2+64), 2) MAT28+Escort XP (Streamline)+Krenite (7.5+2+96) 3) MAT28+Escort XP (Streamline)+Krenite (7.5+2+128) 4) MAT28+Escort XP+Arsenal (Viewpoint)+Krenite (5.76+1.5+64), 5) MAT28+Escort XP+Arsenal (Viewpoint)+Krenite (5.76+1.5+96), 6) MAT28+Escort XP+Arsenal (Viewpoint)+Krenite (5.76+1.5+128), 7) MAT28+Escort XP+Arsenal (Viewpoint)+Krenite (5.76+1.5+64), 8) MAT28+Escort XP+Arsenal (Viewpoint)+Krenite (7.5+2+20.8+128), 9) Krenite (192), 10) Roundup (192), 11) MAT28+Escort XP (Streamline), and 12) MAT28+Escort XP+Arsenal (Viewpoint). In Mississippi only, treatment 13 was Chopper Gen2+Accord XRT II+NIS (32+128+1%) with 13 total treatments tested in the 10 and 20 GPA sites. In Oklahoma, there was an untreated check for a total of 25 test treatments. Arsenal was formulated in a 2lb gallon. Oklahoma control was evaluated September 2011 and Mississippi control on July 2011. Percent control was computed as the ((initial pre-treatment height - height at a measurement date)/initial pre-treatment height)*100. In Oklahoma, one growing season after treatment, carrier volume was not a significant determinant of control. Mean 10 GPA and 25 GPA were 89% and 85%. All herbicide treatments provided excellent and statistically similar control of mixed red oaks, white oaks, and pines. Species groups other and all exhibited minor statistical differences between treatments. The inclusion of Arsenal in the tank mixtures may have contributed to a broader spectrum of control for species groups diverse in their composition. For example, the species group all, contains a mixture of numerous species with unbalanced replication in plots. This apples-to-oranges contrast may highlight the importance of broad-spectrum control. Oklahoma experienced an extreme 2011 drought that probably impacted control. In Mississippi, in the 10 GPA trial, Chopper Gen2+Accord XRT II provided highest sweetgum and cherrybark oak control. Similar control was achieved with Chopper Gen2+Accord XRT II and treatment 6 for red oak, and 2 and 7 for post oak, and several treatments (1, 2, 4, 5, 6, 7, 8, and 12) for red maple. In the 20 GPA trial, Chopper Gen2+Accord XRT II and treatments 6, 8, and 12; 6, 7, and 8; 2, 3, 4, 6, 7, 8, and 12; 6, 7, 8, and 12; and 3, 7, and 8 provided best and comparable control of sweetgum, cherrybark oak, post oak, red oak, and red maple, respectively. In conclusion, the 2011 drought probably influenced the results from the Oklahoma trial. In Mississippi, increasing to 20 GPA increased the number of Streamline mixtures providing comparable control as the industry check over that of 10 GPA for sweetgum and oaks but not red maple. Numerically, 20 GPA increased control over 10 GPA from 78% to 71%, respectively.

MAT28 FOR CUT STUMP AND BASAL CONTROL OF ASH, ELM, AND SUGARBERRY. **J.L. Yeiser*[1], J. Grogan[2]; [1]Stephen F Austin State University, Nacogdoches, TX, [2]Stephen F. Austin State University, Nacogdoches, TX (108)**

ABSTRACT

The purpose of this study was to investigate the potential of basal bark and cut stump treatments containing MAT28 for the control of unwanted woody rootstocks of sugarberry, green ash, and winged elm. Green ash and sugarberry were located on the Richland Creek Wildlife Management Area and winged elm at the Gus Engeling Wildlife Management Area, both near Corsicana, TX. Herbicides were applied with a 5500 adjustable conejet with a 08 adjustable solid fan nozzle using 11psi on 3-May-2010 to sugarberry and green ash and 4-May-2010 to winged elm. Basal bark treatments were applied to a height of 14-inches with sufficient volume to saturate the bark without runoff and puddling on the ground. For the cut stump treatments, a chain saw was used to sever stems 4-inches above the ground and herbicide applied immediately and sufficiently to thoroughly wet the surface, edges, and top 2 inches of the stem. Herbicides were mixed with Basal Oil Blue by UAP. Test treatments were: (1) MAT28 5%, (2) MAT28 10%, (3) MAT28 15%, (4) MAT28-128 10%, (5) MAT28-128 20%, (6) MAT28-128 30%, (7) MAT28-111 20%, (8) MAT28-111 40%, (9) MAT28-111 60%, (10) KJM44-097 24%, (11) KJM44-097 48%, (12) KJM44-097 72%, (13) Garlon 20%, and (14) untreated check. MAT28, MAT28-128, MAT28-111, and KJM44-097 were formulated with 2, 1, 0.5 lb, and 0.42 pounds of aminocyclopyrachlor per gallon, respectively. Garlon was formulated with 4.0 pounds of triclopyr per gallon. Herbicides were mixed with Basal Oil Blue by UAP. Treatments were evaluated for efficacy 45, 90, 150, 365 days after treatment (DAT). Percent control was computed as the ((initial pre-treatment height - height at a measurement date)/initial pre-treatment height)*100. Cut stump treatments provided excellent control of green ash rootstocks. MAT28-111 (10%) was the only herbicide treatment exhibiting green ash sprouts 45-150 DAT. At 150 DAT, the untreated check exhibited 90%, MAT28-111 (10%) 90%, and all other herbicide treatments 100% control of green ash. Rank of herbicide treatment means for green ash control did not change 90-365 DAT. For rootstocks of sugarberry, cut stump treatments of MAT28 (5%) and MAT28-111 (10%) had sprouts 45-DAT. At 150 DAT, the untreated check exhibited 88%, MAT28-111 (10%) 89%, MAT28-111 (5%) 89%, and all other herbicide treatments 100% sugarberry control. Winged elm rootstocks were controlled by all cut stump herbicide treatments. The untreated check 150 DAT exhibited 87% control of winged elm. Basal bark control of green ash 45 DAT ranged from a low of 32% (check) to a high of 81% (MAT28 15%). By 90 DAT, all herbicide treatments, except MAT28 (5%), were statistically similar with control 96% and greater. MAT28 (5%) exhibited 65% control while the check had 48% basal bark control of green ash. Changes in the rank of treatment means were not detected 90-365 DAT. Winged elm control 90 DAT with a basal bark treatment was statistically similar for many herbicides with a low from 95% control to a high of 100% control. Exceptions were MAT28 15% (69% control) and 10% (58% control). Both of these treatments were better than the check with 6% control of winged elm. Rank changes in treatment means were not detected 150-365 DAT. Sugarberry control with all check and basal bark treatments was 100% 90-365 DAT. The major drought of 2011 probably influenced herbicide efficacy. Basal bark and cut stump treatments of MAT28 show potential for reducing rootstocks of green ash, winged elm, and sugarberry. Numerically and statistically, multiple rates and formulations of MAT28 provided control of green ash, winged elm, and sugarberry similar to the industry check, Garlon.

TWO- YEAR LOBLOLLYPINE GROWTH RESPONSE FOLLOWING HERBACEOUS WEED CONTROL TREATMENTS.

A.W. Ezell*[1], J.L. Yeiser[2]; [1]Mississippi State University, Starkville, MS, [2]Stephen F Austin State University, Nacogdoches, TX (109)

ABSTRACT

Twelve treatments were applied over the top of recently planted loblolly pine seedlings for the purpose of herbaceous weed control. Initial seedling measurements included total height and groundline diameter. Seedlings were measured again at the end of the first and second growing seasons. Growth results were analyzed to examine differences among treatments and to compare the seedlings in treated plots to those in untreated control plots. Results for both height and groundline diameter growth will be presented.

ARE EUROPEAN STARLINGS (*STURNUS VULGARIS*) DISPERSAL AGENTS FOR RUSSIAN OLIVE (*ELAEAGNUS ANGUSTIFOLIA)?*. **R.J. Edwards*[1], K. Beck[2]; [1]Mississippi State University, Starkville, MS, [2]Colorado State University, Fort Collins, CO (110)**

ABSTRACT

Two studies were performed to determine if European Starlings disperse Russian olive seeds. In the first study, Russian olive trees were monitored for 1 year at two field sites to determine feeding behaviors of wild animals on Russian olive seeds using two trail cameras (WSCA01 Wing-Scapes Birdcam and a Moultrie MFH-DGS-I60 Game Spy digital camera). In the second study, 20 European Starlings were collected in the field and housed at the USDA-NWRC research facility in Ft. Collins, CO. Birds were fed 25 Russian olive seeds per day and monitored for behavior in individual cages. Seeds that were fed upon were tested for germination and viability and compared to control seeds, hulled seeds, seeds ground on sandpaper and nicked, and seeds soaked in 17.8 M sulfuric acid (H_2SO_4) for 1hour. From the first study we determined that European Starlings do feed on Russian olive seeds, particularly in November and December. From the second study we determined that Russian olive seeds are actively fed upon by European Starlings in cage trials, with the majority of seeds being regurgitated after 30 minutes. Digested/regurgitated seeds had the highest level of germination (57%) compared to hulled seeds (40%) and ground/nicked seeds (30%). Viability tests confirmed that 87% digested seeds remained viable after consumption compared to control seeds (76), hulled seeds (31%), ground/nicked seeds (0%) and acid scarified seeds (0%).

COST-EFFECTIVE POISON IVY CONTROL USING GLYPHOSATE,TRICLOPYR, AND 2,4-D APPLIED ALONE AND IN SELECTED COMBINATIONS. **G.R. Wehtje*, C.H. Gilliam; Auburn University, Auburn, AL (111)**

ABSTRACT

Poison ivy (*Toxicodendron radicans*) was progagated by cuttings, grown in containers and over wintered so as to have a large popluation of uniform-sized and perennialized test plants. Five treatment series were evaluated: glyphosate alone, triclopyr alone, 2,4-D alone, glyphosate + 2,4-D (ie. a 1:1 tank mixture), and glyphosate + triclopyr (9:1 tank mixture). Each series was applied at a series of rates, ranging from marginally active to completely efective. At least seven rates were included for each treatment series. Treatments were applied with an enclosed-cabinet sprayer, calibrated to deliver 30 GPA (280 L/ha). Reduction in foliage fresh weight was determined 1 MAT, and regrowth (if any) was determined 4 MAT. Expressing these reductions as a percent of the nontreated control, and then subtracting these values from 100, yielded a weight-based, 1-to-100 measure of control. Control data were subjected to ANOVA followed by nonlinear regression. By comparing the postion of the dose response curve of the tank mixtures to the position of the components of the mixture applied alone, it is possible to determine if the mixture is noninteractive (additive) versus interactive; and if interactive, either synergistic or antagonistic. Glyphosate + 2,4-D was deemed to be noninteractive. Conversely, the interaction of the glyphosate + triclopyr mixture was variable; snyergisitic at low (ineffective) rates, but slightly antagonistic at higher (effective) rates. The rate and it's associated cost required for 95% control for each of the five treatment series was also determined through non linear regression. The two hormone-disrupting herbicides, i.e. 2,4-D and triclopyr applied alone were far more cost effective than either glyphosate alone or the two glyphosate-contained tank mixtures. If a treatment option with two modes of action is desired, the 1:1 glyphosate + 2,4-D mixture was more cost effective than the 9:1 glyphosate + triclopyr mixture.

COGONGRASS RESPONSE TO FALL AND SPRING TREATMENTS OF AMINOCYCLOPYRACHLOR.

S.F. Enloe*, J.L. Belcher; Auburn University, Auburn, AL (177)

ABSTRACT

Aminocyclopyrachlor is a new pyrimidine carboxylic acid herbicide that has activity on a wide range of troublesome broadleaf weeds that infest roadsides and rights of ways. Recent research has shown that this synthetic auxin may also have some selective activity against certain weedy grasses such as cogongrass that are problematic in roadside turf. Given that currently available herbicide options for cogongrass control on roadsides are all non-selective, any additional selective tools would be extremely useful. Our objective was to evaluate aminocyclopyrachlor applied at fall or spring timings against glyphosate and imazapyr for cogongrass rhizome, shoot, and flowering control. Studies were established in heavily infested fields near Bayou LaBatre and Theodore, Alabama in 2009 to compare fall (October) and spring (May) application timings of aminocyclopyrachlor (0.28 kg/ha) , glyphosate (3.36 kg/ha) and imazapyr (0.84 kg/ha). Methylated seed oil (1% v/v) was added to each aminocyclopyrachlor and imazapyr treatment and a nonionic surfactant (0.25% v/v) was added to the glyphosate treatment. Treatments were broadcast applied at 187 l/ha to green, actively growing cogongrass at each treatment timing. Cogongrass flowering and vegetative cover data were collected during the growing season after treatment timing and rhizome biomass was also quantified at twelve months after each treatment timing. At 12 MAT, aminocyclopyrachlor reduced rhizome biomass by 30% compared to the untreated control, while glyphosate and imazapyr reduced rhizome biomass by 79 and 83%, respectively. Both fall and spring treatment timings resulted in a similar pattern of good spring cogongrass suppression followed increasing cogongrass cover over the summer. For aminocyclopyrachlor this pattern always resulted in significantly less cogongrass control than either glyphosate or imazapyr. Fall herbicide treatments reduced flowering by 99% and spring treatments reduced flowering by 92% at 12 MAT. Additional studies were also conducted near Bay Minette, Alabama to quantify the impact of repeated fall aminocyclopyrachlor treatments on cogongrass control. Treatments were applied in September or October for two consecutive years at two field sites using rates of 0.07, 0.14, 0.21, 0.28, and 0.56 kg/ha with methylated seed oil at 1% v/v. Visual control and flowering response were evaluated each spring following treatment. Dose response modeling indicated that cogongrass flowering was inhibited at a much lower rate than cogongrass vegetative cover. These results indicate that aminocyclopyrachlor does provide short term vegetative control of cogongrass and can strongly inhibit flowering. This ability to prevent cogongrass flowering while selectively suppressing vegetative cover may allow aminocyclopyrachlor to be useful in certain roadside situations.

CHEMICAL CONTROL OF *MIKANIA MICRANTHA:* A NEW INVASION IN SOUTH FLORIDA . **B.A. Sellers*[1], N. Rana[1], K. Langeland[2]; [1]University of Florida, Ona, FL, [2]University of Florida IFAS Center for Aquatic and Invasive Plants, Gainesville, FL (178)**

ABSTRACT

Chinese creeper (*Mikania micrantha*) is a fast growing vine that has recently been identified invading disturbed areas in the "Redlands" Agricultural Area of Homestead, Florida. Chinese creeper is native to Central and South America, but its range has expanded to Southeast Asia, and more recently, Australia. Chemical control methods for this invasive species are somewhat limited considering previous research has indicated that several persistent herbicides are effective, but these herbicides could be detrimental to many of the crops and ornamental nurseries in this area. Therefore experiments were conducted to determine the effect of several herbicides on the control of Chinese creeper under greenhouse conditions. A preliminary greenhouse screen indicated that aminocyclopyrachlor, aminopyralid, fluroxypyr, glyphosate, and triclopyr were most effective in controlling Chinese creeper. Therefore, rate-titration experiments were conducted with each of these herbicides in a completely randomized design under greenhouse conditions. Treatments included aminocyclopyrachlor at 0.04, 0.07, 0.14, and 0.28 kg/ha, aminopyralid at 0.002, 0.03, 0.06, and 0.12 kg/ha, fluroxypyr at 0.14, 0.28, 0.56, and 1.12 kg/ha, glyphosate at 0.56, 1.12, 2.24 and 4.48 kg/ha, and triclopyr at 0.28, 0.56, 1.12 and 2.24 kg/ha. An untreated check was included for all herbicide treatments. Fresh weight biomass was recorded four weeks after treatment and four weeks after the initial harvest to measure regrowth. Data were converted to percent of the untreated checks and analyzed using regression analysis to calculate the rate of each herbicide required to achieve 90% control. Only aminocyclopyrachlor and fluroxypyr resulted in greater than 90% control with any of the application rates. At least 0.09 kg/ha aminocyclopyrachlor was required to achieved 90% control, while 0.15 kg/ha fluroxypyr was required. Aminopyralid and glyphosate resulted in 87% control of Chinese creeper, but only at the highest application rates of 0.12 and 4.48 kg/ha, respectively. Triclopyr provided 88% control at 2.24 kg/ha. Regrowth of plants treated with aminocyclopyrachlor was reduced by 85 to 100% compared to the untreated check, but application rates at or greater than 0.07 kg/ha was required to achieve greater than 90% reduction in plant biomass. No regrowth was observed from plants treated with fluroxypyr at any application rate. Biomass of triclopyr-treated plants was reduced from 87 to 100% compared to the untreated check, and application rates at or greater than 0.56 kg/ha resulted in 100% reduction in biomass. Biomass of aminopyralid- and glyphosate-treated plants was more variable compared to the other herbicide treatments. Regrowth of aminopyralid-treated plants was reduced 47 to 100%, but application rates of 0.06 and 0.12 kg/ha resulted in greater than 90% control. Glyphosate at 2.24 and 4.48 kg/ha was required to reduce biomass by greater than 90% compared to the untreated control. These data indicate that aminocyclopyrachlor, fluroxypyr and triclopyr may be most effective for Chinese creeper control.

CARROTWOOD (*Cupanuiosis anacardioides*) , AN INVADER OF FLORIDA'S COASTAL HABITATS, SEEDLING GROWTH IN RESPONSE TO SALINITY CONCENTRATIONS IN ROOTING MEDIUM..

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ABSTRACT

Carrotwood (*Cupaniopsis anacardioides*), native to Australia, is a single-trunked evergreen tree that grows to 10 m tall. It is a prolific seed producer and the seeds, which are covered by a bright orange aril, attract birds who consume and disperse them. Carrotwood was introduced into Florida for landscaping in the 1960s and quickly became popular in southern Florida for its fast growth, ease of propagation, and adaptability to coastal conditions. By 1990, seedlings were found established on both the Atlantic and Gulf Coasts of Florida, where it invades spoil islands, beach dunes, marshes, tropical hammocks, pinelands, mangrove and cypress swamps, scrub habitats, and coastal strands. To help understand the potential competitiveness of carrotwood in coastal plant communities, studies were conducted to determine seed germination and seedling growth in response to light and the effects of salinity on seedling growth. Germination, indicated by radicle emergence, was 89% (SE=4.3) from one of two seed collection sites and 30% (SE=6.6) from another site. Radicle emergence was not different between seeds exposed to full sun or shade for the two collections sites(P=0.55, P=.40), which suggests that germination will occur equally as well if seeds are deposited under dense vegetative canopy or in the open. Radicle emergence was rapid and regression analysis predicted that no additional germination occurred after 27 days (y=27-x, r^2=0.70, P<.0001), suggesting the recalcitrant nature of the seed, for one of the seed collections sites but time after planting explained little of the variability in germination (r^2=0.18) of seed from the other site. Seven months after planting ,plants grown in 99% shade had less (P<.0001) root weight (52 mg, SE=20.0), shoot weight (67 mg, SE=29.5), number of leaves (2.4, SE=.64) and leaflets (4.8 SE=1.38) than root weight (289 mg, SE=133.1) shoot weight (319 mg, SE=92.9) leaves (4.1, SE=1.12) or leaflets (10, SE=2.8) of plants grown in 85% sunlight. In one of two similar experiments, shoots grew at salinity concentrations of 1, 10, and 30 ppt but growth rate was decreased as salinity increased and no growth occurred at concentrations of 50 or 80 ppt. In the second experiment, shoots grew only at salinity concentrations of 1 and 10 ppt and growth was much slower at 10 ppt compared to 1 ppt. Growth did not occur in the second experiment at 30, 50, or 80 ppt. Roots in the first experiment grew in salinity concentrations of 1, 10, 30, and 50 ppt but growth decreased as salinity concentrations increased and root-growth did not occur at 80 ppt. Root growth only occurred at the two lowest salinity concentrations in the second experiment. Carrotwood seeds are expected to germinate if deposited under heavy vegetation canopy but seedlings are expected to be more competitive at higher light levels. Carrotwood can be expected to tolerate the lower and, perhaps, temporary elevations of salinity in coastal plant communities but will not be competitive at the higher ranges of salinities where halophytes such as red mangrove (*Rhizophora mangle*) and black mangrove (*Avicennia germinans*) thrive.

EFFECTS OF METSULFURON AND PRESCRIBED FIRE FOR CONTROL OF *Lygodium microphyllum* ON TREE ISLANDS IN THE A.R.M. LOXAHATCHEE N.W.R.

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ABSTRACT

Following aerial and ground treatments with metsulfuron to control *Lygodium microphyllum* on eight Everglades tree islands from 2006-2007, prescribed fire was applied to eight islands in August 2008. Visual observations at 1 month post-fire indicated >75% scorch of the tree islands with near complete loss of canopy cover, especially in the interior with high densities of *L. microphyllum* growing into the canopy. The perimeters of the tree islands were partially unburned. The majority of one area on a single tree island, which was dominated (99%) by native vegetation, was not affected by fire. Six and 12 months post-fire, following two herbicide applications, *L. microphyllum* was still common on all tree islands, accounting for > 4% cover. There was a loss of dominant ground cover of native ferns with a concomitant increase in ground cover species richness and evenness six and 12 months post-fire. Ground cover six and 12 months post-fire was dominated by early successional and ruderal plants, not typically found on tree islands. We observed a reduction in canopy cover from 45% pre-treatment (2005) to 9% at six months and 14% at 12 months post-fire (2009). It is unclear how prescribed fire effects tree island ecology over time, but combining herbicide treatment and fire did not eliminate *L. microphyllum* while concomitantly altering the structure and composition of the tree islands. The use of herbicide and fire on tree islands over a large scale within A.R.M. Loxahatchee N.W.R. will completely change the structure and composition of the tree islands. At this time, we do not recommend prescribed fire following herbicide application for control of *L. microphyllum* on tree islands. Further research is needed to determine the effects of herbicide and fire on tree islands that have no tree canopy, few native plants and near 100% cover of *L. microphyllum*.

TOLERANCE OF *Lygodium microphyllum* AND *L. japonicum* SPORES AND GAMETOPHYTES TO FREEZING TEMPERATURE.

J.T. Hutchinson*[1], K. Langeland[2]; [1]University of Florida, Gainesville, FL, [2]University of Florida IFAS Center for Aquatic and Invasive Plants, Gainesville, FL (181)

ABSTRACT

Spores and gametophytes of *Lygodium microphyllum* and *L. japonicum* were exposed to -2.2 ºC for 0, 0.25, 0.5, 0.75, 1, 3, 6 and 12 hours to determine freeze tolerance. An additional experiment was conducted under the same conditions to determine the freeze tolerance of *L. microphyllum* sporophytes. Spore germination rates of *L. microphyllum* were reduced during longer exposure times to freezing temperatures ($P = 0.0072$). *L. microphyllum* spores had lower germination rates after being frozen for ≥ 3 hours and were highly susceptible to freezing periods ≥ 6 hours with a 5.8 to 13.3-fold reduction in spore germination compared to controls. There was no difference ($P = 0.32$) between germination of *L. japonicum* spores at any exposures rates or controls. Gametophytes of *L. microphyllum* had reduced survival at all exposures to freezing temperatures compared to controls ($P < 0.0001$). There was a ≥ 6.5-fold decrease in gametophyte survival for all exposure times of *L. microphyllum* compared to controls. *L. microphyllum* gametophyte survival was <0.5% for exposure times ≥ 3 hours. The gametophytes of *L. japonicum* had reduced survival at exposures to freezing temperatures ≥ 1 hour ($P < 0.0001$) compared to controls. *L. japonicum* gametophyte survival was 52.5% at 3 hours exposure time, but dropped to < 0.1 at exposure times ≥ 6 hours. All *L. microphyllum* sporophytes exhibited 100% necrosis for all exposure times 24 hours post-exposure, but new growth was observed for exposure time ≤ 6 hours at six months post-exposure. *L. microphyllum* sporophytes dry weight biomass was greatly reduced for all exposure times compared to controls ($P < 0.0001$). An 18-fold or higher reduction in sporophyte weight was recorded for all exposure times ≥ 3 hours. Results with non-linear regression ($R^2 = 0.92$) indicted that a single freeze at -2.2 ºC would reduce OWCF dry weight biomass to 0.1, 0.01, and ≤0.0001 g at five months post-freezing for freeze times of 1.7, 2.5, and 4.0 hours freeze, respectively. These results indicate that *L. japonicum* spores and gametophytes are more tolerant of longer exposure periods to freezing temperatures than *L. microphyllum*. However, the spores of *L. microphyllum* can survive freezing temperature with a 50% reduction in viability compared to controls and re-growth occurred in sporophytes frozen up to 6 hours. This indicates the potential of *L. microphyllum* to spread further in northern Florida.

INVASIVE PLANT MAPPING; I CAN DO ALL THAT ON MY PHONE? **R.D. Wallace*, C.T. Bargeron; University of Georgia, Tifton, GA (182)**

ABSTRACT

The Center for Invasive Species and Ecosystem Health began as an image database but has now expanded to provide a variety of services to be used by professionals and the general public alike. One of the services now provided is the Early Detection and Distribution Mapping System (EDDMapS). EDDMapS' purpose is to discover, and accurately map, the existing range and leading edge of invasive species range and documenting vital information about the species and habitat using data collection protocols. EDDMapS also serves as an information sharing system linking data from various state, federal and non-governmental entities. The first tool for reporting in EDDMapS was the reporting page. From the Reporting page a contributor can add as little or much data for each observation as they have. More recently, smartphone technology has made it possible for citizen scientists and other casual reporters to submit observations of invasive species. The first EDDMapS tool for in-field reporting was the EDDMapS Mobile website. The site is designed to be easily viewable on a smartphone and has information directly related to reporting and identifying invasive species. The mobile website works well with all phones, however, iPhone's currently cannot upload pictures to websites. As a solution to iPhone's inability to upload pictures to a website and to add increased functions to the tools available to iPhone users, several apps have been developed. The first app was created in cooperation with the National Park Service, Florida Fish and Wildlife Commission and the University of Florida. The IveGot1 app is built for reporting non-native plants and animals in Florida, but can be used nationwide. The Center has created a similar app for the Missouri River Watershed Coalition, which promotes reporting new and potential invasive plants in the coalition, can coalition partner, states. The Center is also working with What's Invasive to integrate their website into the Bugwood Network, aggregate their data into EDDMapS, and to host their iPhone and Android apps. Currently, Invasive Plants of Southern Forests, an identification guide, has been formatted into an iPhone app. The entire text and images from the book have been added and the species are searchable by habit, common name, or scientific name. The distribution maps for each species are linked to within the app, and the link takes the user to the distribution map on the Mobile EDDMapS website. The app also contains the entire pdf version of A Management Guide for Invasive Plants in Southern Forests. Reporting directly from this app will be added at a later time.

ROLE OF HERBICIDE TREATMENTS AND APPLICATION TIMES IN COGONGRASS ERADICATION UNDER OPEN FIELD INFESTATION SCENARIO. **J.S. Aulakh*[1], S.F. Enloe[1], A.J. Price[2]; [1]Auburn University, Auburn, AL, [2]USDA-ARS, Auburn, AL (183)**

ABSTRACT

A cogongrass eradication study was conducted from spring 2008 through fall 2011 on open-field cogongrass infestations at two locations near Tilman's Corner and Bayou La Batre in southwestern Alabama. Treatments consisted of glyphosate alone (4 lb/acre), imazapyr alone (0.75 lb/acre) and a combination of both at three different application times (May, August and October) repeated annually for three years. One additional treatment replaced the May glyphosate treatment alone with glyphosate applied twice per year in May and October. The experiment was established in a randomized complete block design with four replications. The plot size was 30’ x 30’ with a 10’ buffer around each plot that was maintained cogongrass free for the duration of the study. Treatments were applied with an ATV mounted boom sprayer at 20 gallons per acre. Measurements were made three times a year (May, August and October) on rhizome dry weight, maximum live-rhizome depth and rhizome total non structural carbohydrate (TNC) content. Statistical analysis was done using Proc GLIMMIX in SAS. Rhizome dry weight and live-rhizome depth data 12, 24 and 36 months after treatment (MAT) and TNC data 12 and 24 MAT were analyzed. The results revealed significant effect of location, herbicide, MAT and their two way interactions on rhizome dry weight, %TNC content and live-rhizome depth. Time of herbicide application did not affect any response variable. However, application time by herbicide interaction was significant for rhizome dry weight only. Rhizome dry weight, %TNC content and live- rhizome depth decreased as the eradication process advanced. Imazapyr alone and the combination of glyphosate plus imazapyr were equally effective regardless of the application timing. Further, the glyphosate applied twice in May and October was as effective as imazapyr alone and the combination of glyphosate plus imazapyr 12 MAT onwards at Bayou La Batre and 24 MAT onwards at Tilman’s corner site. At Bayou La Batre, complete rhizome kill was achieved by 24 MAT with the combination of glyphosate plus imazapyr and glyphosate applied twice in May and October and by 36 MAT with imazapyr alone. However, at Tilman’s corner, the same treatments reached complete rhizome kill by 36 MAT. Annual glyphosate applications either in July or October resulted in complete rhizome kill at Bayou La Batre site by 36 MAT but never reached complete rhizome kill at the Tilman’s corner site. Both the maximum live-rhizome depth and % TNC content followed the same decreasing trend as the rhizome dry weight under different locations, herbicides, MAT and their interactions. Deeper rhizomes were killed first likely due to higher sink activity of the younger rhizomes concentrated in deeper layers. Additionally, the effective herbicide treatments exercised double adverse impact on cogongrass through direct rhizome kill and depletion of reserves that eventually lead to eradication.

