Proceedings of the

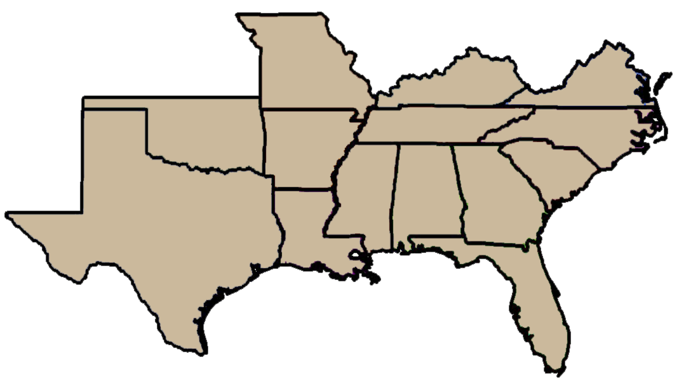
Southern Weed Science Society

67th Annual Meeting

Hyatt Regency – The Wynfrey Hotel

Birmingham, AL

January 27-29, 2014



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Preface

These PROCEEDINGS of the 67th Annual Meeting of the Southern Weed Science Society contain papers and abstracts of presentations in Birmingham, AL at the Wynfrey/Hyatt Hotel. Other information in these PROCEEDINGS include: biographical data of recipients of the SWSS Distinguished Service, Outstanding Educator, Outstanding Young Weed Scientist, and Outstanding Graduate Student Awards; lists of officers and committee chairpersons; minutes of all business meetings; the Annual Weed Survey; list of registrants attending the annual meeting and sustaining members.

Only papers presented at the meeting and submitted to the Editor in the prescribed format for printing are included in the PROCEEDINGS. Papers may be up to five pages in length and abstracts are limited to one page. Authors are required to submit an original abstract according to the instructions available in the Call for Papers and on the SWSS web site (www.swss.ws). The use of commercial names in the PROCEEDINGS neither constitutes an endorsement, nor does the non-use of similar products constitute a criticism by the Southern Weed Science Society.

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

Nilda R. Burgos
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 spacing before and after the heading, ABSTRACT.

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

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

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

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

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

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

ABSTRACT

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

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

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

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

SWSS Presidential Address

Steve Kelly

January 28, 2014 Not Available

Outstanding Young Weed Scientist-Academia

Jason Ferrell

Jason Ferrell is an Associate Professor in the Agronomy Department at the University of Florida. Dr. Ferrell's program consists of developing weed management programs for agronomic crops, pastures and industrial sites. Since joining the university in 2004 with a 65% extension and 35% research appointment, Dr. Ferrell has conducted over 400 extension meetings, written over 200 articles for extension newsletters and trade magazines, published 60 refereed scientific articles, and mentored 15 graduate students. He currently serves as associate editor for *Weed Technology Journal* (2009-present) and Editor for *Journal of Aquatic Plant Management* (2013-present). Dr. Ferrell has also been honored with the Dallas Townsend Extension Enhancement Award, Outstanding Specialist Award, Researcher of the Year by the Florida Cattleman's Association, and Outstanding Weed Scientist by the Florida Weed Science Society. He and his wife Amber have 3 children - Abby, Emma and Nathan.

Outstanding Young Weed Scientist- Industry

Vinod Shivrain

Vinod Shivrain was born and raised in a farming family in Haryana, India. He obtained his B.Sc. (Hons.) in Agriculture from C.C.S. Haryana Agricultural University. Vinod completed his M.S. and Ph.D. from the University of Arkansas under the guidance of Dr. Nilda Burgos. His graduate research was focused on understanding the biology, physiology, and genetic diversity of red rice, a problematic weed globally in rice production systems. Vinod has authored/co-authored 18 refereed articles and 70 abstracts and presentations. He serves as reviewer for various journals including Weed Science, Weed Research, and Weed Technology. Vinod has been working for Syngenta since 2009 starting as a scientist in the Biological Analytics group in Greensboro, NC. He then moved to a research scientist role at the Vero Beach Research Center in Florida in 2011. Vinod’s current focus is on the research for herbicide-resistant weed management. He is also involved in design and coordination of research and development programs for herbicides and HTC trait development.

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	
2008	Stanley Culpepper	University of Georgia
2008	no nomination	
2009	Jason K. Norsworthy	University of Arkansas
2009	no nomination	
2010	Bob Scott	University of Arkansas
2010	no nomination	
2011	J. Scott McElroy	Auburn University
2011	Eric Palmer	Syngenta Crop Protection
2012	Jason Bond	Mississippi State University
2012	Cody Gray	United Phosphorus Inc.
2013	Greg Armel	BASF Company
2013	Shawn Askew	Virginia Tech

Outstanding Educator Award

Scott Senseman

Scott Senseman graduated from Wilmington College of Ohio in 1986 with a B.S. in Agricultural Business. He attended the University of Arkansas where he completed his M.S. in Agronomy-Weed Science in 1990 and his Ph.D. in Agronomy-Pesticide Residue in 1994. He served on that faculty in the Department of Soil and Crop Sciences at Texas A&M University for more than 18 years starting in October 1994. He is currently Professor and Head of the Department of Plant Sciences at the University of Tennessee where he has been employed since July, 2013. Dr. Senseman's research program has concentrated on several aspects of herbicide chemistry including the effectiveness of grass buffer strips on removal of herbicides from runoff water, herbicide dissipation and carryover, herbicide absorption and translocation, herbicide effects on soil microbial activity, extraction method development for soil and water, and weed management in rice. He has authored or coauthored 96 peer-reviewed journal articles, 224 abstracts of poster and oral presentations, 8 technical reports, two magazine articles, and one encyclopedia entry. In 2007, he finished his service as the editor for the Weed Science Society of America's Ninth Edition of the Herbicide Handbook. Dr. Senseman helped develop and teach the beginning course in agronomy (SCSC 101 Introduction to Agronomy), two undergraduate courses related to the evolution, role, and fate of agricultural chemicals in row crop production (SCSC 435 Ecology of Agrochemicals and SCSC 446 Weed Management and Ecology), a graduate and distance course related to herbicide mode of action and environmental fate (SCSC 650 Mode of Action and Environmental Fate of Herbicides) as well as an analytical course related to instrumentation used in environmental aspects of agronomy (SCSC 618 Methods of Plant, Soil, and Water Analysis in Environmental Systems). Dr. Senseman has served as major advisor or co-advisor for 22 graduate students and has served on 59 other graduate student committees and two international undergraduate internships during his tenure at Texas A&M.

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. Wilcut	North Carolina State University
2006	Don S. Murray	Oklahoma State University
2007	Thomas C. Mueller	University of Tennessee
2008	James M. Chandler	Texas A&M University
2009	William W. Witt	University of Kentucky
2010	Peter Dotray	Texas Tech. University
2011	Eric Prostko	University of Georgia
2012	Gregory Mac Donald	University of Florida
2013	Tim Grey	University of Georgia

Outstanding Graduate Student Award (MS)

Brent Johnson

Brent Johnson was raised in West Helena, AR, and he obtained a B.S. degree in Crop Management from the University of Arkansas in 2008. While pursuing his B.S. degree, he worked for Dr. Jason Norsworthy as an undergraduate assistant, with the main responsibility of conducting greenhouse screens of potential herbicide-resistant weeds. Upon completion of his B.S. degree, Brent elected to pursue his M.S. degree in Weed Science under the guidance of Dr. Norsworthy. While pursuing his M.S. degree, Brent also worked as a Research Program Associate for Dr. Norsworthy. Brent's thesis research consisted of confirming glyphosate-resistant johnsongrass in Arkansas, assessing its geographical distribution, developing management programs for its control in soybean, and assessing the effectiveness of late-season herbicide applications in preventing johnsongrass seed production. Brent has authored or co-authored four refereed journal articles, nine non-refereed articles, and 128 abstracts. Brent was a member of the University of Arkansas Weed Team in 2009, 2010, and 2011, and he was 3rd place overall individual and high individual in herbicide symptomology in 2009, 1st place overall individual and high individual in written calibration in 2010, and 8th place overall individual in 2011. In addition, he has won oral presentation competitions at the University of Arkansas Gamma Sigma Delta competition, Southern Weed Science Society, Arkansas Crop Protection Association, and Beltwide Cotton Conference. Brent completed his M.S. degree in August of 2013 and currently works for DuPont Crop Protection as a Field Development Representative in Florida.

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	Whitnee Barker	North Carolina State University
2006	Christopher L. Main	University of Florida
2007	no nomination	
2008	no nomination	
2009	Ryan Pekarek	North Carolina State University
2010	Robin Bond	Mississippi State University
2011	George S. (Trey) Cutts, III	University of Georgia
2012	Josh Wilson	University of Arkansas
2013	Bob Cross	Clemson University

Outstanding Graduate Student Award (PhD)

James McCurdy

James D. McCurdy (Jay for short) was raised on a farm in Dyer, Tennessee by loving parents, Bob and Suzanne. Jay received his Bachelor's degree in Plant and Soil Sciences from the University of Tennessee, Martin, in 2006. He went on to attain a Master's degree in Plant Sciences at the University of Tennessee, Knoxville, in 2008, where his thesis evaluated herbicide efficacy and physiology of mesotrione in turfgrass systems. After completing his Master's degree, Jay worked as a family farm employee and then as a turfgrass research superintendent in Hong Kong, China. Jay's work in China focused upon cultivar selection and best management practices for the Hong Kong Golf Club redesign.

Jay's pursuit of a PhD at Auburn University began in late 2009 under the direction of Dr. Scott McElroy. His dissertation evaluated legume inclusion within low maintenance turfgrass scenarios as a means of supplying supplemental nitrogen and improving pollinator habitat. Jay has also been active in herbicide efficacy evaluations, rate response screening for herbicide resistance, and genomic characterization of resistance mechanisms.

Jay's recognition for outstanding achievement includes: the A.L. Smith Agronomy & Soils Departmental Award and the Watson Fellowship presented by the Environmental Institute for Golf. During his career as a graduate student and private researcher, Jay has authored and co-authored more than ten peer reviewed publications. He has written more than twenty abstracts presented in three different languages. He has presented results at more than a dozen professional meetings and has actively engaged commodity and stakeholder groups at numerous extension events.

Jay and his wife Vicky reside in Starkville, Mississippi, where he continues his career as an Assistant Professor and Turfgrass Extension Specialist in the Department of Plant and Soil Sciences.

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

Year	Name	University
1998	Nilda Roma Burgos	University of Arkansas
1999	A. Stanley Culpepper	North Carolina State University
2000	Jason K. Norsworthy	University of Arkansas
2001	Matthew J. Fagerness	North Carolina State University
2002	William A. Bailey	North Carolina State University
2003	Shea W. Murdock	Oklahoma State University
2004	Eric Scherder	University of Arkansas
2005	Ian Burke	North Carolina State University
2006	Marcos J. Oliveria	Clemson University
2007	Wesley Everman	North Carolina State University
2008	Darrin Dodds	Mississippi State University
2009	Sarah Lancaster	Texas A & M University
2010	Tom Eubank	Mississippi State University
2011	Sanjeev Bangarwa	University of Arkansas
2012	Edinalvo (Edge) Camargo	Texas A&M University
2013	Kelly Barnett	University of Tennessee

Distinguished Service Award from Industry

Tom Holt

Tom Holt currently serves as Manager of Field Biology R&D for BASF Agricultural Products in Research Triangle Park, N.C. Tom obtained his Bachelor’s Degree with a major in zoology and Master’s Degree with a major in entomology at Texas Tech. His professional career began in 1974, serving as an R&D field biologist for Sandoz Crop Protection in the Pacific Northwest from 1974–78, in the Midwest from 1978–81 and in the Southeast from 1981–83. In 1983, Tom became a field R&D manager with various regional changes over an 11-year period. From 1986–94, he served as the Southern Regional Manager working out of Collierville, Tenn. He moved, as a delegate, to Basel, Switzerland, in 1994 and served as Director of Field biology for Europe, Eastern Europe and Africa. In 1996, he became the Global Director of the Sandoz biological business. Holt joined BASF in 1997 with the merger of Sandoz and Ciba. He has served as Director of Field Biology R&D for BASF from 2006-2013. Tom has served in several leadership roles in SWSS including President in 2010-2011.

Tom is a certified Franklin-Covey facilitator of “7-Habits of Highly Effective People” and “The Speed of Trust” and was named Distinguished Alumni from Texas Tech University and holds an Honorary American FFA Degree. He and his wife, Mary, are the proud parents of two sons, one daughter and nine grandchildren. His hobbies are fine furniture building and golf. He and his family attend and are active members of Colonial Baptist Church in Cary, NC. Tom plans to retire September 2 of this year after 40 years in the industry.

Distinguished Service Award from Academia

Dan Reynolds

Dr. Daniel B. Reynolds is a Professor of Weed Science and holds the G.B. Triplett Endowed Chair in Agronomy with Mississippi State University. He is a native of Jerome, Arkansas, and received a B.S. degree in Agricultural Science from the University of Arkansas at Monticello and his M.S. degree in Agronomy from the University of Arkansas at Fayetteville. He received a 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 Sciences with Mississippi State University. Currently his responsibilities include teaching, weed control research in corn, cotton, and soybean along with conservation tillage systems. 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 led 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 33 graduate students and has served on the committee of over 30 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 companies, and farm personnel.

Dan has been actively involved in weed science societies at the state, regional, and national levels. He has served as the President of the Southern Weed Science Society (SWSS) as well as on various committees of the Weed Science Society of America. In 1999 he received the SWSS Outstanding Young Weed Scientist Award, in 2003 he was the recipient of the SWSS Outstanding Educator Award, and in 2012 he was selected as the SWSS Weed Scientist of the Year. Additionally, Dan was selected by the Mississippi Agricultural Forestry Experiment Station as their 2012 Researcher of the Year.

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	Russell 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	Dow Elanco
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	--
2012	Robert Nichols	Cotton Incorporated
2012	David Shaw	Mississippi State University
2013	Renee Keese	BASF Company
2013	Donn Shilling	University of Georgia

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
2012	Daniel Reynolds	Mississippi State University
2013	Barry Brecke	University of Florida

Past Presidents of the Southern Weed Science Society

1948-49 C.A. Brown
1949-50 E.C. Tullis
1950-51 O.E. Sell
1951-52 G.M. Shear
1952-53 D.A. Hinkle
1953-54 W.B. Ennis, Jr.
1954-55 W.C. Shaw
1955-56 G.C. Klingman
1956-57 W.B. Albert
1957-58 E.G. Rogers
1958-59 R. Behrens
1959-60 V.S. Searcy
1960-61 R.A. Darrow
1961-62 W.K. Porter, Jr.
1962-63 J.T. Holstun, Jr.
1963-64 R.F. Richards
1964-65 R.E. Frans
1965-66 D.E. Wolf
1966-67 D.E. Davis
1967-68 R.A. Mann
1968-69 W.L. Lett, Jr.
1969-70 J.B. Baker
1970-71 D.D. Boatright
1971-72 J.R. Orsenigo
1972-73 T.J. Hernandez
1973-74 A.F. Wiese
1974-75 W.G. Westmoreland
1975-76 P.W. Santlemann
1976-77 A.J. Becon
1977-78 G.A. Buchanan
1978-79 C.G. Parris
1979-80 M.G. Merkle
1980-81 C.E. Moore
1981-82 J.B. Weber
1982-83 J.E. Gallagher
1983-84 C.G. McWhorter
1984-85 W.S. McIntire
1985-86 R.E. Talbert
1986-87 H.M. LeBaron
1987-88 R.L. Rogers
1988-89 L.B. Gillham
1989-90 L.R. Oliver
1990-91 J.R. Bone
1991-92 J.M. Chandler
1992-93 J.L. Barrentine
1993-94 A.D. Worsham
1994-95 P.A. Banks
1995-96 S.O. Duke
1996-97 B.D. Sims
1997-98 R.M. Hayes
1998-99 R.L. Ratliff
1999-00 D.S. Murray
2000-01 L.L. Whatley
2001-02 J.E. Street
2002-03 J.W. Wells
2003-04 W.W. Witt
2004-05 J.S. Harden
2005-06 D.R. Shaw
2006-07 J.A. Driver
2007-08 D.W. Monks
2008-09 A.M. Thurston
2009-10 D.B. Reynolds
2010-11 T.J. Holt
2011-12 B.J. Brecke
2012-13 T.C. Mueller

List of SWSS Committee Members
January 31, 2013 – January 31, 2014

100. SOUTHERN WEED SCIENCE SOCIETY OFFICERS AND EXECUTIVE BOARD

100a. OFFICERS
President – Steve Kelly- 2014
President Elect – Scott Senseman- 2015
Vice-President – Brad Minton- 2016
Secretary-Treasurer - Greg MacDonald 2014
Editor - Ted Webster 2014
Immediate Past President – Tom Mueller - 2014

100b. ADDITIONAL EXECUTIVE BOARD MEMBERS
Member-at-Large - Academia - Peter Dotray - 2014
Member-at-Large - Academia – Jason Bond - 2015
Member-at-Large - Industry - Drew Ellis - 2014
Member-at-Large- Industry – John Richburg - 2015
Representative to WSSA - Darrin Dodds - 2014

100c. EX-OFFICIO BOARD MEMBERS
Constitution and Operating Procedures – Carroll Johnson 2016
Business Manager - Phil Banks
Student Representative – Trevor Israel 2014
Web Master – David Kruger
Newsletter Editor - Bob Scott

101. SWSS ENDOWMENT FOUNDATION

101a. BOARD OF TRUSTEES - ELECTED
David Jordan President - 2014
Nilda Burgos - Secretary - 2015
Renee Keese - 2016
James Holloway - 2017
Brent Sellers – 2018

101b. BOARD OF TRUSTEES - EX-OFFICIO
Greg MacDonald (SWSS Secretary-Treasurer)
Brad Minton (SWSS Finance Committee Chair, VP)
Phil Banks (SWSS Business Manager)
Wiley C. Johnson (SWSS Constitution & Operating Proc. Committee Chair)
Trevor Israel (SWSS Student Representative)

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

Brad Minton - 2014	Jay Ferrell - 2014
Jason Bond - 2014	Randall Ratliff – 2014
Tom Mueller** 2014	Daniel Stephenson – 2014

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

102a. Distinguished Service Award Subcommittee

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

102b. Outstanding Young Weed Scientist Award Subcommittee

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

102c. SWSS Fellow

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

102d. Outstanding Educator Award Subcommittee

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

102e. Outstanding Graduate Student Award Subcommittee

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

103. COMPUTER APPLICATION COMMITTEE (STANDING)

Shawn Askew*	2014	Michael Cox	2014	Angela Post	2014

104. CONSTITUTION AND OPERATING PROCEDURES COMMITTEE (STANDING)

Wiley C. Johnson* 2016

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

Stanley Culpepper	2014	Brad Minton*	2015
Bruce Kirksey	2015	Scott Senseman	2014
Greg MacDonald	2014	Ted Webster (ex-officio)	

106. GRADUATE STUDENT ORGANIZATION

President – Trevor Israel (Tennessee)
Vice President – Blake Edwards (Miss. State)
Secretary – Matthew Elmore (Tennessee)
Weed Resistance and Technology Stewardship rep – Chase Samples (Miss. State)
Student Program Committee Rep – Alanna Blaine (Miss. State)
Endowment Committee rep – Michael Flessner (Auburn)

107. WEED RESISTANCE AND TECHNOLOGY STEWARDSHIP (ad hoc)

Jason Bond*	Hubert Menne
Peter Dotray	Jason Norsworthy
Chase Samples (2014)	Eric Palmer
Tom Eubank	Hunter Perry
Jim Griffin	Andrew Price
Griff Griffith	Eric Prostko
Andy Kendig	Larry Steckel
Ramon Leon	Daniel Stephenson

108. HISTORICAL COMMITTEE (STANDING)

William Witt* 2016

109. LEGISLATIVE AND REGULATORY COMMITTEE (STANDING)

Bob Nichols* 2016 Lee Van Wychen Angela Post 2014

110. LOCAL ARRANGEMENTS COMMITTEE - 2014 MEETING (STANDING)

Scott McElroy * 2014 Joyce Tredaway Ducar 2014
Larry Newsome 2015

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

Tom Mueller	2018	Barry Brecke*	2017	Tom Holt	2016
Dan Reynolds	2015	Ann Thurston	2014		

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

C. Yeomans*	2014	G. Schwarzlose	2019	T. Grey	2015
J. Norsworthy	2016	M. Edwards	2017	G. Oliver	2018
P. Banks - Business Mgr. (Ex-officio)				Eric Webster	2020

113. NOMINATING COMMITTEE (STANDING) - *Shall be composed of the Past President as Chair and the Board of Directors as members who provide input and help solicit nominees.*

Tom Mueller* 2014

114. PROGRAM COMMITTEE - 2014 MEETING (STANDING)

Scott Senseman - 2014

115. PROGRAM COMMITTEE - 2015 MEETING (STANDING)

Brad Minton – 2015

116. RESEARCH COMMITTEE (STANDING)

Brad Minton* - 2015

Alabama – Joyce Tredway Ducar	North Carolina – Wes Everman
Arkansas – Bob Scott	Oklahoma – Todd Baughmann
Florida – Ramon Leon	South Carolina – Mike Marshall
Georgia – Eric Prostko	Tennessee – Larry Steckel
Louisiana – Donnie Miller	Texas – Peter Dotray
Mississippi – John Byrd	Virginia – Shawn Askew
Missouri – Open	

117. RESOLUTIONS AND NECROLOGY COMMITTEE (STANDING)

David Black*	2016	Peter Dittmar	2016	Larry Walton	2016

118. SOUTHERN WEED CONTEST COMMITTEE (STANDING)

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

119. STUDENT PROGRAM COMMITTEE (STANDING)

Hunter Perry*, 2014	Drew Ellis**, 2015	Matt Goddard, 2016

120. WEED IDENTIFICATION COMMITTEE (STANDING)

Angela Post	2014	Katelyn Venner 2014

121. SUSTAINING MEMBERSHIP COMMITTEE (STANDING)

Cheryl Dunne	2015	Bruce Kirksey*	2015	Daniel Stephenson	2015
Hunter Perry	2015	Trey Koger	2016		

122. CONTINUING EDUCATION UNITS COMMITTEE (SPECIAL)

Tim Adcock	2016	Matt Matocha	2016
Shawn Askew	2016	Pat McCullough	2016
Todd Baughmann	2016	Scott McElroy	2016
John Byrd	2016	Ken Muzyk	2016
Alan Estes	2016	Bob Scott	2016
Travis Gannon	2016	Ron Strahan	2016
Mike Harrell	2016	Bobby Walls*	2016

123. MEMBERSHIP COMMITTEE (SPECIAL)

Chad Brommer*	2014	Cecil Yancy	2015

Minutes of SWSS Executive Board Meeting
Sunday, January 27, 2013
Royal Sonesta Hotel, Champions III Room
7:00 pm to 9:00 pm

Sunday, January 27, 2013. Tom Mueller called meeting to order at 7:10 pm, then made introductions.

Attending: Tom Mueller-President, Eric Palmer - Member at Large Industry, Darrin Dodds – WSSA Rep, John Byrd – Constitution and By Laws, Greg MacDonald – Secretary/Treasurer, Steve Kelly – Program Chair, Kelly Barnett – Student Rep, Larry Steckel - Member at Large Academia, Drew Ellis - Member at Large Industry, Barry Brecke – Past President, Scott Senseman – Vice President, Tony White - WebMaster, Gary Schwarlose – Local Arrangements, Phil Banks – Business Manager, Lee VanWychen – Director of Science Policy, Jason Bond – newly elected Member at Large - Academia.

Absent - Peter Dotray - Member at Large Academia.

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

Greg MacDonald presented the minutes from the board of directors meeting from July 2-3, 2012 and asked if there were any comments. No changes necessary - Larry Steckel moved, Drew Ellis second. MOTION PASSED – UNANIMOUSLY.

Gary Schwarlose – chair of local arrangements had the following report:

1) everything set and good with hotel so far
2) poster boards will arrive at 8:00am, so presenters will not be able to set up until 9:30
3) projectors are being brought in and covered by moderators – but Gary stated they have extras in case of blown bulb or other problems
4) registration will be in the pre-function area

Kelly Barnett asked for a flip chart for the guest speaker at the graduate student symposium. This person is going to discuss the 7 habits of highly effective people and will used to help engage the audience.

Phil Banks stated the hotel will provide a sandwich line for lunch, as the hotel restaurant cannot accommodate that many parties. The hotel will also provide a continental breakfast in the morning. Both lunch and breakfast are not free and members must pay for own meals.

Mueller briefly discussed the quiz bowl setup – will be in the same generally area, but will need less equipment for this year's event. He has asked via email for pictures/slides/powerpoints of weed science 'things' to help with the contest.

Shawn Askew will have a table near the registration desk for presentations (not turned in via the website) to be picked up by moderators. Although Steve Kelly stated 92% of presentations have been turned in thus far, so not sure how long Shawn will be set up.

There will also be a table for CEU sign up near the registration area.