SPATIAL AND TEMPORAL DISTRIBUTION OF GERMINABLE WEED SEEDS IN A PERENNIAL *Miscanthus* PRODUCTION SYSTEM. **R.K. Bethke*, E. Van Santen, S.F. Enloe; Auburn University, Auburn, AL (184)**

ABSTRACT

The soil seed bank is the primary source of new weed emergence within production fields. Research on *Miscanthus* soil seed banks is limited to its native range in Japan and for some ornamental varieties in the Midwest. However, very little is known concerning *Miscanthus* seed bank establishment in a bioenergy production system. Since there is some concern regarding the potential for invasiveness within the *Miscanthus* genus, understanding the seed bank dynamics in a *Miscanthus* bioenergy production system could better inform on the risk of invasion. In perennial systems, seeds often remain at or very near the soil surface for a significant period of time often resulting in decay or predation which could result in a reduced seed bank. Therefore, the objective of this study was to quantify emergence of *Miscanthus* and other seedlings from soil samples collected from fields where flowering and seed production had occurred the previous two to three years. Seed cores were collected from 3 fields containing 2-3 year old Miscanthus from late March to early April for a total of 310 samples. Sub-samples were taken with a golf cup cutter approximately 5 cm deep; one sample consisted of 3 cores taken randomly from a one quarter square meter quadrat. Fields were blocked and quadrats were laid out randomly in the blocks. The specific location of the cores was noted and mapped to allow for spatial analysis of data. Cores were stored in a cooler and were randomly laid out in 9X18" flats on top of a small amount of potting soil within a few days of collection. Flats were arranged randomly under a shade cloth on a bench and were watered daily from the day of planting until the end of November 2011 when no more seedlings emerged. All seedlings were identified to species as soon as they emerged and were removed from the flats. At three times during the experiment (May 3rd, June 25th and August 30th) the soil surface was disturbed using a fork to help prevent mold and moss from forming on the surface and to bring the soil on the bottom of the flat to the surface to promote germination of any deeper seeds. Statistics were analyzed using a variety of programs in SAS 9.2. In all fields, *Miscanthus* emergence represented a very small fraction of the germinable seedbank (0.05-9%). *Miscanthus* seedlings began emerging Mid-April and the last observed emergence occurred on June 25th. Other prevalent species found in the field included carpetweed (*Mollugo verticillata* L.), henbit (*Lamium amplexicaule* L.), cudweed (*Pseudognaphalium* Kirp.), evening prim rose (*Oenothera* L.) and prickly sida (*Sida spinosa* L.). The most prevalent species was yellow nutsedge (*Cyperus esculentus* L.). Grass species included foxtail (*Setaria* sp.), and were found in much lower numbers than broadleaf species. The small number of *Miscanthus* seedlings that emerged and the timing may be an indication of very limited seed bank formation in the early years of a production system. Additional elutriation of the soil samples will be performed to quantify non-germinated viable seed. Future research will include sampling at future dates, seed burial studies and germination trials to better understand *Miscanthus* seed banks.

EVALUATION OF NOZZLE TYPE AND DEPOSITION AID ON SPRAY DRIFT OF DICAMBA AND GLYPHOSATE TANK-MIXTURES ON ADJACENT RR2Y SOYBEANS.

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ABSTRACT

The objective of this field research was to develop small-scale (backpack and hand boom) methodology for studying actual particle spray drift, rather than "simulated" drift that is commonly used in weed science research. Particle drift was evaluated by applying a tank mixture of dicamba (560 g ae/ha, Clarity® herbicide) plus glyphosate (840 g ae/ha or 1120 g ae/ha, Roundup WeatherMAX® herbicide) using four different #2 nozzles, providing spray droplets in the desired spray quality categories (based upon the ASABE standard 572.1, March, 2009): fine droplets were attained using the XR TeeJet® nozzle (XR); medium to coarse droplets were attained with the Turbo TeeJet® nozzle (TT); very coarse to extra coarse droplets were achieved with the Air Induction TeeJet® nozzle (AIXR); and ultra coarse droplets were achieved using the Turbo TeeJet® Induction nozzle (TTI). Plots were established by planting long strips (>350 m) of Roundup Ready® corn (8 rows), flanked on each side by 35 to 70 meter wide fields of Genuity® Roundup Ready® soybean. Care was taken to plant the corn perpendicular to the normal prevailing winds during the summer months. The herbicide treatments were applied POST to corn, when the soybeans were between the V3 and V6 stage. Plot sizes varied by site, ranging from 2 to 3 m wide and 9 to 31 m long. Buffer area equal to plot length were included between the plots to prevent accidental cross contamination of the drift field. Treatments were installed on days when wind speed was relatively steady and as close to perpendicular to the direction of the corn rows as possible. Wind speed and wind direction was continuously monitored and spray start and stop times recorded for each plot so drift from individual plots could be correlated with associated wind conditions. Each of the different nozzle types was calibrated for the desired output (94 to 188 L/ha) and ground speed (3 to 4.8 km/hr). The criteria used to assess drift distance of the dicamba plus glyphosate tank mixture was to record the maximum distance into the soybean field where 5% visual crop malformation was observed; 5% malformation is defined as the newest expanding trifoliate showing leaf cupping along the margins of all three leaflets. Distances were recorded for 3 to 5 transects from the edge of the treated plot. Monsanto researchers completed two different studies during the 2010 field season. There were 28 locations for the first study where drift distance was evaluated and six locations for the second study where drift distance, plant height and yields were also evaluated. The distance to which drift was observed was associated with the percent fine spray droplets (<150 microns) produced by the nozzles in both studies. The drift field was the greatest with the XR nozzle, and the lowest for the TTI nozzle in both studies. Drift distances for the TT and AIXR nozzles were intermediate between the TTI and the XR nozzles. Higher wind speeds resulted in greater drift distances. In a second drift study the same nozzles and the same methods were used as in the first study but evaluations of visual soybean malformation, plant height and soybean yield was made starting from the edge of the treated plot. The greatest drift was observed with the XR and TT nozzles, and the least drift with the TTI nozzle, with the AIXR being intermediate. Soybean yields were not affected past 3 m from the edge of the treated plot and when the visual crop response was less than 45%. When a drift reduction agent (InterLock® from Winfield Solutions™) was included at 46 ml/ha in the tank-mix of dicamba and glyphosate in the second study, statistical differences between nozzles, in regard to drift distances, were not observed. In laboratory tests, InterLock reduced the percentage of fine spray droplets for the XR (-17%) and AIXR (-30%) nozzles, but not the TT or TTI nozzles. The results of this field research shows that nozzle selection and wind speed are important criteria in drift potential of spray applications. The results also show that the methodology used is a viable method quantifying drift control strategies for dicamba herbicide. Roundup®, Genuity® and Roundup Ready® are registered trademarks of Monsanto Company. Clarity®is a registered trademark of BASF Corp. TeeJet® is a registered trademark of Spraying Systems Company. InterLock® is a registered trademark of Winfield Solutions™

BENEFITS ASSESSMENT OF ATRAZINE IN CORN AND SORGHUM. **D.C. Bridges*; Abraham Baldwin Agricultural College, Tifton, GA (232)**

ABSTRACT

A simulation analysis of the use and benefits of chloro-s-triazine herbicides, in U.S. field corn, sweet corn and grain sorghum employed previously established methods with 2009 regionally-specific data on weed incidence by species, crop yield losses by weed species, herbicide efficacy by weed species and herbicide use data by active ingredient. USDA Farm Resource Regions (FRR), as established by USDA served as the aggregation basis. Across five FRRs and two apportionment scenarios, models predicted that without atrazine weed control costs for U.S. field corn farmers would rise in 7 out of 10 FRR by scenario analyses and that yield would decline in all 10. Scenario 1 assumes that corn farmers would not have access to atrazine or simazine and that acres treated with these herbicides would shift to other herbicides, including glyphosate, causing glyphosate use to expand beyond 2009 levels. In this scenario, field corn yield declines ranged from 4.4 to 15.3 bushels per current atrazine-treated acre. Averaged across all acres in the FRRs, yield declines ranged from 1.8 to 9.2 bushels per planted acre. Averaged across all U.S. field corn acres, the projected yield decline is 6.4 bushels per planted acre. Scenario 2 assumes that corn farmers would not have access to atrazine or simazine and that the glyphosate market share would remain constant at 2009 levels (approximately 75% of corn acres). In this scenario, field corn yields decline even more, between 5.7 and 17.6 bushels per current atrazine-treated acre. Averaged across all acres in the FRRs, yield declines range from 2.9 to 13.6 bushels per planted acre. Averaged across all U.S. field corn acres, the projected yield decline is 7.7 bushels per planted acre. The difference between 6.4 and 7.7 bushels per planted acre predicts a 20% marginal yield loss due to maintaining the percent of field corn acres treated with glyphosate at 2009 levels, and thus causing the use of non-glyphosate and non-triazine alternatives. Atrazine is equally important for grain sorghum farmers. This analysis showed that if atrazine and propazine were not available to U.S. producers, grain sorghum yield would decline approximately 17 bushels per triazine treated acre, or 13 bushels per planted acre, nationwide. Sweet corn yields also would decline without atrazine or simazine in all FRRs. Yield declines would range from 25% to 33% per atrazine-treated acre and approximately 20% per planted acre.

ENDANGERED SPECIES ASSESSMENTS CONDUCTED UNDER FIFRA AND ESA - PLANS FOR IMPLEMENTATION. **D.D. Campbell*; Syngenta Crop Protection, Greensboro, NC (233)**

ABSTRACT

The Endangered Species Act of 1973 (ESA) requires all federal agencies to consult with Fish and Wildlife Services (FWS) or National Marine Fisheries Services (NMFS) when any activity permitted, funded or conducted by that agency "may" affect" listed species or designated critical habitat. Recent court cases have ruled that this requirement pertains to the registration of pesticides by the Environmental Protection Agency (EPA). Numerous lawsuits have been filed claiming EPA has failed to appropriately apply ESA to pesticide registrations, and EPA indends to systematically conduct endangered species assessments to all pesticides during Registration Review (a required review of pesticides that occurs on a 15-year cycle). EPA has developed plans to implement local mitigations where needed based upon the outcome of their assessment and consultation with FWS and NMFS. The implementation plans include requirement of the herbicide applicator to access web-based county bulletins which will contain the additional required measures where needed. EPA's implementation plans will be described and examples provided.

USING SPATIAL TECHNOLOGIES TO HELP IDENTIFY THE EXTENT OF BEST MANAGEMENT PRACTICE INSTALLATION IN WATERSHEDS AND THEIR POTENTIAL SIGNIFICANCE.

P. Hendley*; Syngenta Crop Protection, LLC, Greensboro, NC (234)

ABSTRACT

There are numerous publications describing the use of modeling to predict the potential vulnerability of watersheds to transport of sediment, water and agricultural inputs such as agrochemicals and nutrients via runoff processes on farm fields. Additionally, there is a growing body of research on the extent to which various land management practices (e.g. vegetative buffers or strip cultivation) can reduce the impact of runoff transport on water quality. However, little work has been reported to identify the extent to which mitigation practices that are already present in watersheds participating in monitoring programs might be improving water quality. This may be a significant consideration where water monitoring data are being used to develop and refine watershed vulnerability modeling approaches. As one research component of the atrazine ecological monitoring programs conducted by Syngenta in small headwater watersheds, technology has been developed combining GIS data layers with true color aerial imagery to conduct detailed photo-interpretation across small (typically 9-40 sq mi) Midwest watersheds. This approach can be used to remotely quantify the extent of "structural" best management practices on a field-by-field basis (e.g. the occurrence of various types of terracing, filter strips/buffers, permanent pasture, grassed waterways, contour farming and wetland buffers). More careful observation can also estimate the degree to which water flow paths are potentially sustainable (stabilized) or may be subject to erosive degradation (unstable). The integration of the presence of best management practices with vulnerability modeling is being investigated as a potential contributing factor in the development of watershed vulnerability models.

A CHANGING REGULATORY ENVIRONMENT . J.J. Arthur*; BASF Corporation, Research Triangle Park, NC (235)

ABSTRACT

The regulatory environment under which we operate is always changing in response to internal and external pressures. A transparent and predictable federal regulatory process is critical to successfully integrate regulatory requirements with the manufacturing and marketing efforts needed to alunch products to our customers. Currently there is a significant increase in pressure from multiple sources on the regulatory landscape creating change and uncertainty in the federal regulatory process. Primary drivers of this change include legal challenges from NGO organizations with anti-pesticide agendas, internal government initiatives such as increasing transparency and environmental justice, and increased globalization. All change is not necessarily bad for our industry and not all efforts at change succeed. Regardless, whether successful or helpful the process of change complicates the regulatory process.

HERBICIDE REREGISTRATION. **J.W. Wells*; Syngenta, Greensboro, NC (236)**

ABSTRACT

All pesticides registered for use in the United States before November 1984 were subject to reregistration. The Environmental Protection Agency's (EPA) review to determine the continued registration eligibility of these pesticides was completed by September of 2008. Their decisions are published as Reregistration Eligibility Decisions (RED). The Food Quality Protection Act of 1996 amended the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) to require periodic review of pesticide registrations on a 15-year cycle to ensure that pesticides continue to meet FIFRA standards. An overview of the registration review process for herbicides will be presented including a discussion on EPA's schedule for herbicide review, new data requirements, changes in policy for data requirements and the registration review process.

GLOBAL HARMONIZATION OF PESTICIDE MRLS AND TOLERANCES. **H.B. Irrig*; Syngenta Crop Protection, Greensboro, NC (237)**

ABSTRACT

Maximum Residue Levels (MRLs), known as Tolerances in the USA, are an important part of agricultural trade today. Agricultural trade extends all around the world for our farmers. The challenges farmers face are not limited to growing healthy crops but extend to meeting foreign governments food standards. Using a product registered in the USA is not enough assurance that the crop will meet the MRLs in foreign markets. Current farming practices require anticipating where your crop will be going and knowing the MRL in that destination. There are many reasons why MRLs vary around the world but the core difference arises from the need to use agricultural chemicals to the control pest or disease pressure unique to a specific growing region. Perhaps our best chance at harmonizing MRLs and thereby easing trade restrictions, lies with supporting and establishing CODEX MRLs.

PUBLIC INTEREST FINDINGS IN SUPPORT OF PESTICIDE REGISTRATIONS. **C.A. Sanson*; BASF Corporation, Research Triangle Park, NC (238)**

ABSTRACT

The requirement for Public Interest Findings (PIF) for the finalization of a conditional registration has been in place since 1986. Given EPA's recent commitments to increase public transparency the focus of PIFs has also increased. Consequently, registrants need to demonstrate that registration of a new active ingredient is in the public's interest when a conditional registration is granted. To manage this, when companies review the regulatory profile of new active ingredients they will need to evaluate and determine if the chemical meets the criteria for reduced risk status or develop a PIF. During their collection phase, registrants will need to demonstrate that the new active ingredien; 1) will work, 2) is equivalent to or better than industry standard, 3) is IPM friendly, 4) supports resistance management or 5) reduces environmental load.

HERBICIDE RESISTANCE EDUCATION - A CRITICAL STEP IN PROACTIVE MANAGEMENT.

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ABSTRACT

Herbicide resistance education and training have been identified as critical paths toward advancing the adoption of proactive best management practices to delay and mitigate the evolution of herbicide-resistant weeds. In September 2011, the Weed Science Society of America (WSSA) introduced a training program designed to educate certified crop advisors, agronomists, pesticide retailers and applicators, growers, students, and other interested parties on the topic of herbicide resistance in weeds. A peer reviewed, five-lesson curriculum is currently available at the Society's web page via web-based training and PowerPoint slides. Topics include: (1) An introduction to herbicide resistance in weeds (2) How do herbicides work? (3) What is herbicide resistance? (4) How do I scout for and identify herbicide resistance in weeds? and (5) How do I manage resistance? The lessons are unique among herbicide resistance training materials in that, for the first time, the WSSA presents a unified message on the causes of herbicide resistance and offers several strategies for identifying and mitigating herbicide resistance in weeds. The lessons contain the most up-to-date definitions for use in the field, including those for low- and high-level resistance, a video on how to scout for herbicide-resistant weeds, and an emphasis on proactive management. The lessons utilize animations to showcase these important points. A Spanish-language version has been also produced. As of December 27, 2011, the lessons have been downloaded greater than 499 times since they were made available the end of September.

DIGITAL DEMONSTRATIONS FOR TEACHING WEED SCIENCE LABS - IS IT REALLY FEASIBLE?

G. MacDonald*[1], J. Ferrell[1], B.A. Sellers[2]; [1]University of Florida, Gainesville, FL, [2]University of Florida, Ona, FL (240)

ABSTRACT

Distance education is one of the most rapidly increasing areas of collegiate education. Many courses are easily translatable and deliverable through web-based platforms, but those courses with a heavy laboratory component are much more challenging. Introductory weed science is a junior/senior level course in most land-grant universities and most often includes a once a week 2 to 3 hour laboratory section. Given this format, students are, on average, exposed to 25 to 35 hours of hands-on experiences in weed science per semester. At the University of Florida, the laboratory component of PLS4601 – Principles of Weed Science comprises weed identification and biology, mechanisms of weed-crop interference, and methods of weed management – including pesticide application techniques, sprayer calibration, and herbicide symptomology. These topics are conveyed to the students using a combination of classroom-type lectures, PowerPoint presentations and hands-on demonstrations. Evaluations of learning include a combination of weed collections, site recognition identification quizzes, homework assignments, and lab reports. Distance based delivery has been utilized at the University of Florida since 2005, and 8 classes have been delivered to students at 4 locations during this time frame. Currently enrollment is restricted to students based at the universities research and education centers (REC's). Previous delivery has utilized narrated PowerPoint for the lecture portion and whenever possible for certain portions of the lab. Weed identification is based solely on a weed collection, and the other areas are briefly covered during 1 to 2 semester visitations by the instructor to the REC to interact with the students. While these visits are beneficial and readily accepted by the students, the amount of material that can be covered and travel restrictions warrant the need for supplemental material. One method of distance delivery that has been piloted is the use of digital video presentations. These presentations were filmed during regular lab sections, and comprise 10 clips ranging in length from 5 to over 17 minutes. Each clip covers a specific section of the lab and is narrated by the instructor. Learning objectives have been developed to address pertinent points for the students, and online, open-book quizzes are most often utilized to evaluate student performance. It should be mentioned that the videos were quickly developed with minimal expense, and based on the current lab delivery in the on-campus labs. Only one semester of digital delivery utilizing this approach has been conducted with mixed results from the students. In the current format this method will probably not provide an adequate means of lab delivery, but can be easily modified with more specific learning targets to clarify the objectives of each section.

ANNUAL BLUEGRASS CONTROL ON PUTTING GREENS WITH PACLOBUTRAZOL. **A. Post*[1], S. Askew[1], J. Corbett[2]; [1]Virginia Tech, Blacksburg, VA, [2]Qualipro, Raleigh, NC (112)**

ABSTRACT

Annual bluegrass (*Poa annua*) is the most common weed problem on creeping bentgrass putting greens and there are no effective selective control products available. A combination of paclobutrazol and trinexapac ethyl is the most common chemical suppression of annual bluegrass on golf putting greens. Paclobutrazol suppresses annual bluegrass more than creeping bentgrass and the addition of trinexapac ethyl improves the overall putting green quality. Both of these plant growth regulators are available from multiple sources following recent patent expiration. The recent economic downturn has turf managers considering post-patent products in search of cost savings. Cost savings realized by switching to a post-patent product are irrelevant if the product does not work as well as the proprietary product. The objective of this study was to compare PGR programs using new generic formulations of paclobutrazol and trinexapac ethyl compared to the original proprietary products. Studies were initiated May 13th and 14th, 2011 at Draper Valley Country Club in Draper, VA and Spotswood Country Club in Harrisonburg, VA, respectively. Treatments were repeated every three weeks thereafter. Treatment programs included the following: 1 and 2) paclobutrazol (Trimmit 2SC or Tide Paclo) applied twice in spring and three times in fall at 0.28 kg ai ha^{-1} and three times in summer at 0.14 kg ai ha^{-1} plus trinexapac ethyl (Primo Maxx or T-Nex) at 0.05 kg ai ha^{-1}; 3 and 4) paclobutrazol (Trimmit 2SC or Tide Paclo) applied at same rates and timings as treatments 1 and 2 except all paclobutrazol rates are reduced by half; 5) flurprimidol (Cutless 50WP) applied twice in spring and three times in fall at 0.3 kg ai ha^{-1} and three times in summer at 0.15 kg ai ha^{-1} plus trinexapac ethyl (Primo Maxx) at 0.05 kg ai ha^{-1}. At Draper Valley initial annual bluegrass cover was 35 to 47%. By mid July, annual bluegrass cover at Draper was 62% in the nontreated check and 13 to 27% and equivalent for both formulations at the low paclobutrazol rate and 4.0 to 4.7% and equivalent in both formulations at the high paclobutrazol rate and the flurprimidol program. All treatments significantly reduced annual bluegrass cover compared to the nontreated control but product formulation did not significantly impact annual bluegrass cover. At Spotswood annual bluegrass cover ranged from 58 to 67% at trial initiation. On June 23, the nontreated control had 50% annual bluegrass cover and all treatments significantly reduced cover to 21 to 33% with no differences between treatments. In July and August, no differences were noted in annual bluegrass cover at Spotswood. Significant creeping bentgrass injury was not observed at either site, though overall turf quality was affected by high rate paclobutrazol programs due to annual bluegrass phytotoxicity. Based on these results from two golf putting greens in Virginia, there appears to be no difference in annual bluegrass suppression or putting green quality between Tide Paclo plus T-Nex (generic products) and Trimmit 2SC plus Primo Maxx.

DETERMINING THE NORTHERN BOUNDARY OF EFFECTIVE RATES OF AMINOCYCLOPYRACHLOR FOR THE CONTROL OF DANDELION (*Taraxacum officinale*) AND HENBIT (*Lamium amplexicaule*).

J.B. Workman*[1], C. Waltz[2], J. McElroy[3], R. Baker[4], S. Kelly[5], B. Wherley[6]; [1]University of Georgia, Griffin, GA, [2]The University of Georgia, Griffin, GA, [3]Auburn University, Auburn, AL, [4]Scotts Company, Columbus, OH, [5]Scotts Company, Apopka, FL, [6]Texas A&M-Dallas, Dallas, TX (113)

ABSTRACT

Aminocyclopyrachlor is a new synthetic auxin for annual and perennial broadleaf weed control in turfgrass. The objective of this study was to determine the northern boundary for the lowest effective rate of aminocyclopyrachlor for the control of dandelion (*Taraxacum officinale*) and henbit (*Lamium amplexicaule*). Field experiments were conducted at four locations including Griffin, GA, Auburn, AL, Dallas, TX, and Apopka, FL. Plots measured 1.5 x 1.5 m and were arranged in a randomized complete block design with 4 replications. Aminocyclopyrachlor was applied at all locations at 0.028 kg ai/ha. For comparative purposes, 2, 4-D, MCCP-p was applied at 2.52 kg ai/ha and atrazine was applied at 2.24 kg ai/ha. Although activity was observed, the low use rates of aminocyclopyrachlor may not provide acceptable control at the northern boundary assessed in this study. When applied mid-March in Georgia and Alabama, 60 to 70% control was observed between 28 and 40 days after treatment. In Florida and Texas, greater than 80% control was observed when treatments were applied later in the season at warmer temperatures.

SELECTIVE BERMUDAGRASS CONTROL IN COOL-SEASON TURF WITH METAMIFOP. **M.C. Cox*, S. Askew; Virginia Tech, Blacksburg, VA (114)**

ABSTRACT

Metamifop is an aryloxyphenoxypropionate herbicide marketed in several Asian countries for weed control in crops and is under evaluation in the US for selective grass weed control in turfgrass. Bermudagrass is listed among the most troublesome weeds of cool-season turfgrasses in most transition zone states. The difficulty of selective bermudagrass control in turf forces grounds managers to rely on herbicides that often injure cool-season turfgrasses. Fenoxaprop, fluazifop, triclopyr, and mesotrione are examples of such herbicides. Metamifop has not injured cool-season turfgrasses when used at rates much higher than needed for annual grass control, which is usually 0.20 to 0.40 kg ai ha^{-1}. With the safety that metamifop has demonstrated in recent experiments, research is needed to determine if metamifop is an effective herbicide for controlling bermudagrass in cool-season turfgrass. The objectives of this study were to evaluate metamifop at 0.40 and 0.80 kg ai ha^{-1} for control of bermudagrass in tall fescue and Kentucky bluegrass and determine if the addition of ammonium nitrate (UAN) enhances metamifop efficacy. Two studies were conducted as randomized complete block designs with three replications at two locations on or near the Virginia Tech campus in Blacksburg, VA. All treatments were applied at 280 L ha^{-1} using Teejet flat fan 11004 nozzles at 262 kPa on June 27, 2011 initially at the Glade Road Research Facility (GR) and on July 20, 2011 initially at the Turfgrass Research Center (TRC). Metamifop was applied at 0.40 and 0.80 kg ai ha^{-1} with and without UAN at 1.5 kg ai ha^{-1}. Fenoxaprop plus triclopyr was applied at 0.14 and 1.12 kg ai ha^{-1}, respectively, as a standard comparison. Three applications were made at 3 week intervals for all herbicides. Turfgrasses included perennial ryegrass maintained at 3.8 cm infested with 3 to 30% bermudagrass at GR and Kentucky bluegrass maintained at 6.3 cm and infested with 50 to 90% bermudagrass at TRC. Metamifop applied at 0.80 kg ai ha^{-1} with and without the addition of UAN controlled bermudagrass equivalent to fenoxaprop + triclopyr and significantly better than metamifop applied at 0.40 kg ai ha^{-1} with and without UAN. The addition of UAN did not significantly enhance or inhibit metamifop efficacy. Perennial ryegrass and Kentucky bluegrass was not injured by metamifop at any time during the study. These data suggest that metamifop could potentially be an alternative to fenoxaprop + triclopyr for bermudagrass control in cool season turf, given that control is comparable between them but metamifop is less injurious to the turf.

DOSE RESPONSE TO ACCASE INHIBITING HERBICIDE ON A CREEPING BENTGRASS CONTAINING A RESISTANCE CONFERRING MUTATION. **T.M. Tate*, P. McCullough, P. Raymer; University of Georgia, Griffin, GA (115)**

ABSTRACT

Herbicide resistance has been used quite successfully as a tool for the control of weeds in various agricultural crops. Most often herbicide resistant cultivars have been developed using genetic modification (GM). However, the commercialization of GM herbicide resistant turfgrass has thus far been unsuccessful. A tissue culture technique was used as a non-GM approach to develop a sethoxydim resistant *Agrostis stolonifera.* This sethoxydim resistant bentgrass line, known as SR1-A, was confirmed to contain a mutation (Ile-1781-Leu) known to confer the resistance to Acetyl coenzyme A carboxylase (ACCase) inhibiting herbicides. Plant material of this line was propagated and a whole plant herbicide dose response experiment was conducted. The experiment included two lines, SR1-A and PennA4, a resistant and susceptible control, respectively. Three ACCase inhibiting herbicides were included at eight rates ranging from 0-3200 grams active ingredient per hectare(g ai ha^{-1}). Each herbicide block was a completely random design replicated four times. Visual herbicide injury percentage ratings were taken at 21 and 28 days. The SR1-A line had significantly lower injury at 400 g ai ha^{-1} and above rates for all three herbicides at 21 and 28 days at alpha=0.05. Also the 21 day I20 values (amount of herbicide to cause 20% injury) were greater than 3200 g ai ha^{-1} for SR1-A compared to values ranging from 74-180 g ai ha^{-1} for the susceptible PennA4. The resistant SR1-A bentgrass has great potential for use in an herbicide resistant weed control system in turfgrass.