Lee VanWychen – provided a written report (see below), summarized the high points. He will also provide a report during the general session on Monday. Here is a brief overview of items discussed:

- Federal grants pushed by CAST – new group PCAST
- EPA ruling to plant Arundo donax and Pennisetum
- Spent a lot of time on plans for committee activities
    - Jill S. stepping down as subject matter expert, applications due very soon
    - Thinking about a similar position with USDA – maybe a sabbatical?
    - APHIS PPQ – program was gutted, organization changes within the organization
    - Need to refill Program Leader for Weed Science – death of John Lydon

2013 Director of Science Policy Report
Southern Weed Science Society: 2013, Houston, TX

Lee VanWychen

Summary of Activities

1. Generated support for USDA research funding through competitive grants (AFRI) and formula funds (Hatch, Smith-Lever) as well as integrated programs (Regional IPM): met with House and Senate committee staff and wrote coalition letters on behalf of the National and Regional Weed Science Societies. FY 2013 budget is in limbo and a continuing resolution based on FY 2012 may fund the entire FY 2013. The current funding for FY 2013 is funded through March of 2013.
   a. President's Council of Advisors for Science and Technology (PCAST) recommended that the U.S. increase its investment in agricultural research by a total of $700 million per year:
      i. $180 million for new graduate and post-doctoral fellowships;
      ii. $235 million for new competitively funded research at USDA AFRI;
      iii. $130 million for basic research at NSF; and
      iv. $150 million for new public-private institutes.
   b. Top challenges they listed for 21st century agriculture:
      i. Managing new pests, pathogens, and invasive plants.
      ii. Increasing the efficiency of water use.
      iii. Reducing the environmental footprint of agriculture.
      iv. Growing food in a changing climate.
      v. Managing the production of bioenergy.
      vi. Producing safe and nutritious food.
      vii. Assisting with global food security and maintaining abundant yields.
      viii.

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

3. Worked with interested coalitions to get support in both the House and Senate for the NPDES legislative fix bill, H.R. 872 and S. 3605. However, legislation remains blocked by Sen. Boxer (CA). Submitted letters of support on behalf of the National and Regional Weed Science Societies. New legislation will have to be reintroduced in the 113th Congress.

4. Generated support for the Pesticide Safety Education Program (PSEP) through a technical paper, and a joint press release with entomology and plant pathology. Currently participating in a national stakeholder group to find more permanent funding mechanisms at the federal and state level for PSEP.

5. Generated support for Army Corps of Engineers Aquatic Plant Control Research Program (APCRP) and sent letters to House and Senate Energy and Water appropriations committee members. FY 2013 funding in limbo again for APCRP. Senate has proposed $4 million, but House and President proposed $0. Senate support from Schumer (NY), Leahy (VT) and Cochran (MS) will be key again. I will need to send another letter to House and Senate appropriators before the end of March.

6. Coordinated and co-organized support for National Invasive Species Awareness Week activities which occurred Feb. 26 to March 3, 2012. Planning for NISAW 2013 is in the final stages. WSSA is hosting a presentation on Capitol Hill on Mar. 4, 2013 regarding invasive plants and biofuels. We are also working with other NGO's to introduce a Congressional resolution in the House and Senate supporting NISAW.

7. Supported Public Awareness Committee activities and responded to press inquiries. Recent headlines include six news releases on pesticide stewardship as well as the following:
    a. Three Leading Scientific Societies take an Objective Look at the Issues Associated with "Least Toxic Pesticides" Applied as a "Last Resort".
    b. Annual Meetings of Weed Science Societies to Highlight Latest Developments in Research and Management of Weeds and Invasive Plants.
    c. Decades Old Weed Seeds Trigger New Outbreak of Devastating Plant Parasite.

8. Continued educating Federal agency and NGO stakeholders on herbicide resistance management. Watched and listened for any legislation that would attempt to regulate herbicide resistance or restrict the interstate movement of herbicides due to resistance issues.

9. Helped plan and coordinate 2012 EPA Herbicide Resistance Education Tour on the Delmarva Peninsula in August. The tour report is on the WSSA website.

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

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

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

2013 Plan for Committee Activities

- Discuss weed science priorities with NIFA Director, Sonny Ramaswamy and generate support for USDA to fund a $10 million CAP grant for weed resistance management.
- Investigate the "fine print" of provisions that get incorporated in the 2013 Farm Bill.
- Investigate FY 2014 federal budget proposal for programs affecting weeds and invasive plants
- Support funding for the Aquatic Plant Control Research Program
- Monitor any new Renewable Fuel Standard proposals that try to add invasive plants as biofuels.
- Continue support for an NPDES Fix bill in the 113th Congress.
- Advertise and hire a new EPA Subject Matter Expert (SME) to replace Jill Schroeder.
- Explore the possibility of establishing a similar SME position within USDA

- Engage in formal discussions with USDA-ARS leadership on the importance of refilling John Lydon's position of National Program Leader for Weed Science.
- Work with new APHIS PPQ leadership to reestablish federal funding for noxious weed control and eradication. The witchweed eradication program is the only funding that has survived.
- Hold a successful National Invasive Species Awareness Week (NISAW)

Submitted via email from Phil Banks:

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

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

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

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

Submitted by Phil Banks, Business Manager

Summary of Financial Status

The society has total assets of $338,773.61, all earning very low interest but not showing any loss. The liabilities consist solely of the SWSS contest fund, which is $348.59 and will be depleted this year. Overall total net worth is therefore $338,425.02. This continues to be a substantial increase from previous years. The distribution of funds is as follows: Merrill Lynch fixed account - $111,528.96 (very low interest and actually a net zero for return on investment); Money Market - $115,785.30; SWSS Checking - $77,250.74; Wells Fargo Savings - $34,208.61.

The society showed cash inflows from June 1, 2012 to January 22, 2013 of $92,069.94 primarily from annual meeting registration, meeting support from donations and member dues. The society also showed income from sales of books (~$6,000), but the DVD sales are slow at this point in time. Gary Schwarlose asked if the books are advertised on extension sites – answer was yes. Cash outflows during the same time period were $40,450.78, primarily from annual meeting expenses, managerial fees, and director of science policy. Overall the society showed a net gain of $51,619.16 during this time frame.
Phil would like to discuss the funds with Merrill Lynch, as they are so conservative that we are essentially making no money with the fee they charge.

Program update provided by Program Chair, Steve Kelly. However, President Tom Mueller also provided this update on January 17, 2013 to the general membership:

"Program Update: We are pleased to announce that the Texas Commissioner of Agriculture, Todd Staples, will be the keynote speaker at the general session. Commissioner Staples has championed issues that directly impact Texas agriculture such as reduced water for agriculture through the WaterSmart program, encouraging water conservation by all citizens. The TDA also encourages the selection of Texas commodities through the GO TEXAN program, and also supports improved child nutrition. We are pleased to have Commissioner Staples as our keynote speaker and look forward to hearing his outlook on agriculture.

General Session - Legends Ballroom IV, 1:30 PM - 3:00 PM
1:30 PM Welcome & announcements, Steve Kelly
1:40 Presidential Address, Tom Mueller
2:00 Keynote Address, Commissioner Todd Staples, Texas Department of Agriculture
2:40 Director of Science Policy update, Lee Van Wychen
3:00 Adjourn

Reminder about dates:
Deadline for presentation submission - January 23, 2013
Deadline for abstract submission - January 25, 2013

Change in quiz bowl format.
The SWSS Quiz bowl has previously used a "scholar's bowl " format. I will be changing this up slightly and moving to a "trivia night" format. This will allow more flexibility in student participation, but still allow for a good time of fellowship. Please send me your images for inclusion as questions if you wish. Please send to tmueller@utk.edu "

At the board meeting Steve Kelly stated there were 91 students registered and 301 preregistered. There were 10 spouses registered and this was lower than last year. He also mentioned some USDA folks, including Editor Ted Webster, were denied travel to the meeting.

Regarding the program, there were 274 titles submitted but 3 dropped for a current total of 271. Of these there are 174 oral presentations and 101 posters, with 16 Masters and 6 PhD students in the oral presentation contest. The number of students in the poster contest was not known at this time. There are 294 total authors and an amazing 92% submission of presentations and also abstracts. As mentioned previously, Shawn Askew will be there tomorrow for one day to collect remaining presentations; all others must go directly to moderator of the particular session. Steve has been unable to touch base with the forestry presenters – asked if folks can help with that section. Steve also reiterated that the Texas Commissioner of Agriculture will be at the general session.

Once again there was discussion on whether a student could participate in both poster and oral at same time – it has not been allowed in the past and it was decided not to allow for logistical reasons of judging. Over the past several years there has been a need to delineate between MS or PhD on the website during the submission process and that the program chair can have access to help plan the program and assist with contest judging. Steve Kelly and webmaster Tony White said they would discuss this issue with WSSA webmaster David Kruger. President Mueller suggested that the student judging committee have overlapping terms to maintain continuity.

President Mueller asked for suggestion for a slate of candidates for elections this coming fall. The positions are vice president - academia, endowment trustee, member at large for industry and academia, secretary/treasurer, and WSSA representative.

Election results from this year are as follows:
Vice president – Brad Minton
Member at Large – Academia – Jason Bond; replacing Larry Steckel
Member at Large – Industry – John Richburg; replacing Eric Palmer
Endowment Trustee – Brent Sellers; replacing John Byrd
Carroll Johnson will replace John Byrd as constitution and bylaws chair

Old business – grad student report by Kelly Barnett – stated there will be a substitute speaker for the graduate student symposium and that Trevor Israel from University of Tennessee will be the new rep. Trevor will bring the issue of bringing both the rep and the vice rep to the summer meeting.

Darrin Dodds - WSSA report: The Weed Science Society of America will be going to Baltimore in 2013, Vancouver in 2014, Lexington in 2015, Puerto Rico in 2016, and Tucson in 2017 as annual meeting sites. Scott Senseman posed the issue of having a joint meeting with WSSA in Puerto Rico and asked why SWSS couldn't consider a joint meeting again. There was some discussion and Darrin Dodds said he told WSSA that SWSS wasn't interested at the WSSA summer BOD meeting. Steve Kelly and Tom Mueller will revisit at WSSA during the presidents breakfast at WSSA next week about the possibility of a joint meeting in 2016 at Puerto Rico. Phil Banks will also check with Joyce Lancaster to see if logistically it would work with the hotel in Puerto Rico.

There was a motion to adjourn at 8:30pm by Scott Senseman, Steckel seconded. MOTION PASSED – UNANIMOUSLY.

SWSS Executive Board Meeting
Monday, January 28, 2013
Royal Sonesta Hotel, Founders Ballroom IV
11:00 am to 12:00 pm

Monday, January 28, 2017. Tom Mueller called meeting to order at 11:01am, then made introductions.
Attending: Tom Mueller-President, Eric Palmer - Member at Large Industry, Darrin Dodds – WSSA Rep, John Byrd – Constitution and By Laws, Greg MacDonald – Secretary/Treasurer, Steve Kelly – Program Chair, Kelly Barnett – Student Rep, Larry Steckel - Member at Large Academia, Drew Ellis - Member at Large Industry, Barry Brecke – Past President, Scott Senseman – Vice President, Tony White - WebMaster, Jason Bond – incoming Member at Large Academia, Brad Minton – incoming Vice President, John Richburg – incoming Member at Large Industry, Tom Eubanks – Weed Contest Committee Chair.

Tom Mueller made suggestions for candidates for the various positions and asked the board for suggestions; he also stated he would take an email of candidates at a later date.

Jason Bond is the incoming chair of the Herbicide Resistance Committee. He asked the status of the committee as a standing committee. The previous BOD meeting minutes stated that John Byrd would help develop the MOP's with input from the current ad hoc Herbicide Resistance Committee. Larry Steckel said he patterned the function of the committee on the WSSA Herbicide Resistance Committee and would send this to Carroll Johnson for finalizing wording for insertion into the MOP's

Tom Eubanks, Chair of the Weed Contest Committee, provided a report. Tom Mueller prefaced his report stating that the responsibility of soliciting funds for the contest was longer part of the chairperson's duties. As such Tom Eubanks asked the BOD for suggestions as to how to fund the contest, including whether or not the contest would receive monies from the BOD. It was mentioned that the endowment foundation would provide $2,500 per annum to the contest fund. Tom Eubanks also mentioned that the award structure for the contest winner would remain the same. John Byrd pointed out that the donations to the endowment fund is not as good as it could be and asked members of the BOD to contribute and ask the membership to do the same.

Greg MacDonald asked if there was an archive of various letters of support written by the presidents of the society. The answer was no. Greg MacDonald will send an email to the past 3 presidents asking for brief details of supporting letters (to whom/what cause the support was for and the date).
Tom Mueller did a straw poll of which BOD members would be interested or not in a joint meeting with WSSA in Puerto Rico in 2016. There were many more for than against, so Darrin Dodds will discuss at the WSSA BOD meeting next week in Baltimore and communicate with incoming president Steve Kelly at the WSSA meeting.

Tom Mueller went through items for the business meeting and who would be presenting. He then asked each of the BOD members to provide comment on anything within the society. To summarize, the possibility of a joint meeting with WSSA was a positive for many, our webmaster Tony White asked for any improvements to the website, and Steve Kelly asked for comments on on-line program submission. There was a motion to adjourn the meeting at 11:40am by Scott Senseman, seconded by Larry Steckel. MOTION PASSED – UNANIMOUSLY.

AGENDA

Sunday Evening - 7:00 PM Champions III

7:00 pm Introductions and approval of agenda – Mueller

Secretary's Report – MacDonald

Local Arrangements report - Schwarzlose

Director of Science Policy report – Van Wychen

Financial overview and report – Banks

8:00 pm Break

8:15 pm 2013 Program update – Kelly

Discussion of candidates for elections – Mueller

Old Business – BOD

New Business – Mueller

Monday Morning – 11:00 AM Founders Ballroom IV

11:00 am Recap and review from Sunday PM – Mueller

SWSS field contest – Mueller, Eubank

Old Business and New Business – Mueller

11:45 am Adjourn meeting – Mueller

Minutes – January 28, 2013
SWSS Annual Business Meeting
Royal Sonesta Hotel, Houston, TX

The annual business meeting was called to order by President Mueller. Secretary Treasurer MacDonald was asked to read the minutes and provide a treasurer's report. Minutes are included in the 2012 proceedings posted on the website and no changes were noted. Larry Steckel motioned to accept, Scott Senseman seconded. MOTION PASSED – UNANIMOUSLY. The treasurer's report reflected those numbers included in the SWSS BOD January 28, 2013 meeting. Below is a highlight of what was covered:

The society has total assets of $338,773.61, all earning very low interest but not showing any loss. The liabilities consist solely of the SWSS contest fund, which is $348.59 and will be depleted this year. Overall total net worth is therefore $338,425.02. This continues to be a substantial increase from previous years. The distribution of funds is as follows: Merrill Lynch fixed account - $111,528.96 (very low interest and actually a net zero for return on investment); Money Market - $115,785.30; SWSS Checking - $77,250.74; Wells Fargo Savings (conservative bond fund, earning 2.5%) - $34,208.61.

The society showed cash inflows from June 1, 2012 to January 22, 2013 of $92,069.94 primarily from annual meeting registration, meeting support from donations and member dues. The society also showed income from sales of books (~$6,000). Overall the society showed a net gain of $51,619.16 during this time frame.

Endowment fund is also in very good shape financially with total assets of $372,588.72. A little over $100,000 is available for use. The endowment committee is looking into several options for utilizing useable assets for educational opportunities for graduate students. The golf tournament continues to be a valuable contributor to the endowment foundation and this year there was over $4,500 from the players and donations from Bayer Crop Science, Bayer BioScience, BASF, Dow AgroSciences and Gylling Data Management. Barry Brecke motion to accept, Tim Grey seconded. MOTION PASSED – UNANIMOUSLY.

Tim Grey provided a site selection report, indicating the 2014 meeting would be held in Birmingham, AL and the 2015 meeting in Savannah, GA. Tim will be rotating off and Jason Norsworthy will be chair for the 2016 site selection committee. Then Tom Mueller asked membership about the possibility of a joint meeting with WSSA in Puerto Rico in 2016, the results almost entirely yes.

Matt Goddard provided an update on the student program. There are 59 students competing presenting oral presentations and 25 posters given by students. For the oral presentations there are 34 total papers – 21 Masters, 13 PhD and for the posters - 14 Masters and 11 PhD. There are also 40 judges, with 5 alternates to help judge.

Steve Kelly provided an update of the program, which was similar to the report for the BOD.

David Black provided the necrology report. Ray Cooper, Mark Boyles, Karen DeFelice, Craig Collins, Richard Albridge, and Marshall McClamary passed away this past year or recently within 2013. President Mueller will write a letter of condolence to each of the families on behave of SWSS.
Tom Eubanks provided a report of the weed contest. He stated it was a huge success held at the University of Arkansas. There were 11 Universities participating, with 51 students, including 12 undergraduate students. BASF will host this year on Aug 7, 2013 in RTP Raleigh, NC and the society is looking for a host for the 2014 contest.

Darrin Dodds – WSSA rep – same report as BOD meeting

Endowment – given by President Mueller for Stanley Culpepper, Chair-Endowment Committee

1 – new initiative enrichment scholarship – week-long visit with participating industry/faculty
2 – covering student contest – ~~~$2,500
3 – painting by Charles Bryson at registration
4 – support the endowment through contributions

Nominating report – given by Tom Mueller earlier, same a BOD report.

Motion to adjourn at 5:19pm by John Byrd, seconded by Barry Brecke. MOTION PASSED – UNANIMOUSLY.

SWSS Executive Board Meeting

Thursday, January 31, 2013
Royal Sonesta Hotel, Club Board Room
7:00 am to 10:00 am

Attending: Steve Kelly - President, John Richburg - Member at Large Industry, Darrin Dodds – WSSA Rep, Greg MacDonald – Secretary/Treasurer, Steve Kelly – President, Jason Bond - Member at Large Academia, Drew Ellis - Member at Large Industry, Scott Senseman – Program Chair, Brad Minton – Vice President, Tony White - WebMaster, Joyce Ducar – Local Arrangements-Birmingham, Phil Banks – Business Manager, Matt Goddard – Student Committee Chair, Trevor Israel Graduate Student Representative.
Absent – Tom Mueller – Past President, Peter Dotray - Member at Large Academia, Carroll Johnson – Constitution and By Laws, Proceedings Editor – Ted Webster (both Carroll and Ted unable to travel due to USDA travel restrictions).

Trevor Israel is the Graduate Student Representative and Blake Edwards is the newly elected vice president.

Thursday, January 31, 2013. Steve Kelly called meeting to order at 7:23 am, then made introductions. Secretary report was provided by MacDonald and stated he would provide an email of the up to date minutes very soon.

Joyce Ducar is the local chair for the Birmingham Annual Meeting in 2014. Summer board meeting dates was asked by Phil Banks. It was agreed that tentative dates are July 11-12, 2013. Schedule would be a half day (afternoon) and then the next morning for half day.

A review of the annual meeting was given by Banks. He stated there was 310 preregistered, 52 walk-ins that included 40 regular members, 7 students and 5-one day registrations. There were also 2 additional spouses. Phil stated there were fewer problems this year than in years past and also stated that Gary Schwarlose did a great job. There were approximately 200 attendees at the banquet. There were a few complaints that the screens were set a little low and difficult to see the whole slide. Scott Senseman asked if the local arrangements got any praise for their help. It was suggested that the president could send a letter of thanks.

Drew Ellis asked about return and potential revenue/loss for the meeting. Phil stated he didn't know the final numbers but the society would be fine and not lose money on the meeting. The endowment foundation collected about $1000 from individual donations and the golf tournament generated about $4,500 but this will be somewhat less after expenses. Overall the endowment will likely garner over $5,000. The painting by Charles Bryson sold for $250, which also will be donated to the endowment. Jason Bond asked about sponsorship at the meeting and Phil stated about $27,000 was donated by corporate sponsors.

Finance committee report: The committee met Sunday evening – Scott Senseman, Stanley Culpepper, Greg MacDonald, and Phil Banks attending. The concern has been with the $111,000+ Merrill Lynch account that is not gaining or possibly losing money. Phil stated there are several options with what to do with those funds. These included:

1. Nothing – leave it alone but will continue to have no gain or lose money
2. Place in CDs in other areas besides Merrill Lynch (to get better returns)
3. Mutual funds
4. Talk with an investor with Royal Bank – current managing western weed with very good returns, charges about 1% to manage.

Scott Senseman will send out an email to BOD to ask for input. Phil would contact the person from Royal Bank and ask him to provide his plan for managing these funds. Phil mentioned he could set up a conference call. Steve Kelly asked if we had any CD's currently, Phil stated no they have all matured.

Phil suggested a conference call on a quarterly basis, potentially March. We would potentially discuss financial matters, including the investor at that time.

Student contest – Matt Goddard is rotating off and Hunter Perry is incoming chair. Matt will continue to help, along with other past chairs including Drew Ellis. Matt stated he is looking to improve web site submission to reduce doubling up and having to contact folks individually – this was discussed in the earlier Sunday BOD meeting. Matt said he had some difficulty getting the last few judges. There was a suggestion to have a check box on the registration if that individual would be willing to judge. Matt also stated they he would work with his committee, past judges, major advisors and the graduate student rep to provide improvement on the judges score sheet, including reordering and streamlining of some of the categories. Darrin Dodds said he would also help in this area. Once the changes have been made, the board will approve and this change in the MOP's. Matt will provide a draft at the summer board meeting.

Steve Kelly suggested we have past chair, chair and vice chair of this committee. Currently there is no vice chair, and Matt will work with Hunter Perry to designate a vice chair by the summer BOD meeting. So far the process has been a smooth transition from one chair to the next, but need to make sure this continues.

Matt also stated there were problems with obtaining the abstracts from the web site for collation for the judges. After discussion it was concluded that the chair (Matt) did not have access to the program to allow for easy pulling off of abstracts. Matt and committee, along with program chair Senseman will work with Tony White and WSSA webmaster David Kruger to help rectify this issue.

The contest currently separates talks and awards by degree program. This was the format again this year, but there were a few individuals that suggested having all degree program students competing together. However, the feeling of the BOD was to keep separate. Matt was also able to separate out presentations by discipline and this was also considered a positive by most members.

The question was asked why only first place (not first and second) was given in a couple sections. Matt stated this was driven by a fewer number of talks. Darrin Dodds asked about how it was determined, basically a percentage of total numbers in the pool of presentations. Tried to get around 15-20% of the total would be winners. Trevor suggested the moderators for the contest not be students.

There were student moderators at this meeting and the BOD was in favor of continuing this procedure. Another suggestion was to have a symposium or training of how to moderate and run a session.

The site selection committee is highly in favor of a joint meeting in 2016 with WSSA. Phil talked with Joyce Lancaster and has the following information: the meeting room space is adequate, and space to accommodate is also fine. WSSA/Allen meeting management would need to redo contract for rooms if approved by WSSA. The cost is $189/night at the Sheraton in San Juan, Puerto Rico and the resort fee of $20/night has been waived. The meeting is scheduled for the week of Feb 8th 2016. Some issues with the hotel could include the lack of committee meeting room space – may have to hold some committee meetings at other times.

President Kelly will go through committee assignments and check with folks who want to serve and also gather input from the BOD. President Kelly also asked for names of candidates for awards and BOD positions to Past-President Tom Mueller. One suggestion was to provide the outstanding educator a cash award – maybe an industry sponsor? Scott Senseman stated they we needed to make sure to have nominations for all awards.

Graduate Student rep Trevor Israel reported the symposium featuring speaker Tom Brazeale from Dale Carnegie Training was very good and received well. Trevor also provided the following information on graduate student committee chairs: Chase Samples – Mississippi State University for Herbicide Resistance Committee; Michael Flessner – Auburn University for Endowment Foundation; Alanna Blaine – Mississippi State University for Student Program Committee; Ally Shinkle - Mississippi State University for Secretary; and Blake Edwards - Mississippi State University as incoming vice chair. BASF sponsored the student luncheon with 80 attendees. Trevor also stated he will work with Ally to revise the MOP's.

Old Business – President Kelly discussed the endowment enrichment opportunity as developed by the Endowment Foundation. According to former Chair Stanley Culpepper, there will be 3 slots available for students this year and will target with summer for the week long opportunity. The foundation is asking for input the procedure and plans on choosing and awarding students this March. Students will be given $1500 for the week long experience and any additional expenses will be covered by the student. Sponsors will not be allowed to pay for any expenses. To date, 11 persons/institutions said they would be willing to sponsor. There is no delineation between MS and PhD at this time, and there was a question whether to restrict to SWSS members. The foundation would like to expand the program to 6-12 students per year. Scott Senseman asked about requirements to provide a report of their experience and maybe present this material as an oral presentation or poster at the SWSS annual meeting. In other business the endowment foundation will provide $2,500 for weed contest each year, regardless of expenditures.

New Business - Scott Senseman is thinking about professional development for young and old theme. He asked for suggestions for the program and also asked if there were monies for guest speakers. Phil Banks said SWSS has covered speakers in the past. Another suggestion was to look at getting a corporate sponsor for speakers, and possibly obtain a company person within their HR departments to provide a presentation (s).

There was a motion to adjourn by Scott Senseman, seconded by Darrin Dodds at 9:17am. MOTION PASSED – UNANIMOUSLY.

Synopsis of the 2014 SWSS General Session

Scott Senseman, President-Elect

The General Session opened with President-Elect Scott Senseman welcoming the group and introducing the speakers for the General Session. The first speaker was Mr. John McMillan, the Commissioner of Agriculture and Industries for the State of Alabama. He provided an overview of the state and agricultural issues. President Steve Kelly then provided a presidential address to the group and discussed the standing of SWSS as a society. Finally, Dr. Mitch Owen of Mitchen Incorporated, provided a presentation entitled "Catching a Swarm of One" that was centered around the work/life balance issues that all of us continue to face as demands, workload, and expectations seemingly encroach on personnel within our important discipline.