CREEPING BENTGRASS PUTTING GREEN RESPONSE TO METHIOZOLIN AND PLANT GROWTH REGULATOR MIXTURES. **K.A. Venner*[1], A. Post[1], S. Askew[1], S. Koo[2]; [1]Virginia Tech, Blacksburg, VA, [2]Moghu Research Center, Daejeon, South Korea (116)**

ABSTRACT

Methiozolin is a new herbicide being investigated for selective removal of annual bluegrass in creeping bentgrass putting greens. For management purposes, plant growth regulators (PGRs) are often utilized to maintain greens and suppress annual bluegrass growth. Inevitably, PGRs will either be tank-mixed or applied concurrently with methiozolin applications on putting greens. Research is needed to evaluate interactions between methiozolin and various PGR products used on greens. The objective of this study was to examine effects of several popular PGRS on annual bluegrass control and creeping bentgrass putting green quality when applied alone or with methiozolin. Studies were conducted at Draper Valley Country Club (DV), Draper,VA and at the Glade Road Research Facility (GR) in Blacksburg, VA beginning in early April 2011. Single applications of ethephon (Proxy) at 1900 g ai ha^{-1}, flurprimidol (Cutless) at 280 g ai ha^{-1}, mefluidide (Embark 2S) at 70 g ai ha^{-1}, paclobutrazol (Trimmit) at 210 g ai $ha^{-1}$and trinexapac-ethyl (Primo MAXX) at 48 g ai ha^{-1}were made with or without methiozolin (MRC-01) at 1000 g ai ha^{-1}. At GR, the creeping bentgrass cultivar was 'A4' and annual bluegrass cover was less than 1% of in all plots at trial initiation. The interaction of methiozolin and PGR was not significant for creeping bentgrass injury at any time ($P>0.05$). The main effect of PGR was significant ($P<0.05$) and at 2 weeks after initial treatment (WAIT), mefluidide injured turfgrass 18% and more than all other PGRs. Paclobutrazol and flurprimidol injured creeping bentgrass 7 to 9% and more than all other PGRs, except mefluidide. At 3 WAIT, mefluidide injured turf 19%, paclobutrazol, 15% and flurprimidol, 11%. Normalized difference vegetation index (NDVI) was lowest from the three most injurious PGRs but was not influenced by methiozolin. At DV, the creeping bentgrass cultivar was ‘Penncross’ and ‘L93’ and annual bluegrass cover ranged from 32 to 50% at trial initiation. The interaction of methiozolin and PGR was significant ($P<0.05$) for annual bluegrass control but not for creeping bentgrass injury. At 1 WAIT, mefluidide and paclobutrazol were the only PGRs that significantly injured creeping bentgrass when compared to the nontreated. NDVI did not follow trends in creeping bentgrass injury due to annual bluegrass phytotoxicity from methiozolin and certain PGRs. By 8 WAIT, annual bluegrass control with PGR’s alone decreased to less than 15%, and methiozolin alone or mixed with any PGR effectively controlled annual bluegrass more than 50%, with the exception of only 10% control with methiozolin plus ethephon. Based on these data, methiozolin does not appear to interact with PGRs to cause more creeping bentgrass injury; however, methiozolin efficacy on annual bluegrass control could be antagonized by ethephon. Future research will further evaluate the methiozolin/ethephon interaction.

INTEGRATING ZINC INTO ANNUAL BLUEGRASS CONTROL PROGRAMS IN BERMUDAGRASS PUTTING GREENS. **C.L. Bristow*, J. McElroy, E.A. Guertal; Auburn University, Auburn, AL (117)**

ABSTRACT

Annual bluegrass (*Poa annua* L.) is one of the most problematic weeds in turfgrass. Due to prolific seedhead production and an increase in herbicide resistance, herbicide efficacy varies and is sometimes less than desirable. However, integration of cultural control practices could lead to improved weed control. Initial research shows that zinc, which is commonly applied as a micronutrient, has a negative effect on annual bluegrass when applied at non-agronomic rates. Additionally, literature indicates that acidifying the zone of germination reduces annual bluegrass emergence. The objectives of this research were: 1) determine the tolerance of various turfgrass seedlings to zinc at three soil pH levels, and, 2) evaluate annual bluegrass control following zinc applications in bermudagrass. Greenhouse and field studies were conducted during 2009-2011 in Auburn, AL. Zinc sulfate heptahydrate ($ZnSO_4 \cdot 7H_2O$) was used as the zinc source, and all Zn rates were applied as a granular treatment. Greenhouse studies were conducted at the Auburn University Plant Science Research Center. Daytime and nighttime temperatures were approximately 20 and 24°C, respectively. Annual bluegrass, roughstalk bluegrass, creeping bentgrass, and perennial ryegrass were grown in separate experiments from seed (50 per pot) in pots containing Marvyn loamy sand. Each experiment was a three by five factorial of pH (5.5, 6.0, 6.5) and Zn rate (0, 34, 67, 101, 134 kg ha^{-1}), arranged in a completely randomized design, replicated four times. Total number of seedlings in each pot was determined every 7 days for 28 days. Field studies were conducted at the Auburn University Turfgrass Research Unit. The study was a randomized complete block design with three replicates, conducted on a non-overseeded bermudagrass putting green. Treatments included four zinc rates (22, 45, 90, 179 kg ha^{-1}), single and multiple applications of fenarimol (2.2 kg ai ha^{-1}), fenarimol + Zn (22 and 90 kg Zn ha^{-1}), and prodiamine (1.1 kg ai ha^{-1}). Fenarimol and prodiamine treatments were applied at 285 L ha^{-1}. Initial treatments were applied in mid-September. Annual bluegrass control was evaluated throughout the fall and winter, and final data included individual plant counts in each plot. Data for both studies was analyzed using Proc GLM in SAS, and means were separated using Fisher's Protected LSD (P=0.05). In the greenhouse study, all applications of Zn reduced germination, regardless of grass species or pH. Only germination of bentgrass was affected by soil pH, with germination of annual bluegrass, roughstalk bluegrass, and perennial ryegrass unaffected by soil pH. At the lowest rate of Zn application (0 kg ha^{-1}) approximately 85% of seed planted germinated for all grass species. At the highest rate of Zn application (134 kg ha^{-1}) less than 55% of the perennial ryegrass, roughstalk bluegrass, and bentgrass seed germinated (28 DAT). Sixty percent of the annual bluegrass seed germinated at the highest Zn rate (134 kg ha^{-1}) (28 DAT). Injury symptoms at all pH levels included stunting and chlorosis, which first appeared in the leaf tips and moved towards the base of the plant. In the field study, zinc applied at 179 kg ha^{-1} controlled annual bluegrass 80% throughout the season. Prodiamine, which is currently not labeled for putting greens, controlled annual bluegrass 90%, while applications of fenarimol controlled annual bluegrass only 40%. These data indicate that by applying 90-179 kg Zn ha^{-1}, it is possible to greatly reduce annual bluegrass populations.

TRANSITIONING OVERSEEDED BERMUDAGRASS FAIRWAYS WITH SP 25052. **A. Post*[1], S. Askew[1], D. Spak[2]; [1]Virginia Tech, Blacksburg, VA, [2]Bayer Environmental Science, Clayton, NC (118)**

ABSTRACT

Spring transition to a pure stand of bermudagrass (*Cynodon dactylon*) after overseeding with perennial ryegrass (*Lolium perenne*) is typically accomplished with sulfonylurea herbicides such as foramsulfuron (Revolver, Bayer) or flazasulfuron (Katana). Transitioning from winter perennial ryegrass cover to bermudagrass can lead to thin turf stands and poor quality during spring and early summer. Sulfonylurea (SU) efficacy tends to increase with increasing temperatures so it is important to evaluate SU products in cooler temperatures since transition programs may be initiated in early spring. Two studies were initiated to evaluate Tribute Total™ effects on transitioning bermudagrass fairways. The objective of study 1 was to examine efficacy of Tribute Total™ for transitioning bermudagrass overseeded with perennial ryegrass. The objective of study 2 was to examine efficacy of Tribute Total™ for clumpy perennial ryegrass (*Lolium perenne*) control under cool temperature conditions. Study 1 was initiated June 20, 2011 in Blacksburg, Virginia on fairway height 'Tifway' bermudagrass maintained at 1.5cm. Tribute Total™ treatments included: 42, 85, and 127 g ai ha^{-1} + 0.5% v/v MSO, as well as the 127 g ai ha^{-1} rate with ammonium sulfate at 2% w/v. Two industry standards were included for comparison: foramsulfuron at 29 g ai ha^{-1} + 0.5% v/v MSO and flazasulfuron at 26 g ai ha^{-1} + 0.25% v/v NIS. Initial bermudagrass cover was 10 to 23%, perennial ryegrass cover was 30 to 33%, and 10-15 tiller smooth crabgrass cover was 30 to 40%. By 4 weeks after treatment (WAT), Tribute Total™ controlled perennial ryegrass 100% at all rates and equivalent to foramsulfuron and flazasulfuron. Tribute Total™ also controlled smooth crabgrass up to 43% 4 WAT and 27% 8 WAT which was significantly better than foramsulfuron. Study 2 was initiated March 25, 2011 in Blacksburg, Virginia on fairway height 'Patriot' bermudagrass maintained at 1.5cm. Treatments included Tribute Total™ at 42, 85, and 127 g ai ha^{-1} + 0.5% v/v MSO; foramsulfuron at 43 g ai ha^{-1} + 0.5% v/v MSO; and flazasulfuron at 26 and 53 g ai ha^{-1} + 0.25% v/v NIS. Daytime temperature at initiation was 42 F. Dormant bermudagrass cover ranged from 42-60% and perennial ryegrass cover ranged from 15-40%. Perennial ryegrass control was minimal from all treatments for the first 14 days and Tribute Total™ exhibited a rate response at 27, 42, and 55 days after treatment (DAT). The high rate of Tribute Total™ controlled perennial ryegrass the most at 56% 27 DAT. Minimal control from Tribute Total™ at this site is likely due to low soil temperature and should be studied further. Foramsulfuron controlled perennial ryegrass no more than 28%. Flazasulfuron controlled perennial ryegrass equivalent or better than foramsulfuron and Tribute Total™ all ratings. Flazasulfuron at either rate was the only treatment that completely controlled perennial ryegrass by 55 DAT.

EVALUATION OF AMINOCYCLOPYRACHLOR EFFICACY, MOWING, AND APPLICATION TIMING ON COGONGRASS. **L. Coats*[1], J.D. Byrd[2], J.M. Taylor[1]; [1]Mississippi State University, Mississippi State, MS, [2]Mississippi State University, Mississippi State University, MS (119)**

ABSTRACT

Because of the proximity to the major ports of New Orleans and Mobile, Mississippi is a high risk for the introduction of nonindigenous invasive plants. It is estimated that nearly 20% of the species in the state are nonindigenous, such as cogongrass (*Imperata cylindrica* (L.) Beauv.) a highly invasive, warm-season, perennial grass. It effectively chokes out other species forming dense, monotypic stands. In the fall of 2010, the Environmental Protection Agency approved the registration of several herbicide blends that contain aminocyclopyrachlor. Field trials were established in Forrest County, Mississippi in 2010 to evaluate the effectiveness of these blends for the treatment of cogongrass. Plot size for the cogongrass was 3.1 by 6.1 meters, with subplots sized 3.1 by 3.1 m. Two weeks prior to the initiation of the trial, the subplots were mowed to 12.7 cm. A backpack sprayer was used to apply the herbicides to the split-plots previously determined to receive early-summer applications. Herbicides applied were 120 + 40 g ai/ha aminocyclopyrachlor + metsulfuron methyl with 1% v/v MSO, 87 + 35 g ai/ha aminocyclopyrachlor + chlorsulfuron and 1% v/v MSO, 101 + 73 + 26 g ai/ha imazapyr + aminocyclopyrachlor + metsulfuron methyl and 1% v/v MSO, 315 g ai/ha aminocyclopyrachlor as a liquid and 1% v/v MSO, 315 g ai/ha aminocyclopyrachlor as a soluble granule and 1% v/v MSO, 140 + 1064 g ai or ae/ha aminocyclopyrachlor + 2,4-D amine and 1% v/v MSO, 140 + 280 g ai or ae/ha aminocyclopyrachlor + triclopyr ester and 1% v/v MSO, 840 g ai/ha imazapyr as a liquid and 1% v/v MSO, and 1120 g ae/ha potassium salt of glyphosate. A 0.5 liter shaker was used to distribute 840 g ai/ha imazapyr as a granule with calibration blanks to aid in even distribution. Evaluation of the plots began 1 month after initial treatment (MAIT) and continued until 4 MAIT. Each plot was evaluated monthly for control. Culm density and shoot height were evaluated at the time of application and at 4 MAIT. In the unmowed subplots, imazapyr liquid showed the significantly greatest visual control and the significantly greatest reduction in density of culms. In mowed subplots, the imazapyr granule, glyphosate, and impazapyr, aminocyclopyrachlor, and metsulfuron all showed significant visual control of cogongrass. Glyphosate and the imazapyr, aminocyclopyrachlor, and metsulfuron combination provided the significantly greatest reduction of culm density in the mowed subplots. The results show that aminocyclopyrachlor, when paired with imazapyr and mowing, can provide an acceptable level of control for cogongrass when applied in early summer. This will provide landowners with additional mean of combating this highly invasive plant.

GOOSEGRASS CONTROL AND BERMUDAGRASS RESPONSE TO HERBICIDE PROGRAMS. **M.C. Cox*, S. Askew; Virginia Tech, Blacksburg, VA (120)**

ABSTRACT

With the removal of MSMA from most turfgrass markets, turf managers, particularly sports turf managers have a new challenge—control of mature goosegrass. Several herbicides are available for effective control of goosegrass at seedling stages, however, control programs for goosegrass at the >2 tiller stage are lacking. A few herbicide programs have controlled mature goosegrass but high costs and significant turf injury have decreased their credibility and use by turf managers. The objectives of this study were to evaluate efficacy of programs that include low rate and repeat applications of various herbicides for control of mature goosegrass (>12 tillers) and determine if the addition of PAR turf dye or chelated iron effectively masks any visual injury to bermudagrass, in order to reduce costs and improve turf quality from goosegrass control programs. A total of 30 treatments were applied to a bermudagrass rough at The Cedars Golf Course in Chatham, Virginia on August 12, 2011 and two varieties of bermudagrass ('Yukon' and 'Riviera') at the Glade Road Research Facility at Virginia Tech in Blacksburg, Virginia on August 15, 2011. Each herbicide was applied with either the addition of chelated iron at 7 kg ai ha^{-1}, PAR turf dye at 1.17 kg ai ha^{-1}, or no additive. Herbicide treatments included: MSMA (2.19 kg ai ha^{-1}) + metribuzin (0.56 kg ai ha^{-1}) at 1 application (app), metribuzin (0.56 kg ai ha^{-1}) + quinclorac (0.42 kg ai ha^{-1}) at 1 app, metribuzin (0.28 kg ai ha^{-1}) + quinclorac (0.21 kg ai ha^{-1}) at 1 app, metribuzin (0.28 kg ai ha^{-1}) + quinclorac (0.21 kg ai ha^{-1}) at 2 apps, metribuzin (0.14 kg ai ha^{-1}) + quinclorac (0.21 kg ai ha^{-1}) at 4 apps, metribuzin (0.07 kg ai ha^{-1}) + quinclorac (0.109 kg ai ha^{-1}) at 4 apps, metribuzin (0.07 kg ai ha^{-1}) + quinclorac (0.42 kg ai ha^{-1}) + sulfentrazone (0.21 kg ai ha^{-1}) at 4 apps, metamifop (200 g ai ha^{-1}) and metamifop (400 g ai ha^{-1}) at 1 app. An untreated check was also incorporated for comparisons. All treatments were applied at 280 L ha^{-1} using Teejet flat fan 11004 nozzles at 262 kPa. Metribuzin (0.14 kg ai ha^{-1}) + quinclorac (0.21 kg ai ha^{-1}) and metribuzin (0.07 kg ai ha^{-1}) + quinclorac (0.21 kg ai ha^{-1}) + sulfentrazone (0.21 kg ai ha^{-1}) controlled mature goosegrass significantly better than all other treatments 8 WAT when pooled over all additives. When compared between additives and within herbicide treatments, metribuzin (0.14 kg ai ha^{-1}) + quinclorac (0.21 kg ai ha^{-1}) applied with no additive and chelated iron did not significantly differ from metribuzin (0.07 kg ai ha^{-1}) + quinclorac (0.21 kg ai ha^{-1}) + sulfentrazone (0.21 kg ai ha^{-1}) applied with no additive, chelated iron, and PAR. Only these herbicide programs controlled goosegrass greater than 85%. The two herbicide programs that controlled goosegrass did not injure Yukon and Riviera bermudagrass greater than the 30% threshold when chelated iron or PAR was added. Metribuzin (0.56 kg ai ha^{-1}) + MSMA (2.19 kg ai ha^{-1}) injured bermudagrass 65 to 90% and more than other treatments but turf injury was decreased on both bermudagrass varieties to less than 40% when chelated iron was added. These data indicate that 4 applications of metribuzin (0.14 kg ai ha^{-1}) + quinclorac (0.21 kg ai ha^{-1}) and metribuzin (0.07 kg ai ha^{-1}) + quinclorac (0.21 kg ai ha^{-1}) + sulfentrazone (0.21 kg ai ha^{-1}) with no additive controlled mature goosegrass better than all other treatment combinations; however, the addition of chelated iron or PAR to the herbicide treatment is needed to mask injury in some bermudagrass varieties. Future work will evaluate more specifically the influence of quinclorac and sulfentrazone on metribuzin efficacy for goosegrass control.

EVALUATION OF EPTC AS A PREPLANT SOIL TREATMENT IN WARM-SEASON SOD PRODUCTION. **X. Li*[1], J.L. Belcher[2], R.H. Walker[2]; [1]University of Georgia, Athens, GA, [2]Auburn University, Auburn, AL (121)**

ABSTRACT

Field research was conducted at Auburn University Turfgrass Research Unit, Auburn AL, from 2008 to 2010 to evaluate EPTC(*s*-ethyl dipropylcarbamothioate) as a preplant soil treatment in warm-season sod production and to determinate minimum plant-back intervals for 'Palmetto' St. Augustinegrass and 'BK-7' zoysiagrass. For three plant-back intervals, Palmetto St. Augustinegrass sod planted 1 week after treatment (1 WAT) exhibited significant dry weight differences among chemical treatments in 2008 and 2009. EPTC and EPTC plus high rates of dazomet constantly resulted in lower dry weights than dazomet alone at 1 WAT. St. Augustinegrass planted 1 WAT had similar or significantly higher dry weights and average stolon lengths than those planted 2 or 3 WAT. BK-7 zoysiagrass responded differently to chemical treatments during this study. Chemical treatments failed to affect zoysiagrass growth in 2009, although EPTC treatment produced the lowest dry weights when zoysiagrass was planted 1 WAT or 3 WAT in 2008. Plant-back interval comparisons suggested zoysiagrass could be planted back 1 week after EPTC, dazomet or EPTC plus dazomet treatment without receiving significant injury. Addition of the fumigant dazomet with EPTC did not adversely affected St. Augustinegrass dry weight more than EPTC applied alone and similar results were found in the cucumber bioassay, in which no significant cucumber dry weight differences could be found within EPTC and EPTC plus various rates of dazomet.

SEQUENTIAL INDAZIFLAM APPLICATIONS FOR SMOOTH CRABGRASS CONTROL IN BERMUDAGRASS LAWNS. **K.A. Venner*[1], D. Spak[2], S. Askew[1]; [1]Virginia Tech, Blacksburg, VA, [2]Bayer Environmental Science, Clayton, NC (122)**

ABSTRACT

Indaziflam (Specticle, Bayer) was registered by US EPA in July 2010 and subsequently sold in spring 2011 primarily as a preemergence herbicide for annual bluegrass, crabgrass, and goosegrass control in warm-season turf. Currently, indaziflam is available as Specticle 20WP, and Specticle Flo, a new formulation, is under evaluation. Indaziflam has primarily been researched and sold as a herbicide for golf course uses but its registration allows use on many turf sites, including lawns. Research is needed to evaluate indaziflam in lawn situations. Two field trials were conducted to evaluate the effect of the new flowable formulation of indaziflam applied once, twice or three times at various rates on crabgrass control and potential bermudagrass injury. Trials were initiated on March 3, 2011 one month before typical crabgrass emergence at the Glade Road Research Center (GRRC) and Turfgrass Research Center (TRC) in Blacksburg, Virginia. Application regimes were: PRE only at 16, 24, 32, 49, and g ai ha^{-1}; PRE + 45 days at 16, 24, and 32 g ai ha^{-1} at each application; and PRE + 45 and 90 DAIT at 16, 24, and 32 g ai ha^{-1} initially and followed by 16 g ai ha^{-1} applied two more times. Applications of the flowable indaziflam product were compared to pendimethalin (Pendulum Aquacap) applied PRE + 45 DAIT at 1650 g ai ha^{-1}. 'Yukon' bermudagrass was maintained at 3.8 cm throughout the study. Bermudagrass was not injured by any treatment at either site. Crabgrass cover differed between locations. At GRRC crabgrass cover was never more than 1%, therefore crabgrass control will not be discussed for this site. At TRC in June, July, and August, respectively, crabgrass cover was 20, 50, and 70% in nontreated plots. When assessed on June 16, indaziflam applied once on March 13 controlled smooth crabgrass 45 to 100% as rate increased from 16 to 65 g ai ha^{-1}, respectively at TRC. Indaziflam applied two or three times controlled crabgrass 98 to 100% regardless of rate. At TRC, single PRE treatments of indaziflam controlled crabgrass 65, 74, 88, 91, and 93% when applied at 16, 24, 32, 49, and 65 g ai ha^{-1}, respectively, while pendimethalin applied once controlled smooth crabgrass 43%. These results are similar to past studies on golf fairways and roughs and agree with the Specticle 20WP label that lists the rate range for crabgrass control at between 35 and 70 g ai ha^{-1}. All programs that included more than one treatment of indaziflam controlled smooth crabgrass 95% or greater. The flowable indaziflam formulation appears to control smooth crabgrass at rates similar to what can be expected based on past experience with the wettable powder.

EVALUATION OF AMINOCYCLOPYRACHLOR FOR INVASIVE SPECIES MANAGEMENT.

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ABSTRACT

Aminocyclopyrachlor (MAT 28) is a synthetic auxin herbicide developed for noncrop and turf weed management. This herbicide is also being evaluated for invasive species management, particularly for selective perennial grass control. As a component to natural areas restoration, it is also beneficial to understand the impact that herbicide residues have on native plant species. Studies were therefore initiated to determine the efficacy of aminocyclopyrachlor on several invasive grass species and the impact of aminocyclopyrachlor on native species establishment and growth. All studies, regardless of location or growing parameters, were arranged in completely randomized block designs with a minimum of 3 replications. Data was subjected to analysis of variance to determine treatment effects. Regression analysis was utilized to determine the response to aminocyclopyrachlor rate and Fishers Protected LSD procedure was used to determine differences between cogongrass field efficacy treatments. Aminocyclopyrachlor was evaluated under greenhouse conditions at rates of 0.018, 0.035, 0.07, 0.14, and 0.28 kg-ai/ha applied postemergence to several invasive grasses including natalgrass (*Melinis repens*), torpedograss (*Panicum repens*), paragrass (*Uriochloa mutica*), West Indian marshgrass (*Hymenachne amplexicaulis*) and cogongrass (*Imperata cylindrica*). Treatments included a non-ionic surfactant at 0.25% v/v and were applied postemergence to 2 month old plants. All species, with the exception of cogongrass, showed no response to aminocyclopyrachlor. Cogongrass was visually stunted and showed a 25% reduction in regrowth biomass compared to the untreated control at the 0.28 kg-ai/ha rate. To further investigate the potential of aminocyclopyrachlor for cogongrass control, two field studies were conducted at a heavily infested cogongrass site in Hillsborough County, FL. Plots were 6 by 16 m and treatments were broadcast applied at 20 GPA carrier volume. Plots were visually evaluated for % injury every 3 months using the following scale: 0 = no control and 100 = complete control. Study one evaluated the efficacy of aminocyclopyrachlor alone or in combination with imazapyr or glyphosate at 0.28 and 0.82 or 1.65 and 3.3 kg-ai/ha, respectively. Standard treatments of glyphosate and imazapyr were included for comparison. The second study included aminocyclopyrachlor alone or in combination with imazapyr, glyphosate, metsulfuron, sulfometuron, and/or chlorsulfuron. In both studies, aminocyclopyrachlor alone provided good initial control, but within one year control was less than 20%. The combination of metsulfuron, sulfometuron, and/or chlorsulfuron increased control in the second experiment, but the greatest control was observed with standard rates of imazapyr and glyphosate. To assess the impact of aminocyclopyrachlor on native species, seedlings of several common forbs, grasses, and tree species were transplanted into field plots treated with aminocyclopyrachlor at 0.009, 0.018, 0.035, 0.07, 0.14, and 0.28 kg-ai/ha. The study was located in a continuously cultivated, cogongrass-free field at the Plant Science Research and Education Unit in Citra, FL. Treatments were applied one day prior to transplanting at 20 GPA carrier volume and immediately incorporated to a depth of 8 cm. Approximately 4 month old native plant seedlings were utilized and plants were visually evaluated every 2 weeks for injury (stunting, stem twisting, abnormal leaf development). Regression analysis was used to determine the rate that would result in < 30% injury from aminocyclopyrachlor. The least tolerant species were forbs, followed by live oak and longleaf pine. The most tolerant species were turkey oak and chalky bluestem where little to no injury was observed at rates > 0.14 kg-ai/ha. Though not effective for cogongrass control, aminocyclopyrachlor has potential for use in natural areas where native grasses are prevalent or desired and invasive forbs are the target species.

TURFGRASS TOLERANCE AND WEED CONTROL WITH METAMIFOP. **M.L. Flessner*[1], J. McElroy[2]; [1]Auburn University, Auburn University, AL, [2]Auburn University, Auburn, AL (124)**

ABSTRACT

Metamifop is an aryloxyphenoxypropionate herbicide that controls various turfgrass weeds including barnyardgrass (*Echinochloa crus-galli*), crabgrasses (*Digitaria* spp.), and goosegrass (*Eleusine indica*). Turfgrass tolerance to metamifop is largely unknown. If turfgrass tolerance occurs, metamifop may have a role in turfgrass situations. Research was conducted to evaluate the response of bermudagrass (*Cynodon dactylon* x *C. transvaalensis*), bentgrass (*Agrostis stolonifera*), crabgrass (*Digitaria* spp.), dallisgrass (*Paspalum dilatatum*), Kentucky bluegrass (*Poa pratensis*), seashore paspalum (*Paspalum vaginatum*), tall fescue (*Festuca arundinacea*) and zoysiagrass (*Zoysia matrella*) at the Auburn University Turfgrass Research Unit in Auburn, AL and FarmLinks golf course in Sylacauga, AL. Treatments varied for different turfgrass and weed species, but generally included metamifop applied at 0.1, 0.2, 0.4, and 0.8 kg ai ha^{-1}, a nontreated check, and relevant standard herbicide comparisons. Metamifop was also applied sequentially for a total of two applications to certain turfgrass and weed species. All treatments were applied using a hand-held sprayer with four TeeJet 8002VS nozzles on 25cm spacings calibrated to deliver 280 L ha^{-1}. Treatments were arranged in a randomized complete block with 3 or 4 replications. Separate experiments were conducted for each species. Visual injury data were collected relative to the nontreated at 4, 6, and 8 weeks after initial treatment where 0 corresponds to no visual injury and 100 corresponds to complete plant necrosis or death. Data were analyzed separately by rating date. Data were subjected to ANOVA and means separated using LSD at $P = 0.05$. Results indicate that metamifop is safe to cool-season turfgrasses including bentgrass, tall fescue, and Kentucky bluegrass. Metamifop is more injurious to warm-season turfgrasses. Metamifop $\geq$ 0.2 kg ha^{-1} injured bermudagrass unacceptably (>30%). Rates $\geq$ 0.4 kg ha^{-1} injured seashore paspalum unacceptably. Metamifop is safe to zoysiagrass. Crabgrass was controlled 75 to 95% 4 WAT and 55 to 85% 8 WAT across metamifop rates, indicating that metamifop may be useful to control crabgrass in the early postemergence stage. Maximum dallisgrass control was 60% at 8 WAT indicating that metamifop may be useful for suppression but not control of this weed. Overall, results indicate that metamifop may have a role of suppressing warm-season grasses in cool-season grasses as well as controlling certain weeds.