Outstanding Educator Award Committee Report 2014

Jason Ferrell, Chair

Committee Members:

Shea Murdock
Peter Ditmar
Steve Enloe
Stanley Culpepper
Eric Webster

Three individuals were nominated in the Fall 2013 for the SWSS OEA. Each nominee was evaluated based on the strength of their educational programs, considering their commitment to graduate education, classroom teaching, and/or extension. Leadership within their department and/or university was also considered as important criteria. Each member of the committee reviewed all packets and responded with a 1-3 ranking for each candidate.

After all votes were tallied, Dr. Scott Senseman was put forward as the winner of the 2014 OEA.

Nominating Committee Report 2014

Tom Mueller, Chair

<u>SWSS candidates for 2014 elections:</u>

Office to be filled	Candidates
Vice President	Bob Scott (U Ark) Peter Dotray (Texas Tech)
BOD- Industry rep	Cheryl Dunne (Syngenta) Vernon Langston (Dow)
BOD-Academia	Scott McElroy (Auburn) Tom Barber (U Ark)
Secretary-Treasurer	Daniel Stephenson (LSU) Andrew Price (ARS-Auburn)
WSSA Rep	Eric Palmer (Syngenta) Ramon Leon (U. Florida)
Endowment Trustee	Darrin Dodds (Miss State) Trey Koger (Syngenta)
Proceedings Editor	Nilda Burgos (U Ark) Tom Mueller (U Tenn)

Program Report 2014

Birmingham, AL
Hyatt Regency Wynfrey Hotel

Scott Senseman, Program Chair

The theme for the program this year was "Striving for Professionalism and Balance in a High Speed World". The General Session was highlighted by Dr. Mitch Owen who presented "Catching a Swarm of One". We also had symposia related to this topic by Ms. Stefani Mundy, however, weather conditions precluded her participation. We however continued with a Mr. Tom Holt from BASF who did a great job filling in for Stefani in presenting some items related to "7 Habits of Highly Effective People" and "The Speed of Trust". Mr. Holt also volunteered to speak at the Graduate Student Symposium on some of these subjects.

The program consisted of the following sections this year:

- Poster section
- General session
- Weed Management in Forestry
- Vegetation Management in Utilities, Railroads & Highway Rights of Way; Industrial Sites
- Educational aspects of Weed Science
- Student Contest Sections (I, II, and III)
- Weed Management in Agronomic Crops (I, II, III)
- Weed Management in Horticultural Crops
- Weed Management in Turf
- Symposia: Balancing Life and Career
- Weed Management in Pasture and Rangeland
- Graduate Student Symposium
- Physiological & Biological Aspects of Weed Management

There were 282 total presentations that included 98 posters and 184 oral presentations. The student contest oral presentation section contained 51 papers. This caused us to start the program at 7:30 to fit all of the papers in prior to the lunch break. There were 10 Ph.D. posters and 19 M.S. student posters included in the competition as well. The student posters were organized by Ph.D., M.S. and general membership to help make it more convenient for judges with the scoring.

One note for the next program chair, Dr. Brad Minton: The chairs for Weed Management in Forestry and Vegetation Management in Utilities, Railroads & Highway Rights of Way; Industrial Sites asked that those two sections not be concurrent next year since many of the same people are presenting in both sections. This caused a problem with attendance in both sections as people were moving back and forth during those sessions.

Although weather was a factor in the ultimate turnout and partially affected our program, the Program Committee did a great job along with the hotel staff to provide a great meeting. Thanks to them as well as our membership for providing great content this year.

Editor's Report for the 2013 Proceedings

Submitted by: Theodore M. Webster

Summary of Progress: The 2013 Proceedings of the Southern Weed Science Society contained 387 pages, including 274 abstracts (Houston, TX). By comparison, the 2012 Proceedings had 277 abstracts and 375 pages (Charleston, SC), the 2011 Proceedings had 342 abstracts and 515 pages (San Juan, Puerto Rico), 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 2013 Proceedings was not dedicated to anyone. The proceedings contained the Presidential Address, list of committees and their members, executive board minutes from the January and summer board meetings, committee reports (including reports from: Editor, Business Manager, Director of Science Policy, Endowment, and Necrology), 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.	87
Posters	101
Weed Management in Agronomic and Horticultural Crops	72
Weed Management in Turf	26
Weed Management – Pastures and Rangelands	7
Weed Management in Forestry	5
Vegetation Management In Utilities, Railroads & Highway Rights-Of-Way, and Industrial Sites	4
Physiological and Biological Aspects of Weed Control	7
Regulatory Aspects of Weed Science	4
Graduate Student Oral Paper Contest	37
Symposium: Off-Target Movement of Auxin Herbicides, a Summary of What We Know	11
Weed Survey (Most Common & Most Troublesome)	14
Registrants of 2013 Annual Meeting	13

Objectives for Next Year: Assist in the transition to the new Proceedings Editor.

Finances (if any) Requested: None.

Respectively submitted,
Theodore M. Webster, Editor

Business Manager's Report
for the 2014 SWSS Meeting
Birmingham, Alabama, January 27, 2014

Phil Banks, Business Manager

All tax forms and bills were paid on time during the past year. The attached financial statements show that SWSS is in good financial order and posted an increase in net worth ($19,292.89) during the last fiscal year (ended May 31, 2013). The Finance Committee and the Board agreed we should move the funds invested with Merrill Lynch to a more diversified fund with Royal Bank of Canada. This transfer was done at the end of March, 2013. As interest rates begin to slowly rise, we will start a laddered purchase of longer term CDs.

During the past year, Tony White resigned as Webmaster and we contracted with David Krueger of ApexWebstudio to take over as Webmaster and to create a new website. The progress on the site was slow due to turnover in Mr. Krueger's company but we were able to go live with the new site in mid-October (about 2 months later than planned). Overall, the new site is working well although there have been some behind the scenes problems that are still being worked out. The main problem involved no way for new members to register for the meeting. The Business Manager had to create a new file for each person in the online database. Over 90 new member files were created during the meeting preregistration period. There were also some problems with abstract submissions.

Preregistration for the Birmingham meeting has run smoothly and we have easily met our room block commitment with the Hyatt Regency Hotel. As of January 21, 2014, we have 222 regular members, 91 students, and 4 spouses/friends registered. I also handled the registration of the SWSS Golf Tournament (21 golfers). Industry support for this effort is strong and the number of golfers is much better than last year. It appears that the tournament will raise approximately $ 8000 for the Endowment Foundation. I have worked closely with Joyce Tredaway Ducar and Scott McElroy (Co-chairs of the local arrangements committee) as well as Scott Senseman, Program Chair. The posting and printing of the meeting program went smoothly and was done in a timely manner. Award plaques and the Awards Program were printed well ahead of the meeting (thanks to the timeliness of Tom Mueller).

At the Houston meeting in 2013, the Board of Directors agreed that SWSS should have a joint meeting with WSSA in 2016 in Puerto Rico. I have worked with Joyce Lancaster, WSSA Executive Secretary, and we have come to an agreement on how funding from the meeting will be shared and the arrangements have been made with the hotel to accommodate both groups. The rotation of the meeting site for 2017 should be in the western part of our region (Oklahoma, Texas, Arkansas, and Louisiana). I will poll the committee and start the search process in time to have a recommendation to the Board by the summer meeting.

Southern Weed Science Society Net Worth Summary as of 5/31/2013

Account	Balance	
ASSETS		
Cash and Bank Accounts		
Merrill Lynch	0	Moved to RBC Investments
Money Market	115,957.66	American Heritage National Bank
RBC Account	111,572.99	
SWSS Checking	41,058.90	American Heritage National Bank
Wells Fargo Savings	34,411.48	
TOTAL Cash and Bank Accounts	303,001.03	
TOTAL ASSETS	303,001.03	
LIABILITIES		
Other Liabilities		
Liability	348.59	For Weed contest
TOTAL Other Liabilities	348.59	
TOTAL LIABILITIES	348.59	
OVERALL TOTAL	302,652.44	
		Net change in assets
Total Assets on May 31, 2008	**242,242.37**	**-10,079.63**
Total Assets on May 31, 2009	**239,102.58**	**-3,139.79**
Total Assets on May 31, 2010	**247,056.17**	**7,953.59**
Total Assets on May 31, 2011	**264,386.91**	**17,330.74**
Total Assets on May 31, 2012	**283,708.14**	**19,321.23**
Total Assets on May 31, 2013	**303,001.03**	**19,292.89**

SWSS Cash Flow Report for fiscal year ending May 31, 2013

	6/1/2012- 5/31/2013	
Category		
INFLOWS		
Annual Meeting Registration	82,666.24	
Annual Meeting Support	27,876.95	
Div Income	732.5	
Endowment Funds Received	1,355.88	
Forest Plants Of The SE	1,735.29	
Golf Tournament	5,750.00	
Interest Inc	1,561.57	
Other Inc	45	
Renewal	2,196.48	Membership renewals
Royalty On Pubs	54.33	
Sustaining Member Dues	13,161.90	
Weed DVD	1,873.11	
Weeds Of Midwestern US & Canada	1,085.58	
Weeds Of The South	1,914.77	
TOTAL INFLOWS	**142,009.60**	
OUTFLOWS		
Account Fee	510.82	Investment fees
Annual Meeting Expense	63,447.58	
Awards	4,300.00	
Director Of Science Policy	10,802.00	
Endowment Funds Transferred	8,890.00	
Insurance	500	
Management Fee	23,000.00	
Merchant Acct.	4,134.38	For credit card
Newsletter	200	
Summer Board Meeting	1,611.95	
Supplies	333.7	
Tax Preparation	457.14	
Travel To Annual Meeting	793.02	
Travel To Summer Meeting	534.3	
Website Editor	2,500.00	
Website Host	970	
Weed Contest	3,178.13	
TOTAL OUTFLOWS	**126,163.02**	
OVERALL TOTAL	**15,846.58**	

Science Policy Report 2014
SWSS Meeting, Birmingham, Alabama

Lee Van Wychen, Director

11. Generated support for **USDA research, education and extension funding** through competitive grants (AFRI), formula funds (Hatch, Smith-Lever) as well as integrated programs (Regional IPM): met with House and Senate committee staff and wrote coalition letters on behalf of the National and Regional Weed Science Societies. FY 2014 budget numbers are very good compared to the continuing resolutions of the previous two years and last year's sequester. For details, see: http://wssa.net/wp-content/uploads/Jan-2014-DSP-Report.pdf
12. Participated in **Farm Bill** stakeholder meetings and advocated for the following provisions:
    a. Establishment of the Foundation for Food and Agricultural Research (FFAR) in the Senate version. FFAR would be a new nonprofit corporation designed to supplement USDA's basic and applied research activities. FFAR would provide up to $100 million in matching funds and would solicit and accept private donations to award grants or enter into agreements for collaborative public/private partnerships with scientists at USDA and in academia, non-profits, and the private sector.
    b. Strongly oppose the House provision that require matching funds for applied research and extension that is commodity or state specific.
    c. Support for the NPDES fix language in the House version.
    d. Support for reauthorization of the Specialty Crops Competitiveness Act.
    e. Support for conservation compliance in the Senate version, but only if exemptions are granted for herbicide resistance management.
13. Worked to get EPA to include **BMP's for managing high risk feedstocks**. The initial EPA rule approving *Arundo donax* and *Pennisetum purpureum* as biofuel feedstocks was delayed over a year and a half due to concerns WSSA and other natural areas stakeholders had. There are still many concerns about how EPA is implementing the rule. EPA is pushing a lot of the enforcement and 3rd party verification of the biofuel management plan permits on to APHIS. Neither agency has the money to conduct these reviews. EPA wrote the rule and APHIS opposed it, but it was still approved. Now APHIS is getting the short end of the stick.
14. Continued educating Federal agency and NGO stakeholders on **herbicide resistance management**, including coordination among WSSA, the Tri-Societies, Certified Crop Advisors, and the National Association of Independent Crop Consultants (NAICC). Watched for any legislation that would attempt to regulate herbicide resistance or restrict the interstate movement of herbicides due to resistance issues. A very successful herbicide resistance Stakeholder Conference was held in DC in Sept 2013. Recognition of the issues at highest levels of USDA (i.e. Deputy Secretary) and EPA (i.e. Director of OPP). Planning underway for 2nd Herbicide Resistance summit in Sept. 2014.
15. Worked with interested coalitions to get support in both the House and Senate for the **NPDES legislative fix bill** and submitted letters of support on behalf of the National and Regional Weed Science Societies. Our best hope is to get it included in the Farm Bill. Sen. Boxer (CA) is still adamantly opposed, but her rationale is flawed. Given the rumors surrounding EPA's draft rule that would greatly expand the scope of the Clean Water Act, it is more important than ever that we get Congress to clarify the jurisdictional boundaries between FIFRA and the Clean Water Act.
16. Generated support for the **Pesticide Safety Education Program (PSEP)** and have been participating in a national stakeholder group on behalf of WSSA. The mission of the stakeholder group is to find more permanent funding mechanisms at the federal and state level for PSEP. See www.psep.us
17. Generated support for Army Corps of Engineers (ACOE) **Aquatic Plant Control Research Program (APCRP)**. For the 3rd year in a row, funding was not requested by ACOE leadership. Support from Senator's Schumer (NY), Leahy (VT) and Cochran (MS) helped secure $4 million for FY 2014. We will likely be facing the same scenario again in FY 2015. Discussions were had with APMS leadership about transferring APCRP authority to USDA-ARS, but we decided the risks of completely losing the program was too great. APMS would like to see Lars Anderson's position refilled with USDA-ARS.
18. Submitted comments on behalf of WSSA regarding the Notices of Intent to prepare Environmental Impact Statements (EISs) for **2,4-D and dicamba resistant crops** under the National Environmental Policy Act (NEPA) issued by USDA-APHIS.
19. Coordinated and co-organized support for **National Invasive Species Awareness Week** (NISAW). However, due to the federal budget sequestration that happened two days before the start of NISAW, the Dept. of Interior

withdrew all National Invasive Species Council (NISC) funding for NISAW activities. Ggggrrrrrrr. However many state organized activities still occurred during the week as well as some events on Capitol Hill. On behalf of the Science Policy Committee, Jacob Barney presented his latest research to congressional and agency staff on Capitol Hill in a briefing titled "Invasive Weeds and Bioenergy Crops: Economic Boon or Environmental Disaster?"

20. Supported **Public Awareness Committee activities** and responded to press inquiries. Recent headlines include:
    a. Ornamentals Gone Wild: Weed Scientists Recommend Smart Shopping When Selecting New Flowers and Shrubs
    b. Cotton Growers Still Searching for Viable Solutions in Battle against Herbicide Resistance
    c. From Tsunamis to Turf Wars: Hot Topics Take Center Stage at Annual Meetings of Weed Science Societies
    d. WSSA Weed Control Spotlight: Hydroacoustics Technology Makes Waves in Weed Control
    e. National Stakeholder Team Creates Initiative to Strengthen U.S. Pesticide Safety Education
21. Stressed the importance to **USDA-ARS** leadership about hiring a new national program leader for weed science. I also coordinated with members of the National and Regional Weed Science Societies to help review and comment on USDA-ARS's 5 yr action plan for Crop Protection & Quarantine. Recent actions by ARS leadership leave me more puzzled and confused than ever about their commitment to weed science and their ability to carry out the mission of the Crop Protection and Quarantine program.
22. Submitted comments on behalf of WSSA to EPA for the FIFRA Science Advisory Panel (SAP) meeting regarding problem formulation phase **of risk assessment of pesticidal products based on RNA interference** (RNAi). *WSSA applauds EPA's decision to conduct this ASAP and to evaluate the latest science regarding the risk assessment process for this exciting new technology. Early development of the regulatory approach needed to appropriately assess human health and ecological risks will facilitate the timely approvals and commercialization of this needed new technology. Our greatest concern about RNAi technology is that its regulation will exceed the risks, and it will be excessive to the point of stifling innovation. The potential of the topical application of dsRNA to, in effect, reverse resistance to many of our existing herbicides including glyphosate and members of the ALS inhibitor herbicide group is urgently needed to maintain our highly productive cropping systems and to stop the increase in soil erosion we are seeing due to the increased use of tillage to control herbicide resistant weeds. From a risk assessment perspective, we have a technology that offers the promise of being active only on a specific pest species. This fact should dramatically change the conduct of risk assessments that we have done for current GE crops. If an RNAi product is active only on the target pest which we'll be able to demonstrate through sequence alone, then there is no hazard other than to the target pest. Because risk is the joint probability of hazard and exposure, there is no risk because there is no hazard to non-target organisms or other environmental resources. It is our hope that these characteristics can lead to regulatory approaches that are reasonable and predictable. While much needs to be defined, fulfilling the promise of this technology for pest management may well be dependent on the time and cost of the regulatory structure for both the topical and biotechnology applications. We urge EPA to continue to rely on the many precedents that have been established to demonstrate the safety of nucleic acids to humans and the environment.*
23. **GMO Labeling-** DRAFT STATEMENT: <u>The Compulsory Labeling of Plants and Plant Products Derived from Biotechnology</u>: *WSSA supports biotechnology as a means for improving plant health, food and feed safety, and sustainable gains in plant productivity. Biotechnology is a valuable tool to introduce functional traits into plants, which has resulted in multiple benefits, including yield increases, reduced inputs, and significant gains in soil conservation. Of particular interest to WSSA is the application of biotechnology to manage weeds and invasive plants. WSSA has long opposed regulating food, feed, and fiber products based solely on the particular technology that was used to create the varieties/cultivars. Thus, WSSA advocates regulating on the basis of the products derived and not the breeding process. Gene transfer to achieve herbicide, disease, and insect resistance, as well as nutrition, color, and taste, have a long history in plant hybridization and cytogenetics. These techniques are considered conventional in breeding, even though they constitute gene mobilization from both species and genera to recipient plants.*

    Currently there are several efforts to require labeling for products derived from plants produced using molecular genetic manipulation. These plants are referred to as genetically modified (GM) or genetically engineered (GE) organisms. It is imperative that any plant product entering our food supply is safe and does not negatively impact the environment. To date, no documented and reproducible studies have shown harm to human or animal health associated with GM crops. Current scientific evidence supports the conclusion that *approved GM plants pose no greater safety risk than traditionally developed plants. Thus, labeling foods as GM would be considered arbitrary and capricious, and would be confusing to consumers. Further, such labeling could reduce the availability and use of biotechnology for the management of weeds.*

Since their widespread introduction 20 years ago, GM crops have significantly enhanced food and fiber production. Mandatory labeling of food derived from GM plants would focus on regulation of a plant improvement process rather than on public and environmental safety and would be contrary to the data-based decision process of U.S. law. WSSA supports transparent science-based regulations that foster innovation, are environmentally sound, ensure food safety, and reinforce consumer confidence. Compulsory labeling of GM food could undermine this confidence and reduce the availability of valuable tools for managing crop losses caused by weeds.

Legislative and Regulatory Committee Report
Southern Weed Science Society (SWSS)
Birmingham, Alabama – January 29, 2014

Robert L. Nichols, Chair

Chairmanship:

Robert Nichols will serve as Chair in 2014, 2015, and 2016. The Committee thanks Donn Shilling, immediate past Chair, for his long and able service.

Membership:

Harold Coble has retired and will be missed for his personal qualities, his knowledge of the operations of federal agencies, and his devotion to advancing weed science.

Robert Nichols asked President Scott Senseman to add Jill Schroeder and Michael Barrett to the Committee. Drs. Schroeder and Barrett have served, or are now serving, respectively, as the Weed Science Society of America's (WSSA) liaison to the Environmental Protection Agency. President Senseman agreed.

Because of the nature of the Committee's business, members must be experienced in weed science and in engaging national issues. None the less, the committee must provide for the societies' future. It is important that the Committee bring on younger members and provide for continuity of our capacities. Robert Nichols will meet with President Senseman over the summer and identify additional, early-career society members with interest in national issues and government liaison, and invite them to Committee membership.

Special Session to Participate in ARS NP 304 Review:

The USDA Agricultural Research Service (ARS) scheduled a five-year stakeholder review of National Program (NP) 304, "Crop Production and Protection Program" on January 29, 2014. This NP comprises ARS's principal weed science research activities. Several of us have felt that ARS support for weed science has been under-resourced for many years. The date of the review fell during the annual meeting of the SWSS. Robert Nichols conferred with past Committee Chair Shilling, Donn Science Policy Director Lee van Wychen, and then-President, Steve Kelly about holding a special session of the Legislative and Regulatory Committee meeting for the purpose of participating in the NP 304 review. The result was that President Kelly and then-Program Chair, now President Senseman assisted the Committee by setting up a meeting room with audio-visual connections to support the Committee's participation in the 6-hour webinar. Drs. Kelly, Shilling, van Wychen, Schroeder, and Nichols participated for the whole review. Several ARS weed scientists, who were required to observe the review, were guests of the Committee for the webinar.

Immediately following the webinar, the Committee discussed the review and concluded that NP was predominantly an entomology program. We do not criticize the entomology mission; rather our concern is that weed science is under-represented in NP 304. The Committee drafted a letter intended for submission to USDA and forwarded it to the SWSS Executive Committee for consideration. The letter was approved by the SWSS Executive Committee and forwarded it to the WSSA Science Policy Committee. The Science Policy Committee forwarded it to the WSSA Executive Committee which revised and expanded it. The result is that WSSA, the Aquatic Plant Management Society, and the regional weed science societies jointly sent a letter to USDA's Office of National Programs recommending addition resources for weed science. As follows, the letter is reproduced in its entirety.

Joint Letter of the Weed Science Societies to the USDA-ARS National Program

February 25, 2014

Dr. Rosalind James
USDA, ARS, Office of National Programs
National Program Leader, Weed Science
5601 Sunnyside Ave.
Beltsville, MD, 20705-5139

Dear Dr. James:

The weed science community, including the Weed Science Society of America (WSSA), appreciates being invited to participate in the NP304 Crop Production and Protection Program stakeholder webinar on January 29, 2014, and to provide subsequent comments on the next five-year research priorities for the program. As the external review of the previous five years of the NP304 revealed, the USDA-ARS weed scientists involved in this program are highly productive and are conducting important and cutting edge research. However, it was also noted in the review and again during the webinar that there is an imbalance in the investment of resources between entomology and weed science programs within the NP304 program. Weeds and invasive plants are the most impactful and economically damaging pest group for managed and natural ecosystems. Seventy percent of the pesticides applied in the United States are herbicides, representing an annual cost of $7 billion for US farmers and land managers. Without effective weed management, estimates of crop yield losses range from 20 to 40%, and many horticultural crops would be a total loss. While herbicide treatments return more than $3.50 for every dollar spent, it is widely recognized that weed management systems in both agricultural and natural systems need be more diversified to be sustainable, as well as to preserve the utility of our current herbicides. Therefore, WSSA, the Aquatic Plant Management Society (APMS), and all four regional Weed Science Societies strongly urge USDA-ARS to direct more personnel and financial resources within NP304 to address critical weed science needs facing the country.

WSSA periodically tasks its Research and Competitive Grants Committee with assessing the research and funding priorities for our discipline. The following three priority areas for weed science research outline some of our recommendations to USDA-ARS for weed research priorities in the next five-year NP304 Project Plan.

1. Weed systematics, genetics, biology, physiology and ecology – factors related to weed species ability to reproduce, optimize genetic variability, and interact with other organisms. This includes the evolutionary mechanisms of multiple herbicide resistance in weeds.

2. Weed environment and climate change – factors related to the weed environment, including mechanisms of dispersal, dynamics in differing ecosystems, and responses to a changing climate.

3. Integrated weed and invasive plant management systems – factors related to weed control through the integrated use of chemical, physical, cultural, and biological practices.

As was clearly articulated in the webinar, understanding the taxonomy, biology and ecology of insects is essential to developing effective and sustainable management systems. These same principles also apply to both agricultural weeds and invasive plants. A fundamental understanding of weed biology and ecology is essential for developing environmentally and economically sustainable systems. Because herbicides have been both economical and effective, they are the principal means of weed control in most systems. However, widespread evolution of herbicide-resistant weeds threatens the utility of these tools. In particular, herbicide resistant Palmer amaranth (*Amaranthus palmeri*), waterhemp (*Amaranthus rudis* and *A. tuberculatus*), kochia (*Kochia scoparia*), Italian ryegrass (*Lolium perenne* ssp. *multiflorum*) and horseweed (*Conyza canadensis*) seriously impact the economic sustainability of many crops throughout the country (resistant populations occur in at least 20 states for each of these species). Many of these species are already resistant to multiple herbicide sites of action, often overlapped in the same biotypes, and many alternative tools for their control have yet to be identified. Therefore, solutions to the expanding herbicide resistance problems will require new weed management technologies combined with holistic and sustainable integrated weed management systems. This will only be attained through an understanding of weed biology in diverse production systems and environments across the US. In addition to herbicide resistance issues, there are several other weed management concerns that will have dramatic effects on the sustainability of agricultural systems. Many of these issues severely impact water quality. As an example, the impact of tillage on soil loss and water quality due to erosion has become one of the major areas of concern in many waterways throughout the US. These problems will also require researchers to develop sustainable integrated management solutions.