RESPONSE OF CREEPING BENTGRASS CULTIVARS TO METAMIFOP. **T. Cooper*[1], L.L. Beck[1], C. Straw[1], G.M. Henry[1], S. Askew[2]; [1]Texas Tech University, Lubbock, TX, [2]Virginia Tech, Blacksburg, VA (125)**

ABSTRACT

Experiments were conducted at the Plant and Soil Science greenhouse facility in Lubbock, TX. 'Crystal Bluelinks', 'Penncross', 'Seaside II', 'Penn A-4', 'T-1', and 'L-93' creeping bentgrass; and 'SR7200' velvet bentgrass were seeded at 147 kg ha^{-1} into 10.2 cm square pots containing a soilless potting media on August 26, 2011. Pots were allowed to mature in the greenhouse over a three month period. Prior to herbicide application bentgrass was mowed to 0.6 cm with hand-held grass shearers. Treatments were arranged in a randomized complete block design with five replications. Herbicides were applied with a CO_2 backpack sprayer equipped with XR8003VS nozzles calibrated to deliver 375 L ha^{-1} at 221 kPa. Herbicide treatments were applied on December 1, 2011 and consisted of metamifop at 200, 300, 400, and 500 g ai ha^{-1}. A sequential application of each treatment was made on December 22, 2011. An untreated check was included for comparison. Visual ratings of percent bentgrass phytotoxicity was recorded weekly on a scale of 0 (no phytotoxicity) to 100% (completely dead bentgrass). Pots were cut to 0.6 cm after three weeks of growth (prior to sequential treatments), biomass was dried, and weighed. This procedure was conducted again three weeks after sequential treatments. Data were subjected to analysis of variance (ANOVA) (P = 0.05) with sums of squares partitioned to reflect a split plot treatment structure. Bentgrass cultivar was considered the main plot and metamifop rate was considered the subplot. Where main plot effects were significant, regressions were used to explain the relationship of measured responses to metamifop treatments. Effect of metamifop treatments were separated using Fisher's Protected LSD test at P = 0.05. Metamifop at 200 to 300 g ai ha^{-1} exhibited 0 to 7% bentgrass phytotoxicity 3 WAIT, regardless of cultivar. Metamifop at 400 to 500 g ai ha^{-1} exhibited 11 to 21% phytotoxicity on 'L-93' and 'Penn A-4', while phytotoxicity on all other cultivars was ≤ 9% 3 WAIT. The phytotoxicity observed on 'L-93' and 'Penn A-4' in response to metamifop at 400 to 500 g ai ha^{-1} coincided with large reductions in biomass (71 to 84%) compared to the untreated checks 3 WAIT. All bentgrass cultivars exhibited ≤ 11% phytotoxicity in response to metamifop at 200 g ai ha^{-1} 6 WAIT. Bentgrass cultivars responded differently to applications of metamifop at 300 g ai ha^{-1} 6 WAIT. Phytotoxicity was only 10% for 'Crystal Bluelinks', 19% for 'Seaside II', 20% for 'SR7200', and 29% for 'T-1'. Phytotoxicity was 44 to 78% for the remaining cultivars 6 WAIT. 'Seaside II', 'SR7200', 'T-1', and 'Crystal Bluelinks' exhibited 22 to 35% phytotoxicity in response to metamifop at 400 g ai ha^{-1} 6 WAIT, while all other cultivars exhibited 68 to 88% phytotoxicity. 'Seaside II', 'SR7200', and 'Crystal Bluelinks' exhibited 48 to 50% phytotoxicity in response to metamifop at 500 g ai ha^{-1} 6 WAIT, while all other cultivars exhibited 66 to 86% phytotoxicity. High levels of phytotoxicity 6 WAIT coincided with large amounts of biomass reduction when compared to the untreated checks.

A DIAGNOSTIC ASSAY FOR ALS HERBICIDE RESISTANCE IN ANNUAL BLUEGRASS (*Poa annua*).

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ABSTRACT

Annual bluegrass (*Poa annua* L.) is a problematic winter annual grass weed to control in turfgrasses. Its light green color and prolific seedhead production disrupt the aesthetic quality of turf stands. ALS-inhibiting herbicides are a large group of herbicides whose mode of action is inhibition of the acetolactate synthase (ALS) enzyme and show promise as a control mechanism for annual bluegrass. Recently, reports of poor control using ALS-inhibiting herbicides on annual bluegrass have surfaced from turfgrass managers. Therefore, a screening method for rapid diagnosis of ALS-inhibiting herbicide resistance in annual bluegrass would be beneficial. A laboratory study was initiated in 2011 at Clemson University to develop a rapid screening method to determine annual bluegrass resistance to ALS-inhibiting herbicides. The laboratory screening method quantifies resistance by analyzing acetolactate accumulations, an intermediate in the branched-chain amino acid biosynthetic pathway. Annual bluegrass leaves were incubated in a solution for 16-20 hours in a growth chamber under a light intensity of 300 µmol m^{-2} s^{-1} at ambient atmospheric conditions. The solution contained a nutrient media, L-alanine, nonionic surfactant, and cyclopropane dicarboxylic acid (CPCA), an inhibitor of ketol acid reductoisomerase (KARI). Trifloxysulfuron, an ALS-inhibiting herbicide used for annual bluegrass control in turfgrass, was added at 0, 0.001, 0.01, 0.1, 1, 10, 100, or 1000 µM. Acetolactate concentrations were measured by analyzing aceotin (via decarboxylation of acetolactate) using a spectrophotometer to determine absorbance at 530 nm. Of five suspected resistant (R) biotypes, two had significantly greater acetolactate accumulations than two known susceptible (S) biotypes. These R biotypes showed continued accumulation of acetolactate at the highest concentration of trifloxysulfuron, 1000 µM. In addition, these two biotypes had AR_{50} values approximately 10,000 times greater than the known S biotypes. This laboratory screening method is a rapid and accurate method to determine the activity of annual bluegrass ALS in the presence of ALS-inhibiting herbicides, and thus is useful for the determination and quantification of ALS-inhibiting herbicide resistance.

WEED CONTROL PROGRAMS WITH HPPD-INHIBITING HERBICIDES IN CORN.

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ABSTRACT

A field study was conducted in Keiser, AR, to evaluate selected hydroxyphenylpyruvate dioxygenase (HPPD)-inhibiting herbicides for weed control in corn. The study was set up as a randomized complete block design (RCBD) with a factorial arrangement of HPPD herbicides (Balance Flexx, Callisto, Capreno, Impact, and Laudis) and a tank-mix partner (none, Aatrex, and Dual II Magnum). Treatments were replicated four times and the individual plot sizes were four rows by 30 ft. Herbicides were applied at the recommended field rate for a clay soil. Adjuvants were applied according to the product label. The weed species evaluated were broadleaf signalgrass (*Urochloa platyphylla*), Palmer amaranth (*Amaranthus palmeri*), and pitted morningglory (*Ipomoea lacunosa*). Weed control was evaluated at 3 and 9 weeks after treatment and again immediately prior to crop harvest (17 weeks after treatment). Season-long control ($\geq$97%) of Palmer amaranth was provided by Laudis, Balance Flexx, or Capreno in combination with Aatrex. Broadleaf signalgrass was ($\geq$97%) controlled by Capreno alone and with Capreno plus Dual II Magnum. Pitted morningglory was controlled ($\leq$70%) by Laudis plus Dual II Magnum, or Balance Flexx or Callisto in combination with Aatrex. In regards to yield, only the mean effect of a tank-mix partner was significant. The addition of Dual II Magnum or Aatrex to the HPPD-inhibiting herbicides resulted in greater yields compared to just HPPD herbicides alone. On average, the addition of Dual II Magnum or Aatrex improved yields 25 to 26 bu/A.

ABSORPTION, TRANSLOCATION, AND METABOLISM OF ^{14}C-AMINOCYCLOPYRACHLOR IN LOBLOLLY PINE. **R. Roten*, R.J. Richardson; North Carolina State University, Raleigh, NC (128)**

ABSTRACT

Greenhouse and laboratory experiments were conducted using ^{14}C-aminocyclopyrachlor to evaluate root and foliar absorption, translocation, and metabolism in loblolly pine. Pine seedling plugs were used for all experiments. Trees designated for foliar experiments were first treated with formulated aminocyclopyrachlor in an overhead track sprayer before application of radiolabeled aminocyclopyrachlor to a single pine needle. Trees for root absorption studies were grown in half strength Hogland's solution spiked with ^{14}C-aminocyclopyrachlor. Plants were harvested at 1, 2, 4, 8, 24, and 48 hours after treatment (HAT) for all experiments. Plants with foliar treatments were harvested and divided into roots, lower stem, upper stem, bud, treated pine needle with fascicle, and untreated pine needle(s). Plants treated by root application were harvested and divided into roots, lower stem, upper stem, and bud. All partitioned plant parts were stored at -20C. To determine absorption and translocation, designated plant parts were dried, homogenized, and radiation was quantified using liquid spectroscopy after being combusted in a biological oxidizer. Aminocyclopyrachlor metabolism was determined only in the treated needle and fascicle. The tissue was extracted in 90% methanol, and evidence of metabolism was determined using High Performance Liquid Chromatography. A maximum of 37% of aminocyclopyrachlor (free acid) was absorbed after foliar application. Absorption was rapid, with maximum reached by one hour after treatment. No difference was found in translocation regardless of harvest interval; 59% of the free acid remained within the treated needle and fascicle, 27% remained in the upper stem section, and all other parts had significantly less aminocyclopyrachlor with a range of 0.5 to 9%. Root absorption occurred in a linear fashion at a rate of one percent per hour and showed high xylem mobility after 48 HAT. Lastly, no metabolism of aminocyclopyrachlor free acid was seen between 1 and 48 HAT when foliar applied

MINIMIZING PPO SELECTION PRESSURE ON PALMER AMARANTH IN NO-TILL COTTON. **C.W. Cahoon*, A.C. York, D. Jordan, R.W. Seagroves; North Carolina State University, Raleigh, NC (129)**

ABSTRACT

Widespread resistance to glyphosate and ALS-inhibiting herbicides in Palmer amaranth (*Amaranthus palmeri*) has led to greater reliance on PPO-inhibiting herbicides. One of the most effective strategies for managing glyphosate-resistant Palmer amaranth in no-till cotton includes an early preplant (EPP) application of flumioxazin followed by a PRE application of fomesafen, both of which are PPO inhibitors. Extensive use of PPO inhibitors in cotton and other crops is reason for concern over possible resistance to this mode of action. This is especially the case where PPO inhibitors are used EPP and PRE in the same season. Currently, populations of common waterhemp (*Amaranthus tuberculatus* syn. *rudis*), common ragweed (*Ambrosia artemisiifolia*), and wild poinsettia (*Euphorbia heterophylla*) resistant to PPO-inhibiting herbicides have been confirmed. The objective of this research was to determine if diuron is a suitable alternative to one PPO-inhibiting herbicide in no-till production systems. The experiment was conducted at Rocky Mount and Mount Olive, NC during 2010 and 2011. Soils included Aycock sandy loam with 0.5% humic matter at Rocky Mount and Wagram loamy sand with 0.3% humic matter at Mount Olive. Diuron at 0.75 lb ai/acre, flumioxazin at 0.064 lb ai/acre, or no residual herbicide plus paraquat at 0.75 lb ai/acre were applied EPP 21 to 25 days ahead of planting. Cotton cultivar PHY 375WRF or PHY 499WRF was planted no-till. Paraquat alone at 0.75 lb/acre, paraquat plus diuron at 0.75 lb/acre, and paraquat plus fomesafen at 0.25 lb ai/acre were applied within 2 hours of planting. All treatments, except checks, included glufosinate ammonium at 0.53 lb ai/acre applied to two-leaf cotton and repeated on eight-leaf cotton. Prometryn plus trifloxysulfuron plus MSMA at 1.0 plus 0.1 plus 2.0 lb ai/acre were directed to 18- to 20-inch cotton. Checks received only paraquat EPP and PRE. Palmer amaranth control was estimated visually, and plots were harvested mechanically to determine seed cotton yield. Data, with checks deleted, were subjected to ANOVA and means were separated using Fishers Protected LSD at $p \leq 0.05$. At the time of the two-leaf glufosinate application (17 to 26 days after planting), flumioxazin applied EPP controlled Palmer amaranth 93 to 99%. Control was not increased by diuron or fomesafen PRE. Diuron EPP and flumioxazin EPP were similarly effective at Rocky Mount in 2011, but diuron EPP controlled Palmer amaranth only 55 to 72% at the other three locations. Diuron PRE and fomesafen PRE, without a residual EPP, were similarly effective both years at Rocky Mount (87 to 93% control). Diuron PRE and fomesafen PRE at Mount Olive controlled Palmer amaranth 50 and 68%, respectively, in 2010 and 96 and 84% in 2011. Control by flumioxazin EPP, flumioxazin EPP plus diuron PRE, and flumioxazin EPP plus fomesafen PRE was similar at all locations (93 to 99%). At 3 of 4 locations, control by diuron EPP plus fomesafen PRE and flumioxazin EPP plus fomesafen PRE was similar (92 to 99%). At one location with limited rainfall after PRE application, diuron EPP plus fomesafen PRE controlled Palmer amaranth 65% compared with 99% control by flumioxazin EPP followed by fomesafen PRE. Differences among systems were less obvious following the two well-timed POST applications of glufosinate. No differences were observed among any systems in 2010 at time of lay-by application. In 2011, systems with EPP plus PRE were more effective than EPP alone or PRE alone. However, no differences were observed among systems with flumioxazin EPP plus fomesafen PRE, flumioxazin EPP plus diuron PRE, and diuron EPP plus fomesafen PRE. Following the lay-by application, good control was noted with all systems. Control late in the season ranged from 91to 97%, with no differences among systems for Palmer amaranth control or seed cotton yield. Check plots could not be harvested due to extreme Palmer amaranth infestations. This research shows the value of residual herbicides as components of burndown systems in no-till cotton. A residual herbicide as part of the burndown program protects the grower from poor weed control if PRE herbicides are not activated timely. Flumioxazin and diuron are the only residual options registered in North Carolina for EPP application. Our results suggest flumioxazin is the preferred product. Hence, if one's goal is to limit PPO inhibitors to one application during early season, flumioxazin EPP followed by diuron PRE would be the preferred system. For growers who insist on using flumioxazin EPP and fomesafen PRE, we suggest including another mode of action, such as diuron or fluometuron, with the fomesafen PRE to help prevent selection for resistance to PPO inhibitors.

HERBICIDE PROGRAMS FOR MANAGEMENT OF PALMER AMARANTH IN COTTON.

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ABSTRACT

Palmer amaranth's (AMAPA) rapid growth rate, drought tolerance, and high reproductive potential make it the most common and troublesome weed in cotton fields throughout South Carolina and the southeastern United States. Glyphosate- and ALS-resistant AMAPA are present in South Carolina. This has dramatically reduced control options for Palmer amaranth in cotton. With glyphosate-resistant AMAPA populations emerging, herbicide options for cotton producers are limited (especially in dryland, conservation tillage areas). With glyphosate-tolerant varieties (such as Phytogen widestrike that are tolerant of over-the-top applications of Ignite), these combinations of Ignite and glyphosate-based need to be examined for glyphosate-and ALS-resistant AMAPA management. Field sites were established at Pee Dee REC (PDREC) and Edisto REC (EREC). Cotton variety planted at EREC was Phytogen 375 Roundup Ready Flex Widestrike and Phytogen 565 RR Flex Widestrike was planted at PDREC (Both varieties have tolerance to both Roundup and Ignite applications over the top). A companion premergence study was also established to evaluate the length of residual AMAPA control provided by Staple LX, Cotoran, Prowl H2O, Reflex, and Direx alone and in combination. The premergence study evaluated length of soil residual AMAPA control provided by various combinations of Staple LX, Cotoran, Prowl H2O, Reflex, and Direx. At 14 days after treatment (DAT) at EREC, Palmer amaranth control was greater than 98% control for Staple + Direx, Cotoran, Prowl H2O, and Reflex; Cotoran + Direx, Prowl H2O, Reflex; and Direx plus Reflex. Staple alone provided only 86% control of Palmer amaranth. At 28 DAT, Palmer amaranth control (80-83%) declined rapidly in the Staple, Staple + Direx, Cotoran, and Cotoran + Prowl H2O treatments. Cotoran + Direx and Reflex alone remained above 90%. At PDREC, PRE Palmer amaranth control was similar at 14 DAT and 28 DAT. At the EREC site, AMAPA control was at least 95% across all treatments at 14 DAT after treatment. At 60 DAT, AMAPA control was similar in both glyphosate-based programs and Ignite-based programs (at least 88% control of AMAPA). This indicated that a majority of the AMAPA populations were sensitive to glyphosate. At the PDREC site, AMAPA control was at least 95% across all treatments at 14 DAT. At 60 DAT, AMAPA control declined to 88% in the Prowl H2O + Direx (both glyphosate and Ignite programs). Programs that contained Reflex as a preemergence treatment performed similarly in control of AMAPA as Direx containing programs. A majority of the AMAPA populations at PDREC are resistant to glyphosate; however, Staple programs performed well (indicating ALS-sensitive AMAPA populations). If significant rainfall occurs within 3 to 7 days of a soil residual herbicide application, then growers can expect approximately 14-21 days of weed control activity from the programs we tested and highlight the importance of preemergence herbicide in a farmer's management plan. The Prowl + Direx followed by (fb) Ignite + Staple fb Ignite yields were significantly lower than the other treatments. Phytogen Widestrike cotton variety adoption will become more important in the face of glyphosate-resistant AMAPA. The key to managing AMAPA in an Ignite-based program is the use of overlapping residual herbicides. If AMAPA is more than 4 inches, the rate of Ignite (>29 oz/A of Ignite) needed will injure and/or potentially reduce yield of Widestrike cotton.

SOYBEAN SENSITIVITY TO DRIFT RATES OF IMAZOSULFRUON. **S.S. Rana*[1], J.K. Norsworthy[1], D.B. Johnson[1], P. Devkota[1], B. Scott[2]; [1]University of Arkansas, Fayetteville, AR, [2]University of Arkansas, Lonoke, AR (131)**

ABSTRACT

Imazosulfuron is a new sulfonylurea herbicide recently labeled in rice. Soybean is prone to drift of herbicides from rice fields in the southern U. S. because the two crops are often grown in close proximity. Therefore, field trials were conducted at Fayetteville and Pine Tree, Arkansas, to determine the sensitivity of soybean (cv. AG 4703) to drift rates of imazosulfuron. Imazosulfuron is labeled for use in Arkansas rice at a maximum rate of 0.3 lb ai/A. Soybean was treated at the VC, V2, V6, and R2 growth stages with 1/256, 1/128, 1/64, 1/32, 1/16, 1/8, and 1/4 times (X) the maximum labeled rate of imazosulfuron. Soybean was injured regardless of herbicide rate or application timing. Injury to soybean plants from imazosulfuron was in the form of stunting and purple veins. At 2 weeks after treatment (WAT), imazosulfuron at the 1/256 to 1/4X rates injured soybean by 26 to 83, 35 to 74, 27 to 55, and 11 to 49% when applied at the VC, V2, V6, and R2 growth stages, respectively, where the highest injury was caused by the highest imazosulfuron rate (1/4X). However, soybean treated with lower rates of imazosulfuron at early growth stages (VC and V2) recovered from injury over time. At 20 weeks after planting (WAP), soybean treated with 1/256 to 1/16X rates of imazosulfuron at the VC and V2 growth stages had 0 to 8% and 8 to 27% visible injury, respectively. At higher rates (1/8 and 1/4X) of imazosulfuron, soybean treated at the VC growth stage recovered more from injury compared to soybean treated at the V2 growth stage. Soybean treated with imazosulfuron at the V6 and R2 growth stages had better recovery from the injury at the lower two rates (1/256 and 1/128X) compared to the higher rates (1/64 to 1/4X). Imazosulfuron applied at 1/256 to 1/4X rates delayed soybean maturity by 3 to 8, 5 to 9, 5 to 12, and 6 to 17 d for the VC, V2, V6, and R2 growth stages, respectively. Injury to soybean at 2 WAT resulted in higher yield loss for the later growth stages (V6 and R2) compared with the early growth stages (VC and V2). At 1/256 to 1/4X rates, imazosulfuron reduced soybean yields by 0 to 33, 14 to 53, 19 to 70, and 21 to 93% for the VC, V2, V6, and R2 growth stages. Results of this research indicate that imazosulfuron can severely injure soybean regardless of the growth stage at which drift occurs; however, soybean injured by imazosulfuron at early growth stages (VC and V2) with lower application rates have a better chance of recovery over time compared to later growth stages (V6 and R2).

DIFFERENTIATION OF WEEDY TRAITS IN ALS-RESISTANT RED RICE.

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ABSTRACT

Red rice is a weedy form of cultivated rice (*Oryza sativa*) that competes aggressively with rice in the southern U.S., reduces yields & contaminates rice grains. The introduction of ClearfieldTM rice, a nontransgenic, herbicide-resistant rice cultivar decade ago has led to increased use of imazethapyr in rice fields to control red rice. Prolonged use of ALS inhibitor herbicides has led to the appearance of ALS-resistant red rice in recent years, primarily due to gene flow from ALS-resistant rice cultivars. The study was conducted to characterize the variation in weedy traits among these ALS-resistant red rice accessions collected from 11 counties of Arkansas along with 3 Clearfield rice cultivars. 39% of the plants were found to be resistant to imazethapyr, 96% of them were highly resistant. Nearly 80% of the plants exhibit <75° stem angle relative to ground which showed their potential for ground cover and to shade other plants. Plant height of 47% of red rice plants ranged from 130-160 cm. More than 50% of the red rice plants have delayed flowering as compared to Clearfield rice cultivars and the onset of flowering among all the accessions ranged from 74 DAP to 134 DAP which indicates flowering synchronization between red rice populations and rice cultivars. These resistant weedy plants were outcrosses with the rice crop and their degree of weediness accounts for longer persistence which needs to be evaluated further.

ACTIVITY OF AMINOCYCLOPYRACHLOR ON HORSENETTLE AND TALL IRONWEED. **W. Phillips*[1], N. Rhodes[1], T.C. Mueller[1], G. Armel[1], J. Green[2], W. Witt[2]; [1]University of Tennessee, Knoxville, TN, [2]University of Kentucky, Lexington, KY (133)**

ABSTRACT

Previous research and producer experience have shown that management of horsenettle (*Solanum carolinense*) and tall ironweed (*Vernonia gigantea*) in cool-season grass pastures and hayfields is difficult with many herbicides and cultural practices. Because of this, studies were conducted at Alcoa, Fork Creek, Greenback, Maynardville, and Pulaski, Tennessee, and at London, Kentucky, in 2010 and 2011 to examine efficacy of aminocyclopyrachlor on these two perennial weeds. All experiments were conducted on naturally-occurring infestations utilizing a CO_2 backpack sprayer and a six-nozzle boom. Treatments were as follows: aminocyclopyrachlor (0.7 oz ai/a) with and without 2,4-D amine (5.3 oz ai/a), aminocyclopyrachlor (1.4 oz ai/a) with and without 2,4-D amine (10.6 oz ai/a), and aminopyralid (1.25 oz ai/a). All treatments included Induce surfactant at 0.25% v/v. These treatments were applied at three post-emergent timings to horsenettle, which corresponded horsenettle in a vegetative (early-POST), flowering (mid-POST), or fruit-setting (late-POST) growth stage. Treatments were applied at two post-emergent timings to tall ironweed, corresponding to ironweed that was either vegetative (early-POST) or flowering (late-POST). Analysis of this RCB was conducted utilizing ANOVA in SAS. Means were separated using SNK. Treatment effects were found to be significant for visual weed control ($P<.001$) and weed density and height ($P<.05$). Year-after control of horsenettle was found to be as high as 81% with a late-POST application of aminocyclopyrachlor at 1.4 oz ai/a with 2,4-D at 10.6 oz ai/a. Equivalent control was achieved with aminocyclopyrachlor at other rates applied mid- and late-POST, and with aminopyralid at 1.25 oz ai/a applied mid-POST. Ninety-nine percent year-after control of tall ironweed was achieved with aminocyclopyrachlor in either timing at rates as low as 0.7 oz ai/a. 96% control was achieved with aminopyralid applied late-POST at 1.25 oz ai/a. Both aminocyclopyrachlor and aminopyralid were found to significantly reduce horsenettle and tall ironweed biomass the following year ($P<.05$). The best year-after control of horsenettle (≈80%) was achieved with aminocyclopyrachlor late-POST and aminopyralid applied mid-POST. The best year-after control of tall ironweed (>96%) resulted from late-POST applications of aminocyclopyrachlor or aminopyralid. Based on the results of this research, a late-summer application, when there is adequate soil moisture, would be recommended for best lasting control of horsenettle and tall ironweed with aminocyclopyrachlor. A rate of at least 1.4 oz ai/a would be recommended to control horsenettle; tall ironweed may be well controlled with rates as low as 0.7 oz ai/a.

CONFIRMATION OF GLYPHOSATE-RESISTANT COMMON RAGWEED IN VIRGINIA. **A.N. Smith*, E. Hagood; Virginia Tech, Blacksburg, VA (134)**

ABSTRACT

Glyphosate resistance has become a serious concern in production agriculture and the loss of glyphosate as a management tool can have severe consequences. Common ragweed (*Ambrosia artemisiifolia*) is prevalent weed in no-tillage corn and soybean, and left unmanaged, can cause significant yield reductions. There are seven confirmed instances of glyphosate resistance in common ragweed. A suspect population was confirmed in Virginia, expressing resistance to 3.44 kg ae ha^{-1} of glyphosate. A field trial was initiated in 2011 near Richmond,VA in no-tillage soybean. The producer first experienced glyphosate failure two seasons prior to the initiation of this experiment. Glyphosate was applied POST at 0.86 kg ae ha^{-1}, 1.72 kg ae ha^{-1}, and 3.44 kg ae ha^{-1}. At 68 DAT, common ragweed control was 21, 31, and 56%, respectively. There were fifteen additional treatments comparing POST tank mixtures including glyphosate and/or the inclusion of PRE herbicides. Flumioxazin + chlorimuron ethyl, sulfentrazone + chlorimuron ethyl, sulfentrazone + cloransulum-methyl, S-metolachlor + fomesafen, and V-10233 were applied PRE at normal use rates. Additionally, glyphosate was tank mixed with S-metolachor and linuron and applied PRE. Fomesafen, cloransulum-methyl, and S-metolachlor were tank mixed with glyphosate and applied POST at normal use rates. Fomesafen was also applied alone. Weed control was estimated visually. The following treatments had 97% control or better at 68 DAT: flumioxazin + chlorimuron ethyl PRE with a tank mix of glyphosate and cloransulam-methyl POST; sulfentrazone + chlorimuron ethyl PRE with a tank mix of glyphosate and fomesafen POST; sulfentrazone + chloransulam-methyl PRE with a tank mix of glyphosate and fomesafen POST; sulfentrazone + chloransulam-methyl PRE with a tank mix of glyphosate and cloransulam-methyl POST; V-10233 PRE with a tank mix of glyphosate and fomesafen POST; flumioxazin + chlorimuron ethyl PRE with a tank mix of glyphosate and fomesafen POST; and sulfentrazone + cloransulam-methyl PRE and glyphosate POST. These results suggest that soybean producers experiencing herbicide resistance in common ragweed have several options for weed control.

***EPSPS* GENE AMPLIFICATION AND RESPONSE TO GLYPHOSATE OF ITALIAN RYEGRASS.**

R.A. Salas*[1], N.R. Burgos[1], F.E. Dayan[2], Z. Pan[3], T. Tseng[4], E.A. Alcobar[4], G.M. Botha[1], B. Scott[5], J.W. Dickson[5]; [1]University of Arkansas, Fayetteville, AR, [2]NPURU, Oxford, MS, [3]United States Department of Agriculture-ARS, University, MS, [4]UNIVERSITY OF ARKANSAS, Fayetteville, AR, [5]University of Arkansas, Lonoke, AR (135)

ABSTRACT

The sustainability of glyphosate use in weed management systems is being threatened by the evolution of glyphosate-resistant weeds. Resistance to glyphosate in Italian ryegrass was confirmed in Desha County, Arkansas in 2009. Glyphosate-resistant weeds usually exhibit either target site mutation or reduced translocation; however, *EPSPS* gene amplification and vacuole sequestration are recently reported to also make plants insensitive to glyphosate. This research was conducted to determine the resistance mechanism to glyphosate in Des03, Des05, Des14, and D8 Italian ryegrass populations from Arkansas. Plants were analyzed for *EPSPS* gene sequence, EPSPS enzyme activity, and *EPSPS* gene copy number. The resistance level of selected glyphosate-susceptible (S) and -resistant (R) plants from Des03 population was also determined and correlated with EPSPS enzyme activity and *EPSPS* gene copy number of the same plants. *EPSPS* gene sequencing revealed that resistance to glyphosate was not due to target site mutation. Resistant (R) plants in Des03 population had six-fold higher basal EPSPS enzyme activity and contained more copies of *EPSPS* than the S plants. Also in Des03 population, the S plants contained 1 to 9 *EPSPS* copies whereas R plants had up to 100 copies. The resistance levels of selected R and S plants from Des03 population correlated with their *EPSPS* copy numbers and EPSPS enzyme activities. Therefore, resistance to glyphosate in Des03 population is due to increased EPSPS enzyme activity and amplification of the *EPSPS* gene. Dose-response bioassays showed that Des05, Des14, and D8 populations were seven-, eight- and twelve-fold more resistant to glyphosate, respectively, than the susceptible population. Resistant plants from Des05, Des14, and D8 population had up to 122, 444, and 516 *EPSPS* copies, respectively; whereas, the susceptible population had only up to two copies. This indicates that *EPSPS* gene amplification confers resistance to glyphosate in Italian ryegrass. The occurrence of gene amplification was first reported in Palmer amaranth and now is also observed in Italian ryegrass. It is likely that this mechanism may occur in other weed species. Future research in this area should investigate ways to mitigate *EPSPS* gene amplification.

ALLYL ISOTHIOCYANATE AND METAM SODIUM AS METHYL BROMIDE ALTERNATIVES FOR WEED CONTROL IN PLASTICULTURE TOMATO.

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ABSTRACT

Methyl bromide (MeBr) was classified as a Class I ozone-depleting substance, and production and use has been banned. Because of the loss of MeBr and unavailability of effective MeBr alternatives, optimum weed control is a major challenge for quality and quantity harvest in commercial tomato production. A field study was conducted at Fayetteville, AR, in summer 2010 and 2011 to evaluate the effectiveness of allyl isothiocyanate (ITC) and metam sodium for weed control in low-density polyethylene (LDPE) mulched tomato. Allyl ITC was applied at 450, 600, and 750 kg/ha, and metam sodium was applied at 180, 270, and 360 kg/ha. A standard treatment of MeBr plus chloropicrin (67% and 33%, respectively) at 390 kg/ha and a non-treated check were used for the comparison. Crop injury and weed control were rated at 2, 4, 6, and 8 wk after transplant (WATP). Marketable fruits were harvested, graded according to USDA standard, weighed, and subjected to yield analysis. Additionally, at the end-of-season, five soil cores (0.075-m diameter and 0.15-m depth) were removed from each plot, washed, and viable yellow nutsedge tubers were recorded. Allyl ITC and metam sodium did not injure tomato. Weed control was rate dependent and higher rates provided greater weed control. Allyl ITC at 750 kg/ha and metam sodium at 360 kg/ha controlled yellow nutsedge (>89%) similar to MeBr (97%) at 4 WATP. Likewise, at 8WATP, yellow nutsedge control (>80%) from the highest rates of allyl ITC and metam sodium were comparable to the control from MeBr. Palmer amaranth control was >87 and >80% at 6 and 8 WATP, respectively, and control was similar for allyl ITC at 750 kg/ha, metam sodium at 240 and 360 kg/ha, and MeBr. In addition, allyl ITC at 750 kg/ha and metam sodium at 360 kg/ha controlled large crabgrass comparable to MeBr. Large crabgrass control from these treatments was >89 and >77% at 4 and 8 WATP, respectively. Total marketable fruit yield was similar for allyl ITC at 750 kg/ha, metam sodium at 360 kg/ha, and MeBr with total yield >32 ton/ha. Additionally, tomato yield for different grades from these treatments was equivalent to the different grades of tomato from MeBr. The viable yellow nutsedge tuber density (no. of tuber/m^2) was similar (>60 tuber/m^2) for metam sodium at 360 kg/ha and MeBr; however allyl ITC at 750 kg/ha had more (132 tuber/m^2) than MeBr. In conclusion, metam sodium at 360 kg/ha was equivalent to MeBr for weed control, tomato yield, and viable yellow nutsedge tuber density in LDPE mulched tomato. Therefore, the metam sodium at 360 kg/ha has potential as a MeBr alternative for plasticulture tomato.

EFFECT OF DICAMBA AND GLUFOSINATE APPLICATION RATE AND TIMING ON PALMER AMARANTH CONTROL.

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ABSTRACT

Glyphosate-resistant (GR) Palmer amaranth has rapidly spreading across the Southeast and Mid-Southern regions of the United States. As a result, new transgenic technologies have been identified that will provide growers with additional postemergence options for control of GR-Palmer amaranth in cotton. Dicamba tolerant cotton is under development from Monsanto Company with a preliminary release date of 2016. Previous research examining the effect of dicamba application rate and timing on GR-Palmer amaranth is lacking. Therefore, the objective of this research was to evaluate the effect of dicamba and glufosinate application rate and timing on GR-Palmer amaranth control. Research was conducted in 2011 on grower field infested with glyphosate-resistant Palmer amaranth in Robinsonville, MS. Herbicides utilized in these experiments included glufosinate and dicamba. Glufosinate and dicamba were applied to 10- and 20-cm GR-Palmer amaranth in the first experiment. In the second experiment, initial dicamba and glufosinate applications were made to 20 or 30-cm GR-Palmer amaranth. An additional second application was also made following seven days after each 20- and 30-cm application. Glufosinate applications were made at 0.59 kg ai ha^{-1} in the both experiments. In addition, dicamba was applied at 0.28 and 0.56 kg ai ha^{-1} in the both experiments. All herbicide applications were made with a CO_2- powered backpack sprayer equipped with Turbo Teejet Induction spray tips. A randomized complete block design was utilized for both experiments. Visual estimates of GR-Palmer amaranth control were collected weekly after each application. All data were subjected to analysis of variance and means were separated using Fisher's Protected LSD at P = 0.05. Control of 10-cm GR-Palmer amaranth two weeks after dicamba application at 0.28 and 0.56 kg ai ha^{-1} was 50 and 66%, respectively. Similarly, control of 20-cm GR-Palmer amaranth two weeks after dicamba application at 0.28 and 0.56 kg ai ha^{-1} was 63 and 68%, respectively. Glufosinate application to 10- and 20-cm GR-Palmer amaranth resulted in 56 and 74% control, respectively two weeks after treatment. Tank-mix combinations of glufosinate and dicamba at 0.28 and 0.56 kg ai ha^{-1} applied to 10- and 20-cm GR-Palmer amaranth resulted in 73 to 85% control. Sequential applications of dicamba at 0.28 kg ai ha^{-1} to 20- and 36-cm GR-Palmer amaranth resulted in 78% control two weeks after the second treatment. In addition, sequential applications of dicamba at 0.56 kg ai ha^{-1} to 20- and 36-cm GR-Palmer amaranth resulted in 89 and 83% control, respectively, two weeks after treatment. Sequential applications of glufosinate followed by dicamba to 20- and 36-cm GR-Palmer amaranth resulted in 66 – 81% control. However, sequential applications of dicamba followed by glufosinate to 20- and 36-cm GR-Palmer amaranth resulted in 83 to 92% control. Based on these data, sequential applications of dicamba and glufosinate are required for adequate control of GR-Palmer amaranth. However, if sequential applications of these products are utilized, dicamba should be applied first followed by glufosinate.

DIFFERENTIAL RESPONSE AND TOLERANCE MECHANISM OF GLYPHOSATE-RESISTANT PALMER AMARANTH TO GLUFOSINATE. **G.M. Botha*[1], N.R. Burgos[1], T. Tseng[2], M.B. Batoy[1]; [1]University of Arkansas, Fayetteville, AR, [2]UNIVERSITY OF ARKANSAS, Fayetteville, AR (138)**

ABSTRACT

Palmer amaranth (*Amaranthus palmeri*) is a major weed problem in the southern USA. It grows fast and is efficient in using water and intercepting light. Resistance to glycine, acetolactate synthase, dinitroaniline, and photosysytem II herbicides caused a shift in weed management systems leading to increased adoption of Liberty Link® crops and other technologies. The use of glufosinate in Liberty Link® crops is one alternative tool for glyphosate-resistant Palmer amaranth management. This research aimed to evaluate the response of glyphosate-resistant Palmer amaranth accessions to glufosinate, and determine the mechanism of tolerance to glufosinate when it occurs. Twelve glyphosate-resistant Palmer amaranth accessions from Arkansas were evaluated in the greenhouse at the University of Arkansas Main Agricultural Research Center, Fayetteville, in July 2011for their tolerance to 183, 365, and 730 g ai ha^{-1} glufosinate. The recommended dose is 730 g ha^{-1}. Two accessions were selected (one susceptible and one tolerant) for tolerance mechanism studies. Seeds from plants that survived 730 g ha^{-1} glufosinate were grown in the greenhouse and assayed for glutamine synthetase (GS) activity and ammonia accumulation. Rates evaluated in the GS enzyme assay ranged between 0 and 1,600 µM. Differential tolerance to glufosinate exists among the Palmer amaranth populations evaluated in this experiment. The preliminary LD_{50} was estimated to be 230 to 568 g ha^{-1}, with an overall average of 340 g ha^{-1} for all populations. Pra-C accession was the least sensitive to glufosinate, with an LD_{50} of 568 g ha^{-1}; Lee-A was the most sensitive, with an LD_{50} of 230 g ha^{-1}. The commercial dose of 730 g ha^{-1} controlled Palmer amaranth 76 to 100%. Results from the enzyme activity assay showed that Pra-C had a higher basal GS activity than Lee-A. However, the GS activity in both accessions was similarly reduced as the herbicide dose increased from 0 to 1600 µM. The I_{50} (glufosinate concentration required to inhibit GS activity by 50%) for Lee-A and Pra-C accessions was 257 and 361 µM/g fresh leaf wt, respectively. The susceptible accession Lee-A showed higher NH_3 production in its leaves prior to glufosinate treatment than the tolerant accession Pra-C. Both accessions accumulated similar NH_3, with Pra-C accumulating 70 µg g^{-1} fresh leaf weight and Lee-A accumulating 67 µg g^{-1} 72 h after treatment (HAT). Fifty percent of the accumulation occurred within 6 HAT for both accessions. This study showed that a small percentage of glyphosate-resistant Palmer amaranth can survive the labeled rate of glufosinate. The differential response between plants could eventually lead to the evolution of resistant populations, if escapes are allowed to produce seed and the management strategy is not diversified. The tolerance mechanism for Pra-C accession is primarily dependent on high basal GS activity. This could be due to increased enzyme production in the tolerant plants or higher specific enzyme activity of the enzyme. Protein quantification and specific activity assays will be initiated to provide further understanding of the tolerance mechanism.

SURFACE VS. INCORPORATED FALL RESIDUAL HERBICIDES FOR GLYPHOSATE-RESISTANT ITALIAN RYEGRASS CONTROL. **R.C. Bond*, J.A. Bond, T.W. Eubank; Mississippi State University, Stoneville, MS (139)**

ABSTRACT

Italian ryegrass resistant to glyphosate was identified in Mississippi in 2005, and it is now present in 13 counties. Glyphosate-resistant (GR) Italian ryegrass has also become problematic in other southern states. Populations of GR Italian ryegrass have been confirmed in at least one county/parish in Arkansas, Louisiana, and North Carolina. Research on control of GR Italian ryegrass has been ongoing at the Mississippi State University Delta Research and Extension Center in Stoneville since 2005. This research has established that residual herbicides applied in the fall offer the best opportunity for controlling GR Italian ryegrass. Forty-six different residual herbicides have been screened in field studies for efficacy against GR Italian ryegrass. This research has identified seven herbicides that provide effective residual control, but only four of these are labeled for application to fallow ground in the fall. Although the probability of rainfall adequate for incorporation of fall residual herbicides in Mississippi is high, grower questions about mechanical incorporation coinciding with traditional land preparation are common. Research was conducted in 2010-11 near Elizabeth, MS, to (1) evaluate the efficacy of fall residual herbicides against GR Italian ryegrass and (2) compare surface applications with mechanically incorporated applications of residual herbicides. The experimental design was a split plot with four replications. Whole plots were application methods (surface or mechanical incorporation). Surface treatments were applied November 1, 2010. Mechanically incorporated treatments were applied at the same time but were incorporated approximately 4 hr after application with two passes in opposite directions with an S-tine harrow equipped with double rolling baskets. Rainfall adequate for incorporation (1 inch) of surface treatments was received at the study site approximately 24 hr after application. Sub-plots were herbicide treatments and included Command (0.75 lb ai/A), Dual Magnum (1.27 lb ai/A), Boundary (1.63 lb ai/A), Zidua (0.147 lb ai/A), Harness (2.19 lb ai/A), Intrro (2.75 lb ai/A), Micro-Tech (2.75 lb ai/A), Outlook (1 lb ai/A), Paarlay (1.27 lb ai/A), Warrant (2.19 lb ai/A), Sencor (0.375 lb ai/A), Axiom (0.51 lb ai/A), Canopy (0.375 lb ai/A), and Prowl H2O (1.5 lb ai/A). Gramoxone Inteon (0.75 lb ai/A) was included with all residual herbicides to control emerged GR Italian ryegrass. Data collected included GR Italian ryegrass density 45 days after treatment (DAT) and visual estimates of GR Italian ryegrass control 30, 80, and 130 DAT. Data were subjected to ANOVA and estimates of the least square means were used for mean separation. Surface applications of all herbicides except Zidua, Warrant, and Prowl H2O reduced GR Italian ryegrass density at least 95% 45 DAT. Glyphosate-resistant Italian ryegrass density was reduced more following mechanically incorporated than surface applications of Zidua, Warrant, and Prowl H2O. In contrast, density was higher in plots treated with Sencor when this herbicide was mechanically incorporated. At 30 DAT, nine of 14 herbicides controlled GR Italian ryegrass better when mechanically incorporated than when applied to the soil surface. This trend was less obvious 80 and 130 DAT. At those evaluations, Zidua, Micro-Tech, Warrant, Axiom, and Prowl H2O controlled more GR Italian ryegrass when mechanically incorporated. Similar to what was observed with GR Italian ryegrass density 45 DAT, control from Sencor was less at 80 and 130 DAT following mechanical incorporation compared with surface application. Application method did not influence control with Command, Boundary, Harness, and Outlook at any evaluation. By 130 DAT, Command, Dual Magnum, Boundary, Harness, and Outlook controlled GR Italian ryegrass at least 90%. Mechanical incorporation can improve efficacy of fall residual herbicide treatments; however, the effect varied with herbicide. Herbicides from this research that are currently labeled for fall application and provide extended residual control of GR Italian ryegrass include Command, Dual Magnum, and Boundary. Among these herbicides, mechanical incorporation influenced efficacy of Dual Magnum, but this was only observed 30 DAT. Unless forecasts call for a prolonged period of dry weather, mechanical incorporation of labeled fall residual herbicides would not be beneficial.

INFLUENCE OF PLANT POPULATION AND HERBICIDE PROGRAM ON PALMER AMARANTH CONTROL, SOYBEAN YIELD, AND ECONOMIC RETURN. **A. Hoffner*, D. Jordan, A.C. York, J. Dunphy, E. Wesley; North Carolina State University, Raleigh, NC (140)**

ABSTRACT

Since the presence of glyphosate resistant Palmer amaranth (*Amaranthus palmeri*) was confirmed in North Carolina and other states, there has been increased emphasis on developing alternative herbicide programs to control this weed. Using residual preemergence herbicides, postemergence herbicides with a mode of action different from glyphosate, establishing high plant populations, and utilizing mechanical removal of weeds through cultivation or hand removal are becoming increasingly important to consider in management systems for Palmer amaranth in soybean [*Glycine max* (L.) Merr.] and other crops. Many of these alternative programs can increase production costs, especially when considering technology fees of genetically modified crops and the herbicides used within these crops. Palmer amaranth control, soybean yield, and economic yield often vary depending upon soybean plant population, herbicide programs, and herbicide resistant traits. Prior to development of glyphosate-resistant weed biotypes, growers often reduced soybean seeding rates to decrease production costs. This approach has been successful when weed control programs are effective and competition of weeds and crops is not an issue. However, there is concern that this approach may be less successful when weed control is more challenging in presence of glyphosate-resistant weed biotypes, in particular Palmer amaranth. Therefore, the objective of this research was to define interactions among herbicide resistant traits (glufosinate-resistant vs. glyphosate-resistant soybean in Roundup Ready® vs. LibertyLink® cultivars, respectively), herbicide programs (combinations of preemergence and postemergence herbicides), and plant population with respect to Palmer amaranth control, soybean yield, and economic return. Eight trials were conducted during 2010 (five trials) and 2011 (three trials) in eastern North Carolina. Most locations had populations of glyphosate-resistant Palmer amaranth. Soybean was planted in mid May to early June in rows spaced 20 or 38 cm apart depending on location. Treatments included two levels of herbicide resistant trait (glufosinate vs. glyphosate), soybean population (approximately 165,000 versus 390,000 plants/ha), preemergence (PRE) herbicide treatment (no herbicide, *S*-metolachlor, and *S*-metolachlor plus fomesafen), and postemergence (POST) herbicide treatment (no herbicide and glufosinate or glyphosate). Visible estimates of percent Palmer amaranth control were determined at four intervals over the growing season using a scale of 0 to 100 where 0 = no control and 100 = complete control. Density of Palmer amaranth and other weeds and soybean were determined prior to postemergence applications. Soybean yield was determined and economic return calculated using North Carolina Cooperative Extension Service enterprise budgets. Variables other than seeding rate, herbicide and application cost, and technology fees were held constant. The experimental design was a split plot with HRT as whole plots and combinations of soybean population and PRE and POST herbicides as sub-plot factors. Data were subjected to ANOVA by location considering the factorial arrangement of treatments with means separated using Fisher's Protected LSD test at $p \leq 0.05$. Considerable variation was noted when comparing Palmer amaranth control, soybean yield, and economic return within and across locations due to the number of experiments and differences in populations and environmental conditions. As expected, a more intensive PRE herbicide program and application of a POST herbicide increased control of Palmer amaranth and protected yield and increased economic return. However, this result was not the case at all locations. Soybean plant population also affected Palmer amaranth control, yield and economic return at some locations but not in all instances, and in some instances glyphosate and glufosinate varied in effectiveness. Consistent control and protection of yield were often observed with intensive herbicide programs (PRE and POST herbicides) and higher plant populations. However, fewer differences in economic return were noted among treatment factors even when Palmer amaranth control and soybean yield varied. One goal of resistance management for Palmer amaranth is minimizing seed production and contribution to the soil seed bank. While yield and economic return were not always affected by interactions of herbicide program (PRE and POST) and soybean plant population, the more expensive management strategy most likely would be beneficial in the long term.

DGT COTTON TECHNOLOGY FOR BROADSPECTRUM WEED CONTROL. **T.J. Cogdill*, J.M. Chandler; Texas A&M University, College Station, TX (141)**

ABSTRACT

A field experiment was conducted in 2011 near College Station, Texas, to evaluate weed control in dicamba/glufosinate tolerant (DGT) cotton (*Gossypium hirsutum*). Plots consisted of four 7.6-m rows arranged in a RCB design with four replications. Treatments were applied in a spray volume of 112 l/ha with a tractor-mounted sprayer equipped with air induction flat spray tips. Treatments consisted of dicamba (Clarity), glufosinate (Ignite), and glyphoste (Roundup PowerMax) alone or in tank-mixes applied preemergence (PRE), early postemergence (EPOST), delayed early postemergence (DLEPOST), or mid-postemergence (MPOST). All treatments received a post-directed application of diuron (Direx) and MSMA at layby. Weed control data was collected on glyphosate susceptible smellmelon (*Cucumis melo*), ivyleaf morningglory (*Ipomoea hederacea*), Palmer amaranth (*Amaranthus palmeri*), and browntop millet (*Urochloa ramosa*). Seed cotton yield (kg/ha) was determined by harvest of the center two rows of each plot. PRE application of Clarity provided 40-50% reduction in broadleaf weed emergence. Clarity tank-mixed with Ignite or Roundup at EPOST improved broadleaf weed control (>90%) when compared to either Ignite or Roundup applied alone(<80%). The treatment Reflex (PPL) fb Cotoran (PRE) fb Roundup + Warrant (EPOST) fb Roundup + Warrant (MPOST) fb Direx + MSMA (LAYBY) provided greater than 95% control of all weed species. This shows the importance of residual preemergence herbicides. Additionally, treatments without an application of Roundup provided unacceptable control of browntop millet. Treatments with less than 75% control of browntop millet at the layby application timing had statistically lower yields (<2,000 kg seed cotton ha^{-1}) than the highest yielding treatments (>2,590 kg seed cotton ha^{-1}). While the addition of Clarity improved broadleaf weed control, inclusion of Roundup was essential to broadspectrum weed control and seed cotton yield.

IS METABOLISM THE MECHANISM OF TOLERANCE TO GLYPHOSATE IN PITTED MORNINGGORY?

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ABSTRACT

Glyphosate is considered by many as the most important herbicide ever developed. Glyphosate deregulates the shikimate pathway, inhibiting the biosynthesis of aromatic amino acids and leading to metabolic disturbances and disruption. The natural tolerance of morningglories to glyphosate has made these plants among the most common and troublesome weeds in the southeastern U.S. since the adoption of glyphosate-resistant (GR) crops. Experiments were conducted to determine (1) levels of glyphosate tolerance (GT) of morningglories accessions, (2) if the variability in GT levels is correlated with time-exposure to GR systems, and (3) if differential metabolism of glyphosate to aminomethyl phosphoric acid (AMPA) is the underlying mechanism for differential tolerance to glyphosate among pitted morningglory (PM) populations. Seed from a total of 72 accessions of ivyleaf morningglory (*Ipomoea hederacea*), palmleaf morningglory (*I. wrightii*), pitted morningglory (*I. lacunosa*), and purple moonflower (*I. turbinata*) were collected in multiple locations across the southern U.S.; two populations of PM were collected in 1990 (before the advent of GR crops) and 1999 (with four years of exposure to GR crop management) and the others collected in 2004-2006. The plants were sprayed with glyphosate (0, 420, and 840 g ae ha^{-1}) at four- to five-leaf stage, and growth reduction was determined three wk after treatment (WAT). Dry weight reduction compared to the untreated check ranged from -120 to 85% at 420 g ae ha^{-1}, and from -25 to 100% at 840 g ae ha^{-1} glyphosate; PM was relatively more tolerant than the other morningglory species. Consequently, fourteen PM populations were selected for dose-response assays. Glyphosate GR_{50} (glyphosate rate that causes 50% plant growth reduction) values were determined by treating plants at four- to five-leaf stage with 0, 105, 210, 420, 840, and 1680 g ae ha^{-1} glyphosate. Growth reduction was measured at two WAT. Glyphosate GR_{50} rates ranged from 59 to 151 g ae ha^{-1} glyphosate, with a 2.6-fold variability in tolerance to glyphosate among the accessions. PM population collected in 1990 was one of the least tolerant to glyphosate. These results indicate that the variable levels of GT may be correlated with selection pressure exerted by GR crop management systems, resulting in evolution of low levels of resistance in some populations. The most tolerant (MT) and the least tolerant (LT) populations where selected for a differential metabolism study. Ten plants were sprayed with glyphosate (420 g ae ha^{-1}) at four- to five-leaf stage. At two WAT, plants were harvested, washed to remove remaining glyphosate on leaf surface, air-dried, and analyzed for glyphosate and AMPA by GC-MS (gas chromatography-mass spectroscopy). Less glyphosate (per unit leaf weight) was recovered in MT population as compared to LT. However, more AMPA (per unit leaf weight) was recovered in MT in comparison to LT. This suggests that higher level of glyphosate metabolism may explain the higher level of tolerance to glyphosate.

CONTROL OF FAILED STANDS OF TRANSGENIC SOYBEAN AND CORN.

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ABSTRACT

Over the past ten years, row crop acreage has shifted toward adoption of transgenic crops. Corn (*Zea mays*) acreage has increased from 26% transgenic to 88% while transgenic soybean (*Glycine max*) acres has increased from 68 to 94%. Early planted corn may often experience weather conditions in which frost may injure the crop to the point that it must be terminated and replanted to the same crop or replaced with an alternate crop. Prior to the adoption of transgenic hybrids, glyphosate could be used to easily and effectively remove the failed stands. Producers need new effective herbicide options to aid in the removal of these failed stands or they will have to rely on less efficient and more costly mechanical means. Experiments were designed to examine herbicide combinations to control both failed corn (*Zea mays*) and failed soybean (*Glycine max*) stands. Experiments were conducted in 2010 and 2011 at the Blackbelt Branch Experiment Station. Plots 3.8 m wide by 12.2 m long were established in both studies. All herbicide applications were made using a hooded boom mounted on a tractor and were applied @ 140 L/ha. In the corn study, Dekalb 67-23 and 67-21 were planted in 2010 and 201, respectively at 67,190 seeds/ha. Treatments were arranged as a three factor factorial in a randomized complete block design with 4 replications. Factor A was a burndown herbicide of either paraquat at 0.701 kg ai/ha or glufosinate at 0.594 kg ai/ha. Factor B was residual tank mix partner which included no residual, atrazine at 0.560 kg ai/ha, diuron at 0.560 kg ai/ha, metribuzin at 0.140 kg ai/ha, linuron at 0.560 kg ai/ha, simizine at 0.560 kg ai/ha, or rimsulfuron at 0.018 kg ai/ha. Factor C was insecticide treatments which include no insecticide or the organophosate insecticide chlorpyrifos at 0.560 kg ai/ha. All treatments contained appropriate adjuvants where needed. In the soybean study, Pioneer 95Y70 and Asgrow soybean (*Glycine max*) varieties were planted in 2010 and 2011 respectively @ 284,171 seeds/ha. Treatments were arranged as a two factor factorial in a randomized complete block design with 4 replications. Factor A was a burndown herbicide of either paraquat at 0.701 kg ai/ha or glufosinate at 0.594 kg ai/ha. Factor B was residual tank mix partners which included no residual, sulfentrazone at 0.126 kg ai/ha + metribuzin at 0.189kg ai/ha, metribuzin at 0.180 kg ai/ha + chlorimuron at 0.029 kg ai/ha, chlorimuron at 0.012 kg ai/ha + flumioxazin at 0.041 kg ai/ha + thifensulfuron at 0.004 kg ai/ha, linuron at 0.560 kg ai/ha, metribuzin at 0.280 kg ai/ha, saflufenacil at 0.025 kg ai/ha, flumioxazin at 0.036 kg ai/ha, or saflufenacil at 0.025 kg ai/ha + demethanamid at 0.218 kg ai/ha. All treatments contained appropriate adjuvents where needed. Both studies were evaluated 7, 14, 21, and 28 days after application (DAA). Data are pooled as appropriate where interactions were not present. In the corn experiment data were pooled over insecticide treatments as no interactions were present and insecticide did not affect the level of efficacy observed. Significant differences were observed between burndown herbicides and among residual herbicides but no interactions were found. Results from the failed corn study indicate paraquat provided greater control at both 7 and 14 DAA compared to glufosinate. When averaged over residual herbicides at 7 DAA, paraquat provided 88% control of failed corn stands compared to glufosinate which only provided 68% and by 14 DAA paraquat provided 97% control as compared to the 85% provided by glufosinate. AT 7 DAA, when averaged over burndown herbicide, diuron, linuron, metribuzin, atrazine, simazine, and rimsulfuron, gave 81, 80, 79, 79, 76 and 75% control, respectively. By 14 DAA, 96, 95, 95, 91, 88 and 86% control was observed with diuron, linuron, metribuzin, atrazine, simazine, and rimsulfuron, respectively. AT 28 DAA, stand count reductions ranged from 90 to 99% with paraquat treatments while the reduction ranged from 81 to 96% with glufosinate treatments. In the failed soybean study, there was no 2-way interactions between Factor A (burndown treatment) and Factor B (residual herbicide). Paraquat provided greater control than glufosinate 7 and 14 DAA. Evaluations taken 7 DAA indicate paraquat provided 78% control and glufosinate provided 66% control. By 14 DAA, control with paraquat increased to 83% and glufosinate increased to 77%. At 28 DAA, stand count reduction ranged from 50-89% with paraquat and 35-81% with glufosinate. These data indicate that several paraquat and glufosinate based systems may be effectively utilized to control failed populations of Roundup Ready corn. The paraquat based systems would be the only option for hybrids that contain the gene imparting resistance to glufosinate.