Integrated weed management strategies are critical in all terrestrial (agricultural and natural areas) and aquatic systems and investment in the development of these strategies should be increased. In terrestrial systems, invasive plants can reduce forage quality and quantity for both livestock and wildlife, affect animal and human health, dramatically increase the risk of catastrophic fires, and reduce both animal and plant diversity, including endangered species. In particular, the impacts of aquatic weeds can affect almost all segments of our society and culture and can threaten not only our food security, but also pose the greatest threat to our critical riparian and aquatic habitats. Among the primary problem species are hydrilla (*Hydrilla verticillata*), Eurasian watermilfoil (*Myriophyllum spicatum*), Brazilian egeria (*Egeria densa*), and water hyacinth (*Eichhornia crassipes*). The emerging threats are purple loosestrife (*Lythrum salicaria*), Japanese knotweed (*Polygonum cuspidatum*), and many woody species. These weeds impede water movement in canals and irrigation ditches and thus, reduce water availability to crops. They also cause fish kills by reducing dissolved oxygen in aquatic systems, impact recreational activities (e.g., fishing, swimming, boating, etc.), reduce water quality, increase flooding risks, decrease plant and animal diversity, limit the access of both livestock and wildlife to important sources of water, increase the incidence of animal and human disease by harboring mosquitoes and other disease vectors, impede the movement of recreational and commercial navigation vessels, and reduce land values. The investment in research and personnel for these important weeds should be substantially increased to address the extensive negative impacts they pose to our country's many wetland, riparian, and aquatic systems.

The priority areas outlined are equally applicable to all the agricultural and natural areas that are impacted by weeds and invasive plants. Attention to these three priority areas to effectively address the weed and invasive plant management challenges facing the nation will require a more concerted and collaborative effort among USDA-ARS, other government agencies, universities, industries, land managers, and growers. Collaborations between USDA-ARS and other groups can increase the capacity to leverage resources, as was emphasized in both the retrospective review and the stakeholder webinar. We are at a crossroads, whereby our current technological capabilities are not keeping up with the evolving weed issues and therefore the support of research for new solutions in weed management is critical in maximizing both crop yields and preserving natural areas for future generations. It is incumbent upon all of us to seek both applied and fundamental solutions through strategically funded research. Thus, we strongly recommend that USDA-ARS increase their investment in these areas during the next five years as we work together to solve some of the most pressing economic and environmental issues facing agriculture and natural areas in the US.

Sincerely,

Dr. Joseph DiTomaso
President
Weed Science Society of America

____

Dr. J.D. Green
President
North Central Weed Science Society

____

Dr. Scott Senseman
President

Southern Weed Science Society

____

Dr. Gregory Armel
President
Northeastern Weed Science Society

____

Dr. Roger Gast
President
Western Society of Weed Science

____

Dr. Michael Netherland
President
Aquatic Plant Management Society

____

cc: Dr. Chavonda Jacobs-Young, USDA-ARS Administrator
Dr. Caird Rexroad, USDA-ARS Associate Administrator
Dr. Kay Walker Simmons, USDA-ARS Acting Associate Administrator
Dr. Sally Schneider, USDA-ARS National Program Leader, Horticulture
Dr. Sheryl Kunickis, USDA Office of Pest Management Policy, Director

Constitution and By-Laws Committee Report 2014
SWSS Meeting, Birmingham, AL

Wiley C. Johnson, III – Chair

Summary of Progress. In recent years, there has been systematic effort to update and revise the Southern Weed Science Society Constitution and By-Laws. In 2013, there were many minor changes to the By-Laws for individual committees that were essentially updates and not procedural changes, per se. There were two major changes to the By-Laws that occurred in 2013:

1. It was proposed that the Herbicide Resistant Weeds Committee be renamed to Weed Resistance and Technology Stewardship Committee and granted full standing in the Southern Weed Science Society. Previously, this was an ad-hoc committee, temporarily serving at the request of the SWSS Board of Directors. Due to the complexity and importance of weed resistance to commonly used herbicides and the need to protect herbicide effectiveness, full standing of this committee allowed for critical information sharing and collaboration among weed scientists in the southern region.

2. The Weed Identification Committee was inactivated. One of the functions of this committee was to monitor and guide SWSS response to herbicide resistant weeds. That is now addressed by the new Weed Resistance and Technology Stewardship Committee. Another function of the Weed Identification Committee was to manage the Weed Survey, which was redundant with a defined duty of the Research Committee. The Weed Survey will remain a duty of the Research Committee. Additional functions of the Weed Identification Committee were to ensure accurate/standardized weed identification and develop weed identification guides for the southern region. If questions arise regarding weed taxonomy/systematics or weed identification publications need revision, the Weed Identification Committee can be reactivated or serve in an ad-hoc capacity. It should be noted that two dedicated members of the Weed Identification Committee, Drs. Michael DeFelice and Charles Bryson were both consulted regarding the proposed change and they were in complete agreement with the proposal.

These proposals were presented in the newsletter for information, openly discussed, and approved by vote of the general membership at the January 2014 SWSS Business Meeting in Birmingham.

Objectives for Next Year. Continue to revise and update the Manual of Operating Procedures throughout the year, based on input from leadership of the SWSS committees. Furthermore, the Manual of Operating Procedures will be continuously reviewed to ensure compliance with the Constitution and By-Laws.

Respectively Submitted;

Wiley C. Johnson, III - Chair

Weed Resistance and Technology Committee Report
SWSS Meeting, Birmingham, Alabama
January 29, 2014

Jason Bond, Chair

Summary of Progress:
The Herbicide-resistant Weeds committee was given standing as a formal committee in a vote by SWSS membership at the business meeting on January 27, 2014. The committee was also renamed SWSS Weed Resistance and Technology Committee.

Attendees at the committee meeting on January 27, 2014, discussed the transition of this committee from ad hoc to standing committee status. A Manual of Operating Procedures was drafted and submitted for inclusion in the full Manual of Operating Procedures for SWSS. Leadership was unanimously elected for 2015 and included Jason Bond – Chairman; Peter Dotray – Vice Chairman; Eric Prostko – Secretary. Dotray will assume Chairman position in 2016, and Prostko will assume Chairman position in 2017. A new secretary will be elected for 2016.

The attendees discussed who would serve on the committee and edited the draft MOP to reflect their decision. "Voting membership on the SWSS Weed Resistance and Technology Committee will be one representative from universities or USDA-ARS locations in each state located in the SWSS region and one representative from each company. Voting members are appointed to a five-year term."

The attendees provided updates on new cases of herbicide-resistant weeds in represented states. These cases include:
Texas: Glyphosate-resistant Palmer amaranth confirmed in 2011; GR kochia suspected
Louisiana: ALS-resistant rice flatsedge and barnyardgrass confirmed; GR Palmer amaranth and Italian spreading
Mississippi: GR spiny amaranth confirmed; GR common ragweed suspected; GR Italian ryegrass spreading
Arkansas: ALS-resistant barnyardgrass and Cyperus spp. And GR Italian ryegrass spreading; GR and ALS-resistant Palmer amaranth problematic on roadsides
Missouri: ALS-resistant smallflower umbrella sedge, ALS- and ACCase-resistant Italian ryegrass spreading
Georgia: Atrazine-resistant Palmer discovered in major row crop county. This was previously suspected only in dairy regions.

Objective(s) for Next Year:
1) Publish information about Weed Resistance and Technology Committee in next SWSS newsletter after formal committee is finalized by Board of Directors.
2) Encourage scientists who confirm new cases of herbicide resistance to post the species and herbicide on the Intentional Survey of Herbicide Resistant Weeds website.
3) Develop a mechanism for herbicide resistance confirmation for scientists that lack the necessary personnel or facilities.
4) Develop a system for maintaining populations of herbicide-susceptible weed species to be used in resistance screening.

Recommendation or Request for Board Action:
The officers of the Weed Resistance and Technology Committee request guidance from the SWSS Board of Directors in restructuring the process for selecting committee membership. The officers feel that having one representative from each of the 14 states represented in SWSS and interested companies may cause problems when unanimity is required.

Respectively submitted,
Jason Bond (Chair), Peter Dotray, Eric Prostko, Chase Samples, Daniel Stephenson, Tom Eubank, Ken Smith, Ramon Leon, Scott McElroy, David Spak, Carroll Johnson, Jim Griffin, Andy Kendig, Griff Griffith, Neha Rana, Jason Norsworthy

Minutes of the 2014 SWSS Endowment Board Meeting

Monday January 27, 2014
Hyatt Wynfrey Hotel, Avon Room, Birmingham, AL

Renee Keese, Secretary

Present: Nilda Burgos, Stanley Culpepper, Michael Flessner, Brent Sellers, James Holloway and Renee Keese.

Absent: David Jordan

Meeting was called to order by Nilda Burgos at 8:00 am. Members went around the table and introduced themselves.

Action plan for next year – be sure we have stickers to note Endowment contributions and a painting or other items for auction. President and Secretary should meet with Phil Banks prior to the Endowment Committee Meeting (night before or a conference call). Question was raised about SOP for our committee, and circulating this.

2013 Minutes were reviewed and approved and will be sent to Greg McDonald.

Financial Review:

Current endowment status is good, with $100,043.63 available to spend (graduate student contest, enrichment experience, etc.). Fund contributed to the student awards and approximately $3000 was spent on the Enrichment Experience but we are in the positive for 2013. Can there be a portion of the registration fee that goes toward the Endowment, or can the Board dedicate a percentage of the registration that would go to the Endowment?

Merrill Lynch Money Market Account: This account was moved to Canada Bank in 2013. The Committee still wants to have part of our funds in a moderately aggressive fund to increase earnings.

Donations: Member donations are at $585 as of pre-registration, with another $8000 coming from the golf tournament. We need to continue to solicit funds at this meeting.

Print for Auction: No painting was received from Charles Bryson this year.

Nominations for the Endowment Board this year: We will nominate Hunter Perry and give his name to Steve Kelly for the vote. A new graduate student representative will be elected at this meeting. This turned out to Ryan Miller, a Ph.D. student at the University of Arkansas. Ryan was added to the Endowment Board members at the end of this meeting.

SWSS Endowment Enrichment Scholarship: Three students had very successful enrichment experiences. We need feedback from the students on whether the money was sufficient. Timeline worked last year for submissions, we will use similar timeline. Decision was made to increase to 4 student winners at $1500 each. The committee will have flexibility in selecting students – would like 2 PhD and 2MS winners but if 3 PhD are worthy The Committee can select 3 PhD students. The Committee will have applications available by March 1, and this will be announced at the oral session Wednesday.

Action Items:

Create/revise SOP for this committee, with responsibilities during the year. Include meetings, solicitations for Enrichment Experience, judging the applications, golf tournament organization, etc.

Update Enrichment application, and list of opportunities.

Need recognition in the program for the graduate student presentations on Wednesday.

Need process for who will organize the golf tournament? Hunter Perry organized this year (2014) and Tom Holt several years in the past (both volunteers). Hunter has agreed to organize in 2015 and will contact Patrick McCullough for leads on golf courses. James Holloway will represent The Committee and assist Hunter.

2014 SWSS Endowment Enrichment Scholarship

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

Student Application Deadline: Nilda Burgos must receive applications by April 4, 2014.

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

Eligibility Requirements: Applicants must meet the following criteria:
The applicant must be an undergraduate or graduate student in good academic standing enrolled in a degree program (B.S., M.S., or Ph.D.) at an accredited college or university in the southern region.
Graduate students must be actively conducting, or have recently finished, research in the area of weed science.
Undergraduates must document their interest in the area of weed science.
The applicant must be a member of the SWSS at the time of application.

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

Application Procedure:
1. Complete application form (***example provided on page 3***).
2. Cover letter describing applicants interest in weed science and the scholarship (< 1 page).
3. Brief resume or CV summary highlighting recent relevant experiences (< 1 page).
4. Two letters of support, one of which must be from the student's graduate or major advisor.
5. Academic transcripts (unofficial copy is acceptable).
6. Email application information to Nilda Burgos (nburgos@uark.edu) April 4, 2014.

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

Timeline: Students must submit applications by April 4, 2014. The scholarship selection process will be completed by May 1, 2014. Scholarship winners and their host will determine the date in which the experience is to occur during 2014. The Endowment Committee will function as a liaison between the scholarship winners and their hosts throughout the process.

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

For confirmation and Update:

Table 1. University host opportunities provided for the SWSS Endowment Enrichment Scholarship.

Academic Hosts	Location	Experience
Askew, Shawn	Blacksburg, VA	Turf weed management
Brosnan, James	Knoxville, TN	Turf weed management
Burgos, Nilda	Fayetteville, AR	Basic molecular biology techniques, enzyme assay, 14C experiment procedure, GLP trial implementation protocols and practices, vegetable weed management options
Duke, Steve	Oxford, MS	Herbicide resistance, weed resistance, MOA
Griffin, Jim	Baton Rouge, LA	Soybean and sugarbeet weed management
Jordan, David	Raleigh, NC	Peanut weed management
MacDonald, Greg; Dittmar, Peter; Ferrell, Jay	Gainsville, FL	Weed management in agronomic crops and pastures; managing invasive weeds
Miller, Donnie; Stephenson, Daniel	St. Joseph, LA	Weed mgmt in sweet potato and agronomic crops
Prostko, Eric; Culpepper, Stanley	Tifton, GA	Peanut, corn, soybean, cotton, and vegetable weed mgmt. from extension specialist's point of view.
Reynolds, Dan	Starkville, MS	Weed management in agronomic crops and GIS/Remote Sensing Technology
Webster, Ted	Tifton, GA	Weed biology in field crops

Table 2. Industry host opportunities provided for the SWSS Endowment Enrichment Scholarship.

Industry Hosts	Location	Experience
BASF - Steve Bowe	RTP, NC	BASF Opportunities: Exposure to Field R&D, GH & Lab Research, Tech Service, and much more
Bayer CropScience – Gary Henniger	Lubbock, TX	Broad Exposure to Trait R&D for cotton
Bayer CropScience – Robert Humphries	Shafter, CA	Trait Research – Field Station
Bayer CropScience – Mark Parrish (Chemistry)	Field Station TBD	Chemistry/Trait R&D
Diligence Technologies - Tim Adcock	Jackson, TN	Ins and outs of contract research
Dow AgroSciences – Hunter Perry and Drew Ellis	Greenville, MS	A comprehensive look at a research based agrichemical/biotechnology company. Multi-faceted experience including early-stage research (research station), field R&D (Field scientist off-station) and commercial. Primary areas of focus will be herbicides and herbicide-tolerant crops.
Monsanto – Jay Mahaffey	Scott, MS	Work at the Scott Learning Center with Monsanto research scientists in cotton, soybean, and corn, including Roundup Ready Xtend, Interact with breeding, research, agronomy, and sales organizations.
Syngenta – David Black – Plant Pathologist	Searcy, AR	Pest management (insect, disease, and weeds) in cotton, soybean, corn, and rice.
Syngenta – Scott Moore - Nematologist	Monroe, LA	Nematodes and pest management (insect, disease, and weeds) in cotton, soybean, corn, and rice.
Syngenta – James Holloway – Weed Scientist	Jackson, TN	Pest management (insect, disease, and weeds) in cotton, soybean, corn, and rice.
Syngenta – Cheryl Dunne – Weed Control Lead	Vero Beach, FL	Work with weed scientist in glass houses and field environments, screen for resistance in weeds.
Syngenta - Jerry Wells – Herbicide regulatory	Greensboro, NC	Get an in depth look at the regulatory world
Valent – Mid South Research Center	Leland, MS	In depth field and greenhouse research techniques focusing on evaluations of early stage pesticides through sales support trials of available products.
Valent – Field Market Development	Olive Branch, MS	Exposure to herbicide resistance issues in rice, cotton, soybean, corn, grain sorghum, peanuts, and sweet potatoes. Experience how industry cooperates with Universities and independent companies throughout AR, TN, and MS.

Scholarship Application Form

1. Applicant Name:

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

3. Cover Letter (max 1 page):

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

5. Academic Transcript (official form NOT required):

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

Applicant Evaluation

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

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

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

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

Scoring & overall ranking

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

____ 1. Quality of research

____ 2. Applicability of research to weed science in general

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

____ 4. Student involvement in weed science issues and activities

____ 5. Quality of student's academic record

Total Points:_________________________

Name of Reviewer: ____________________________________

Meeting adjourned at 9:16 am.

Respectfully submitted,

Renee J. Keese, Secretary

Necrologies

David Black

Three necrology reports were submitted, Dr. Robert E. Eplee, Dr. Jim F. Stritzke and Jack Sheets.

Dr. Robert Eugene Eplee, 79, died January 30th, 2013. He was born on November 15th, 1933 on a family farm in Glenwood, North Carolina.

Gene attended Berea College in Kentucky. While there he met his future wife, Mary Mabel Mullins, from Tennessee. After they were married in 1955, he served two years in the U.S. Army in France. Upon his discharge, he became the USDA county agent for Morehead, Ky. In 1963, Gene completed his master's degree at the University of Kentucky. Three years later, he earned his doctorate and moved to Whiteville, NC. Gene eventually was assigned as the head of the federally funded portion of the Border Belt Research Station to discover methods to control or eradicate invasive species of plants – namely witchweed. The facility was commonly known as "The Witchweed Lab". Dr. Eplee pioneered methods to control numerous invasive plant species until his retirement in 2000.

His many accomplishments include helping save local farmers – and those across the national and around the world – from invasive plant species such as Witchweed. Thanks in large part to his 30 year research program to develop methods and equipment for USDA-Carolinas Witchweed Eradication Program, the infestation has been reduced from 432,000 acres in North and South Carolina Costal Plains (1970) to 1,542 acres (end of 2012). Dr. Eplee may be remembered more for the five decades of volunteer service he rendered to the Boy Scouts of America. Dr. Eplee became involved with BSA when both of his sons (both achieving Eagle awards) became active in the organization. He remained active in the organization for decades to follow. In 1981, he receive Scouting's highest honor for a council-level volunteer – the Silver Beaver. In 2012, Gene and Mary Eplee both received the William T. Hornaday Conservation Award. A national honor which has only been awarded to 1,100 Scouting volunteers across the nation since its inception 80 years ago.

Eplee traveled the world in his role as a USDA agronomist, once spending months crossing the breadth of Africa from its western to its eastern shore. Gene Eplee said Witchweed was a worldwide problem noting, "It was contained here, but it was a large-scale problem in Africa". In addition to Africa, Dr. Eplee traveled throughout the Middle East in his role with the USDA. Gene is survived by his wife of 57 years, Mary Mullins Eplee and his son Gene Eplee.

WHEREAS Dr. Eplee served with distinction with the United State Department of Agriculture and,

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

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

Dr. Jim F. Stritzke, 75, died February 21st, 2013. He was born September 9th, 1937 on a Nowata County farmhouse in Northeast Oklahoma. On September 9th, 1959 he married Donna Marie Stewart in Virginia where he was serving in the US Army.

Jim attended high school in NE Oklahoma and became the first member of his family to attend college when he enrolled in Oklahoma State University. He obtained a bachelor's degree in agronomy at OSU in 1958. After serving for a period in the US Army, he returned to Oklahoma State University where he obtained a master's degree in Agronomy. He subsequently obtained a doctorate in agronomy from the University of Missouri before returning to Oklahoma State University in 1969 to join the faculty as a professor in the College of Agriculture.

Jim's life was one of service to others. He dedicated his professional energies to agriculture and worked tirelessly to find ways for the people he served to improve their own lives. He was admired and respected by his fellow faculty members, not only at Oklahoma State University but also by those he worked with throughout the country.

Among his most important contributions was the pioneering work he did on chemical brush control in the rough, rolling hills of southeast Oklahoma. His efforts there were widely acknowledged as he found and shared practical solutions for the enormous challenges faced by agricultural producers.

Jim was member of many professional societies and a long standing active member of SWSS.

He is survived by his wife of 53 years, Donna Stritzke; his brother Elmer Eckel; his son Jerry Stritzke and his wife; his daughter Sheila Mackey and her husband; 5 grandchildren; and 1 great-grandchild.

WHEREAS Dr. Stritzke served with distinction at Oklahoma State University and,

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

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

Dr. Thomas J. "Jack" Sheets, died July 6^{th}, 2013. Jack was a native of Fairview, North Carolina and a longtime resident of Raleigh, North Carolina.

Jack served with the U.S. Army from late 1944 to 1946. He graduated from North Carolina State College with a Bachelor's Degree in 1951 and Master's Degree from that institution in 1954. He earned a Doctorate from the University of California (Davis) in 1959. He worked for several years with the U.S. Department of Agriculture and was a member of the College of Agriculture and Life Sciences Faculty, North Carolina State University for 27 years before retirement in 1992. His research on pesticide residues in plants, soil, and water was widely recognized. He served as a member and as chair on the North Carolina Pesticide Advisory Committee from its beginning in 1972 until his retirement.

Jack was member of many professional societies and a long standing member of SWSS.

He is survived by his wife of 61 years Marie Sheets, two daughters Susan Baker and husband Thomas, and Nancy Thomas and husband Scott; 3 grandchildren; one great grandson.

WHEREAS Dr. Sheets served with distinction with North Carolina State University and,

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

WHEREAS Mrs. DeFelice served with distinction as an author,

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

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

EVALUATION EFFICACY ON PALMER AMARANTH WITH DRIFT REDUCTION NOZZLES. S. Butler*[1], L.E. Steckel[1], E. Walker[2]; [1]University of Tennessee, Jackson, TN, [2]University of Tennessee, Martin, TN (1)

ABSTRACT

Weed management has become a challenge in soybean and cotton production because of the steady increase in number of glyphosate-resistant (GR) weed species. In order to consistently control weeds and slow the development of further herbicide resistance, diverse herbicide chemistries should be applied. Future soybean and cotton crops tolerant to synthetic auxins, such as dicamba and 2,4-D, and inhibitors of 4-hydroxyphenylpyruvate dioxygenase (HPPD), such as mesotrione, give growers another post emergence option to control problematic GR Palmer amaranth (*Amaranthus palmeri*). With multiple non-selective herbicides being used POST in crops, the need for drift management will increase. Also, synthetic auxins possess high rates of drift potential and volatility. Drift reducing nozzle technology should be utilized in order to manage weeds POST in crops with crop-tolerant herbicides. Nozzles designed for minimizing drift manipulate spray mixtures to be applied in course droplets (>400 micron volume median diameter). Course droplets typically decrease efficacy of both soil-applied residual herbicides and contact herbicides, such as glufosinate. Contact herbicides work most effectively through nozzles producing fine droplets (between 150 and 400 micron volume median diameter). Droplets from both spectrums should be produced to effectively apply contact and systemic herbicides tank-mixed.

A field experiment was conducted at the West Tennessee Research and Education Center in Jackson, Tennessee in 2013 to evaluate efficacy of contact and systemic herbicides tank-mixed through single and dual fan nozzles. This study was performed in corn (*Zea mays*) comparing efficacy of glufosinate, glufosinate plus mesotrione, glufosinate plus 2,4-D, and glufosinate plus dicamba on Palmer amaranth. Each herbicide was applied through single fan nozzles of TeeJet air-induced extended range (AIXR) and Teejet turbo teejet induction (TTI), and dual fan nozzles of TeeJet air-induction turbo twinjet (AITTJ), Dual Greenleaf Airmix arranged vertically-parallel, Greenleaf turbodrop asymmetric dual fan (TDAF), and Greenleaf Airmix dual fan (AMDF). Applications were made POST on 15 to 21 cm Palmer amaranth. Assessments were made of Palmer amaranth control 7 days after application (DAA) and 14 DAA. Fresh weight biomass samples were taken 14 DAA and corn was harvested for yield at maturity and adjusted to 15.5% moisture. Asymmetrical-angled dual fan nozzle systems and dual fan nozzle systems arranged vertically-parallel were shown to improve control up to 7% at 14 DAA over symmetrical-angled dual fan nozzles and single fan nozzles. In most instances, Palmer amaranth control when using an asymmetrical-angled dual fan nozzle, such as the TDAF or AMDF, was similar or greater than the proposed recommended nozzle systems, such as AIXR and TTI, for applying synthetic auxins POST. Treatments containing glufosinate tank-mixed with dicamba, mesotrione, and 2,4-D were shown to improve control 7-13% over glufosinate applied alone at both 7 DAA and 14 DAA. Thus, the ability to apply alternate herbicide chemistries tank-mixed with glufosinate has the potential to improve Palmer amaranth control in future herbicide-tolerant soybean and cotton crops and promote protection of herbicide chemistries from resistance.

PALMER AMARANTH EMERGENCE AS IMPACTED BY SOYBEAN POPULATION WITH AND WITHOUT A RESIDUAL PRE-APPLIED HERBICIDE. H.D. Bell*, J.K. Norsworthy, Z.T. Hill, C.J. Meyer, D.S. Riar, B.W. Schrage, M.T. Bararpour, and M.V. Bagavathiannan, Department of Crop, Soil and Environmental Sciences, University of Arkansas, Fayetteville, AR (2)

ABSTRACT

Palmer amaranth is the most troublesome weed in Arkansas row crops, causing producers to rely heavily on residual herbicides to successfully produce a profitable crop. In 2013, a field experiment was conducted at the University of Arkansas Research and Extension Center in Fayetteville, AR and at the Lon Mann Cotton Research Station in Marianna, AR, to determine the effect of drill-seeded soybean population density on Palmer amaranth emergence. This experiment was arranged in a split-plot design replicated four times. The main plot factor was soybean seeding rate. The subplot factor was no preemergence (PRE)-applied residual herbicide or a PRE application of Fierce® (flumioxazin + pyroxasulfone) at 3.5 oz/A. Palmer amaranth emergence was counted weekly in two half meter quadrats in each plot, and Palmer amaranth seedlings were removed after counting. Plots that had no residual herbicide applied were sprayed weekly with Liberty® (glufosinate) at 29 oz/A. Additionally, soybean groundcover was monitored throughout the growing season, and daily soil temperature (maximum and minimum) was measured in selected treatments. For both Fayetteville and Marianna, Palmer amaranth emergence in the absence of a PRE-applied residual herbicide was significantly different between bare ground (100% emergence) and soybean populations (<58% emergence), but increasing soybean density had a minimal effect within soybean populations, suggesting the value of crop canopy in preventing Palmer amaranth emergence in the absence of residual herbicides or when residual herbicides are not activated. In the presence of a PRE-applied residual herbicide, no difference was observed in Palmer amaranth emergence among soybean populations, except bare ground. The onset of soybean canopy (>75%) reduced daily soil temperature fluctuations, thus reducing Palmer amaranth emergence. Based on this research, Palmer amaranth emergence is dependent upon the degree of daily soil temperature fluctuations, which is a function of soybean population. Few differences were seen in soybean canopy formation over the populations evaluated. In the absence of a PRE-applied residual herbicide, there were minimal differences in Palmer amaranth emergence among soybean populations, and no difference were observed when an effective PRE-applied herbicide was integrated into the system.

PERFORMANCE OF IMPACT® BASED HERBICIDE PROGRAMS FOR WEED MANAGEMENT IN FIELD CORN ACROSS THE SOUTHERN US. Ned M. French, Ph.D., AMVAC Chemical Corporation, Newport Beach, CA (3)

ABSTRACT

In field corn, weed interference by Palmer amaranth (Amaranthus palmeri) and other weed species limits yields, and herbicides are a key tool for minimizing weed densities. In recent years, the selection for glyphosate-resistant weeds has exacerbated the challenge of managing weeds in field corn. Consequently, corn growers have adopted herbicide programs that consist of more than one application, overlapping residuals, and multiple modes of action. A series of field trials was conducted to compare Impact® based herbicide programs with competitive programs. Findings are reported.

Nine trials were conducted by University and Extension weed scientists across the southern US from North Carolina to west Texas. The objective was to evaluate the influence of Impact® and other herbicide programs on management of difficult to control weeds and yield in glyphosate tolerant field corn. Each experiment was arranged in a randomized completed block design with four replications. Across locations, glyphosate-tolerant corn hybrids were planted from 8-Mar to 28-May 2013. Herbicide programs of Impact® (topramezone) at 0.75 oz./A + Roundup PowerMAX® (glyphosate) at 22 oz./A + AAtrex® (atrazine) at 1 qt./A, Impact® at 0.75 oz./A + Roundup PowerMAX® at 22 oz./A + AAtrex® at 1 qt./A + Warrant® (acetochlor) at 3 pt./A, Impact® at 0.75 oz./A + Sequence® (s-metolachlor + glyphosate) at 2.5 pt./A + AAtrex® at 1 qt./A, Halex® GT (s-metolachlor + glyphosate + mesotrione) at 3.6 pt./A + AAtrex® at 1qt./A, and Laudis® (tembotrione) at 3 oz./A + Roundup PowerMAX® at 22 oz./A + AAtrex® at 1 qt./A were assessed alone and following Dual II Magnum® (s-metolachlor) at 1 pt./A applied pre-emergence (PRE) at planting. A nontreated check was included for comparison. All herbicide programs included ammonium sulfate at 8.5 lbs./100 gal. or liquid equivalent and adjuvant (methylated seed oil or non-ionic surfactant) as directed by herbicide label. Two post-emergence application timings were scheduled: 1). target 2-4” weeds and corn at V2-V3 (E-POST 1), and 2). delayed for treatments with a residual applied PRE and timed for 3-4" weeds with corn at V3-V4 (E-POST 2). Weeds observed were AMAPA, BRAPP, CASOB, CHEAL, DATST, DIGSA, ECHCG, ELEIN, IPOHE, IPOLA, LEFFI, PANRA, PANTE, SEBEX, and SIDSP. Only Palmer amaranth, pitted morningglory, and ivyleaf morningglory were observed at more than two locations. Findings focus on these species. Requested measurements included plant stand count, visual estimates of crop safety, weed control, and lodging, as well as yield. All nine trial locations were harvested. Data were subjected to ANOVA, and means were separated using Student-Newman-Keuls test (p=0.05, protected).

All herbicide programs provided 93-98% control of Palmer amaranth at 27 to 56 days after application. In a composite assessment of pitted and ivyleaf morningglories, control ranged from 83-89%. Regardless of whether a foundation residual herbicide (e.g. Dual II Magnum®) was applied pre-emergence, Impact® + atrazine + Sequence® and Halex® GT + atrazine offered equivalent control of Palmer amaranth and morningglories. The addition of an acetamide herbicide, Warrant® (acetochlor) or s-metolachlor (Dual II Magnum® or Sequence®) to the weed management program, tended to improve overall weed control compared with herbicide programs without an acetamide herbicide. All herbicide programs boosted grain yield by 31 to 43 bushels per acre above the untreated check, which averaged 154 bu./A.

Across replicated, small plot trials implemented to investigate herbicide efficacy against weeds in field corn, Impact® herbicide based programs provided excellent results against Palmer amaranth, pitted morningglory, and ivyleaf morningglory. Compared with competitive herbicide programs, weed control and corn yield were very favorable with Impact® based programs.

TROPICAL BUSHMINT [*HYPIS MUTABILIS* (A. RICH.) BRIQ.] CONTROL ON A HIGHWAY RIGHT-OF-WAY IN MISSISSIPPI. V. Maddox*[1], J. Byrd[1], D. Thompson[2]; [1]Mississippi State University, Mississippi State, MS, [2]Mississippi Department of Transportation, Jackson, MS (4)

ABSTRACT

Tropical bushmint (*Hyptis mutabilis*) is increasingly problematic weed on roadsides in southern Mississippi and continues move northward. Little is known about effective tropical bushmint controls on roadsides. This study evaluates the efficacy of twelve herbicides on tropical bushmint in bahiagrass (*Paspalum notatum*) roadside turf. Treatments were foliar applied once on July 3, 2012, and evaluated over a one-year period. Treatments (oz product A^{-1}) were Arsenal (2 lb ae gal^{-1}) at 6.0; Escort (60XP) at 1.0; Garlon (4 lb ae gal^{-1}) at 128; Lineage Clearstand (73DG) at 2.0; Milestone (2 ae gal^{-1}) at 7.0; Oust (75XP) at 6.0; Overdrive (0.52 lb ae gal^{-1}) at 6.0; Pastora (71DF) at 1.25; Perspective (55DF) at 4.0; 2,4-D at 48.0; Viewpoint (62DF) at 15.0; Streamline (52DF) at 4.0; and an untreated check. A NIS at 0.25 % V/V was added to each herbicide treatment. Garlon 4, Perspective, Streamline, 2,4-D, and Viewpoint showed the greatest control, while Arsenal, Oust, and Overdrive showed the least control compared to other treatments at 60 DAT. Garlon 4, Milestone, Overdrive, Perspective, and 2,4-D caused the least damage to bahiagrass. At 120 DAT, bushmint responses to treatments were similar except 2,4-D which showed a decrease in control. Arsenal, Escort, Lineage Clearstand, Streamline and Viewpoint showed the greatest damage to the bahiagrass turf at 120 DAT. Only Garlon 4, Milestone, Overdrive, Perspective, and 2,4-D treatments showed no bahiagrass discoloration at 120 DAT. Based upon percent tropical bushmint cover at 1 YAT, Garlon 4, Milestone, Perspective, Streamline, 2,4-D, and Viewpoint provided the best control. Although some treatments provided good control, no treatments resulted in 100 percent control at 1 YAT. In addition, some treatments significantly discolored and damaged the bahiagrass turf, which should be a consideration when using certain treatments despite the efficacy on tropical bushmint.

HOW DOES RYE AFFECT PALMER AMARANTH (*Amaranthus palmeri*) GROWTH? Danielle Simmons[1], Theodore M. Webster[2], Timothy L. Grey[3], and David C. Bridges[1]; [1]Abraham Baldwin Agricultural College, Tifton, GA; [2]USDA-ARS, Tifton, GA; and [3]University of Georgia, Tifton, GA (5)

ABSTRACT

Palmer amaranth has developed resistance to many common herbicides and has become the most troublesome weed in cotton in the Southern US. One potential weakness of this exotic weed is the small seed size, which may limit Palmer amaranth safe sites. Experiments were conducted using seed from a naturalized population of glyphosate-resistant Palmer amaranth collected in Tifton, GA. The objective of the study was to determine how high-residue rye mulch affects Palmer amaranth establishment. A greenhouse study was conducted in Tifton, GA, using seven rates of rye mulch residues, ranging from 2,000 to 14,000 kg/ha, as well as nontreated control Palmer amaranth seeds (50) were planted in greenhouse pots and then covered with the different rye mulch rates and ability to emerge through the rye residue evaluated. Cotton was used as a positive control using the same procedures. Palmer amaranth emergence declined as rye residues increased and was described by a log-logistic regression model. In the absence of rye, there was approximately 80% emergence, while the highest rye rate prevented Palmer amaranth emergence. A second study evaluated the amount of photosynthetic active radiation measured by a Li-Cor Li-190 that was transmitted through each of the seven previously described rye mulches. The rye residue was placed onto translucent plastic covering a greenhouse pot and the intensity of light was recorded by the sensor. The highest level of residue reduced the amount of light to 13% full sunlight, median reduction of light occurred at 5,400 kg/ha of rye. A third study determined the effects of rye mulch on soil water retention. Growth chamber studies were conducted in Tifton, GA using locally collected intact soil cores and two rates of biomass (7,000 and 14,000 kg/ha) and a nontreated control. The soil cores were brought to field capacity, covered with appropriate rye mulch, and then placed in the growth chamber for two weeks. The mass of the saturated soil core with the rye treatments was measured at the initiation of the study and then daily during the study. Changes in soil water content over time were described by a log-logistic regression model. The median water loss in the absence of rye occurred at 1.4 days, which soil with a rye cover had median water loss at 3.9 ad 5.5 days for the 7,000 and 14,000 kg/ha rye residues, respectively. Additional research is needed to further clarify the mechanism of Palmer amaranth suppression by rye mulch and separate the physical factors from the potential light quality factors.

ASSESSMENT OF DOUBLE-CROP AND RELAY-INTERCROPPING SYSTEMS OF PEANUT WITH CLEARFIELD WHEAT AND RESIDUAL HERBICIDES. J.W. Moss*[1], R.S. Tubbs[2], T.L. Grey[2], N.B. Smith[2], J.W. Johnson[3]; [1]Auburn University, Auburn, AL, [2]University of Georgia, Tifton, GA, [3]University of Georgia, Griffin, GA (6)

ABSTRACT

The prolonged growing season of the southeastern U.S. allows multiple cropping systems using peanut (*Arachis hypogaea* L.) to potentially provide viable production options for growers. Full season wheat (*Triticum aestivum* L.) production typically pushes peanut planting later than optimum, but a relay-intercrop (RI) system may allow peanut to be planted on-time while still harvesting wheat for grain. However, practical approaches to achieve an economically sustainable method for this system must be identified. The objectives of this project were to determine the most effective cropping systems to maximize wheat and peanut yield potential, evaluate the economic viability of the systems and to establish an effective post-emergence herbicide program for the RI treatments using imazapic or pyroxasulfone. A randomized complete block design was used with twelve cropping systems including variations of double-crop (DC), RI and monocrop (MC) management as main-plots. Studies were conducted in Tifton and Plains, GA in 2011. The DC treatments tended to exhibit higher peanut (4104 to 7216 kg/ha) and wheat (3547 to 5006 kg/ha) yields compared to the RI peanut (3877 to 5088 kg/ha) and wheat (2808 to 3572 kg/ha) systems. Sufficient weed control was attained across all treatments. Income above variable cost for the DC ($1184 to $2577/ha) systems exceeded the potential of RI ($969 to $1537/ha) and most MC ($104 to $1922/ha) treatments. Growers interested in producing peanuts and wheat in the same year would be at an advantage to use a DC system.

OVERSEEDED PERENNIAL RYEGRASS SAFETY AND ANNUAL BLUEGRASS CONTROL AFTER FALL AMICARBAZONE APPLICATIONS IN THE SOUTHEAST. R.G. Leon*[1], L.B. McCarty[2], and A.G. Estes[2]; [1]University of Florida, Jay, FL, [2]Clemson University, Clemson, SC (7)

ABSTRACT

Amicarbazone is a photosystem-II inhibiting herbicide that provides POST control of annual bluegrass in bermudagrass turf overseeded with perennial ryegrass. Amicarbazone application interval and rate after overseeding are critical for perennial ryegrass safety. The objective of this research was to determine the minimum interval between perennial ryegrass overseeding and safe amicarbazone applications in the southern United States in bermudagrass. Amicarbazone was applied at 0, 147 and 196 g ai ha^{-1} at 6, 8, 10, and 12 wk after overseeding (WAOS) in three locations (Jay, FL and Clemson and Isle of Palms, SC). Perennial ryegrass injury varied across locations. In Jay and Clemson, perennial ryegrass injury was greater at 6 to 8 WAOS (25 to 79%) than at 8 to 12 WAOS (0 to 30%) at 4 weeks after initial treatment (WAIT). Conversely, in Isles of Palms, no perennial ryegrass injury was observed in plots treated 6 and 8 WAOS, but 52 and 86% injury was observed in plots treated 10 and 12 WAOS, respectively, at 4 WAIT. Plots treated at 6 WAOS exhibited a 5 to 10-fold reduction in perennial ryegrass cover compared to the non-treated control (88%) at 4 to 12 WAIT. Overall, annual bluegrass control was acceptable to excellent (81-100%) with amicarbazone applications 10 and 12 WAOS in Jay and Isle of Palms. Annual bluegrass control was more variable in Clemson (46-71%) with 10 and 12 WAOS treatments. Results suggest amicarbazone applications for annual bluegrass control should be applied at least 10 WAOS to reduce the risk of perennial ryegrass injury and cover loss. Site dependent variation in annual bluegrass control and perennial ryegrass injury with amicarbazone was likely due to soil differences across sites. Future research should focus on the importance soil physical and chemical properties on amicarbazone activity.

RICE PERFORMANCE FOLLOWING FALL RESIDUAL HERBICIDES. H.M. Edwards, J.A. Bond, G.B. Montgomery, T.W. Eubank, and T.W. Walker; Delta Research and Extension Center, Mississippi State University, Stoneville, MS (8)

ABSTRACT

Fall-applied residual herbicides are commonly recommended in Mississippi for management of glyphosate-resistant (GR) horseweed [Conyza canadensis (L.) Cronq.] and Italian ryegrass [*Lolium perenne* L. ssp. *multiflorum* (Lam.) Husnot]. Fall applications are advantageous because they target weeds in an earlier developmental stage when they are easier to control. Mississippi State University recommends fall applications of clomazone (Command), pyroxasulfone (Zidua), *s*-metolachlor (Dual Magnum), and trifluralin (Treflan) for control of GR Italian ryegrass. Problematically, pyroxasulfone, *s*-metolachlor, and trifluralin are not labeled for fall application prior to planting rice. Therefore, research was conducted to determine the rice response to residual herbicides applied in the fall prior to planting.

The study was conducted from 2010-11 through 2012-13 at the Mississippi State University Delta Research and Extension Center in Stoneville. Soil at Stoneville was Sharkey clay with a pH of 8.2 and 2.1% organic matter. Individual plots were eight 8-in rows measuring 15 feet in length. Rice was managed throughout the growing season to optimize yield. Treatments were arranged as a two-factor factorial within a randomized complete block design with four replications and were repeated in space each year. Factor A was residual herbicide and included clomazone, pyroxasulfone, *s*-metolachlor, and trifluralin. Factor B was application rate and included one-half, one, and two times (0.5-, 1-, and 2-X) the recommended rates for control of GR Italian ryegrass in Mississippi. Clomazone at 0.38, 0.75, and 1.5 lb ai/A; pyroxasulfone at 0.074, 0.15, and 0.29 lb ai/A; *s*-metolachlor at 0.64, 1.27, and 2.54 lb ai/A; and trifluralin at 0.75, 1.5, and 3 lb ai/A were surface-applied in early November each year. Trifluralin treatments were incorporated with two passes in opposite directions with a tandem disk. A nontreated control that received no fall-applied residual herbicide was included for comparison. Plots were left undisturbed until rice was planted in mid-May each year. Rice height and visual estimates of rice injury were recorded 7, 14, 21, and 28 days after rice emergence (DAE). Rice seedling density was determined 14 DAE. The number of days to 50% heading was recorded as an indication of rice maturity. Rough rice yields were adjusted to 12% moisture content. Data for rice height, days to 50% heading, and rough rice yield were converted to a percent of the nontreated control prior to analysis. Data were subjected to ANOVA and estimates of the least square means were used for mean separation.

Rice height 14 DAE was similar following all fall-applied residual herbicides at 0.5-X rates. For 1- and 2-X rates, fall applications of pyroxasulfone, *s*-metolachlor, and trifluralin reduced rice height 14 DAE compared with clomazone. Pooled across application rates, pyroxasulfone, *s*-metolachlor, and trifluralin reduced rice seedling density 20 to 21% compared with clomazone. Rice injury ranging from 8 to 53% was observed 14 DAE for all fall-applied residual herbicides and rates except clomazone. Injury was similar 14 DAE for each rate of pyroxasulfone, *s*-metolachlor, and trifluralin. Rice injury was still visible 28 DAE for all fall-applied residual herbicides except clomazone. Rough rice yields were similar following all fall-applied residual herbicides applied at 0.5-X rates. Rough rice yields were lower following 1-X rates of pyroxasulfone and trifluralin compared with clomazone and *s*-metolachlor. Applications at 2-X rates reduced yield in plots treated with pyroxasulfone, *s*-metolachlor, or trifluralin compared with clomazone.

Pyroxasulfone and trifluralin applied at 1-X rates negatively influenced rice growth, development, and yield. Although rough rice yields were not reduced following *s*-metolachlor at the 1-X rate, early-season injury and reductions in seedling density and height would preclude this treatment from being applied in the fall before rice. Therefore, only clomazone should be utilized as a fall-applied residual herbicide treatment targeting GR Italian ryegrass prior to planting rice.

SQUASH AND BELL PEPPER TOLERANCE TO DICAMBA DRIFT. P.J. Dittmar*[1], J.V. Fernandez[2], J.A. Ferrell[1]; [1]University of Florida, Gainesville, FL, [2]University of Florida, Belle Glade, FL (9)

ABSTRACT

Field trials were conducted at the Plant Science Research and Education Unit, Citra Florida to evaluate the effect of drift glyphosate + dicamba rates and growth stage on bell pepper and squash growth and yield. Herbicide treatments were glyphosate at 0.84 kg ae ha^{-1} + dicamba at 0.56 kg ha^{-1} based on 15, 30, and 46 L ha^{-1} application rates in a production field. Treatments were applied with a controlled droplet applicator calibrated at 0.383 L ha^{-1}. Treatments were applied at the early bloom, mid-bloom with fruit present, and nontreated. The crops were bell pepper 'Aristotle' and yellow squash 'Enterprise' grown in raised bed covered with polyethylene mulch. Data were analyzed with analysis of variance and means were separated with Fisher's Protected LSD ($P \leq 0.05$). Glyphosate + dicamba application rate had Glyphosate + dicamba applied at early blooming had higher cull and small fruit yield weight and counts than the nontreated. Cull fruit had compacted fruit height. The nontreated and mid-bloom treatments had higher large, fancy, and marketable fruit weight and counts than the early bloom application. Application rates were not significant for squash harvests. Squash were harvest 8 times and application timing was significant at harvest 1, 8 and total harvest. Glyphosate + dicamba at drift rates at early bloom of bell pepper has a negative impact on bell pepper yield. The impact of glyphosate + dicamba drift causes squash injury and minimal impact on yield.

RESIDUAL HERBICIDE MIXTURES FOR CONTROL OF GLYPHOSATE-RESISTANT ITALIAN RYEGRASS AND WINTER ANNUAL WEEDS. H.M. Edwards, J.A. Bond, T.W. Eubank, and G.B. Montgomery; Delta Research and Extension Center, Mississippi State University, Stoneville, MS (10)

ABSTRACT

Fall-applied residual herbicides provide excellent control of winter annual weeds. These applications are commonly recommended in Mississippi for management of glyphosate-resistant horseweed [Conyza canadensis (L.) Cronq.] and Italian ryegrass [Lolium perenne L. ssp. multiflorum (Lam.) Husnot.]. Fall applications are advantageous because they target weeds in an earlier developmental stage when they are easier to control. Research at the Mississippi State University Delta Research and Extension Center in Stoneville has documented that fall-applied residual herbicides offer the best opportunity to control GR Italian ryegrass. Dual Magnum (s-metolachlor) is commonly applied in the fall in Mississippi for GR Italian ryegrass control. However, Dual Magnum is often less effective on some winter annual broadleaf weeds compared with other residual herbicides. Therefore, research was initiated to evaluate mixtures of Dual Magnum with other residual herbicides. The objective of this research was to evaluate the efficacy of fall applications of Dual Magnum applied in mixtures with other residual herbicides.

The study was conducted in 2011-12 at an on-farm site near Elizabeth, MS, known to be infested with GR Italian ryegrass. Soil at the research site was a Dundee very fine sandy loam with a pH of 6.7 and 1.2% organic matter. Individual plots were 10 by 40 feet. The experimental design was a split plot with four replications. Whole plots consisted of Dual Magnum at 0 or 1.27 lb ai/A. Subplots were residual herbicides applied in mixture with Dual Magnum and consisted of no tank-mix herbicide, Authority MTZ (sulfentrazone + metribuzin) at 0.338 lb ai/A, Direx (diuron) at 0.75 lb ai/A, Goal 2XL (oxyfluorfen) at 0.25 lb ai/A, and Sencor (metribuzin) at 0.375 lb ai/A. Herbicide treatments were applied on November 7, 2011. All applications included Gramoxone SL (paraquat) at 0.75 lb ai/A and a crop oil concentrate at 1% (v/v) to control any GR Italian ryegrass emerged at the time of application. All herbicide treatments were applied using a tractor-mounted, compressed-air boom equipped with regular flat-fan nozzles calibrated to deliver 15 gallons per acre at 40 psi. Control of henbit and GR Italian ryegrass was visually estimated 42 and 134 days after treatment (DAT) on a scale of 0 to 100% with 0 = no control and 100 = complete control. Data were subjected to ANOVA with means separated by Duncan's multiple range test at P=0.05.

When applied alone, Authority MTZ, Goal 2XL, and Sencor controlled more GR Italian ryegrass 42 DAT than Direx. Authority MTZ applied alone controlled GR Italian ryegrass as well as mixtures that included Dual Magnum 42 DAT. Authority MTZ, Direx, Goal 2XL, and Sencor controlled GR Italian ryegrass less than 60% 134 DAT when applied without Dual Magnum. The treatments that included Dual Magnum controlled GR Italian ryegrass at least 86% at both evaluations. The addition of Authority MTZ, Direx, Goal 2XL, or Sencor did not improve GR Italian ryegrass control compared with Dual Magnum alone at either evaluation. With the exception of Authority MTZ at 42 DAT, GR Italian ryegrass control was greater at both evaluations when Dual Magnum was included with other residual herbicides. Henbit was controlled 91 to 95% following all treatments. The addition of Authority MTZ, Direx, Goal 2XL, or Sencor did not improve henbit control compared with Dual Magnum alone at either evaluation.

Dual Magnum applied alone or in mixtures with other residual herbicides controlled GR Italian ryegrass at least 86% 134 DAT. This is similar to control reported previously for Dual Magnum. Other residual herbicides applied alone controlled GR Italian ryegrass less than Dual Magnum. Mixtures of Dual Magnum with other residual herbicides were not required for control of GR Italian ryegrass or henbit. Rainfall through the fall and winter can impact fall-applied residual herbicide treatments. It can also influence when GR Italian ryegrass emerges. Although GR Italian ryegrass and henbit were controlled with Dual Magnum alone at 134 DAT in the current research, data from this study only represent one year and one location. Had the work been conducted over multiple years or locations, residual herbicide mixtures may have been required to achieve the same level of control as with Dual Magnum alone.