IDENTIFICATION OF DORMANT WEEDY RED RICE POPULATIONS USING MICROSATELLITE MARKERS.

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ABSTRACT

Weedy red rice is a serious weed in southern US rice production. Competition with cultivated rice results in significant yield losses and reduction of rice grain quality. Seed dormancy contributes to its persistence. Weedy and wild relatives of rice exhibit high levels of dormancy. This high degree of dormancy allows red rice to escape weed management tactics and increases the potential for flowering synchronization, and therefore gene flow, between weedy and cultivated rice. Understanding the genetic controls of dormancy could help find means to circumvent this weedy trait for better red rice management. The use of molecular markers has made it possible to analyze complex traits such as seed dormancy. The objective of this study was to identify microsatellite markers that are highly associated with seed dormancy and, to investigate their association with red rice hull types. Thirteen simple sequence repeat (SSR) markers, distributed across 4 chromosomes were used. Four populations were included: dormant blackhull, dormant strawhull, non-dormant blackhull, and non-dormant strawhull. A total of 90 alleles with a mean value of 6.9 alleles per locus were detected. All 13 markers were polymorphic, but only 5 were able to distinguish between dormant and non-dormant ecotypes. Among the five markers, RM118, located on chromosome 4, distinguished dormant strawhull red rice, while RM180, located on chromosome 7 and, RM28595, RM28603, and RM28621, located on chromosome 12, distinguished dormant blackhull red rice from the other groups. These markers associated with the dormant red rice may be unique, and would be good candidates for the manipulation of dormancy gene expression in red rice. Silencing the dormancy trait can reduce the persistence of red rice. Conversely, the genomic regions linked to the five dormancy markers can be used in breeding programs to introduce pre-harvest sprouting resistance in cereal crops.

FACTORS AFFECTING THERMAL WEED CONTROL. **J.A. Hoyle*, J. McElroy, E.A. Guertal, G.B. Fain, F.J. Arriaga; Auburn University, Auburn, AL (145)**

ABSTRACT

Early thermal weed-control measures were rudimentary and sometimes hazardous. Thermal weed control has progressed in sophistication, application, and efficiency and has resulted in many commercial systems for row-cropping application. However, flame weeding for established turfgrass is not effective because of the inability to treat weeds without injuring the turfgrass system. Aesthetically this type of treatment is unacceptable. Therefore, thermal weed control methods such as emerged-weed flaming, soil flaming, and solarization can be used within a turfgrass system to establish a stale seedbed. Many factors alter the efficacy of thermal treatment methods, including seed heat tolerance, seed depth, soil thermal conductivity, and soil moisture content. The most important factor contributing to acceptable control is adequate soil temperature. Initial soil-sterilization and flame heating studies conducted in 2009 and 2010 demonstrated potential for reducing weed populations before turfgrass establishment. Independent research trials were conducted at Auburn University's greenhouse and turfgrass research facilities to determine efficacy of various thermal weed control methods. Weed seed mortality influenced by thermal heat, soil texture and planting depth effects on weed seed emergence, and thermal conductivity of soil textures at 0.1 and 0.2 volumetric water content (θ) studies were conducted to evaluate efficacy of thermal weed control methods. Planting depths (0, 0.5, 1.0, 2.0, 4.0, 6.0, and 8.0 cm) were evaluated in a Marvyn loamy sand (Fine-loamy, kaolintic, thermic Typic Kanhapudult), Sumter silty clay (Fine-silty, carbonic, thermic Rendollic Eutrudepts), or a sand/peat mix (85:15%, v/v) for influence on weed seed emergence. Seed heat-tolerance studies were conducted to evaluate germination after thermal heat at 60, 80, 100, 120, 160, 200, and 250°C for 5 and 20 seconds. Heat transfer studies utilizing a PL8750 Poultry House Flame Sanitizer (Flame Engineering, Inc; LaCrosse, KS) in Marvyn loamy sand at 0.1 θ were conducted to determine soil energy transfer rates of thermal treatment apparatus. Laboratory studies adapted from previous experimentation determined soil thermal conductivity of Marvyn loamy sand, Sumter silty clay, and sand/peat mix at 0.1 and 0.2 θ. Large crabgrass (*Digitaria sanguinalis*), Virginia buttonweed (*Diodia virginiana*), and cocks-comb kyllinga (*Kyllinga squamulata*) emerged from 8, 6, and 2 cm maximum planting depths, respectively. Temperature and duration effects on weed germination experiments resulted in 0% germination of large crabgrass, Virginia buttonweed, and cocks-comb kyllinga at 120, 250, and 120°C, respectively, for 5 second heat exposure. Heat transfer studies utilizing field thermal treatment unit resulted in only surface temperatures adequate to prevent weed germination. Further experimentation resulted in a thermal conductivity of 0.96 W m^{-1} K^{-1} at 0.1 θ. Compilation of results provides information for effective application of thermal weed control in turfgrass management. Information reported from individual experiments can be applied to Fourier's Law ultimately determining the energy tranfer rate in the soil profile by the evaluated thermal weed control methods. Further calculations with Fourier's law can determine surface temperature needed for effective weed seed mortality of evaluated species at various environmental conditions. Thermal weed control prior to turfgrass establishment shows potential for production of stale seedbed. Further experimentation at increased thermal heat intensities can improve efficacy for future thermal weed control methods prior to turfgrass establishment.

COTTON AND PEANUT RESPONSE TO PYROXASULFONE. **P.M. Eure*[1], E.P. Prostko[2], S. Culpepper[2], W. Vencill[1], R.M. Merchant[2]; [1]University of Georgia, Athens, GA, [2]University of Georgia, Tifton, GA (147)**

ABSTRACT

Since the evolution of glyphosate-resistant weeds, there has been a shift from POST only herbicide programs of glyphosate in many crops to the inclusion of soil residual herbicides in weed management systems. Pyroxasulfone, previously known as KIH-485, is a proposed residual herbicide for the control of annual grasses and broadleaf weeds in corn, soybean, wheat, and sunflower. While highly effective for the control of troublesome weeds such as *Amaranthus* spp., large crabgrass, and Texas panicum, little is known about cotton and peanut tolerance to pyroxasulfone. Therefore, experiments were conducted in Georgia to evaluate cotton (PRE and POST) and peanut (POST) tolerance to pyroxasulfone. *Cotton Tolerance:* Field studies were conducted at the UGA Ponder Research Farm and an on-farm site (LT Farms) near Ty Ty, Georgia on a sandy loam soil. 'PHY 375 WRF' cotton was planted on May 18, 2011 at the on-farm site and 'PHY 499 WRF' was planted on June 1, 2011 at the UGA Ponder Research Farm. Both studies included, pyroxasulfone 85WG applied PRE (immediately following planting) or POST (2-3 leaf) in cotton at 1.0, 1.5, 2.0 and 3.0 oz/A. A system with pyroxasulfone PRE (1 oz/A) followed by pyroxasulfone POST (1 oz/A) was also included. Acetochlor 3ME (Warrant) at 3 pt/A and *S*-metolachlor 7.62EC (Dual Magnum) at 1 pt/A were applied PRE or POST for comparison. All POST applications of residuals included glyphosate 4.5L (Roundup WeatherMax) at 23 oz/A. Irrigation was applied immediately following PRE herbicide applications and again prior to emergence to enhance the potential for crop injury. Plots were maintained weed-free using glyphosate. Cotton injury was recorded weekly through boll set and plant densities were recorded after cotton emergence. At harvest, seed cotton yield data was collected. At both locations, PRE applications of pyroxasulfone caused unacceptable cotton injury (54-79%) 9-12 days after treatment (DAT). Cotton injury by PRE applied acetochlor (9-12%) and *S*-metolachlor (18-24%) was lower. PRE applied pyroxasulfone and *S*-metolachlor reduced cotton density by 26-76 % and 12-17 %, respectively, compared to no PRE herbicide. Acetochlor PRE did not influence plant density. Topical applications of pyroxasulfone injured cotton 33-50% at 2-4 DAT with sequential applications of pyroxasulfone causing the greatest injury (66-69%). Injury from POST applied acetochlor ranged from 6-29% and *S*-metolachlor from 20-21%. At boll set, cotton injury from PRE and POST applications of pyroxasulfone ranged from 6-34%, *S*-metolachlor 8-10%, and acetochlor 4-5%. The sequential pyroxasulfone system continued to have severe injury (33-39%). Seed cotton yields were reduced 18-83% when pyroxasulfone was applied PRE. Pyroxasulfone at 1 oz/A POST did not impact cotton yield. However, POST applications of pyroxasulfone at 1.5, 2.0, and 3.0 oz/A resulted in a 13-32% reduction in cotton yields when compared to systems that included POST applications of acetochlor and *S*-metolachlor; the sequential pyroxasulfone system reduced yields 26-51%. *S*-metolachlor applied PRE reduced cotton yields 7-14% when compared to PRE applications of acetochlor. Cotton yields were similar when *S*-metolachlor and acetochlor were applied POST. While POST applications of pyroxasulfone had less impact on cotton injury and yield than PRE applications, further research will be conducted to determine the influence of environmental conditions on injury during POST applications. Additionally, directed applications of pyroxasulfone will be evaluated. *Peanut Tolerance*: The peanut cultivar 'GA-06G' was planted on May 9, 2011 at the UGA Ponder Research Farm near Ty Ty, Georgia on a loamy sand. Pyroxasulfone treatments were arranged in a factorial design that included four application timings [11, 30, 60, and 90 days after planting (DAP)] and three pyroxasulfone 85WG rates (0, 4, and 8 oz/A). The plot area was maintained weed-free using pendimethalin + flumioxazin + diclosulam applied PRE and sethoxydim and imazapic applied POST. Peanut stunting was recorded biweekly, beginning 24 DAP until digging. Since certain peanut herbicides have been associated with an increase in tomato spotted wilt virus (TSWV), TSWV incidence was recorded prior to digging by counting the number of disease loci per linear row in 1 ft sections. Peanut yield was recorded and adjusted to 10% moisture. Pyroxasulfone applied 11 DAP at 4 and 8 oz/A resulted in 10 and 27% stunting 24 DAP, respectively. However, peanut recovered by 99 DAP. Applications of pyroxasulfone at 30, 60, and 90 DAP at both rates did not result impact peanut growth (0-2%). TSWV was not influenced by any rate or timing of pyroxasulfone. Peanut yields were not influenced by pyroxasulfone timing or rate. Future research in peanut will focus on weed management systems, tank-mixtures with other herbicides, and peanut cultivar tolerance.

THE EFFECTS OF KIH-485 APPLIED PRE AND POST TRANSPLANT ON SWEETPOTATO YIELD.

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ABSTRACT

Weed control in sweetpotato (*Ipomoea batatas*) production systems is essential in order to maximize yield potential, but there are limited herbicides labeled for use in this crop. KIH-485 (pyroxasulfone) is a new herbicide developed by Kumiai Chemical Company and marketed by several companies in the United States as a stand-alone product and as a package mix. KIH-485's mode of action is like that of a seedling growth inhibitor similar to metolachlor. The objectives of this study were to determine if KIH-485 has acceptable crop tolerance, grass control, and broadleaf weed control for use in sweetpotato. The study was conducted on a Falkner silt loam (Fine-silty, siliceous, thermic Aquic Paleudalfs) in 2008, 2009, 2010 and 2011. Treatments include KIH-485 at 1.5, 2.0, 2.5, and 3.0 oz/A applied PRE and POST transplant and standard treatment of Valor (flumioxazin) at 2.5 oz/A applied PRE transplant followed by (fb) Command (clomazone) at 2.66 pt/A applied POST transplant. Foliage injury was less than 5% for all treatments at 14 days after transplant (DAT). All KIH-485 POST treatments controlled redroot pigweed (*Amaranthus retroflexus* L.) at least 97%, which was higher than the treatment of Valor fb Command at 35 DAT. Pigweed control was at least 94% and 75% for all PRE treatments of KIH-485 at 14 and 35 DAT, respectively. Postemergence treatments resulted in pigweed control of at least 97 % with 1.5 oz/A KIH-485 at 35 DAT. Broadleaf signalgrass (*Brachiaria platyphylla*) control was at least 93% at 35 DAT for all POST treatments. At 35 DAT, broadleaf signalgrass control ranged from 67 to 100% for PRE KIH-485 at 1.5 oz/A and Valor fb Command, respectively. Broadleaf signalgrass control in 2009 was at least 96 and 91% for all KIH-485 treatments applied POST at 21 and 28 DAT, respectively. Across the four years, US No. 1 grade yield was highest with KIH-485 at 3 oz/A applied POST, which was greater than the standard treatment of Valor fb Command. US No. 1 and Total Marketable grade yields with KIH-485 at 2.5 and 3.0 oz/A applied POST were greater than Valor fb Command. Yield for all PRE treatments of KIH-485 were less than Valor fb Command for US No. 1 and Total marketable grades. This research indicates that KIH-485 is an effective herbicide that could be applied over-the-top of sweetpotato slips after transplanting.

PALMER AMARANTH AND MORNINGGLORY MANAGEMENT IN GLYPHOSATE/GLUFOSINATE-TOLERANT COTTON. **J.D. Reed*[1], W. Keeling[1], P.A. Dotray[2]; [1]Texas AgriLife Research, Lubbock, TX, [2]Texas Tech University, Lubbock, TX (149)**

ABSTRACT

Palmer amaranth (*Amaranthus palmeri*) is the most common and troublesome weed on the Texas High Plains. Residual herbicides are typically used in conjunction with glyphosate to control this weed, but weed shifts have been observed following continued use of glyphosate. Ivyleaf morningglory (*Ipomoea hederacea*) is not controlled well with glyphosate and is becoming problematic this region. GlyTol® + LibertyLink® (GL) cotton may offer improved opportunities to manage ivyleaf morningglory while maintaining effective control of Palmer amaranth. However, there are concerns about antagonism between glyphosate and glufosinate-ammonium when tank-mixed. Field trials were conducted in Lubbock, TX in 2010 and 2011 to evaluate tank-mix combinations of glyphosate and glufosinate-ammonium in GL cotton for control of Palmer amaranth and ivyleaf morningglory. Field trials included glyphosate and glufosinate-ammonium applied at varying tank-mix rates (1X:1X, 1X:0.75X, 1X:0.5X, 1X:0.25X and 1X:0X for each herbicide). The 1X rate of glyphosate was 0.84 kg ae/ha while the 1X rate of glufosinate-ammonium was 0.58 kg ai/ha. All treatments were applied postemergence (POST) to 5 to 10 cm weeds. Treatments were made using a CO_2-presurized backpack sprayer calibrated to deliver 94 l/ha. FM 9250GL was planted on May 20, 2010 and May 23, 2011 on 102 cm rows. Plots, 4 rows by 9.14 m in length, were replicated three 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 with weed density counts. Greenhouse studies were conducted in 2011 to quantify antagonistic or synergistic effects. Locally harvested glyphosate-susceptible Palmer amaranth and ivyleaf morningglory were planted in 8 by 8 cm pots and thinned to two plants per pot after emergence. Pots were arranged in a randomized complete block design with four replications. Treatments included an untreated control; glyphosate at 0.84, 0.63, 0.42, and 0.21 kg ae/ha; glufosinate-ammonium at 0.58, 0.44, 0.29, and 0.15 kg ai/ha; and all tank-mix combinations of each herbicide rate. Treatments were applied when plants reached 5 to 10 cm in height using a CO_2-pressurized spray chamber calibrated to deliver 94 l/ha. Fourteen days after treatment, above-ground plant biomass was harvested and dried. Dry weights were recorded and converted to percent growth (calculated as a percent of the untreated control mean). Percent growth values for each rate of the two herbicides alone were used to calculate expected responses of tank-mix combinations using Colby's Method. Expected values were compared to observed percent growth values using an augmented mixed-model methodology. Results of field studies indicated that tank-mixes of glyphosate and glufosinate-ammonium were less effective at controlling Palmer amaranth (50-93%) than glyphosate applied alone (98-99%). The addition of any rate of glufosinate-ammonium to a 1X rate of glyphosate reduced Palmer amaranth control (70-93%) compared to glyphosate alone (98-99%). Tank mixes of glyphosate and glufosinate-ammonium were as effective at controlling ivyleaf morningglory (82-95%) as glufosinate applied alone (85-88%). The addition of any rate of glyphosate to a 1X rate of glufosinate-ammonium did not affect control of ivyleaf morningglory. Greenhouse studies confirmed Palmer amaranth antagonism seen in the field. All tank-mix treatments except one (glyphosate at 0.42 kg ae/ha + glufosinate-ammonium 0.44 kg ai/ha) provided less control than calculated expected response values. Greenhouse studies of ivyleaf morningglory showed low levels of antagonism with some tank-mix treatments and no antagonism in other treatment combinations. The data from field and greenhouse studies on ivyleaf morningglory suggest some antagonism with glyphosate/glufosinate tank-mixes, but not to the degree seen in Palmer amaranth. These results indicate that sequential applications of these two herbicides are a better option for Palmer amaranth and ivyleaf morningglory weed management.

UPTAKE AND TRANSLOCATION OF AMINOCYCLOPYRACHLOR IN TALL FESCUE.

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ABSTRACT

Aminocyclopyrachlor (AMCP) is a newly registered synthetic auxin herbicide utilized for broadleaf weed control in turfgrass systems. Classified as a pyrimidine carboxylic acid, AMCP has similar chemical structure and mode-of-action to the pyridine compounds aminopyralid and clopyralid. The absorption, translocation, and metabolism of radiolabeled AMCP has been documented in susceptible broadleaf weed species but no research has characterized AMCP in tolerant turfgrass. Due to off-target plant injury from synthetic auxin residues in turfgrass clippings, information regarding AMCP absorption, translocation, and metabolism in turfgrass could provide useful environmental fate insight. Research was conducted in 2011 at North Carolina State University, Raleigh, NC, to characterize the absorption, translocation, and metabolism of radiolabeled ^{14}C-AMCP in tall fescue [*Lolium arundinaceum* (Schreb.) S.J. Darbyshire]. Experiments were arranged in a randomized complete block design with three replications and two experimental runs. Following a foliar AMCP application (79 g ae ha^{-1} plus 0.25% v/v NIS), five 1 µL droplets of ^{14}C-AMCP plus 0.25% v/v NIS were applied on the adaxial surface of a protected tall fescue leaf for a total of 4.2 kBq per plant. Plants were harvested 0-192 hours after treatment (HAT) and separated into treated leaf, treated leaf wash, remaining foliage, crown, roots, and root exudates. Radioactivity in each respective plant part was quantified through liquid scintillation spectroscopy and metabolism was determined through high performance liquid chromatography. At all harvest intervals, recovery was ≥80% of total applied radioactivity. In general, the majority of ^{14}C-AMCP was recovered in the treated leaf wash at all harvest intervals. Absorption into the treated leaf increased as harvest intervals increased, ranging from 15% 12 HAT to a maximum of 39% 96 HAT. Translocation of absorbed ^{14}C-AMCP from the treated leaf to other foliage was 44% 192 HAT. Minimal translocation was found in the roots or root exudates, indicating ^{14}C-AMCP either remained unabsorbed or in the aboveground tissue of tall fescue. No AMCP metabolism was detected in any tall fescue plant part at 192 HAT.

FLEX COTTON YIELD AND WEED COMPOSITION AFTER SIX CONTINUOUS YEARS OF THE SAME 16 HERBICIDE TREATMENTS.

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ABSTRACT

An experiment with Flex cotton was started in 2005 at the South Central Research Station near Chickasha, OK. The purpose of this research was to measure weed species composition and cotton yield in a continuous long-term experiment comparing glyphosate and conventional herbicide treatments. The experimental design was a randomized complete block design with sixteen herbicide treatments replicated four times. Plot size was 12 rows (1.0 m per row) X 30.5 m long. All weed counts and harvest data were collected from the four center rows of each plot. All herbicides used were applied at the labeled rates. The weeds that were most common in the experiment were johnsongrass, Palmer amaranth, and common cocklebur, and on drier years, silverleaf nightshade. Weed counts were taken after all treatments were applied. Cotton yield data was collected on all plots that were harvestable, except in 2011, no plots were harvested due to severe drought. Herbicides which were used in various combinations from 2005 through 2009 included Treflan (PPI), Caparol (PRE), Staple (PRE and POST), Roundup (POST), Dual Magnum (POST), and an untreated check. In 2010, the entire experimental area was treated with an application of Treflan, and then a Post 1 application of Roundup® Weathermax on an as needed basis followed by a POST 2 and 3 application of Roundup® Weathermax. Conventional herbicides applications from 2005 through 2009 did not control common cocklebur nor Palmer amaranth, therefore; those plots were not harvested. Data collected from 2005 through 2009 indicated that eight of the sixteen treatments were not harvested due to high populations of common cocklebur and Palmer amaranth. In 2010 the best management practices were Treflan (PPI) followed by Roundup (POST 2 and 3) and Treflan (PPI) followed by Roundup (POST 1,2, and 3) provided effective weed control and all plots were harvested. The best management practices selected in 2010 successfully controlled the targeted weeds and allowed for a uniform cotton lint yield over the entire experiment area. Data from 2011 shows that *Gossypium hirsutum* L. did not canopy over exposed soil in row due to lack of water and abnormally hot and dry conditions; therefore there was noticeable increase in silverleaf nightshade in two of the treatments.

SELECTIVE HERBICIDE OPTIONS FOR CLOVER INCLUSION WITHIN WARM-SEASON TURF.

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ABSTRACT

Inclusion of nitrogen-fixing legumes is a proposed means of increasing the sustainability of certain turf scenarios. However, little is known about managing for legumes within maintained turf. Noxious weed succession is problematic during the establishment of mixed turf-legume swards. Selective weed control within mixed swards proves challenging, often because of legume susceptibility to herbicide injury. Clovers (*Trifolium* spp.) are common turf "weeds" throughout the United States and are likely large net contributors to nitrogen fertilization within poor soils. For these reasons, our objectives were to identify herbicides that are safe on clovers and turf as well as describe their effects upon important phenological characteristics of clover stands. Research was conducted in Auburn, AL on naturalized stands of three clover species, including: white clover (*T. repens*), ball clover (*T. nigrescens*), and small hop clover (*T. dubium*). Herbicide treatments were applied March 1, 2011 via a CO_2 pressurized back-pack sprayer at 280 L Ha^{-1} utilizing Tee-Jet 8002 nozzles. Studies were randomized complete blocks by design (4 blocks) and were repeated at two locations per species. Treatments included a non-treated control and fourteen herbicides: 2,4-D amine (15.8 g ae 100 m^{-2}), 2,4-DB amine (15.8 g ae 100 m^{-2}), clopyralid (4.2 g ae 100 m^{-2}), imazaquin (5.6 g ai 100 m^{-2}), imazethapyr (0.7 g ai 100 m^{-2}), imazamox (0.5 g ai 100 m^{-2}), glyphosate (11.2 g ai 100 m^{-2}), halosulfuron-methyl (0.5 g ai 100 m^{-2}), metsulfuron-methyl (8.4 g ai 100 m^{-2}), nicosulfuron (0.3 g ai 100 m^{-2}), pronamide (2.8 g ai 100 m^{-2}), simazine (11.2 g ai 100 m^{-2}), bentazon (8.4 g ai 100 m^{-2}), and metribuzin (4.2 g ai 100 m^{-2}). Flower- and trifoliate leaf- density, as well as clover stand height, were measured 4 WAT, during flower senescence, and are presented as reduction relative to the non-treated. Clover injury was visually assessed relative to a non-treated check 1, 2, 4, and 6 weeks after treatment (WAT). We discuss 6 WAT assessments, as they are indicative of the long-term control expected from these herbicides. Basic normality assumptions were confirmed within SAS procedure MIXED. Species response did not differ due to location; therefore, herbicide main-effects were separated by LSD ($\alpha = 0.05$), and results are presented for each species. White clover was uninjured by bentazon, simazine, imazamox, imazethapyr, halosulfuron, pronamide, and 2,4-DB when assessed 6 WAT. Like that of previous research, 2,4-D and metribuzin injury to white clover was acceptably low (< 35%). However, nicosulfuron, imazaquin, glyphosate, clopyralid, and metsulfuron injured white clover greater than 65%. When assessed 4 WAT, trifoliate leaf-densities and stand-heights were similarly affected by herbicides. An interesting observation was that 2,4-D and 2,4-DB equally reduced leaf-density (18%), but of the two, only 2,4-D reduced clover height. White clover flower-density was highly variable, though 2,4-D, glyphosate, clopyralid, and metsulfuron clearly reduced flower-density to zero. Ball clover was uninjured by bentazon, pronamide, and 2,4-DB when assessed 6 WAT. Imazamox and simazine injury was less than 25%, while 2,4-D and imazethapyr injury was less than 45%. All other treatments injured ball clover greater than 77%. Trifoliate leaf-densities and clover heights generally confirm visual assessments. Only pronamide and imazamox did not affect leaf-density, while 2,4-DB, bentazon, simazine, 2,4-D, and imazethapyr reduced leaf-density less than 41%. Unlike previous greenhouse experiments, metribuzin was highly injurious to ball clover, with nearly 90% reduction in trifoliate leaf-density and greater than 75% reduction in clover height. Ball clover height was unaffected by pronamide and 2,4-DB but actually increased due to treatment with bentazon and simazine. Similar increases in plant vigor have been reported due to other photosystem-II inhibiting herbicides. Flower-densities were not affected by 2,4-DB or bentazon but were slightly reduced (< 50%) by pronamide and simazine. All other treatments reduced flower-density by greater than 79%. Hop clover was uninjured by bentazon, pronamide, imazethapyr, and 2,4-DB when assessed 6 WAT. Imazamox injury was less than 30%, while nicosulfuron injury was 50%. All other treatments injured hop clover greater than 80%. Pronamide, simazine, bentazon, and imazethapyr did not reduce clover height. Pronamide, simazine, imazamox, and imazethapyr did not reduce hop clover leaf-density, while other herbicides reduced leaf-density greater than 40%. These results demonstrate a range of herbicides tolerated by *Trifolium* species. They include pronamide, 2,4-DB, bentazon, simazine, imazamox and imazethapyr. They also demonstrate a range of effects upon phenological responses, such as height, flowering, and leaf characteristics. Future research must determine the effects of application timing as well as define injury to other important amenity turf-legumes.

LAYBY TIMING FOR IDEAL LATE-SEASON WEED CONTROL IN COTTON. **R.C. Doherty*, K.L. Smith, J.A. Bullington, J.R. Meier; University of Arkansas, Monticello, AR (154)**

ABSTRACT

One trial was established in Rohwer, AR, on the Southeast Research and Extension Center in a Hebert silt loam soil in 2010 and 2011to 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 the layby application timing and herbicide system that provides optimum late-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 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, 96-100% 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.

SOIL PH IMPACTS BAHIAGRASS:SMUTGRASS COMPETITION. **N. Rana*[1], B.A. Sellers[1], J. Ferrell[2], G. MacDonald[2]; [1]University of Florida, Ona, FL, [2]University of Florida, Gainesville, FL (155)**

ABSTRACT

Smutgrass (*Sporobolus sp.*), a native of tropical Asia, is a serious perennial weed that affects many improved perennial grass pastures in Florida and throughout the southeastern United States. The two varieties of smutgrass prevalent in Florida are small smutgrass (*Sporobolus indicus* var. *indicus*) and giant smutgrass (*Sporobolus indicus* var. *pyramidalis*). Forage losses due to lack of smutgrass control is a major problem in bahiagrass (*Paspalum notatum*) pastures. Studying the impact of bahiagrass-smutgrass interactions at different levels of pH might aid in developing improved weed management programs for smutgrass control in bahiagrass pastures to control this troublesome pasture weed. Replacement series experiments were conducted in a controlled environment in 2010 and 2011 to compare the competitive ability of bahiagrass with each of the two varieties of smutgrass at three levels of soil pH (4.5, 5.5 and 6.5), two densities; 4 (low) and 8 (high) plants pot^{-1}, and at five planting ratios of 100:0, 75:25, 50:50, 25:75, and 0:100. Bahiagrass and each smutgrass variety was planted at ratios of 4:0, 3:1, 2:2, 1:3 and 4:0 for 4 plants pot^{-1}, and planting ratios of 8:0, 6:2, 4:4, 2:6 and 0:8 for 8 plants pot^{-1} at the three levels of soil pH. The experiment was a completely randomized design with three replications. Relative competitive ability and aggressivity of giant smutgrass were higher than bahiagrass across all pH levels and densities, whereas relative competitive ability and aggressivity of bahiagrass was greater than small smutgrass in all pH levels and densities, except at pH 6.5. At pH 5.5 and pH 6.5, biomass accumulation of giant smutgrass was at least 73 and 67%, respectively, higher than bahiagrass at both density levels, at the 50:50 planting ratio. Giant smutgrass biomass was not different from bahiagrass at pH 4.5. In general, small smutgrass responded differently than giant smutgrass. At pH 4.5, small smutgrass biomass was 80% lower than bahiagrass at the low density level and 50:50 planting ratio. At pH 5.5, small smutgrass biomass was at least 46% lower than bahiagrass at both density levels at the 50:50 planting ratio. At pH 6.5, small smutgrass was 42% higher than bahiagrass at low density level at the 50:50 planting ratio. Small smutgrass biomass was not different than bahiagrass at the high density levels of pH 4.5 and 6.5. The results obtained from this study indicate the differential response of soil pH on bahiagrass competitive ability with small and giant smutgrass. Amending soil pH is not a likely option to increase the growth and competitive ability of bahiagrass over giant smutgrass. However, for small smutgrass, it is likely to increase the aggressivity of bahiagrass in bahiagrass vs. small smutgrass mixture, unless the soil pH is raised above 5.5.