TOLERANCE OF *ARUNDO DONAX* GROWN AS A BIOENERGY CROP TO APPLICATIONS OF POSTEMERGENCE HERBICIDES. B.A. Hicks*[1], W. Everman[2]; [1]North Carolina State University, Raleigh, NC, [2]NC State University, Raleigh, NC (11)

ABSTRACT

Although many states include Arundo donax on their noxious weed list, it is being considered as a source of biomass for biofuel production in North Carolina. Since there is little to no information on the effects of herbicides for establishment of Arundo donax, greenhouse studies were conducted in 2012 and 2013 to observe the tolerance of Arundo donax to Postemergence (POST) herbicides. Our objective was to screen POST herbicides for potential use in the establishment of Arundo donax as a biomass crop. The study was conducted using greenhouse propagated plants. All plants were established from cuttings into 10.16 cm square pots and allowed to grow to an average height of 25 cm before treatments were applied. Treatments consisted of 2,4D @ 0.475 lb a.i./A, aminopyralid @ 0.109 lb a.i./A + NIS 0.50% v/v, atrazine @ 1 lb a.i./A + COC 1%v/v, bentazon @ 1 lb a.i./A + COC 0.25% v/v, bispyribac-sodium @ 0.0285 lb a.i./A, bromoxynil @ 0.375 lb a.i./A, carfentrazone @ 0.0313 lb a.i./A + COC 1% v/v, chlorsulfuron @ 0.047 lb a.i./A + NIS 0.25%v/v, clethodim @ 0.0682 lb a.i./A + NIS 0.25% v/v, clopyralid @ 0.188 lb a.i./A, cloransulam @ 0.016 lb a.i./A + NIS 0.25% v/v, clorimuron @ 0.012 lb a.i./A + NIS 0.25% v/v, dicamba @ 0.25 lb a.i./A, fluazifop @ 0.141lb a.i./A + NIS 0.25% v/v, fomesafen @ 0.353 lb a.i./A + NIS 0.25% v/v, glufosinate @ 0.402 lb a.i./A + AMS 8.5lbs/100 gal, halosulfuron @ 0.031 lb a.i./A + NIS 0.50% v/v, imazamox @ 0.039 lb a.i./A + NIS 0.25% v/v, imazapic @ 0.063 lb a.i./A + NIS 0.25%v/v, mesotrione @ 0.094 lb a.i./A + COC 1% v/v, metsulfuron methyl @ 0.038 lb a.i./A, nicosulfuron @ 0.031 lb a.i./A + NIS 0.25% v/v, pinoxaden @ 0.054 lb a.i./A, pyraflufen-ethyl @ 0.001 lb a.i./A, quinclorac @ 0.75 lb a.i./A + MSO 1.5 pt/A, rimsulfuron + thifensulfuron @ 0.018 lb a.i./A, sulfometuron @ 0.094 lb a.i./A + NIS 0.25% v/v, sulfosulfuron @ 0.031 lb ai ac+ NIS 0.50% v/v, tembotrione @ 0.082 lb ai ac + MSO 1% v/v, tembotrione + thiencarbazone-methyl @ 0.081 lb a.i./A + COC 1% v/v, thifensulfuron @ 0.004 lb a.i./A + NIS 0.25% v/v, topramazone @ 0.016 lb a.i./A + MSO 1% v/v, trifloxysulfuron @ 0.005 lb a.i./A + NIS 0.25% v/v. The greenhouse study resulted in clethodim, fluazifop, sulfometuron, imazapic having greater than thirty percent injury, with clopyralid, tembotrione + thiencarbazone-methyl, and pinoxaden having less than fifteen percent injury. All other treatments fell between these two percentages.

HERBICIDE APPLICATION VOLUME EFFECTS ON WEED CONTROL IN CONSERVATION TILLAGE COTTON. Andrew J. Price and Robert L. Nichols; USDA-ARS, Auburn, AL and Cotton Inc., Cary, NC (12)

ABSTRACT

Currently, glyphosate-resistant weeds have become a serious threat to conservation tillage cotton production. However, integrating herbicide systems and high residue covers crops in a conservation tillage systems is are increasingly being recommended to combat resistant and hard to control weeds. An experiment was established in fall 2011 and 2012 at the Wiregrass Research and Extension Center near Headland, AL and contained an augmented factorial treatments arranged in a complete block, with a split block restriction on randomization, containing eighteen treatments and three replications. Treatments included two preemergence herbicides: pendimethalin (Prowl 3.8 H_2O) applied at 0.84 kg ai ha^{-1} or fomesafen (Reflex 2EC) applied at 0.28 kg ha^{-1}. Herbicides were broadcast applied at 10, 15, 20, 25, 30, and 60 GPA immediately after planting in a high-residue conservation tillage system. A non-treated check high residue was included for comparison. Palmer amaranth control was not significantly influenced by application volume in-row in 2011 or 2012 although amaranth control with Prowl was negatively numerically influenced by increasing volume in 2012. Reflex application at any volume resulted in excellent in-row amaranth control in 2011 and 2012. Prowl performed similarly in 2013; however in 2012, in-row amaranth control was inadequate when volume exceeded 15 gpa. Results revealed excellent between-row amaranth control provided by the integration of residual herbicides and a high residue rye cover crop. The use of a high-residue cereal cover crop in cotton production potentially can aid in early-season *Amaranthus* suppression. The ongoing evaluation of weed management options suggests that control of herbicide resistant Palmer amaranth might be achieved while protecting soil resources; however, it will require the use of diverse management tactics.

EFFICACY OF RESIDUAL HERBICIDES AND ENGENIA^{TM} IN BOLLGARD II XTENDFLEX^{TM} COTTON. J. Keeling*[1], J. Reed[2], J.L. Spradley[1], C. Webb[1]; [1]Texas A&M AgriLife Research, Lubbock, TX, [2]BASF Corporation, Lubbock, TX (13)

ABSTRACT

Engenia^{TM} is a new dicamba formulation (BAMPA) under development by BASF for use in Bollgard II XtendFlex^{TM} cotton which could improve control of a wide range of annual and perennial weeds. Resistant Palmer amaranth (*Amaranthus palmeri*), ivyleaf morningglory (*Ipomoea hederacea*), Russian thistle (*Salsola iberica*), kochia (*Kochia scoparia*), field bindweed (*Convolvulus arvensis*), woollyleaf bursage (*Ambrosia grayi*) and Texas blueweed (*Helianthus ciliaris*) could be more effectively controlled with Engenia^{TM} applied postemergence (POST) compared to Roundup PowerMax (RUPM) alone. Field studies were conducted in 2013 at Lubbock, Seagraves and Halfway TX. The objectives of these studies were to evaluate Palmer amaranth, Russian thistle, and devil's-claw control with Engenia^{TM} applied pre- or postemergence in Bollgard II XtendFlex^{TM} cotton. Efficacy of Prowl H2O applied preplant incorporated (PPI) or preemergence (PRE) and Outlook (POST) with Engenia^{TM} for residual weed control was determined.

Herbicide treatments conducted at the three locations compared Prowl alone and Prowl + Engenia (PRE) fb Roundup PowerMax (RUPM) alone, RUPM + Engenia, or RUPM + Engenia + Outlook mid-postemergence (MPOST). POST only treatments include RUPM + Outlook, RUPM + Outlook + Engenia, RUPM + Engenia, or RUPM only. Treatments were applied using a CO_2-pressurized backpack sprayer calibrated to deliver 15 gallons per acre. Weed control was estimated visually 17-21 and 60 DAP at each location. Due to limited rainfall at Lubbock, early-season Palmer amaranth control 17 days after planting (DAP) was not improved when Engenia^{TM} was applied PRE following Prowl PPI. Palmer amaranth and Russian thistle control was improved 17 DAP when sprinkler irrigation was applied after Engenia^{TM} PRE applications at the other locations. RUPM + Engenia^{TM} treatments, alone or in combination with Prowl or Outlook, controlled all weed species 95 to 100% 60 DAP at Lubbock. RUPM + Engenia^{TM} POST, when used in combination with either Prowl or Outlook, controlled Palmer amaranth 100% 60 DAP at Halfway. All RUPM + Engenia^{TM} treatments controlled Russian thistle 100% 60 DAP at Seagraves. These results demonstrate the continued need for residual herbicides when Engenia^{TM} + RUPM are applied POST.

USE OF SPRAY ADJUVANTS TO REDUCE HERBICIDE RATES WHILE MAINTAINING FALSE DANDELION CONTROL. G. Henry*, K. Tucker, C. Straw, T. Burch; University of Georgia, Athens, GA (14)

ABSTRACT

EVALUATION OF NEGATE FOR PERENNIAL RYEGRASS OVERSEEDING REMOVAL. C. Straw*, K. Tucker, G. Henry; University of Georgia, Athens, GA (15)

ABSTRACT

ANTHEM^{TM}: A NEW TOOL FROM FMC FOR THE MANAGEMENT OF RESISTANT ITALIAN RYEGRASS IN WHEAT. T.W. Mize*[1], H. Mitchell[2], D. Johnson[3], D. Akin[4]; [1]FMC Corp, Olathe, KS, [2]FMC Corporation, Louisville, MS, [3]FMC Corporation, Madison, MS, [4]FMC Corporation, Monticello, AR (16)

ABSTRACT

Anthem Flex***tm*** is a new premixture herbicide in development by FMC Corporation as a premium weed management tool in small grains and other crops, including cotton, dry beans, peanuts, and potatoes. Research trials conducted in North America from 2011 to 2013 on both Anthem*tm* and Anthem Flex*tm* have shown the value of both new products for control of many key broadleaves and grasses in wheat, and especially for the management of resistant Italian Ryegrass, Lolium multiflorum (LOLUM). LOLUM incidence and severity has been growing across the wheat growing regions of the U.S. over the last 10 to 15 years, and is now one of the most challenging threats to wheat production, particularly in the Southern U.S. wheat and soybean relay - cropping areas. LOLUM resistance to glyphosate is found in most areas of the U.S. and other locations around the globe, as well as to ACCase and ALS-inhibiting herbicides[1]. Anthem Flex*tm* was shown in this multiple-year research program conducted by both FMC and University research personnel as an extremely effective tool for the management of LOLUM in wheat and as a new mode of action critical to the management of LOLUM resistance to other modes of action. Anthem Flex*tm* is under review for in the U.S., and is has a tentative USEPA registration set for the 3Q of 2014.

EVALUATION OF PGRS FOR BERMUDGRASS ROUGH. C.C. Jones*1, M.D. Carlton1, L.B. McCarty2, J.S. McElroy3, W. Totten1; 1The University of Tennessee at Martin, Martin, TN, 2Clemson University, Clemson, SC, 3Auburn University, Auburn, AL (17)

ABSTRACT

Due to the rising labor and fuel costs affiliated with maintaining golf courses to their highest degree of quality, plant growth retardants are being utilized in golf course maintenance plans. Reasoning behind the usage of to offset annual increases in maintenance costs by slowing the growth of turfgrass and therefore potentially reducing the fuel and labor needed to maintain golf course turf. The object of this research project is to compare and contrast the growth suppression efficacy of various plant growth retardants on ‘Tifway’ Bermudagrass rough.

Eight different treatments including: Roundup (ROU) at 5 fl. oz./A, Clearcast (CLE) at 16 fl. oz./A, Plateau (PLA) at 4 fl. oz./A, Embark (EMB) at 64 fl. oz./A, Primo Maxx (PRI) at 22 fl. oz./A, Journey (JOU) at 16 fl. oz./A, Stronghold (STR) at 38 fl. oz./A, and EMB + PLA+ PRI at 64, 4, and 22 fl. oz./A were each applied across a two by three meter plot. Experimental design was a randomized complete block with four replications. The experiment site is located at the Rhodes Golf Center on the campus of The University of Tennessee at Martin, and the study was conducted from June 25 to September 21, 2012. Three applications were made on June 25, July 25, and August 24, and height, turf quality, turf injury, seedhead populations, and weed counts were evaluated weekly.

Results showed that STR at 38 fl. oz./A displayed significantly lower turf height on all dates except 2 WAIT. It displayed acceptable quality and injury on all dates. PRI at 22 fl. oz./A and PLA at 4 fl. oz./A displayed significantly lower turf heights on all ratings except 1 and 5 WAIT. They also displayed acceptable quality and injury on all dates. Lastly, EMB + PLA + PRI at 64, 4, and 22 fl. oz./A and JOU at 16 fl. oz./A displayed significantly lower turf heights for all rating dates except 2 WAIT but unacceptable quality and injury 12 WAIT.

EVALUATION OF PYROXASULFONE PERFORMANCE IN PEANUT. T. A. Baughman1, B.C. Glidewell1, P. A. Dotray2, W. J. Grichar2, T.S. Morris2, E.P. Prostko3, and P.M. Eure3; 1Oklahoma State University, 2Texas A&M University, 3University of Georgia, Tifton, GA (18)

ABSTRACT

Effective weed management systems are imperative to producing both a prosperous and quality peanut crop. Peanut is slow growing and not as competitive as many other crops. In addition, weed resistance to some herbicides has made peanut weed control increasingly difficult. One of the most effective ways to ensure the economical production of peanut is the use of preemergence (PRE) herbicides as part of an overall weed management system. Pyroxasulfone is a new herbicide that is currently labeled in corn and soybean. It belongs to a new class of chemistry, isoxazoline. It is root and shoot growth inhibitor with lower use rates than traditional chloroacetamide herbicides. Several studies were conducted in Oklahoma, Texas and Georgia to investigate the tolerance and efficacy of pyroxasulfone in peanut. Typical small plot research techniques were employed in all trials. The first study was conducted near Ft. Cobb, OK, Halfway, TX, and Yoakum, TX. Zidua was applied alone and in combination Prowl H2O and compared with Dual Magnum. All treatments were followed by Gramoxone SL + Storm (at crack) and Cadre (POST). Peanut injury was less than 10% at all 3 locations. Ivyleaf morningglory (*Ipomoea hederacea*) and Texas millet (*Urochloa texana*) control was less than 50% late season at Ft. Cobb. At crack and POST applications were applied late to large weeds at this location, which likely resulted in reduced control. Palmer Amaranth (*Amaranthus palmeri*) control was at least 98% with Zidua alone or in combination with Prowl H2O at Halfway. Smellmelon (*Cucumis melo*) and Texas panicum control was at least 95% with all treatments at Yoakum. Two trials were conducted in Georgia during the 2013 growing season evaluating Zidua, Dual Magnum, and Warrant applied PRE. Cadre or Cobra POST followed these programs. Cadre and Cobra were tank-mixed POST with the respective PRE herbicide also. Peanut stunting was 11% or less early season and less than 5% late season with all treatments at Attapulgus. However, early season peanut stunting was 50% with Zidua and 15 to 21% with Dual Magnum at Tifton. Mid-season peanut stunting was still greater than 20% with Zidua. Palmer pigweed control was 99% with all herbicide programs after POST treatments were applied at both Georgia locations. Sicklepod (Senna obtusifolia) control and annual grass control was greater than 90% with Cadre POST programs at Attapulgus. The only treatment that controlled annual grass at Tifton at least 90% was Zidua followed by Cadre + Zidua. Peanut yield was greater than 4000 lb/A with all POST Cadre programs at Attapulgus. This was influenced by sicklepod and annual grass control. Peanut yield was greater than 5000 lb/A at Tifton with Dual Magnum and Warrant regardless of POST treatment. Preemergence applications of Fierce, Zidua, and Warrant were evaluated for peanut tolerance to 1 and 2X applications of each herbicide in Oklahoma and Texas. Warrant was not included in the Texas location. Spanish market types were evaluated at both locations, while Runner, Valencia, and Virginia market types were evaluated at the Texas location. Fierce at 6 oz/A was the only treatment that caused more than 10% peanut injury (13% on Spanish market type in Oklahoma) early season. Peanut injury was less than 10% with all treatments by the end of the season. A similar study was conducted in Georgia investigating 1 and 2X preemergence applications of Valor and Fierce. Three planting dates were also investigated in Georgia (April 16, April 29, and May 13). Plant stands were not affected by any treatment or planting date. Peanut injury was at least 10% with all treatments and planting date combinations when evaluated on May 31. Peanut stunting was 25% or more except when Valor at 3 oz/A was applied on April 16 and 29 and Fierce at 3 oz/A and Valor at 6 oz/A was applied on April 16. Late season peanut stunting was 5% or less with all treatments except Fierce at 6 oz/A applied on any planting date. Peanut yields were greater than 5000 lb/A with no difference in treatment or planting date combination.

PREEMERGENCE WEED CONTROL IN SOYBEAN. T. A. Baughman1, B.C. Glidewell1, E.P. Prostko2, and P.M. Eure2; 1Oklahoma State University, 2University of Georgia, Tifton, GA (19)

ABSTRACT

Weed control continues to be an important need for soybean producers throughout the southern United States. With the onset and increase of herbicide resistant weeds, it is paramount to research and develop alternative weed management systems. This is best achieved through the use of various herbicide timings and the implementation of various herbicide modes of action. The use of different modes of action will also assist in preventing the onset of future resistant weed populations. Weed control studies were conducted in Oklahoma and Georgia to investigate the use of preemergence herbicide programs for weed control in soybean. Typical small plot research techniques were employed in all trials. Trials were conducted at the Vegetable Research Station near Bixby, OK, and the University of Georgia Research Station near Tifton, GA. Various preemergence herbicide programs were investigated in four different trials in Oklahoma. Soybean injury was less than 10% with all treatments in all trials with the exception of Statement + metribuzin used in combination with the Liberty Link herbicide program. The soybean variety was Hornbeck LL5530 which appeared to be sensitive to metribuzin. Palmer amaranth (Amaranthus palmeri) control was greater than 95% when Canopy + Cinch, Boundary, and Fierce, were followed by Abundit Extra + ammonium sulfate. In the second Oklahoma trial, Palmer amaranth control was greater than 90% when Statement was applied PRE alone or in combination with metribuzin and followed by Liberty or Roundup PowerMax. Postemergence combinations of Liberty or Roundup with fomesafen based herbicides were not as effective. Palmer amaranth control was at least 98% when Verdict or Sharpen was used in combination with Zidua. The addition of metribuzin did not increase Palmer amaranth control in this trial. In the final trial in Oklahoma, Palmer amaranth control was at least 98% with Zidua + Sharpen and Command + metribuzin and followed by Roundup PowerMax + ammonium sulfate. Various preemergence herbicide programs were investigated in Georgia. In this trial, all preemergence programs were followed by Abundit Extra + ammonium sulfate. Early season soybean injury was greater than 25% with Envive and Classic + Tricor + Valor alone or in combination with Zidua. Injury was reduced to less than 10% with all treatments except Envive + Zidua. Palmer amaranth control was at least 99% with all preemergence programs in this trial.

ENLIST SOYBEAN TOLERANCE TO ENLIST DUO. D.M. Simpson*[1], J. Ellis[2], M.A. Peterson[3]; [1]Dow AgroSciences, Indianapolis, IN, [2]Dow AgroSciences, Smithville, MO, [3]Dow AgroSciences, West Lafayette, IN (20)

ABSTRACT

Previous research with Enlist™ soybean across the Mid-South and Midwest, from 2008 through 2012, demonstrated robust tolerance to 2,4-D when applied preemergence or postemergence. In 2012 and 2013, trials were initiated to evaluate injury to Enlist E3™ soybean following applications of Enlist Duo™ herbicide, a proprietary blend of 2,4-D choline and glyphosate, applied at 2185 and 4370 g ae/ha, 2,4-D choline 1065 and 2130 g ae/ha, glyphosate 1120 and 2240 g ae/ha, glufosinate 542 and 1084 g ae/ha and 2,4-D choline + glufosinate at 1065 + 542 and 2130 + 1084 g ae/ha. Single herbicide treatments were applied at V6 and R2 growth stages.

Enlist E3 soybean demonstrated robust tolerance to 2,4-D choline, glyphosate and Enlist Duo across all application timings and rates. Regardless of rate or application timing, injury averaged less that 1% for 2,4-D choline and glyphosate. For Enlist Duo, overall injury with 2815 g ae/ha was 5% or less at any single application timing seven days after treatment. At the 4370 g ae/ha rate, initial injury increased slightly over the 2185 g ae/ha rate yet was negligible by 14 DAT. At seven days after treatment, single applications of glufosinate applied at either V6 or R2, injury averaged 3-4% and 9-10% for 542 and 1084 g ae/ha, respectively. The addition of 2,4-D choline to glufosinate resulted in an 1-2% increase in crop response compared to glufosinate applied alone. Injury observed at seven days after treatment with either glufosinate or 2,4-D choline + glufosinate averaged less than 5% by 14 DAT.

Enlist E3 soybeans are a joint development of Dow AgroSciences and MS Technologies.

ANNUAL RYEGRASS GERMINATION FOLLOWING PASTURE HERBICIDES. R.E. Strahan*, E. Twidwell; LSU AgCenter, Baton Rouge, LA (21)

ABSTRACT

Overseeding bermudagrass pastures with annual ryegrass is a common practice in Louisiana. Annual ryegrass extends the grazing season and can provide greater amounts of forage than

fertilized bermudagrass. It is not unusual for cattlemen to make late season herbicide applications on lingering summer weeds such as smutgrass and emerging winter weeds like thistles. However, several common pasture herbicide labels don't specifically address annual ryegrass plant intervals following a particular herbicide application.

A field study was conducted in the fall of 2013 at the Burden Research Center in Baton Rouge, LA. The purpose of the study was to evaluate the effect of several common pasture herbicides on Gulf annual ryegrass germination. Herbicides were applied on November 4, 2013 and the ryegrass was planted 14 and 28 days after herbicide application (DAA). The seeding rate for the ryegrass was 30 lbs/A. The ryegrass was fertilized with N at a rate of 45 lbs/A 3 weeks after the 28 DAA planting date.

Plot size was 6 ft x 10 ft. The experiment was conducted as a randomized complete block with 3 replications. There were 18 total treatments including non-sprayed ryegrass plots planted at the 14 DAA and 28 DAA timings. Herbicides were sprayed at their recommended rates with a CO_2 backpack sprayer delivering 15 GPA. Visual ratings of percent ryegrass cover were collected at 2 week intervals. Data were subjected to analysis of variance (P=0.05) and means were separated using Fisher's LSD.

Acceptable percent ryegrass germination and coverage ($\geq$75%) was observed with plots treated with 2,4-D, Weedmaster, Grazon Next, Grazon P+D, and Remedy at the 14 or 28 DAA seeding. Unacceptable ryegrass germination at either planting date was observed with Pastora, and Velpar when compared to the unsprayed checks. Velpar plots planted 28 DAA averaged <10% ryegrass coverage, whereas Velpar treated 14 DAA plots allowed < 5% coverage. Ryegrass coverage with Pastora did not exceed 30% during the evaluation period.

RESPONSE OF COTTON VARIETIES TO VARIATION IN LIGHT INTENSITY AND APPLICATION TIMING. B.W. Schrage, J.K. Norsworthy, H.D. Bell, Z.T. Hill, M.V. Bagavathiannan, and D.S. Riar; University of Arkansas, Fayetteville, AR (22)

ABSTRACT

Glufosinate has become an important postemergence alternative to glyphosate in cotton, especially in fields having dense populations of glyphosate-resistant Palmer amaranth. Our objective was to determine if degree of injury to PhytoGen (Widestrike) and Liberty Link cotton is influenced by cotton growth stage and light quantity prior to application. The reduction in light quantity that was simulated in this trial was intended to be reflective of prolonged periods of cloudy conditions prior to applying glufosinate.

An experiment having a split-split-split plot design was conducted in Fayetteville, Arkansas in 2012 and 2013. The main plot consisted of cotton variety (PHY 375 WRF, PHY 499 WRF, and Stoneville 4145 LLB2). The sub-plot factor was degree of shading: shaded cotton (50% shading) and non-shaded cotton. The sub-sub plot factor was application timing (1-, 4-, and 6-leaf stage). The sub-sub-sub plot included two rates of glufosinate (0.88 and 1.76 kg ai ha^{-1}) and a nontreated check. Plots were shaded 3 d prior to application and irrigated 0.25 in 1 d prior to their respective applications. Glufosinate was applied using a $C0_2$-pressurized backpack sprayer calibrated to deliver 140 L ha^{-1}. Injury was visually assessed at 2 and 4 to 5 weeks after treatment (WAT), and seedcotton was harvested. In 2013, epicuticular wax (ECW) quantity was evaluated from leaf samples taken at the time of application.

Cotton tolerance to glufosinate differed by variety at 2 WAT, but injury was observed on all varieties, including Liberty Link cotton. In general, cotton plants that were shaded prior to applying glufosinate were injured to a greater extent than non-shaded plants. Injury at 2 WAT following the 1-leaf application was generally greater for 375 WRF and 499 WRF compared to 4145 LLB2. At 4 to 5 WAT, all varieties showed similar potential for recovery. In 2012, seedcotton yield was reduced when glufosinate was applied at the 1X rate to 1-leaf cotton or at the 1X and 2X rates to 4-leaf cotton when plants were shaded for 3 d prior to glufosinate application. In 2013, there was a general trend for lower yields when plots were shaded 3 d prior to application and differences in ECW were observed at the 1-leaf stage amongst all three varieties. Our results indicate that in general, shading (cloud cover) 3 d prior to glufosinate application at 1X and/or 2X rates increases the risk for injury, irrespective of variety, and may decrease seedcotton yield.

EVALUATING THE LENGTH OF RESIDUAL CONTROL IN COTTON WITH FLURIDONE. Z.T. Hill*, J.K. Norsworthy, M.T. Bararpour, H.D. Bell, C.J. Meyer, D.S. Riar, B.W. Schrage; University of Arkansas, Fayetteville, AR (23)

ABSTRACT

Herbicide-resistant Palmer amaranth control requires that diverse mechanisms of action be used in a herbicide program; albeit, no new modes of action have been discovered and commercialized for use in row crops for over 30 years. In order to maintain some level of control, emphasis has been placed on evaluating older herbicide candidates that were never commercialized in crops. Currently, there are seven residual herbicide applications recommended to control Palmer amaranth throughout the growing season, which consists of using two to three herbicides multiple times per season. In order, to maintain the sustainability of our currently effective residual herbicides, older herbicides that exhibit lengthy persistence in the soil are needed. The herbicide fluridone was discovered in the early 1970's but was never marketed in cotton even though earlier research showed that cotton exhibits a high level of tolerance to preplant incorporated and preemergence applications. An experiment was conducted in 2012 and 2013 to determine if fluridone would control Palmer amaranth in cotton throughout the season. Herbicide treatments in cotton included fluridone applied preemergence at five rates from 0.11 to 0.56 kg ai/ha, fluometuron applied preemergence at 1.12 kg ai/ha, and fluridone at 0.34 kg/ha and fomesafen at 0.28 kg ai/ha applied preplant 14 days prior to planting cotton. In 2012, minimal Palmer amaranth control was seen due to the lack of rainfall. At 4 weeks after initial application (WAIA), all treatments were ineffective in control resulting in no greater than 65% control from fluridone at 0.56 kg/ha. In a low rainfall environment, higher control was seen with fomesafen than fluridone at 9 WAIA. In a high rainfall environment in 2013, effective control was seen with all treatments at 4 WAIA. By 9 WAIA in 2013, both 14 day preplant applications were comparable. Regardless of rainfall environment at the 1X rate, fluridone is not going to provide season-long effective control of Palmer amaranth in cotton. Although the cotton was irrigated in both years, frequent rainfall in the spring and summer of 2013 enhanced activation, and hence, the greater control.