HERBICIDE STEWARDSHIP: PROTECTING THE TECHNOLOGY. **N. Rhodes*; University of Tennessee, Knoxville, TN (85)**

ABSTRACT

An emphasis on herbicide stewardship is essential if we are to protect crops from off-target herbicide injury, prevent potential environmental pollution, and slow/reduce the development of weeds resistant to herbicides. Herbicide stewardship could be defined as the responsible management of herbicides so as to optimize efficacy, minimize potential for non-target impacts, and prolong useable lifespan. Agronomists, horticulturists and weed scientists who have worked with high value broadleaf crops such as cotton, tobacco, or tomato are all too familiar with the impacts of minute amounts of pasture and right-of-way herbicides such as 2,4-D, dicamba, picloram and aminopyralid on these crops as a result of drift or sprayer contamination. Unlike 2,4-D and dicamba, picloram, aminopyralid and the new active ingredient aminocyclopyrachlor are very persistent in plants and soil. This increases the importance of proper residue management and correct crop rotation decisions in situations where these herbicides are applied. Off-target crop damage from herbicides can result in reduced quality and yield, lost revenue, illegal residues, costly litigation, additional restrictions, and bad publicity for our industry. Additionally, the continued development and spread of additional weed species resistant to glyphosate are steadily increasing difficulty and costs of weed management programs in corn, cotton and soybean. As a result, growers are relying heavily on glufosinate tolerant crops and PPO inhibitors to manage weeds resistant to glyphosate. This has led to concerns regarding the possible development of weeds resistant to glufosinate and/or PPO inhibitors. Clearly, good herbicide stewardship is needed now more than ever to protect vital weed management technology and, in turn, the future of sustainable crop production in the United States. To be successful, industry and the academic community must work together closely.

IGNITE STEWARDSHIP: KEEPING THE HEAT ON PIGWEED. **G. Light*[1], W. Mullins[1], T. Kleven[2], G. Henniger[1], K. Rucker[2], J.F. Smith[3], J. Allen[3], R. Bagwell[3]; [1]Bayer Crop Science, Lubbock, TX, [2]Bayer Crop Science, Research Triangle Park, NC, [3]Bayer CropScience, Cabot, AR (86)**

ABSTRACT

Currently, there are more than 5 million acres of glyphosate-resistant Palmer amaranth (*Amaranthus palmeri* S. Wats) in the cropping region covered by the Southern Weed Science Society. Some of these populations are resistant to other modes of action including the dinitroanilines, ALS inhibitors, and photosystem II inhibitors. At the present time, LibertyLink® cotton, soybeans, and corn are the only alternative herbicide-resistant crops providing a means of control. Bayer CropScience is making a concerted effort to steward the use of Liberty® herbicide to maintain the sustainability of Liberty® and LibertyLink® crops. It is acknowledged that the potential exists for glufosinate resistance to develop in cropping situations. Glufosinate-resistant goosegrass (*Eleusine indica)* has been confirmed in Malaysia with a 3.4 to 3.6 fold resistance (Seng et al., 2010). This occurred in a system where glufosinate was applied 6 times per year for 4 years. However, Norsworthy et al. (2008) has shown that the risk of developing resistance can be reduced 7-fold by reducing the number of in-season and between season applications of topical, non-selective herbicides and by applying residual herbicides at preplant, burndown, and at layby

.Bayer CropScience recommends the following programs for LibertyLink® soybeans:

- **Burndown**: Include a residual herbicide effective against Palmer amaranth.
- **Preplant/Preemergence:** Apply recommended rates of herbicides such as Prefix®, Authority MTZ®, Valor®, Boundary®, etc.
- **First Liberty® Application:** Within14 days after crop emergence or if weeds are less than 3-4" tall, apply Liberty® at 29 oz/A + Dual®. If the weeds are 4-12" tall, apply Liberty® at 36 oz/A + Dual®.
- **Second Liberty® Application:** Apply 29 oz/A to address new emergence or within 10 days if preemergence herbicide was not activated or if weeds > 3-4" tall.

In this program, a maximum amount of 65 oz/A of Liberty® should be applied in one season. Additionally, Liberty® should not be applied after soybeans begin blooming.

Bayer CropScience recommends the following programs for LibertyLink® cotton:

- **Burndown**: Include a residual herbicide effective against Palmer amaranth.
- **Preplant/Preemergence:** Apply recommended rates of herbicides such as Reflex® (pre-plant)
- or Cotoran®, Caporal®, or Direx® (pre-emergence).
- **First Liberty® Application:** Within 10-14 days after emergence or if weeds are less than the labeled height, apply Liberty® at 29 oz/A + Dual®. If the weeds are 4-12" tall, apply Liberty® at 43 oz/A + Dual®.
- **Second Liberty® Application:** Apply 29 oz/A to address new emergence or within 10 days if preemergence herbicide was not activated or if weeds > 3-4" tall.
- **Layby:** Apply labeled rates of Valor® + MSMA.

In this program, a maximum amount of 72 oz/A of Liberty® should be applied in one season. The Liberty® label should be followed for additional restrictions. In addition to these specific recommendations, Bayer CropScience has initiated Respect the Rotation tours. This is a comprehensive initiative to drive industry-wide support for weed management stewardship to preserve trait and herbicide technolog which focuses on the rotation of crops, herbicide-tolerant traits, and herbicide mode of action. From an integrated weed management perspective, producers should know the weeds and herbicide history of their fields, begin the season with a clean field and maintain low weed pressure through the application of residual herbicides, ensure that herbicide applications are made appropriately, maintain a zero tolerance for weed escapes and seed set, clean equipment prior to leaving fields, and monitor areas outside cultivated fields for weed movement.

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Seng, C.T., Lun, L.V., San, C.T., and I.B. Sahid. 2010. Initial report of glufosinate and paraquat multiple resistance that evolved in a biotype of goosegrass (*Eleusine indica*) in Malaysia. Weed Biol. and Manag. 10: 229-233.

PICLORAM STEWARDSHIP - COMMITMENT TO AN IMPORTANT TOOL FOR VEGETATION MANAGEMENT.

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ABSTRACT

Picloram (4-amino-3,5,6-trichloropicolinic acid) is a selective herbicide with auxinic mode of action. It is used on a wide range of sites but is a critical tool for noxious and invasive weed management. Most grasses are tolerant to picloram making it a very useful herbicide for controlling problem broadleaf weeds in pasture management. The soil residual activity makes this herbicide particularly useful by controlling a wide range of later emerging weeds allowing desirable pasture grasses to re-establish dominance and provide a weed resistant cover in the pasture. Given that a significant portion of agricultural income comes from livestock, picloram has proven to be a valuable tool to help producers remain economically competitive. While picloram has long been used in rights-of-way vegetation management throughout the United States, weed management in pastures originally was more focused in the southwest and noxious/invasive weed management in the Midwest and western US. As management expertise evolved, there was a greater interest from producers to gain access to picloram herbicides for pasture management in the eastern US. Before the product, Grazon® P+D herbicide was expanded eastward, a plan to minimize damage to non-target plants and crops, protect groundwater and surface water, and promote a culture of stewardship around this product was implemented. Tennessee was the first state to adopt a unique stewardship plan. Dow AgroSciences launched a programmed approach with TN in 1999/2000. The first steps were meetings with Dow AgroSciences, TN Extension, and the distribution channel. The parties involved discussed feasibility of allowing sales of Grazon P+D into certain counties and restricting use in other counties where there was a large acreage of sensitive crops. The process continues to be reevaluated with frequent meetings with extension, distribution and end users. The cooperative approach used in TN has become a model that has been used to launch Grazon P+D in the states of SC, NC, VA, and WV. In all, the cornerstones of stewardship training focuses on proper use site selection, equipment, residue management, and application.

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Grazon P+D is a federally Restricted Use Pesticide. Always read and follow label directions.

UNIVERSITY EXTENSION'S ROLE AND RESPONSIBILITIES IN PROTECTING THE TECHNOLOGY.

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ABSTRACT

With the continued development of new glyphosate-resistant (GR) weed species and spread of current GR weed species, stewardship of technology will be even more critical for sustainable weed management. University Extension has played a key role in stewardship of technology. This role has been in partnership often times with industry. One example of this was the University Tennessee Extension/Industry partnership to steward picloram based products use in Tennessee. This stewardship was directed by UT Extension and Dow to designate Tennessee counties where picloram based products would not be sold. The counties were determined by the presence of species sensitive to picloram. Another example is the Roundup Rewards program developed by Monsanto to promote the use of more herbicide modes of action than just glyphosate in Roundup Ready cotton. This program had quite a bit of input from University Extension and has increased the use of multiple herbicide modes of action in Roundup Ready soybean. A third example of Extension led stewardship is the “flag the technology” (FTT) concept that was constructed by the University of Arkansas Extension weed scientists. The FTT concept consisted of using different colored bicycle flags to designate the herbicide resistant trait in cotton or soybean fields. If the flag is green the crop is tolerant to Liberty, if it is white the crop is tolerant to glyphosate and if it is red it denotes conventional technology where neither glyphosate nor Liberty may be sprayed. The use of FTT was first used in 2011 and likely saved some cotton and soybean fields from being sprayed with the wrong herbicide in Arkansas and Tennessee. Extension stewardship impact is difficult to document as in two of the examples used above it is very hard to prove something that did not happen. We cannot know how many acres of picloram carryover to tobacco was averted or how many acres were saved from Liberty being sprayed on Roundup Ready soybeans. Never the less, supporting or directing technology stewardship is a critical role for University Extension. This is particularly true with the impending problem of GR weeds developing resistance to other herbicides. The role of Extension in stewarding the use of Liberty in glufosinate tolerant crops and PPO inhibiting herbicides is crucial for long-term sustainable weed control. GR Palmer amaranth developing resistance to these herbicides as well would make future weed control very problematic. A recent survey of Mid-South consultants showed that 62% of the soybean acres planted to Liberty Link soybeans in 2011 only had the herbicide Liberty applied to them. The probability of Palmer amaranth developing resistance to Liberty in the very near future is very high unless more herbicides than just Liberty are used in Liberty Link soybeans. A University Extension and industry plan to address the stewardship of Liberty as well as PPO herbicides needs to be developed to help sustain the activity of these herbicides on Palmer amaranth.

ADVANCEMENTS IN DICAMBA FORMULATION. W. Xu[1], T.M. Cannan[1], C. Finch[1], G. Schnabel[2], M. Bratz*[2], S.J. Bowe[1], C. Brommer[1]; [1]BASF Corporation, RTP, NC, [2]BASF SE, Limburgerhof, Germany (156)

ABSTRACT

Dicamba has been a highly effective weed management tool for nearly 50 years. It is the fifth most widely used herbicide in the United States with more than 25 million acres of crops including corn, wheat, pasture, and turf treated annually. Dicamba was discovered in 1958 and first registered as Banvel® herbicide for broadleaf control in turf. Registration of dicamba products for use in corn, sorghum, small grains, and pasture soon followed in 1964 through 1966. Since then dicamba chemistry has evolved over time with the development of formulations such as Marksman®, Clarity®, Distinct® and Status® herbicides. A key difference in the formulations is the use of different bases as counter ions to neutralize the carboxylic acid moiety of dicamba. The respective salts differ in their physical properties, notably in their water solubility and tendency to volatilize. Volatilization is, besides spray drift, a concern for off-target movement of dicamba. Although volatilization contributes 2 to 3 orders of magnitude less than spray drift, it is a concern that can be addressed by formulation innovation.

The presentation introduces a new experimental dicamba formulation innovation based on a proprietary dicamba-BAPMA salt, which is currently under development. The formulation possesses good stability, mixing and handling properties, and is optimized to further reduce the field volatilization potential of dicamba. BAPMA (N, N-Bis-(aminopropyl) methylamine) is a tridentate amine, that provides strong and effective binding of dicamba spray residues, thus suppressing potential volatilization of the herbicide. Since volatilization is a kinetic process, it cannot be easily addressed by thermodynamic material constants like vapor pressure. Vapor pressure defines the equilibrium condition of pure compounds between a deposit and a saturated atmosphere in a *closed* system. For agrochemical applications the atmosphere is an *open* system so vapor phase saturation is not reached. The volatilization kinetic is further influenced by external factors such as wind, relative humidity, temperature and contact substrate. In addition, vapor pressure measurements of less than < 1.0 kPa are subject to systemic errors. In conclusion, the thermodynamically static conditions, such as vapor pressure, are not directly relevant under dynamic agronomic conditions.

However, real life kinetic data like field sampling results are difficult to measure and are notoriously sensitive to a number of unwanted external factors. Therefore, methods were sought to measure and compare volatilization of candidates in screening but also under field conditions with different requirements regarding throughput and sensitivity. Five methods will be presented that can be used to compare and measure dicamba volatilization under lab and field conditions. These include TGA (thermo gravimetric analysis), non-equilibrium evaporation, humidome bioassay and ^{14}C contained system laboratory studies, and field air sampling studies.

EVALUATION OF DRIFT REDUCTION NOZZLES AND ADJUVANTS FOR GLYPHOSATE-DICAMBA APPLICATIONS.

R.E. Wolf*[1], S. Bretthauer[2], A. Hager[2]; [1]Wolf Consulting & Research LLC, Mahomet, IL, [2]University of Illinois, Urbana, IL (157)

ABSTRACT

The objective of this study was to evaluate weed control efficacy and droplet size of drift reduction nozzles and adjuvants for glyphosate-dicamba applications. Treatments included the following nozzles from Spraying Systems: Turbo TeeJet (TT11004 @ 331 kPa (48 psi)); Turbo TeeJet Induction (TTI11004 @ 331 kPa (48 psi)); Air Induction Extended Range (AIXR11004 @ 331 kPa (48 psi)); Air Induction Turbo TwinJet (AITTJ60-11004 @ 331 kPa (48 psi)); and Extended Range (XR11006 @ 303 kPa (44 psi)). All nozzles were tested with and without Interlock at 292 mL/ha (4 fl oz/A). Applications were made with an ATV mounted CO2 sprayer operated at 21 km/h (13 mph) and a spray volume of 94 L/ha (10 GPA). The XR11006 nozzles were operated with a pulse width modulation system (Sharpshooter, Capstan Ag Systems) set at 70% duty cycle. All spray solutions contained glyphosate (840 g ae/ha (0.75 lb ae/A) of Roundup WeatherMax), dicamba (280 g ae/ha (0.25 lb ae/A) of Clarity), and liquid AMS (N-PaK at 3.0% v/v). Control at 59 mL per 379 L (2 fl oz per 100 gal), Array at 4.1 kg per 379 L (9 lbs per 100 gal), and Border Xtra 8L at 2.5% v/v were tested using only the TT11004 nozzle. Two fields with corn were sprayed with the treatments, field 1 with weeds around 15 cm (6 inches) in height and field 2 with weeds around 51 cm (20 inches) in height. The droplet size spectrums of all nozzle and drift reduction adjuvant combinations were measured using a Sympatec Helos laser diffraction droplet sizing system in a low speed wind tunnel. There were no significant differences in weed control among the treatments in either field 1 (26 DAT) or 2 (27 DAT). Average control among all species and treatments was 98% in field 1 and 90% in field 2. In field 1, average control for all species except tall morningglory was 100%; average control for tall morningglory was 91%. Average control for all species except tall morningglory in field 2 ranged from 98% to 100%; average control for tall morningglory was 56% in field 2.The differences in droplet size among the nozzles tested with the glyphosate-dicamba spray solution (no adjuvant) were as expected based on manufacturer droplet size classification. Average % of spray volume <100 µm without a drift reduction adjuvant was 5.04%. All drift reduction adjuvants reduced the percentage of spray volume <100 µm, but there were differences among them depending on the nozzle. The average % of spray volume <100 µm among all nozzles and drift reduction adjuvants was 2.27%. The lowest % of spray volume <100 µm was achieved with the AITTJ60 and Control (0.09%). Array, Border, and Control increased the VMD of all nozzles to varying degrees; Interlock had a minor and varied impact on VMD.

STEWARDSHIP OF DICAMBA IN DICAMBA TOLERANT CROPPING SYSTEMS.

S.J. Bowe*[1], W.E. Thomas[2], L.L. Bozeman[3], S.W. Murdock[4], J.J. Sandbrink[5]; [1]BASF Corporation, RTP, NC, [2]BASF Corporation, Research Triangle Park, NC, [3]BASF, Raleigh, NC, [4]Monsanto Company, St. Louis, MO, [5]Monsanto Company, St Louis, MO (158)

ABSTRACT

New weed control options are needed to manage a growing weed resistance problem that is limiting control tactics and in some areas cropping options. Glyphosate is an important herbicide in many cropping systems, but problematic weeds like Palmer amaranth (*Amaranthus palmeri*), waterhemp (*Amaranthus tuberculatus*), giant ragweed (*Ambrosia trifida*), and horseweed (*Conyza canadensis*) have been confirmed resistant to it in at least 24 states. And many of these populations are also resistant to more than one herbicide mode of action. Given the limited herbicide options in many cropping systems, these weeds present significant management problems for producers. The dicamba tolerant cropping system will offer growers a new weed management option in cotton (*Gossypium hirsutum*) and soybean (*Glycine max*). Dicamba complements the weed control spectrum of glyphosate and controls many broadleaf weeds that have been reported to be resistant to glyphosate. However, proper implementation of the dicamba tolerant cropping system is required to ensure its long term sustainability. As part of an integrated strategy, one should consider several stewardship tactics to address weed resistance management and on-target deposition. Weed management programs should consider an integrated system using multiple herbicide modes of action, residual herbicides, effective rates and timings, and site monitoring as well as mechanical weed control when necessary. Maximizing on-target deposition can be addressed with formulation and application techniques including nozzle selection, boom height, and spray pressure. Environmental conditions such as wind and inversions also have significant influence on the level of on-target deposition and need to be considered before application. The goal of such a stewardship program is to allow growers to maintain flexibility and control of their farming operation. A training and education program can assist growers in achieving this goal. An improved formulation, optimized application techniques, and integration of other effective weed control tactics like alternate modes of action, tillage, and crop rotation will ultimately provide the most sustainable production system.

MANAGING HERBICIDE OFF-TARGET SPRAY LOSSES. **S.H. Jackson*; BASF Corporation, RTP, NC (159)**

ABSTRACT

More than 200 million acres are sprayed annually with crop protection products. Many herbicides can cause non-target plant effects at very low concentrations associated with spray drift. Managing off target movement is essential for the continued success and expanded use of these products in conventional and tolerant crop systems. While spray drift cannot be completely eliminated, there are practices that can minimize off field movement. Regulators have been revising label language to included spray drift protections away from just threatened and endangered species habitat to protecting all non-target areas. This presentation outlines a process for determining buffer distances using non-target species study NOEC's, EC_{25}'s or EC_{50}'s endpoints. The conservatively protective nature of this approach is explored, as well as its current use in regulatory practices.

DEVELOPMENT OF DICAMBA RESISTANT SOYBEANS. **P. Feng*; Monsanto Co, St Louis, MO (160)**

ABSTRACT

Dicamba is a member of the synthetic auxin family and is efficacious on dicotyledonous weeds. Dicamba is effectively used in corn, which is naturally tolerant; however, soybeans are extremely sensitive. Engineering crop safety to dicamba permits its use in-crop for effective control of dicotyledonous weeds and expands weed control options for the growers. In this presentation, I will describe our strategy to engineer dicamba tolerance in soybeans through the deactivation mechanism and the kinetic properties of the microbial dicamba monooxygenase enzyme which enabled rapid deactivation of dicamba in vivo. Soybean plants transformed with the dicamba monooxygenase gene withstood high rates of dicamba (> 0.55 kg/ha) showing little/no visible injury in multi-year, multi-location field trials.

DICAMBA: A HIGHLY EFFECTIVE WEED MANAGEMENT TOOL. **J. Frihauf*[1], S.J. Bowe[1], L.L. Bozeman[2], C. Youmans[3], B. Guice[4], L. Newsom[5]; [1]BASF Corporation, RTP, NC, [2]BASF, Raleigh, NC, [3]BASF Corporation, Dyersburg, TN, [4]BASF Corporation, Winnsboro, LA, [5]BASF Corporation, Tifton, GA (161)**

ABSTRACT

Dicamba has been a highly effective weed management tool for nearly 50 years. It is the fifth most widely used herbicide in the United States with more than 25 million acres of crops including corn, wheat, pasture, and turf treated annually. Dicamba was discovered in 1958 and first registered as Banvel® herbicide for broadleaf control in turf. Registration of dicamba products for use in corn, sorghum, small grains, and pasture soon followed in 1964 through 1966. Since then dicamba chemistry has evolved over time with the development of formulations such as Marksman®, Clarity®, Distinct®, and Status® herbicides. These dicamba formulations effectively control or suppress over 190 broadleaf weeds including 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*). Currently, a next generation dicamba formulation is in development that reduces potential volatility more than the improvement achieved with Clarity® over Banvel®. The next generation of dicamba (EXP; not a registered product) demonstrates similar efficacy as past generations of dicamba when applied postemergence and preemergence. Field trial results show that the EXP formulation and Clarity® provide similar control of broadleaf weeds including glyphosate-resistant common waterhemp and Palmer amaranth when applied postemergence in corn. Research results also show that the combination of dicamba with residual herbicides improves broadleaf weed control compared to residual herbicides alone. The dicamba EXP formulation exhibits a wide-spectrum of broadleaf weed control similar to Clarity® with the additional benefit of even lower volatility. Dicamba will be an important component for integrated weed management systems that include herbicides with additional mechanisms of action, residual herbicides, and agronomic practices that favor early season weed control and crop competition.

ADVANCEMENTS IN DICAMBA PLUS GLYPHOSATE FORMULATIONS. **A. MacInnes*[1], D. Wright[1], J.J. Sandbrink[2]; [1]Monsanto Co, St. Louis, MO, [2]Monsanto Company, St Louis, MO (162)**

ABSTRACT

Monsanto Company is developing a premix formulation containing glyphosate and dicamba for use in dicamba tolerant crops of the future. The formulation is a surfactant containing soluble concentrate delivering a 2 to 1 ratio of glyphosate to dicamba. It shows commercially acceptable physical and chemical properties typical of Roundup® agricultural brand formulations. The experimental formulation shows good tank-mix compatibility with important herbicides used for commercial soybean production.

The premix was tested in 36 field experiments completed by Monsanto agronomists, academic cooperators and 3rd party consultants. A tank-mix of Clarity® (420 g ae/ha) and Roundup® WeatherMAX™ (840 g a.e./ha) was compared to the experimental premix, delivering the same rates of dicamba and glyphosate. The premix was also evaluated with the addition of 0.25% (v/v) non-ionic surfactant. Small-plot research methods, typical of our industry, were used to apply the treatments. Trials were applied with backpack sprayers equipped with 4 to 6 1100015 Turbo TeeJet® Induction (TTI) spray nozzles, spray volumes ranged from 94 to 188 L/ha across studies. Cooperators used the appropriate spray pressure required to deliver the spray volume at 3 to 4.8 km/hr ground speed. Weed control ratings were analyzed using analysis of variance and pair-wise least square mean comparisons for all of the species present in the experiments. There were 25 different non-glyphosate resistant broadleaf weed species (55 site by species occurrences) reported by participants in this protocol, 3 glyphosate-resistant broadleaf weed species (13 site by species occurrences), and 7 grass species (10 site by species occurrences). Results showed the weed control for the premix and the tank-mixture could not be statistically distinguished from one another at the 95% confidence level.

Roundup® is a registered trademark of Monsanto Company.

Clarity ® is a registered trademark of BASF Corp.

TeeJet® is a registered trademark of Spraying Systems Company.

DEVELOPMENT OF WEED MANAGEMENT RECOMMENDATIONS FOR DICAMBA TOLERANT SOYBEAN. **S. Seifert-Higgins*, C.L. Arnevik; Monsanto Company, St. Louis, MO (163)**

ABSTRACT

Effective weed control is an important component of Monsanto's commitment to increase crop yields to meet the growing global demand for food, feed and fuel. Dicamba tolerance is built on the successful Genuity® Roundup Ready 2 Yield® soybean platform and once approved can enable the use of dicamba and glyphosate herbicides for preemergence, preplant burndown with no soybean plant-back restrictions, at planting and for in-season weed control. The current Roundup Ready PLUS™ program provides effective and sustainable weed management recommendations for Roundup Ready® crops and associated rebates provide incentives for adoption of the program. Once all regulatory approvals for the trait and the use of dicamba in Dicamba Tolerant Soybean are obtained, dicamba will become an additional tool in the Roundup Ready PLUS™ Weed Management program. The Dicamba Tolerant Soybean technology will add considerable value to the well-established and effective Roundup Ready® system by providing an additional mode of action for control of broadleaf weeds with crop safety similar to Roundup® agricultural herbicides applied alone and will help preserve the utility of other postemergent herbicides. The use of residual herbicides will continue to be a foundation of effective and sustainable weed management. Monsanto has been working with university weed scientists over the past several years to develop regionalized weed management systems recommendations for Dicamba Tolerant Soybeans. Programs that incorporate the use of preemergent, residual products and Roundup® agricultural herbicides plus dicamba in season provided the most effective season-long weed control. The base recommendation in Roundup Ready PLUS™ is to start clean with tillage or a burndown herbicide and to incorporate a preemergence, residual herbicide which has many benefits including reducing weed competition in early season thereby protecting the yield potential and providing a wider window of timing for postemergent applications later in the season. Under minimum/no-tillage situations growers will be able to use dicamba preemergence with Roundup® agricultural herbicides to control existing weed populations without waiting to plant. The use of a residual product preplant is recommended following a combination of Roundup® agricultural herbicide plus dicamba in season. Additionally, Warrant® herbicide can be added to the mix as an early postemergence application, providing residual control of grasses and small-seeded broadleaf weeds.

WEED SURVEY – SOUTHERN STATES

2012

Grass Crops Subsection

(Corn; Grain Sorghum, Hay, Pastures, and Rangelands; Rice; Small Grains; Sugarcane; Turf; Wheat)

Theodore M. Webster
Chairperson

Information in this report is provided by the following individuals:

Alabama	John Everest Stephen Enloe	Mike Patterson
Arkansas	Bob Scott Ken Smith	John Boyd
Florida	Jason Ferrell Brent Sellers	 Dennis Odero
Georgia	A. Stanley Culpepper Eric P. Prostko Tim R. Murphy	Patrick McCullough R. Dewey Lee
Kentucky	J. D. Green William W. Witt	J. R. Martin
Louisiana	Ron Strahan	Jim Griffin
Mississippi	Tom Eubank Nathan Buehring Dan Reynolds	Jason Bond Normie Buehring John Byrd
Missouri	Kevin Bradley	
North Carolina	Fred Yelverton Leon Warren	 Travis Gannon
Tennessee	Jim Brosnan	Greg Breeden
Texas	Paul Baumann James Grichar Jim McAfee	Brett Bean Dan Fromme
Virginia	Shawn Askew	Scott Hagood

Table 1. The Southern States 10 Most Common and Troublesome Weeds in Corn.

	States		
Ranking	Alabama	Arkansas	Florida
Ten Most Common Weeds			
1	Broadleaf signalgrass	Barnyardgrass	Crabgrasses
2	Crabgrasses	Palmer amaranth	Goosegrass
3	Florida pusley	Broadleaf signalgrass	Wild radish
4	Morningglories	Morningglories	Florida pusley
5	Pigweeds	Prickly sida	Nutsedges
6	Sicklepod	Annual ryegrass	Pigweeds
7	Texas millet	Large crabgrass	Texas millet
8	Johnsongrass	Browntop millet	Morningglories
9	Common cocklebur	Yellow nutsedge	Sicklepod
10	Nutsedges	Velvetleaf	Common bermudagrass
Ten Most Troublesome Weeds			
1	Texas millet	Johnsongrass	Common bermudagrass
2	Morningglories	Morningglories	Morningglories
3	Crabgrasses	Palmer amaranth	Nutsedges
4	Pigweeds	Broadleaf signalgrass	Texas millet
5	Broadleaf signalgrass	Barnyardgrass	Wild radish
6	Sicklepod	Annual ryegrass	Pigweeds
7	Nutsedges	Yellow nutsedge	Hemp sesbania
8	Johnsongrass	Browntop millet	Cutleaf eveningprimrose
9	Smartweeds	Prickly sida	Sicklepod
10	Common cocklebur	Large crabgrass	Benghal dayflower

Table 1. The Southern States 10 Most Common and Troublesome Weeds in Corn (continued).

	States		
Ranking	Georgia	Kentucky	Mississippi
Ten Most Common Weeds			
1	Crabgrasses	Smooth pigweed	Palmer amaranth
2	Texas millet	Morningglories	Morningglories
3	Morningglories	Large crabgrass	Johnsongrass
4	Palmer amaranth/ Pigweed spp.	Giant foxtail	Broadleaf signalgrass
5	Sicklepod	Johnsongrass	Horseweed (Marestail)
6	Florida pusley	Giant ragweed	Crabgrass spp.
7	Nutsedges	Honeyvine swallowwort*	Yellow nutsedge
8	Johnsongrass	Fall panicum	Browntop millet
9	Common bermudagrass	Yellow nutsedge	Goosegrass
10	Annual ryegrass	Smooth crabgrass	Italian ryegrass
Ten Most Troublesome Weeds			
1	Texas millet	Honeyvine swallowwort*	Johnsongrass
2	Morningglories	Burcucumber	Palmer amaranth
3	Bermudagrass	Broadleaf signalgrass	Morningglories
4	Annual ryegrass	Morningglories	Italian ryegrass
5	Crabgrasses	Giant ragweed	Broadleaf signalgrass
6	Nutsedges	Johnsongrass	Crabgrass spp.
7	Johnsongrass	Yellow nutsedge	Browntop millet
8	Sicklepod	Common pokeweed	Goosegrass
9	Benghal dayflower	Dandelion	Yellow nutsedge
10	Palmer amaranth/ Pigweed spp.	Trumpetcreeper	Horseweed (Marestail)

* Formerly known as honeyvine milkweed

Table 1. The Southern States 10 Most Common and Troublesome Weeds in Corn (continued).

	States		
Ranking	Missouri	Texas	Virginia
Ten Most Common Weeds			
1	Waterhemp spp.	Morningglory spp.	Fall panicum
2	Morningglory spp.	Field bindweed	Pigweed spp.
3	Giant foxtail	Texas millet	Crabgrass spp.
4	Common cocklebur	Johnsongrass	Foxtail spp.
5	Large crabgrass	Waterhemp spp.	Common lambsquarters
6	Common ragweed	Pigweed spp.	Morningglory spp.
7	Velvetleaf	Silverleaf nightshade	Broadleaf signalgrass
8	Fall panicum	Sunflower	Common ragweed
9	Goosegrass		Yellow nutsedge
10	Yellow nutsedge		Johnsongrass
Ten Most Troublesome Weeds			
1	Morningglory spp.	Morningglory spp.	Common pokeweed
2	Waterhemp spp.	Field bindweed	Common milkweed
3	Johnsongrass	Texas millet	Hemp dogbane
4	Yellow nutsedge	Johnsongrass	Horsenettle
5	Goosegrass	Waterhemp spp.	Yellow nutsedge
6	Fall panicum	Pigweed spp.	Pigweed spp.
7	Large crabgrass	Horse purslane	Broadleaf signalgrass
8	Horseweed	Hophornbeam copperleaf	Morningglory spp.
9	Prickly sida	Sunflower	Dock spp.
10	Eastern black nightshade		Canada thistle

Table 2. The Southern States 10 Most Common and Troublesome Weeds in Grain sorghum.

	States		
Ranking	Alabama	Arkansas	Florida
Ten Most Common Weeds			
1	Crabgrasses	Barnyardgrass	Crabgrasses
2	Broadleaf signalgrass	Palmer amaranth	Goosegrass
3	Morningglories	Annual morningglory	Wild radish
4	Pigweeds	Broadleaf signalgrass	Florida pusley
5	Common cocklebur	Johnsongrass	Nutsedges
6	Johnsongrass	Large crabgrass	Common bermudagrass
7	Sicklepod	Prickly sida	Pigweeds
8	Prickly sida	Goosegrass	Texas millet
9	Florida pusley	Yellow nutsedge	Morningglories
10	Nutsedges	Sicklepod	Sicklepod
Ten Most Troublesome Weeds			
1	Johnsongrass	Johnsongrass	Common bermudagrass
2	Texas millet	Barnyardgrass	Crabgrasses
3	Broadleaf signalgrass	Broadleaf signalgrass	Nutsedges
4	Pigweeds	Annual morningglory	Johnsongrass
5	Morningglories	Palmer amaranth	Texas millet
6	Sicklepod	Large crabgrass	Goosegrass
7	Crabgrasses	Sicklepod	Morningglories
8	Nutsedges	Goosegrass	Wild radish
9	Florida pusley	Velvetleaf	Hemp sesbania
10	Common cocklebur	Yellow nutsedge	Pigweeds

Table 2. The Southern States 10 Most Common and Troublesome Weeds in Grain sorghum (continued).

	States		
Ranking	Georgia	Mississippi	Missouri
Ten Most Common Weeds			
1	Crabgrasses	Johnsongrass	Shattercane
2	Texas millet	Morningglories	Large crabgrass
3	Morningglories	Crabgrass spp.	Waterhemp spp.
4	Palmer amaranth/ Pigweed spp.	Palmer amaranth	Morningglories
5	Sicklepod	Broadleaf signalgrass	Barnyardgrass
6	Johnsongrass	Browntop millet	Common cocklebur
7	Florida pusley	Fall panicum	Fall panicum
8	Nutsedges	Nutsedge spp.	Johnsongrass
9	Bermudagrass	Italian ryegrass	Common ragweed
10		Horseweed (Marestail)	Yellow nutsedge
Ten Most Troublesome Weeds			
1	Texas millet	Johnsongrass	Shattercane
2	Johnsongrass	Morningglories	Johnsongrass
3	Morningglories	Crabgrass spp.	Large crabgrass
4	Crabgrasses	Palmer amaranth	Morningglories
5	Bermudagrass	Broadleaf signalgrass	Fall panicum
6	Palmer amaranth/ Pigweed spp.	Italian ryegrass	Barnyardgrass
7	Nutsedges	Browntop millet	Waterhemp spp.
8	Florida pusley	Fall panicum	Common ragweed
9	Sicklepod	Horseweed (Marestail)	Yellow nutsedge
10		Nutsedge spp.	Common cocklebur

Table 2. The Southern States 10 Most Common and Troublesome Weeds in Grain sorghum (continued).

	State
Ranking	Texas
Ten Most Common Weeds	
1	Pigweed spp.
2	Sunflower spp.
3	Johnsongrass
4	Morningglories
5	Browntop millet
6	Barnyardgrass
7	Field bindweed
8	Horse purslane
9	Crabgrass spp.
10	Field sandbur
Ten Most Troublesome Weeds	
1	Johnsongrass
2	Texas millet
3	Sunflower spp.
4	Field bindweed
5	Morningglories
6	Waterhemp spp.
7	Pigweed spp.
8	Silverleaf nightshade
9	Russian thistle
10	Kochia

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Hay, Pastures, and Rangelands.

	States		
Ranking	Alabama	Alabama	Arkansas
Ten Most Common Weeds	Hay	Pasture	
1	Crabgrasses	Dogfennel	Buttercups
2	Bahiagrass	Thistles	Bitter sneezeweed
3	*Lolium* spp.	Bitter sneezeweed	Carolina horsenettle
4	Little barley	Buttercups	Common ragweed
5	Field sandbur	Carolina horsenettle	Lanceleaf ragweed
6	*Rubus* spp.	Horseweed	Broomsedge
7	Johnsongrass	*Rubus* spp.	Thistle spp.
8	Foxtails	Broomsedge	Curly dock
9	Dogfennel	Spiny amaranth	Spiny amaranth
10	Carolina horsenettle	Field sandbur	Buckhorn plantain
Ten Most Troublesome Weeds	Hay	Pasture	
1	Crabgrasses	Foxtail spp.	Dallisgrass
2	Field sandbur	Carolina horsenettle	Crabgrass spp.
3	*Lolium* spp.	*Rubus* spp.	Prickly pear cactus
4	Little barley	Spiny amaranth	Persimmon
5	Foxtails	Field sandbur	Sandbur spp.
6	Pigweeds	Broomsedge	Knotroot foxtail
7	Nutsedges	Prickly sida	*Rubus* spp.
8	*Rubus* spp.	Woody spp.	Dock spp.
9	Smutgrass	Rose spp.	Bahiagrass
10	Maypop passionflower	Smutgrass	Buttercups

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Hay, Pastures, and Rangelands (continued).

	States		
Ranking	Florida	Georgia	Kentucky
Ten Most Common Weeds	Pasture		
1	Dogfennel	Crabgrasses	Yellow foxtail
2	Smutgrass	Pigweeds	Common ragweed
3	Tropical soda apple	Thistles	Buttercups
4	Cogongrass	Carolina horsenettle	Spiny amaranth
5	Blackberries	Bahiagrass	Chicory
6	Wild radish	Buttercups	Dandelion
7	Broomsedge	Dogfennel	Tall ironweed
8	*Cyperus* spp.	*Rubus* spp.	Musk thistle
9	Thistle	Bitter sneezeweed	Johnsongrass
10	Mexican tea	Broomsedge	Plantains
Ten Most Troublesome Weeds	Pasture		
1	Cogongrass	Carolina horsenettle	Spiny amaranth
2	Smutgrass	Thistles	Tall ironweed
3	Broomsedge	Arrowleaf sida	Poison hemlock
4	Blackberries	Johnsongrass	Buttercups
5	Sandburs	Crabgrasses	Purpletop
6	Vaseygrass	Smutgrass	Johnsongrass
7	Wild radish	Field sandbur	Blackberries
8	*Sida* spp.	*Rubus* spp.	Horsenettle
9	Tropical soda apple	Spreading pricklypear	Canada thistle
10	Goatweed	Nutsedges	Broomsedge

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Hay, Pastures, and Rangelands (continued).

	States		
Ranking	Mississippi	Mississippi	Missouri
Ten Most Common Weeds	Hay	Pasture	
1	Southern crabgrass	Spiny amaranth	Common ragweed
2	Goosegrass	Dogfennel	Broomsedge
3	Dallisgrass	Woolly croton	Thistles (musk and bull)
4	Wild garlic	Thistle spp.	Tall ironweed
5	Horsenettle	Curly dock	Goldenrod spp.
6	Annual bluegrass	Bitter sneezeweed	Common cocklebur
7	Southern dewberry	Southern dewberry	Horsenettle
8	Knotroot foxtail	Horsenettle	Plantain spp.
9	Annual bentgrass	Buttercups	Yellow foxtail
10	Spurge spp.	Knotroot foxtail	Johnsongrass
Ten Most Troublesome Weeds	Hay	Pasture	
1	Southern crabgrass	Knotroot foxtail	*Rubus* spp.
2	Barnyardgrass	Broomsedge	Broomsedge
3	Nutsedge spp.	Cherokee sedge	Yellow foxtail
4	Vaseygrass	Perennial roses (multiflora, Cherokee, McCartney)	Multiflora rose
5	Dallisgrass	Thistle spp.	Honeylocust
6	Broomsedge	Perilla mint	Tall ironweed
7	Johnsongrass	Woolly croton	Johnsongrass
8	Wild garlic	Prickly sida	Purpletop
9	Goosegrass	Goosegrass	Buckbrush
10	Southern dewberry	Horsenettle	Thistles (musk and bull)

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Hay, Pastures, and Rangelands (continued).

	States		
Ranking	North Carolina	Texas	Virginia
Ten Most Common Weeds			
1	Large crabgrass	Woolly croton	Biennial thistles
2	Docks	Annual broomweed	Spiny amaranth
3	Carolina horsenettle	Western ragweed	Common ragweed
4	Chickweeds	Ryegrass	Plantain spp.
5	Buttercups	Field sandbur	Mustard spp.
6	Wild radish/mustard	Bitter sneezeweed	Common chickweed
7	*Paspalum* spp.	Marshelder	Crabgrass spp.
8	Italian ryegrass	Bahiagrass	Foxtail spp.
9	Henbit	Johnsongrass	Purple deadnettle
10	Johnsongrass	Silverleaf nightshade	Buttercups
Ten Most Troublesome Weeds			
1	Carolina horsenettle	K. R. bluestem	Red cedar
2	Large crabgrass	Texas bullnettle	*Rubus* spp.
3	*Paspalum* spp. (Bahiagrass, Vaseygrass, Dallisgrass)	Carolina horsenettle	Common pokeweed
4	Field sandbur	Marshelder	Hemp dogbane
5	*Rubus* spp. (dewberry, blackberry)	Dallisgrass	Common milkweed
6	Ryegrass spp.	Field sandbur	Multiflora rose
7	Buttercups (hairy, bulbous)	Smutgrass	Horsenettle
8	Wild radish/mustard	Green flatsedge	Dock spp.
9	Foxtails	Vaseygrass	Bladder campion
10	Johnsongrass	Dallisgrass	Star-of-Bethlehem

Table 4. The Southern States 10 Most Common and Troublesome Weeds in Rice.

	States		
Ranking	Arkansas	Mississippi	Missouri
Ten Most Common Weeds			
1	Barnyardgrass	Barnyardgrass/junglerice	Barnyardgrass
2	Annual sedge	Palmer amaranth	Red rice
3	Yellow nutsedge	Hemp sesbania	Amazon sprangletop
4	Broadleaf signalgrass	Morningglories	Yellow nutsedge
5	Hemp sesbania	Red rice	Annual sedges
6	Red rice	Amazon sprangletop	Hemp sesbania
7	Smartweeds	Volunteer soybean*	Ducksalad
8	Sprangletop spp.	Ducksalad	Purple ammannia
9	Jointvetch spp.	Yellow nutsedge	Morningglories
10	Purple ammania	Purple ammannia	Palmer amaranth
Ten Most Troublesome Weeds			
1	Barnyardgrass	Barnyardgrass/junglerice	Not provided
2	Red rice	Palmer amaranth	
3	Broadleaf signalgrass	Amazon sprangletop	
4	Annual sedge/ yellow nutsedge	Texasweed	
5	Sprangletop spp.	Volunteer soybean*	
6	Smartweeds	Spreading dayflower	
7	Crabgrass spp.	Red rice	
8	Palmer amaranth	Morningglories	
9	Jointvetch spp.	Pennsylvania smartweed	
10		Hemp sesbania	

*Glyphosate-resistant

Table 5. The Southern States 10 Most Common and Troublesome Weeds in Small Grains.

	States		
Ranking	Alabama	Arkansas	Florida
Ten Most Common Weeds			
1	Henbit	Ryegrass	Wild radish
2	Italian ryegrass	Annual bluegrass	Wild mustard
3	Cutleaf eveningprimrose	Mayweed	Henbit
4	Mustards	Buttercups	Carolina geranium
5	Wild radish	Henbit	Cutleaf eveningprimrose
6	Chickweeds	Wild onion/garlic	Ryegrass
7	Corn spurry	Vetch spp.	Virginia pepperweed
8	Wild garlic	Curly dock	Chickweeds
9	Vetch	Plains coreopsis	Cudweeds
10	Little barley	Buckhorn plantain	Wild garlic
Ten Most Troublesome Weeds			
1	Italian ryegrass	Ryegrass	Wild radish
2	Wild radish	Wild onion/garlic	Henbit
3	Wild garlic	Cutleaf eveningprimrose	Ryegrass
4	Mustards	Annual bluegrass	Cutleaf eveningprimrose
5	Henbit	Horseweed	Carolina geranium
6	Curly dock	Buttercups	Wild garlic
7	Corn spurry	Cheat	
8	Cutleaf eveningprimrose	Curly dock	
9	Little barley	Mayweed	
10	Virginia pepperweed	Vetch spp.	

Table 5. The Southern States 10 Most Common and Troublesome Weeds in Small Grains (continued).

	States		
Ranking	Georgia	Missouri	Virginia
Ten Most Common Weeds			
1	Henbit	Henbit	Common chickweed
2	Wild radish	Common chickweed	Henbit
3	Chickweeds	Field pennycress	Mustard spp.
4	Italian ryegrass	Speedwell spp.	Italian ryegrass
5	Cudweeds	Shepherd's-purse	Wild garlic
6	Cutleaf eveningprimrose	Purple deadnettle	Speedwell spp.
7	Annual bluegrass	Wild garlic	Annual bluegrass
8	Swinecress	*Bromus* spp.	Mouseear chickweed
9	Wild garlic	Annual bluegrass	Mayweed chamomile
10	Carolina geranium	Cutleaf eveningprimrose	Purple deadnettle
Ten Most Troublesome Weeds			
1	Italian ryegrass	Wild garlic	Purple deadnettle
2	Wild radish	Annual bluegrass	Common chickweed (ALS-resistant)
3	Henbit	Speedwell spp.	Italian ryegrass
4	Annual bluegrass	*Bromus* spp.	Annual bluegrass
5	Carolina geranium	Common chickweed	Speedwell spp.
6	Wild garlic	Curly dock	Wild garlic
7	Chickweeds	Cutleaf eveningprimrose	Star-of-Bethlehem
8	Swinecress	Mouseear chickweed	Starch grapehyacinth
9	Cudweeds	Italian ryegrass	Cornflower
10	Cutleaf eveningprimrose	Purple deadnettle	Dock spp.

Table 6. The Southern States 10 Most Common and Troublesome Weeds in Sugarcane.

	States	
Ranking	Florida	Louisiana
Ten Most Common Weeds		
1	Fall panicum	Bermudagrass
2	Guineagrass	Johnsongrass
3	Goosegrass	Itchgrass
4	Crabgrasses	Purple nutsedge
5	*Sorghum almum*	Red morningglory
6	Napiergrass	Ivyleaf morningglory
7	Bermudagrass	Clovers (burclover, white, medic)
8	Spiny amaranth	Browntop panicum
9	Common lambsquarters	Italian ryegrass
10	Nutsedges (purple and yellow)	Dock spp.
Ten Most Troublesome Weeds		
1	Bermudagrass	Bermudagrass
2	Guineagrass	Johnsongrass
3	Napiergrass	Purple nutsedge
4	Itchgrass	Itchgrass
5	Fall panicum	Red morningglory
6	Torpedograss	Ivyleaf morningglory
7	Giant bristlegrass	Italian ryegrass
8	Nutsedges (purple and yellow)	Clovers (burclover, white, medic)
9	*Sorghum almum*	Browntop panicum
10	Common lambsquarters	Doveweed

Table 7. The Southern States 10 Most Common and Troublesome Weeds in Turf.

	States		
Ranking	Alabama	Arkansas	Georgia
Ten Most Common Weeds			
1	Annual bluegrass	Henbit/purple deadnettle	Crabgrasses
2	Crabgrasses	Chickweed spp.	Annual bluegrass
3	Goosegrass	Crabgrass spp. (large and smooth)	Dallisgrass
4	Spurges	Annual bluegrass	Nutsedge spp.
5	Henbit	White clover	Goosegrass
6	Dandelion	Wild garlic	Bermudagrass
7	Nutsedges	Bermudagrass	White clover
8	Wild garlic	Dallisgrass	Spurge spp.
9	Chickweeds	Cudweed spp.	Henbit
10	Lawn burweed	Virginia buttonweed	Dandelion
Ten Most Troublesome Weeds			
1	Virginia buttonweed	Dallisgrass	Crabgrass spp.
2	Torpedograss	Virginia buttonweed	Annual bluegrass
3	Dallisgrass	Purple nutsedge	Dallisgrass
4	Ground ivy	Annual bluegrass	Nutsedge spp.
5	Tufted lovegrass	Bermudagrass	Goosegrass
6	Nutsedges	*Kyllinga* spp.	Bermudagrass
7	Wild violet	Crabgrass spp. (large and smooth)	Lespedeza spp.
8	Florida betony	Wild violets	Spurge spp.
9	Goosegrass	Goosegrass	Torpedograss
10	Wild garlic	Henbit/purple deadnettle	Doveweed

Table 7. The Southern States 10 Most Common and Troublesome Weeds in Turf (continued).

	States		
Ranking	Kentucky	Louisiana	Mississippi
Ten Most Common Weeds			
1	Dandelion	Crabgrasses	Crabgrasses
2	Large crabgrass	Virginia buttonweed	Henbit
3	Plantain spp.	Dallisgrass	Wild garlic
4	White clover	Goosegrass	Dandelion
5	Nimblewill	Purple nutsedge	Annual lespedeza
6	Common chickweed	Bermudagrass	Prostrate spurge
7	Purple dead nettle/ Henbit	Bahiagrass	Dallisgrass
8	Wild violet	White clover	Virginia buttonweed
9	Dallisgrass	Dollarweed	Dichondra
10	Yellow nutsedge	Annual bluegrass	Annual bluegrass
Ten Most Troublesome Weeds			
1	Nimblewill	Dallisgrass	Virginia buttonweed
2	Wild violet	Virginia buttonweed	Green kyllinga
3	Virginia buttonweed	Torpedograss	Dallisgrass
4	Dallisgrass	Bermudagrass	Henbit
5	Ground ivy	Goosegrass	Florida betony
6	Annual bluegrass	Doveweed	Goosegrass
7	Bermudagrass	Dollarweed	Bahiagrass
8	Common lespedeza	Common lespedeza	Lawn burweed
9	Star-of-Bethlehem	Spurge spp.	Dichondra
10	Yellow nutsedge	Annual bluegrass	Torpedograss

Table 7. The Southern States 10 Most Common and Troublesome Weeds in Turf (continued).

	States	
Ranking	North Carolina	Tennessee
Ten Most Common Weeds		
1	Bluegrasses	Crabgrasses
2	Crabgrasses (smooth, large)	White clover
3	Henbit	Bermudagrass
4	Chickweeds	Annual bluegrass
5	Dandelion	Dallisgrass
6	Clovers (white, hop)	*Cyperus* spp.
7	Goosegrass	Henbit/deadnettle
8	Dallisgrass	Virginia buttonweed
9	Wild garlic	Wild garlic
10	Cudweeds	Hairy bittercress
Ten Most Troublesome Weeds		
1	Dallisgrass	Dallisgrass
2	Bluegrasses	Bermudagrass
3	Bermudagrass	Annual bluegrass
4	Bahiagrass	Nimblewill
5	Sedge spp.	Goosegrass
6	Crabgrasses (smooth, large)	Virginia buttonweed
7	Goosegrass	*Cyperus* spp.
8	Yellow woodsorrel	Ground ivy
9	Henbit	Prostrate spurge
10	*Phyllanthus* spp.	Corn speedwell

Table 7. The Southern States 10 Most Common and Troublesome Weeds in Turf (continued).

	States	
Ranking	Texas	Virginia
Ten Most Common Weeds		
1	Dandelion	Crabgrass spp.
2	Annual bluegrass	White clover
3	Sowthistle	Dandelion
4	Crabgrass spp.	Annual bluegrass
5	Chickweed spp.	Plantains (buckhorn, broadleaf)
6	Henbit	Chickweeds (common, mouseear)
7	Khakiweed	Henbit/purple deadnettle
8	Protrate spurge	Speedwells (Corn, Persian)
9	Nutsedge spp.	Nimblewil
10	Goosegrass	Woodsorrels (creeping, yellow)
Ten Most Troublesome Weeds		
1	Virginia buttonweed	Bermudagrass
2	Dichondra	Nimblewill
3	Nutsedge spp.	Violet spp.
4	Khakiweed	Roughstalk bluegrass
5	Slender aster	Dallisgrass/thin paspalum
6	Bahiagrass	Virginia buttonweed
7	K.R. bluestem	Common lespedeza
8	Dandelion	Sweet vernalgrass
9	Dallisgrass	Sedges (*Cyperus*, *Kyllinga*)
10	Goosegrass	Goosegrass

Table 8. The Southern States 10 Most Common and Troublesome Weeds in Wheat.

	States		
Ranking	Alabama	Arkansas	Florida
Ten Most Common Weeds			
1	Henbit	Ryegrass	Wild radish
2	Italian ryegrass	Annual bluegrass	Wild mustard
3	Cutleaf eveningprimrose	Mayweed	Henbit
4	Wild radish	Buttercups	Carolina geranium
5	Mustards	Henbit	Cutleaf eveningprimrose
6	Chickweeds	Wild onion/garlic	Ryegrass
7	Wild garlic	Vetch spp.	Virginia pepperweed
8	Virginia pepperweed	Curly dock	Chickweeds
9	Curly dock	Plains coreopsis	Cudweeds
10	Little barley	Buckhorn plantain	Wild garlic
Ten Most Troublesome Weeds			
1	Wild radish	Ryegrass	Wild radish
2	Wild garlic	Wild onion/garlic	Henbit
3	Italian ryegrass	Cutleaf eveningprimrose	Ryegrass
4	Mustards	Annual bluegrass	Cutleaf eveningprimrose
5	Henbit	Horseweed	Carolina geranium
6	Chickweeds	Buttercups	Wild garlic
7	Little barley	Cheat	
8	Curly dock	Curly dock	
9	Virginia pepperweed	Mayweed	
10	Cutleaf eveningprimrose	Vetch spp.	

Table 8. The Southern States 10 Most Common and Troublesome Weeds in Wheat (continued).

	States		
Ranking	Georgia	Kentucky	Mississippi
Ten Most Common Weeds			
1	Henbit	Wild garlic	Henbit
2	Wild radish	Common chickweed	Annual bluegrass
3	Chickweeds	Purple deadnettle	Italian ryegrass
4	Italian ryegrass	Henbit	Carolina geranium
5	Cudweeds	Shepherdspurse	Chickweeds
6	Cutleaf eveningprimrose	Virginia pepperweed	Horseweed/(Marestail)
7	Annual bluegrass	Horseweed (Marestail)	Sibara
8	Swinecress	Italian ryegrass	Cutleaf eveningprimrose
9	Wild garlic	Philadelphia fleabane	Wild garlic
10	Carolina geranium	Mouseear chickweed	Shepherd’s=purse
Ten Most Troublesome Weeds			
1	Italian ryegrass	Italian ryegrass	Italian ryegrass
2	Wild radish	Horseweed (Marestail)	Wild garlic
3	Henbit	Hairy chess	Henbit
4	Annual bluegrass	Cheat	Annual bluegrass
5	Carolina geranium	Wild garlic	Horseweed/(Marestail)
6	Wild garlic	Star-of-Bethlehem	Carolina geranium
7	Chickweeds	Curly dock	Chickweeds
8	Swinecress	Musk thistle	Sibara
9	Cudweeds	Speedwells	Cutleaf eveningprimrose
10	Cutleaf eveningprimrose	Annual bluegrass	Volunteer corn

Table 8. The Southern States 10 Most Common and Troublesome Weeds in Wheat (continued).

	States		
Ranking	Missouri	Texas	Virginia
Ten Most Common Weeds			
1	Henbit	Henbit	Common chickweed
2	Common chickweed	Flixweed/tansy mustard	Henbit
3	Field pennycress	Wild oat	Mustard spp.
4	Speedwell spp.	*Bromus* spp.	Italian ryegrass
5	Shepherd's-purse	Annual ryegrass	Wild garlic
6	Purple deadnettle	Corn gromwell	Speedwell spp.
7	Wild garlic	Cutleaf evening-primrose	Annual bluegrass
8	*Bromus* spp.	Pepperweed	Mouseear chickweed
9	Annual bluegrass	Kochia	Mayweed chamomile
10	Cutleaf eveningprimrose	Prickly lettuce	Purple deadnettle
Ten Most Troublesome Weeds			
1	Wild garlic	Field bindweed	Purple deadnettle
2	Annual bluegrass	Annual ryegrass	Common chickweed (ALS-resistant)
3	Speedwell spp.	Jointed goatgrass	Italian ryegrass
4	*Bromus* spp.	Wild oat	Annual bluegrass
5	Common chickweed	Kochia	Speedwell spp.
6	Curly dock	*Bromus* spp.	Wild garlic
7	Cutleaf eveningprimrose	Cutleaf eveningprimrose	Star-of-Bethlehem
8	Mouseear chickweed	Corn gromwell	Starch grapehyacinth
9	Italian ryegrass	Pepperweed	Cornflower
10	Purple deadnettle	Red horned poppy	Dock spp.

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