FORAGE TOLERANCE AND WEED MANAGEMENT WITH AMINOCYCLOPYRACHLOR IN TEXAS PASTURES. M.E. Matocha1, P.A. Baumann2, J.A. McGinty3, T.W. Janak; 1Extension Program Specialist, 2Professor and Extension Weed Specialist, 3Graduate Assistant, Texas A&M AgriLife Extension Service, College Station, TX (24)

ABSTRACT

Field experiments were conducted in 2008, 2009, 2012, and 2013 to evaluate aminocyclopyrachlor (known as MAT28) for forage tolerance and broadleaf weed control. Aminocyclopyrachlor is also being evaluated as a component with several other products containing different active ingredients. The forage tolerance studies were conducted on Tifton 85 and Jiggs hybrid bermudagrass where various rates of aminocyclopyrachlor were applied. The broadleaf weed control studies were conducted on silverleaf nightshade, Texas vervain, Brazilian vervain, camphorweed, annual marshelder, and dogfennel. Treatments employed in the weed control studies included aminocyclopyrachlor and aminocyclopyrachlor plus additional active ingredients applied at various rates and combinations. All weed control studies had at least one comparison product such as GrazonNext, GrazonNext HL, Grazon P+D, or Weedmaster. Excellent crop safety was observed by both forage hybrids across all treatments and both harvest timings. In general, high levels of weed control were observed on most of the species evaluated with aminocyclopyrachlor, and aminocyclopyrachlor plus an additional component.

MINIMIZING DICAMBA DRIFT WITH IMPROVED HOODED SPRAYERS. J. Sandbrink[1], J.N. Travers[1], S. Claussen[2]; [1]Monsanto Company, St. Louis, MO, [2]Willmar Fabrication, Willmar, MN (25)

ABSTRACT

Monsanto is currently developing transgenic cotton and soybean varieties capable of tolerating postemergence applications of dicamba. This technology facilitates effective control of many troublesome weed species, including some that have exhibited resistance to glyphosate. There has been historical concern about incidences of off-target deposition with dicamba. Monsanto will require the use of spray nozzles that produce very coarse to ultra coarse spray droplets and other cultural practices in an effort to reduce fine particles and off target movement. In addition to improved nozzle selection to mitigate drift, Willmar Fabrication LLC is developing new and improved broadcast hooded sprayers for use with this technology. In 2013 Monsanto conducted four field trials comparing the Redball™ Gen II Broadcast Spray Hood vs. an identical open spray boom for mitigating dicamba off-target deposition. These trials were conducted in Robinsonville, MS; Scott, MS; Marion, AR and Hawkinsville, GA. Each 12.2 meter MODEL 642 three point broadcast hooded sprayer was equipped with 11004 Turbo TeeJet® Induction Flat Spray nozzles (TTI). An identical MODEL 642 open boom sprayer was also included in the trials for direct comparison. All spray solutions contained glyphosate - 1120 g ae/ha, dicamba - 560 g ae/ha, drift reduction additive (DRA) - 290 g ai/ha, and MON 10 at 4 %v/v. Sprayers were calibrated to deliver 93.69-140.53 L/Ha. Each sprayer was attached to a tractor and applications were made to non-dicamba tolerant soybeans at the V3-V4 growth stage. Non-dicamba tolerant soybeans were utilized as a bio-indicator because of their sensitivity to dicamba. Winds were generally perpendicular to the sprayed plot and were less than 16.09 km/h. Visual estimates of plant response and plant heights were collected from each downwind experimental unit at approximately 2 and 4 weeks after treatment. Plant response measurements were taken at incremental distances away from the treated plot for each treatment. The distance that plant response was observed to a 5% level was recorded and the data analyzed. Plant response data were fitted as a function of log(distance) using linear regression. Results averaged across all four sites using the 5% crop response criteria indicated 8.96 meters with the Redball™ Gen II Broadcast Spray Hood vs. 38.5 meters with the open boom sprayer. Using 15% crop response as the criteria results were 3.55 meters with the Redball™ Gen II Broadcast Spray Hood and 17.92 meters with the open boom sprayer. These results suggest that the Redball™ Gen II Broadcast Spray Hood can significantly reduce the off target movement of dicamba when used in combination with Turbo TeeJet® Induction Flat Spray nozzles (TTI).

COMPARISON OF HERBICIDE TREATMENTS FOR SIDEWALK CRACK VEGETATION CONTROL.
J. Omielan*; University of Kentucky, Lexington, KY (26)

ABSTRACT

One of the maintenance tasks at locations such as highway rest areas is to keep sidewalk and parking lot expansion joints aesthetically pleasing and clear of vegetation. One can use glyphosate repeatedly during the season but including a residual herbicide should increase the period of control and reduce labor costs. There are a number of pre-mixed products on the market such as Roundup Extended Control plus Weed Preventer (glyphosate + diquat + imazapic), DuraZone (glyphosate + diquat + indaziflam), and Ground Clear (glyphosate + imazapyr). Additional active ingredients included in treatments were diuron and sulfometuron. This trial compares the efficacy of some of these products with mixtures of herbicides used for right-of-way applications.

The study was established June 3, 2012 on an abandoned parking lot, along I-71 near Carrollton. Plots were 8 m long expansion joints in the pavement and the spray width was 15 cm at 1,700 L/ha. The proportion of the "crack" without green vegetation (% bareground) was assessed 50 (7/23/2012), 143 (10/24/2012), and 429 (8/6/2013) days after treatment (DAT).

Since some of the applied herbicide may wash off the sidewalk to adjacent desirable turf areas, a turf damage trial was established the same day. Plots were 0.15 x 3 m and treatments were applied at 850 L/ha. Turf damage (0 = dead to 9 = fully green; with unsprayed strips set at 8.0) was assessed on the same dates as above.

All treatments provided control 50 and 143 DAT. By 143 DAT, three treatments had greater control than glyphosate by itself. These were the treatments including Esplanade (indaziflam), Arsenal (imazapyr), and Karmex (diuron). The treatment with Oust (sulfometuron) was the only one with less vegetation than untreated 429 DAT.

All the treatments damaged the turf 50 DAT except for Esplanade. This treatment did not show turf damage at any assessment. The most severe damage 50 DAT was with the Arsenal and Karmex treatments. The Arsenal plots had dead turf 50 DAT and minimal regrowth 429 DAT. The choice of product or mixture should consider the efficacy, cost, risk of off-site damage, and any label restrictions on site of application.

POSTEMERGENCE WHITE CLOVER CONTROL WITH 2- AND 3-WAY HERBICIDES. R. Grubbs*, K. Tucker, C. Straw, T. Burch, G. Henry; University of Georgia, Athens, GA (27)

ABSTRACT

REDUCED RATES FOR SYNERGISM OF TOPRAMEZONE AND ATRAZINE FOR WEED CONTROL IN CORN. K.M. Vollmer*; Virginia Tech, Painter, VA (28)

ABSTRACT

HPPD-inhibiting herbicides have been shown to be effective in controlling many grass and broadleaf weed species. The effectiveness of these herbicides is improved with the addition of atrazine to the tank mix. Current label recommendations for topramezone suggest applying up to18.4 g ai ha^{-1} with atrazine at 560 g ai ha^{-1}. In 2013, a field study was established in conventional–tillage corn system at the Virginia Tech Eastern Shore Agricultural Research and Extension Center in Painter, VA. The objective of this study was to determine whether or not control using this topramezone/atrazine mix is affected if the recommended rate of one or both herbicides is cut in half. The study was a conducted as a randomized complete block design with 3 replications. All herbicide treatments were made POST when weeds reached 10-15 cm. The recommended rates of 18.4 g ai ha^{-1} topramezone with 560 g ai ha^{-1} atrazine were chosen as standards and applied alone at 1X and ½X rates or in combination rates of 1X + 1X, ½X + 1X, 1X + ½ X, and ½X + ½X topramezone and atrazine, respectively. Each application also contained methylated soybean oil and urea ammonium nitrate at 1% and 1.25% v/v respectively according to label recommendations. The study consisted of a randomized complete block design with 3 replications. Plots were visually evaluated for percent control 7 and 35 DAT on a scale of 0 to 99 with 0 being no control and 99 being almost complete control. Synergism and antagonism were determined by calculating expected values from observed values using the equation: $E = [(x + y) – xy/100]$ where E is the expected level of control given by the combination of 2 herbicides, x is the % control of herbicide 1, and y is the % control of herbicide 2 (Colby 1967). Data were analyzed using ANOVA and expected and observed means compared using Fisher's LSD (0.05). At 7 and 35 DAT, topramezone and atrazine alone or in combination provided over 90% control of common ragweed, ivyleaf morningglory, and smooth pigweed regardless of application rate. All herbicide applications failed to control emerged curly dock. Although there were differences among observed and expected means, there were no statistical differences to conclude that there were any synergistic affects at any rate. It would appear that combining topramezone and atrazine provides an additive affect in controlling certain broadleaf species. However, this study shows that it is possible to alter the rates in the topramezone/atrazine mix and still get excellent control. Additional research needs to be conducted to not only determine whether or not these reduced rates will completely eliminate target weed species, but also assure that herbicide resistance does not develop as a result of these reduced rates.

EFFECTS OF GROWTH REGULATOR RATE AND APPLICATION TIMING ON SORGHUM GROWTH AND YIELD. T.E. Besancon*[1], W. Everman[2], R. Riar[1]; [1]NCSU, RALEIGH, NC, [2]NC State University, Raleigh, NC (29)

ABSTRACT

North Carolina growers produced Sorghum on 100,000 acres in year 2013. This acreage is expected to increase in the future due to an assured market, grower enthusiasm, low production cost, drought tolerance and a lowered risk when compared to corn, especially on sandy soils. Since sorghum is an old crop with renewed interest, this is the first time it has been grown on a large scale in North Carolina. This crop may be a good fit in the overall cropping system of the state. However, limited information on production and weed management is available in the state. Weed control is an important aspect of profitable crop production which has a bearing on the success of a new crop, and in determining its fit in a cropping system. In order to address the issues of successful weed management under the given environment and cropping system, studies were conducted in 2012 and 2013 at the Upper Coastal Plain Research Station (Rocky Mount, NC) and at the Central Crops Research Station (Clayton, NC). The objective was to evaluate the growth and yield response of sorghum to different rates of 2,4-D amine (100, 217 and 333 g ai.ha^{-1}) and one rate of Dicamba (280 g ai.ha^{-1}) applied post-emergence beyond the recommended growth stage (15-20 cm tall), at 25, 35, 46, 56, 66, and 74 cm height. Significant reduction in yield was observed with later applications of both 2, 4-D and dicamba compared to earlier applications. No difference in yield reduction was observed across the different rates of 2,4D-amine. Yield reduction was significantly more important for dicamba compared to 2,4-D amine. Significant yield reduction was observed when growth regulators were applied beyond 50cm tall sorghum.

GROWTH CHARACTERIZATION OF AN ALS-INHIBITOR-RESISTANT YELLOW NUTSEDGE POPULATION FROM EASTERN ARKANSAS. M.V. Bagavathiannan*, J.K. Norsworthy, D. Riar, Z.T. Hill, B.W. Schrage, C.J. Meyer, H.D. Bell; University of Arkansas, Fayetteville, AR (30)

ABSTRACT

Yellow nutsedge (*Cyperus esculentus* L.) is a problematic weed in rice-soybean production systems of the midsouthern United States. Recently, a yellow nutsedge population collected from eastern Arkansas was confirmed to exhibit high levels of resistance to halosulfuron-methyl, an acetolactate synthase-inhibiting herbicide commonly used for sedge control in rice production. Experiments were conducted to examine whether the resistant (*Res*) population exhibited growth and reproductive characteristics similar to susceptible populations (*Sus* 1 to 3) originating from the same geographical region. Two greenhouse experiments were conducted. In the first experiment, growth characteristics were quantified in the absence of competition for space, using nursery flats (6.5 cm x 40 cm x 54 cm). Plants from this experiment were harvested at 50 days after transplanting (DAT) to measure number of shoots produced, shoot weight, and root weight from each sample. The second experiment was conducted using pots (18 cm deep x 17 cm radius) to determine growth and reproduction under competition for space. Plants were harvested at 150 DAT and observations were carried out on shoot weight, root weight, tuber numbers, and tuber weight from each sample. Experiments revealed that the *Res* population exhibited a radically different growth habit, with new shoots emerging away from the mother plant, a characteristic that may favor rapid spatial expansion of the population. At 15 DAT, the *Res* plants moved to the farthest distance of 27 cm, at which point the *Sus* populations moved only to a maximum of 5 cm away from the mother plants. Flowering was observed in the *Res* population, but none of the *Sus* populations flowered under the experimental conditions. Growth and tuber characteristics lead to a suspicion that the *Res* population may be a hybrid between purple and yellow nutsedge. Research is underway to verify the genetic background of the *Res* population and also to understand photoperiodic requirement, fecundity, and seed viability of the experimental populations.

LATE-SEASON HERBICIDE OPTIONS IN RICE. E.A. Bergeron*, E.P. Webster, J.C. Fish, B.M. McKnight; LSU AgCenter, Baton Rouge, LA (31)

ABSTRACT

A study was established at the Louisiana State University AgCenter Rice Research Station near Crowley, Louisiana to evaluate herbicides with predominantly broadleaf and/or nutsedge activity. The study had a randomized complete block design with four replications. 'Clearfield 111' rice was planted on March 27, 2013. The entire area was treated with clomazone at 336 g ai/ha applied preemergence to control grasses. A post-flood application of fenoxoprop at 122 g ai/ha was applied to control late emerging grasses. Salvage treatments were applied to rice in the 4- to 6-tiller stage 73 days after planting. Herbicides applied to rice in a salvage situation were: bensulfuron at 42 g ai/ha, bispyribac at 28 g ai/ha, carfentrazone at 17 g ai/ha, carfentrazone plus quinclorac at 441 g ai/ha, halosulfuron at 52 g ai/ha, halosulfuron plus thifensulfuron at 39 g ai/ha, imazosulfuron at 157 g ai/ha, orthosulfamuron at 70 g ai/ha, orthosulfamuron plus halosulfuron at 79 g ai/ha, penoxulam at 35 g ai/ha, penoxulam plus triclopyr at 336 g ai/ha, propanil at 3360 g ai/ha, quinclorac at 448 g ai/ha, saflufenacil at 50 g ai/ha, and triclopyr at 280 g ai/ha. Indian jointvetch (Aeschynomene indica L.) and hemp sesbania [Sesbania herbacea (Mill.) McVaugh] control, and rice injury were visually evaluated at 14, 28, and 42 days after treatment. Rice was harvested on July 30 with a small plot combine and yield was adjusted to 12% moisture.

At 14 DAT, Indian jointvetch control was 95 to 96% when treated with all herbicides evaluated except carfentrazone, propanil, and triclopyr with 90 to 91% control. Indian jointvetch control increased to 97 to 98% when treated with all herbicides except carfentrazone with 91% control. At 7 days prior to harvest, Indian jointvetch control was above 90% when treated with most herbicides evaluated; however, control declined with bensulfuron 59%, carfentrazone 70%, and propanil 88%. Hemp sesbania was harder to control due to the large size of the plants at application. At 14 DAT, bispyribac, penoxulam plus triclopyr, and saflufenacil controlled hemp sesbania 95 to 98%; however, bensulfuron, carfentrazone, and triclopyr controlled hemp sesbania less than 80%. Hemp sesbania control had similar trends at 28 and 42 DAT.

No injury was observed from the late season applications, and rice plant height at harvest was 98 to 106 cm across all treatments. Rough rice yield was 10,270 kg/ha from rice treated with halosulfuron; however, no difference in yield occurred with rice treated with bispyribac, carfentrazone, imazosulfuron, orthosulfamuron, orthosulfamuron plus halosulfuron, penoxulam, penoxulam plus triclopyr, quinclorac, and triclopyr with yields from 9020 to 9720 kg/ha.

Producers should not rely on salvage applications to manage weed problems; however, unforeseen circumstances dictate these applications. With the number of herbicides available for use in rice some have labels that support salvage applications. Halosulfuron is a herbicide that is legal to apply in many salvage situations, and often fits the weed spectrum present in rice fields in the late season in Louisiana.

DEVELOPMENT OF CLEARFIELD WHEAT FOR SOUTHERN SPANISH CONDITIONS. A.M. Rojano[1], A.I. Jurado[1], F. Jiménez[2], R. De Prado*[3]; [1]Universidad de Córdoba, Córdoba, Spain, [2]IDIAF, BONAO, Dominican Republic, [3]University of Cordoba, Cordoba, Spain (32)

ABSTRACT

The south of Spain, mainly Andalusia, is the main producer of Spanish wheat i.e. approximately 80% of the national total harvest. The fact is that the Andalusian region is favored by several factors such as its geographic location, which gives it a mild climate for this type of crop, and for its early spring. However, this climatology also benefits the weeds which infect extensive wheat fields, causing great economic losses. To combat this new enemy, tests were made of IMI-resistant wheat cultivars developed by agricultural research institutes in Chile in collaboration with the BASFcompany and which were designed using Clearfield technology. These were. Bicentenario, Dollinco, Ikaro, Impulso, Invento and Pandora S. The variables evaluated included dose-response to the Imazamox herbicide and ALS enzymatic activity. The Imazamox dose, expressed as a gram of active ingredient per hectare (g a.i. ha^{-1}), that reduced the wheat fresh mass by 50% (ED_{50}), ranged from 151.0 for Ikaro to 1.6 for Pandora S. The herbicide concentrations that inhibited ALS enzyme activity by 50% (I_{50}) were correlated with the ED_{50}. Thus, the level of resistance in the cultivars is as follows: Ikaro > Impulso > Invento > Bicentenario = Dollinco > Pandora. These results show that the cultivar Ikaro is the most resistant and, for that reason, the next step will be its agronomic behavior in field in Southern Spain.

GLYPHOSATE METABOLISM IN *COLOGANIA BROUSSONETII*. A.M. Rojano[1], R. De Prado*[2];
[1]Universidad de Córdoba, Córdoba, Spain, [2]University of Cordoba, Cordoba, Spain (33)

ABSTRACT

Cologania broussonetii is an important legume that has been used in past years as a cover crop and forage in a mild climate in Mexico. This species presents a ED_{50} of 129.13 g ea ha^{-1} of glyphosate, compred to *Conyza bonariensis* with 35.00 g ea ha^{-1}. The metabolism studies realized in plants (foliar part and root) of both species at 20 days after herbicide treatment with 74.00 g ea ha^{-1} of glyphosate showed approximately 62.74 % conversion of the herbicide into the different metabolites (glyoxylate, AMPA, sarcosine and formaldehyde) in *C. broussonetii*, while in *C. bonariensis*, only traces of one metabolite (AMPA) were detected. Glyphosate absorption and penetration were also studied using the previous method. The *C. broussonetii* exhibited a limited uptake of glyphosate and translocation of the compound to meristematic tissues, in which only the metabolites were translocated. However, in *C. bonariensis*, the glyphosate penetration was about twice that of *C. broussonetii* (76.57 *vs* 36.89 µg glyphosate/ g fresh weight) and the translocation studies revealed increased movement of the herbicide to untreated leaves and roots in this species with respect to the legume. All these results corroborate the high innate tolerance to glyphosate in *Cologania broussonetii*.

USING HERBICIDES IN SESAME. D. Langham*[1], P.A. Dotray[2], W. Grichar[3]; [1]Sesaco Corp, San Antonio, TX, [2]Texas A&M AgriLife Research, Lubbock, TX, [3]Texas A&M AgriLife Research, Yoakum, TX (34)

ABSTRACT

Sesame (*Sesamum indicum* L.) is one of the oldest crops known to humans. It has been planted for over 7,500 years in Asia and Africa in very poor growing conditions. Sesame cultivars in those areas were tall, had very long internodes, and grew above the weeds. Letters from Thomas Jefferson document his trials with sesame between 1808 and 1824. Jefferson stated that sesame "…is among the most valuable acquisitions our country has ever made. … I do not believe before that there existed so perfect a substitute for olive oil." He talks about the rule of thumb that still exists today - that sesame will do well where cotton (*Gossypium hirsutum* L.) does well.

The presence of weeds can negatively influence sesame yields. It has been reported that the major factor influencing sesame yield loss in a competitive situation between the crop and weed is the ratio between the relative leaf area of the weed and the crop at the time of crop canopy closure. In direct combining, the weeds can be a big problem in that they are normally green and add moisture to the combine bin. There are many cases where the sesame seeds are dry and weed seeds are not. Thick stems can add moisture, but the major problem is weed seeds. Since it is logistically difficult to scalp off the weed seeds at harvest, moisture from the weeds will transfer to sesame seeds. Sesame is 50% oil and needs to be harvested at 6% moisture or below in order to be transported by trucks and stored in silos. High moisture under these conditions can lead to heating and ruining of the seed. A second concern is that mechanically harvested sesame moves through a series of augers from the combine screen, to the combine bin, to the truck, to the silo, to the cleaning equipment, and within the cleaning process. Moist sesame can be damaged by this movement forming free fatty acids and leading to spoiling.

The small size of the sesame seed is similar to the size of many weed seeds. In the use of oil, weed seeds within the sesame samples are not as critical unless they are toxic. However, a large percentage of sesame is used in the edible markets that require 99.99% purity. There are seeds such as johnsongrass [*Sorghum halepense* (L.) Pers] that would seemingly be easy to remove because of their size and shape; however, the johnsongrass seed goes through the round holes end first and are difficult to separate in gravity tables because they have a similar specific gravity to sesame. In decortication of the seed for bakery products and tahini, the seed from lanceleaf sage (*Salvia reflexa* Hornem.) caused a unique problem. When the lanceleaf sage seed was hydrated, the seed surface formed a gelatinous substance that caused all the sesame seeds around it to stick and form balls. Kochia [*Kochia scoparia* (L.) Schrad] and grass seeds are other weeds that are difficult to separate out from sesame. Any weed seed that is in a sesame sample in a large percentage, is difficult to separate out, no matter the size and specific gravity, without having to slow down the processing or reprocessing. In Japan, purity needs to be 100% since processors have to pay claims to customers that find anything other than pure sesame seeds. The major form of weed control after the first 40-50 d of planting is the sesame canopy which blocks out light. At about 60 d after planting, current sesame varieties begin losing the leaves under the canopy where there is no light. As the plants mature, they self-defoliate and leaves are shed by about 100 d after planting. It takes 40 to 50 d from the time that the plants lose all their leaves until the sesame is dry enough to combine. The leaves are a major part of the sun-blocking canopy, and as the weight of the leaves is lost, the branches become more erect letting even more sunlight in. With fall rains there may be a new flush of weeds, particularly fast growing grasses. These late weeds can be controlled in four ways: applying POST-directed herbicides that have soil residual properties; having narrower row spacing; planting the rows north/south so that there is light to the ground only at mid-day; and using harvest aids to shorten the sesame drying period and which also kill and dry weeds. With weak seedling vigor, limited competitive ability, and a lack of cheap labor, the use of PRE and POST herbicides are essential for commercial mechanized sesame production.

TOLERANCE OF MELILOTUS ALBUS, MELILOTUS INDICUS AND CROTALARIA PUMILA TO GLYPHOSATE. F. Gonzalez-Torralva1, J. Rios-Gomez1, J.A. Dominguez-Valenzuela2, R. De Prado*1; 1University of Cordoba, Cordoba, Spain, 2Chapingo Autonomous University, Mexico, Mexico (35)

ABSTRACT

Cover crops for controlling weeds play an important role in sustainable agriculture. Unfortunately, the tolerance to herbicides in leguminous that can be used as cover crop are poorly described. Because of its agronomic characteristics, glyphosate can be incorporated into an integrated weed management program by helping to establish the cover crop. Advantages of establishing a cover crop include the incorporation of organic matter, atmospheric N_2 fixation, preventing soil erosion and controlling the growth of other undesirable weeds. With the aim of assessing the tolerance of some legumes to glyphosate, dose-response assays were carried out on *Melilotus albus*, *M. indicus* and *Crotalaria pumila.* Results showed a LD_{50} (dose required to produce 50% mortality) of 979.8, 686.7 and 478.3 g ae ha^{-1} for *M. albus*, *M. indicus* and *C. pumila*, respectively. *M. albus* showed the highest tolerance to glyphosate, so this species could be adopted into an integrated weed management program.

CURRENT STATUS OF HERBICIDE-RESISTANT WEEDS IN MEXICO. F. Gonzalez-Torralva[1], J. Rios-Gomez[1], J.A. Dominguez-Valenzuela[2], R. De Prado*[1]; [1]University of Cordoba, Cordoba, Spain, [2]Chapingo Autonomous University, Mexico, Mexico (36)

ABSTRACT

Herbicide resistance is a global concern. Resistant weeds can considerably decrease yields in any crop. Nowadays, worldwide, there are biotypes of 221 species (130 dicots and 91 monocots) which are resistant to herbicides. In America, most herbicide-resistant weeds are found in USA (144 species), Canada (59 species), Brazil (31 species) and Chile (16 species). In Mexico five species have been reported as being resistant to herbicides: *Avena fatua*, *Phalaris minor* and *P. paradoxa*, which are resistant to ACCase herbicide inhibitors, *Leptochloa virgata* resistant to glycines and *Sorghum halepense* to ALS inhibitors. Nonetheless, recently, new cases have been added: biotypes of *Eleusine indica* resistant to glycines and *Ixophorus unisetus* a monocot weed with biotypes resistant to ALS-inhibiting herbicides. In *Avena fatua*, the maximum resistance index (RI) reported was with fenoxaprop p-ethyl (11.62), while in *P. minor* the maximum RI reported was with herbicide cyhalofop- buthyl (17.49), whereas in *P. paradoxa* this RI was higher (22.58). In *S. halepense*, the RI with nicosulfuron was in the range of 4 to 37 depending on the application growth stage, and in the case of *I. unisetus*, the RI to nicosulfuron herbicide was in the range of 2-4. The RI in *L. virgata* resistant to glyphosate was in the range of 2-3 times. In the case of *E. indica* collected in citrus orchards, this has shown a lower degree of resistance with a RI of 2.68 compared to a S biotype. We observed that the RI found among the different species is still low, and, in most cases, below the recommended field rate. Resistance of weeds in Mexico suggests that measures to mitigate or stop the resistance evolution would have to be implemented.

BAHIAGRASS SEEDHEAD CONTROL AND GROWTH REGULATION WITH BCS25797. P. McCullough*[1], S. Williams[1], D. Spak[2], S.M. Wells[3]; [1]University of Georgia, Griffin, GA, [2]Bayer Crop Science, Research Triangle Park, NC, [3]Bayer CropScience, High Springs, FL (37)

ABSTRACT

Bahiagrass is managed for roadside turf in Georgia but prolific seedhead production may warrant the use of herbicides and growth regulators for suppression. BCS25797 has potential for inhibiting growth of roadside grasses and is currently under evaluation for use in vegetation management. Two field experiments were conducted in Griffin, GA in summer 2013 to evaluate efficacy of BCS25797 for bahiagrass growth regulation and seedhead control. Treatments included BCS25797 at 38, 76, and 102 g ai/ha, imazapic at 53 g ai/ha, and sulfometuron at 53 g ai/ha. An untreated check was included. All treatments had a non-ionic surfactant included at 0.25% v/v. Treatments were applied with CO_2 pressured sprayers at 234 L/ha on June 11, 2013 and June 25, 2013 in Experiments 1 and 2, respectively. On the day of treatments, bahiagrass height was approximately 20 cm and 15 cm in Experiments 1 and 2, respectively. Seedheads emerged in the nontreated plots throughout the experiment but were not present on the day of treatments. In Experiment 1, all treatments provided excellent (>90%) control of bahiagrass seedheads and reduced vegetative height by 30 to 50% from the nontreated at 12 WAT. In Experiment 2, all rates of BCS25797 completely controlled bahiagrass seedheads from 2 to 12 WAT and reduced vegetation height ≥50% from nontreated. Bahiagrass injury was primarily in the form of stunted growth and discoloration. Bahiagrass was injured 30% from all treatments at 2 WAT, and increased to 50% at 4 WAT in Experiment 1. However, bahiagrass recovered with <25% injury by 8 WAT. Bahiagrass injury from all rates of BCS25797 was similar to imazapic and sulfometuron. In Experiment 2, BCS25797 injured bahiagrass 42 to 68% at 8 WAT but was greater than imazapic and sulfometuron treatments. Bahiagrass treated with BCS25797 at 38 g/ha was injured 33% at 12 WAT and was similar to imazapic. BCS25797 at all rates and sulfometuron provided 100% control of buckhorn plantain at 12 WAT. Overall, BCS25797 at all rates tested may be used to reduce vegetation height and control seedheads, but applications at 38 g/ha were the least injurious to bahiagrass and were comparable to imazapic.

APPLICATION TIMING AND FORMULATION INFLUENCE POSTEMERGENCE SMOOTH CRABGRASS CONTROL WITH DITHIOPYR IN BERMUDAGRASS AND TALL FESCUE. C. Johnston*, P. McCullough; University of Georgia, Griffin, GA (38)

ABSTRACT

Dithiopyr is a pyridine herbicide that provides pre- and early postemergence control of smooth crabgrass in turfgrass. The objective of this research was to evaluate formulation and application timing on efficacy of dithiopyr for smooth crabgrass control in bermudagrass and tall fescue. Experiment 1 was conducted on a common bermudagrass field, and Experiment 2 was conducted on a Talladega™ tall fescue field. Bermudagrass and tall fescue were mowed weekly during active growth at 5 and 7.5-cm heights with a rotary mower, respectively, and irrigated as needed to prevent wilting. For the tall fescue experiment, treatments included dithiopyr 2 EW at 0.56 kg a.i. ha^{-1}, dithiopyr 0.27 GR at 0.56 kg a.i. ha^{-1}, and quinclorac at 0.84 kg a.i. ha^{-1}. For the bermudagrass study, treatments included dithiopyr 2 EW at 0.56 kg ha^{-1}, dithiopyr 0.27 GR at 0.56 kg ha^{-1}, and sethoxydim at 0.28 kg a.i. ha^{-1}. Treatments were applied at three growth stages of smooth crabgrass including multi-leaf, 1 to 2 tiller, and 3 to 5 tiller. An untreated check was included in both experiments. In the tall fescue experiment, all treatments provided 88% control of multi-leaf and 1 to 2 tiller smooth crabgrass in late June. By late August, dithiopyr 2EW provided good control (>80%) of smooth crabgrass at the multi-leaf timing, but control from tillered timings was poor (<70%). Dithiopyr 0.27 GR provided fair control (70 to 79%) of smooth crabgrass by late August at the multi-leaf and one-tiller timing, but treatments at multi-tiller timing provided poor control. By late August, quinclorac treatments in tall fescue at the multi-leaf treatment provided poor control, while treatments at the 1 to 2 tiller and 3 to 5 tiller timings provided fair control. In the bermudagrass experiment, both dithiopyr formulations controlled smooth crabgrass 78% in June, but control was poor by late August. Dithiopyr treatments provided poor control of tillered smooth crabgrass in June and August. Sethoxydim excellent control of multi-leaf and 1 to 2 tiller smooth crabgrass in June but control declined to 71% by August. Sethoxydim provided fair control of 3 to 5 tiller smooth crabgrass in June, but control was poor by August. Dithiopyr and quinclorac treatments did not significantly injure tall fescue. Dithiopyr did not significantly injure bermudagrass, but sethoxydim caused unacceptable injury (>20%) on several dates.

MESOTRIONE AND PRODIAMINE COMBINATIONS FOR CRABGRASS CONTROL IN CENTIPEDEGRASS. J. Yu*, P. McCullough; University of Georgia, Griffin, GA (39)

ABSTRACT

Mesotrione effectively controls smooth crabgrass in spring, but subsequent germination of crabgrass in summer may warrant tank-mixtures with PRE herbicides for season-long control. Field experiments were conducted at the University of Georgia in Griffin, GA from April to September in 2013. Treatments were applied to an irrigated common centipedegrass lawn maintained at 5-cm mowing height with clippings returned. Mesotrione plus prodiamine treatments were made with a pre-packaged formulated mixture, delineated as A15879A, at 0.56 kg a.i. ha-1 at three timings including: RRE followed by (FB) 8 weeks after treatment (WAT), POST multi-leaf FB 4 WAT, or POST 1 to 2-tiller FB 2 WAT. Prodiamine alone was applied at the aforementioned PRE program at 0.42 FB 0.42 kg a.i. ha-1, or sequentially at POST multi-leaf FB 4 WAT. Dithiopyr was also applied sequentially at 0.28 kg a.i. ha-1 at the aforementioned PRE program, or singly at 0.56 kg a.i. ha-1 at the two POST timings. Spray solutions of mesotrione plus prodiamine treatments with the exception of PRE application timing included a nonionic surfactant at 0.25% v/v. Herbicide treatments were applied with a CO2-pressured backpack sprayer calibrated to deliver a total of 374 L ha-1 using a single 9504E flat-fan nozzle to 1 x 3-m plots in a randomized complete block with four replications. All PRE, POST multi-leaf, and POST 1 to 2- tiller treatments were made on April 10, April 18, and May 18, respectively. Smooth crabgrass cover increased over time in the nontreated plots, and averaged 94% cover by September 18. Single dithiopyr treatments at POST timings provided good smooth crabgrass control (80 to 89%) on May 29, but control declined to <46% on July 17. Sequential dithiopyr treatments provided fair (70 to 79%) to excellent (90 to 100%) smooth crabgrass control before July 17, but control declined to 48% by August 21. Prodiamine alone provided 90 and 78% smooth crabgrass control on May 29 when applied PRE fb 8 WAT and early POST timings, respectively, but control was poor (<70%) by July 17. All treatments of mesotrione plus prodiamine provided excellent smooth crabgrass control (>90%) by May 29 and excellent control was maintained by July 17. Mesotrione plus prodiamine treatments applied at the PRE timing provided 92% smooth crabgrass control on August 21 and control measured 80 to 85% when applied at POST timings. All mesotrione plus prodiamine treatments provided fair smooth crabgrass control (70 to 79%) by September 18.

EVALUATION OF ECHELON PROGRAMS FOR ANNUAL BLUEGRASS AND SMOOTH CRABGRASS CONTROL IN BERMUDAGRASS. S. Sidhu*, P. McCullough; University of Georgia, Griffin, GA (40)

ABSTRACT

Annual bluegrass (*Poa annua*) is a problematic winter annual weed that reduces turfgrass quality. Areas with heavy annual bluegrass populations may also have smooth crabgrass (*Digitaria ischaemum*) establish in spring after annual bluegrass decline. and herbicide applications are warranted for control. Preemergence herbicide applications are often warranted for controlling these weeds in bermudagrass. Echelon (prodiamine + sulfentrazone) is often used in spring for crabgrass and sedge control. Sequential application programs of Echelon following other herbicides in fall, such as Specticle (indaziflam), may improve potential for controlling summer annual weeds, such as smooth crabgrass. Experiments were conducted in Griffin, GA from September 2012 to September 2013 on a mature stand of Tifway bermudagrass. Turf was grown on a Cecil sandy loam with 2% organic matter and soil pH of 6.0. Turf was irrigated as needed to prevent wilt and mowed 2 d per wk at 1.3 cm height during active growth using a reel mower with clipping returned. Herbicide treatments included Echelon at 1.26 kg ai ha^{-1} applied in fall followed by (FB) spring application at 0.84 kg ai ha^{-1}, or singly at 1.26 kg ai ha^{-1} applied in fall only. Specticle (indaziflam) at 35 g ai ha^{-1} applied in fall FB Echelon at 0.84 kg ai ha^{-1} applied at spring, or Specticle alone at 35 g ai ha^{-1} applied in fall only. Treatments also included Barricade alone at 0.84 kg ai ha^{-1} sequentially applied in fall FB spring applications. Treatments were made at 374 L ha^{-1} spray volume to 0.9 x 3-m plots in a randomized complete block with four replications. Fall applications of Echelon provided good (80 to 89%) to fair (70 to 79%) control of annual bluegrass in February and March. Specticle treatments in fall provided excellent (>90%) control of annual bluegrass from February 15 to April 3, 2013 and was comparable to fall applications of Barricade. Applications of Echelon in March did not improve annual bluegrass control following Specticle treatments in fall. Echelon or Barricade applied sequentially in fall FB spring provided excellent smooth crabgrass control (97%) from July 1 to September 18, 2013. Echelon treatments in spring after fall Specticle applications provided 98% of smooth crabgrass from July 1 to September 18, 2013. Efficacy of Echelon for smooth crabgrass control was not improved when spring applications followed fall applications of Specticle, compared to Echelon FB Echelon. Single Echelon and Specticle treatments applied in fall did not have enough residual activity on crabgrass in summer and provided poor (<70%) control from July to September. Overall, sequential Echelon treatments provided excellent smooth crabgrass control, but Specticle use in fall did not improve efficacy of spring Echelon treatments.

EVALUATION OF TRIBUTE TOTAL FOR DOVEWEED CONTROL IN BERMUDAGRASS. S. Williams*, P. McCullough; University of Georgia, Griffin, GA (41)

ABSTRACT

Doveweed (*Murdannia nudiflora*) is a summer annual weed that is problematic in turfgrasses. Doveweed generally germinates in summer and most preemergence herbicides applied in spring are ineffective for control. Specticle (Indaziflam) and Tribute Total (thiencarbazone-methyl + foramsulfuron + halosulfuron-methyl) are new herbicides for pre- and postemergence weed control in turfgrass, respectively. These herbicides have shown significant efficacy for doveweed control in previous research. However, further research is warranted to evaluate these herbicides in sequential application programs for season-long doveweed control. Field experiments were conducted in a bermudagrass lawn in Valdosta, GA. Treatments included Specticle applications at preemergence (PRE) crabgrass timing in March at 0 or 32 g ai/ha with or without Tribute Total at 136 g ai/ha or Celsius at 233 g ai/ha applied postemergence (POST) for doveweed control in July. All possible combinations were evaluated in a randomized complete block design with four replications of 1 x 3-m plots. Specticle Flo alone applied at preemergence crabgrass timing provided fair (70 to 79%) control of doveweed in August but control was poor (<70%) by September (Figures 1 and 2). However, Specticle in spring followed by Tribute Total in July provided >87% control of doveweed in August and September. Single applications of Tribute Total and Celsius in July provided temporary suppression of doveweed but regrowth was detected and control was poor by September. Results suggest Specticle use in spring followed by Tribute Total or other POST herbicides warrants further investigation for controlling doveweed in turfgrass.

PREEMERGENCE GOOSEGRASS CONTROL IN BERMUDAGRASS PUTTING GREENS. J.D. McCurdy*1, J.S. McElroy2, M.L. Flessner2; 1Mississippi State University, Auburn, AL, 2Auburn University, Auburn, AL (42)

ABSTRACT

Goosegrass (*Eleusine indica*) is a troublesome weed in bermudagrass (*Cynodon dactylon* x *C. transvaalensis*) putting greens, due in part to its delayed emergence relative to crabgrass (*Digitaria* spp.) and due to its prolonged emergence throughout the summer. There are limited options for herbicidal goosegrass control in bermudagrass putting greens. Herbicides with both pre- and early post-emergence activity, such as dithiopyr or dimethenamid-P, may have enhanced utility for goosegrass control if applied at multiple application timings. Likewise, the addition of a postemergence active herbicide, such as sulfentrazone, may enhance goosegrass control efficacy.

Research was conducted to evaluate preemergence and early-postemergence goosegrass control strategies on bermudagrass putting greens at two separate locations during 2013. Treatments included: oxadiazon (2.24 kg ai ha^{-1} applied March 28 and May 31), dithiopyr (0.19 kg ai ha^{-1} applied March 28, April 18, and May 9), dimethenamid-P (0.84 or 1.12 kg ai ha^{-1} applied March 28), sulfentrazone (0.14 kg ai ha^{-1} applied March 28, April 18, May 9), and combination treatments of dimethenamid-P + dithiopyr (1.12 + 0.19 kg ai ha^{-1} applied March 28) as well as sulfentrazone + dithiopyr (0.14 + 0.19 kg ai ha^{-1} applied March 28, April 18, and May 9). With the exception of oxadiazon, which was applied as a 2% granular, all treatments were applied via CO_2 pressurized sprayer at 280 L ha^{-1}. Treatments were watered into the soil profile 30 minutes after application with approximately 3 mm of overhead irrigation. Bermudagrass injury and goosegrass control were visually rated on three-week intervals throughout the season. Sites were analyzed separately. Means were separated using Fisher’s Protected LSD. Treatment effects are discussed for both sites.

All applications containing dimethenamid-P injured TifDwarf and TifGreen bermudagrass greens greater than 75%, 21 days after treatment, at both sites. Dimethenamid-P was too injurious for use, despite reported safety at taller fairway mowing heights, and was therefore excluded from further applications. Both dithiopyr alone and in combination with sulfentrazone provided long-term goosegrass control (≥90% on August 1) with no injury to bermudagrass at either location. The addition of sulfentrazone to dithiopyr did not enhance goosegrass control relative to dithiopyr alone. Oxadiazon controlled goosegrass (84% on August 1) similar to that of dithiopyr alone and in combination with sulfentrazone.

Dimethenamid-P was injurious to bermudagrass putting greens but may still have utility as a preemergence herbicide if applied during dormancy. Results indicate that dithiopyr should be evaluated further for its utility and safety in bermudagrass putting greens. Dithiopyr alone and in combination with sulfentrazone may provide a safe alternative to yearly applications of oxadiazon for preemergence goosegrass control.

WEED CONTROL PROGRAMS WITH HUSKIETM IN ARKANSAS GRAIN SORGHUM. M.T. Bararpour*, J.K. Norsworthy, H.D. Bell, and Z.T. Hill; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR (43)

ABSTRACT

Grain sorghum (*Sorghum bicolor*) is an important feed crop grown in Arkansas, and weed management programs are an essential component of crop production. A field study was conducted at the Agricultural Experiment Station, Fayetteville, Arkansas, in 2013 to evaluate the effectiveness of various Huskie™ (pyrasulfotole 0.31 + bromoxynil 1.75 lb ai/gal) application programs in grain sorghum tolerance and weed control. The experiment was designed as a randomized complete block with nine treatments and four replications. The experiment was established in a natural weed population of Palmer amaranth (*Amaranthus palmeri*), velvetleaf (*Abutilon theophrasti*), yellow nutsedge (*Cyperus esculentus*), and broadleaf signalgrass (*Urochloa platyphylla*). Treatments were as follows: 1) Huskie at 0.21 + Atrazine (Aatrex) at 0.5 + AMS (ammonium sulfate) at 1 lb/A; 2) Huskie at 0.258 + Atrazine at 0.5 + AMS; 3) Huskie at 0.258 + Atrazine 0.5 + AMS + Induce (NIS) at 0.25%; 4) Huskie at 0.21 + Atrazine at 1 + AMS + Induce; 5) Huskie at 0.258 + Atrazine at 1 + AMS + Induce; 6) Dual II Magnum at 0.95 preemergence (PRE) followed by (fb) Huskie at 0.21 + Atrazine at 1 + AMS + Induce; 7) Dual II Magnum PRE fb Huskie at 0.258 + Atrazine at 1 + Induce; 8) Dual II Magnum + Atrazine at 1 PRE fb Atrazine at 1.5 at 10- to 12-inch grain sorghum (standard treatment); and 9) nontreated check. All herbicide rates were in lb ai/A. Huskie was applied postemergence (POST) to 2- to 4-inch weeds.

Grain sorghum injury was 14, 18, 16, 13, 13, 11, and 15% at 4 weeks after emergence (WAE), and 10, 16, 16, 5, 9, 11, 14% at 7 WAE from treatments 1 through 7, respectively. There was no grain sorghum injury by 9 WAE. All treatments provided excellent (95 to 100%) control of velvetleaf and yellow nutsedge. Palmer amaranth control was 78, 89, 86, 88, 89, 91, 94, and 89% from the application of treatments 1 through 8, respectively. Broadleaf signalgrass was difficult to control. Treatments 1 through 8 provided only 70, 66, 69, 71, 73, 78, 85, and 80% control of broadleaf signalgrass, respectively. Weed interference reduced grain sorghum yield 62% as compared to the treatment with maximum yield (trt. 6). There were no significant differences among treatments 5, 6, 7, and 8 in terms of grain sorghum yield. Grain sorghum yield was 3,878, 4,503, 3,717, 3,668, 5,252, 6,318, 5,529, and 4,953 lb/A for treatments 1 through 8, respectively. In conclusion, two shot application (Dual II Magnum PRE fb Huskie + Atrazine POST) is necessary for better weed control and higher grain sorghum yield.

SORGHUM TOLERANCE AND PALMER AMARANTH MANAGEMENT WITH PYRASULFOTOLE PLUS BROMOXYNIL. T. S. Morris*[1,2], P. A. Dotray[1,2,3], R. M. Merchant[1], and M. R. Manuchehri[1] ; [1]Texas Tech University, Lubbock, TX, [2]Texas A&M AgriLife Research, Lubbock, TX, [3]Texas A&M AgriLife Extension Service, Lubbock, TX (44)

ABSTRACT

Postemergence control of broadleaf weeds in sorghum is achieved by using a number of herbicides including 2,4-D or dicamba. Both of these herbicides may cause unacceptable injury to grain sorghum and drift onto nearby cotton fields can be devastating. Pyrasulfotole plus bromoxynil (Huskie™) has been labeled for control of certain broadleaf weeds including Palmer amaranth (*Amaranthus palmeri* S. Wats.) and 46 other broadleaf weeds, which include kochia (*Kochia scoparia* L.), devil's-claw (*Proboscidea louisianica* P. Mill.) , and other *Amaranthus* species in wheat (*Triticum aestivum* L.), barley (*Hordeum vulgare* L.), CRP, grass grown for seed, grain sorghum (*Sorghum bicolor* L. Moench) (grain and forage) and triticale (*Triticale hexaploide* Lart.). According to the Huskie™ label, applications should be made to grain sorghum between 3-leaf to 30 inches in height and/or prior to flag leaf emergence. Pyrasulfotole plus bromoxynil application rates range from 0.214 to 0.268 lb ai/A using a carrier volume of 10+ gallons per acre (GPA). A maximum of two applications totaling 0.536 lb ai/A may be made per year with at least 11 days between applications. Field trials were conducted at two sites in 2013, Lubbock and Halfway, TX, to evaluate sorghum response and Palmer amaranth control when pyrasulfotole plus bromoxynil is applied in or applied with various tank mix partners. Postemergence applications were made using a CO^2-pressurized backpack sprayer delivering 10 GPA of solution. At Lubbock, pyrasulfotole plus bromoxynil tank-mixed with carfentrazone injured sorghum 24% 5 days after treatment (DAT). No other treatment injured sorghum more than 14%. All treatments except bromoxynil + atrazine controlled 2- to 4-inch Palmer amaranth at least 98% 37 DAT. No differences in sorghum yield were noted when treatments were compared to the non-treated control. At Halfway, pyrasulfotole + bromoxynil (0.217 lb ai/A) in combination with dicamba resulted in 35% sorghum injury at 7 DAT. All other treatments injured sorghum less than 25%. All pyrasulfotole plus bromoxynil-based systems controlled Palmer amaranth at least 92% 14, 21, and 28 DAT. Sorghum injury at 28 DAT was less than 17% for all pyrasulfotole + bromoxynil based treatments. Sorghum yield following all treatments was greater than the non-treated control and ranged from 2903 to 4637 lbs/A.

USING A GROWING DEGREE DAY MODEL TO TIME APPLICATIONS OF FLORASULAM FOR DANDELION (*TARAXACUM OFFICINALE*) FLOWER SUPPRESSION. D.V. Weisenberger*[1], A.J. Patton[2]; [1]Purdue University, West Lafayette, IN, [2]Purdue University, W. Lafayette, IN (45)

ABSTRACT

Dandelion (*Taraxacum officinale*) is a deeply taprooted perennial broadleaf. It is one of the top problem weeds for lawn care professionals in the Midwest. Dandelion is particularly obvious to homeowners in early spring (late April to early May in Indiana) during peak flowering. As lawns turn yellow from dandelion blooms, homeowners begin calling their lawn care professionals to make applications. There are many broadleaf herbicides that will control dandelion. The recommended time for perennial broadleaf control is in the fall of the year as control with herbicides early in the spring is inconsistent compared to fall applications and does not always prevent at least some flowering.

Defendor (florasulam) is a new active ingredient to the turf market from Dow AgroSciences and is currently sold prepackaged with Dimension® 2EW. The unique result from Defendor applications is that it prevents dandelion plants from flowering. From previous work we knew that some application timings provided better flower suppression than other timings. The objectives of this study were 1) Determine how early an application of Dimension® 2EW plus Defendor can be made and still provide optimum flower suppression, 2) Determine what dandelion growing degree day an application of Dimension® 2EW plus Defendor provided optimum flower suppression, and 3) Determine at what dandelion growing degree day will an application of Dimension® 2EW plus Defendor cease to prevent dandelion flowering.

The experiment was conducted at the W.H. Daniel Research and Diagnostic Center in West Lafayette, IN and The Taylor Oil Company grounds in Zionsville, IN. The sites were a Kentucky bluegrass blend with a uniform cover of dandelion. Plots were mown at 5.1 cm (2 in) in West Lafayette and 6.4 cm (2.5 in) in Zionsville. Experimental design was randomized complete block with four replications and an individual plot size of 2.25 m^2 (25 ft^2).

Plots were treated with herbicide on 13 February, 12 March, 15 March, 22 March, 29 March, 5 April, 12 April, 18 April, 24 April and 30 April. Herbicides were applied in 815 L/ha (87 gpa) water with a CO_2 pressurized sprayer at 207 kPa (30 psi). Dandelion coverage was visually rated as percent coverage. Bloom reduction of dandelion was rated as percent reduction in the number of blooms per plot. Additionally, using digital image analysis, we quantified the percent of the images containing yellow pixels (dandelion blooms) using ImageJ. All data were analyzed using SAS (SAS institute, Inc.). Means were separated using Fisher's protected least significant difference when F tests were significant at α=0.05.

The first application of this study was made on 13 February and resulted in a visual rating of 100% flower reduction on 30 April in Zionsville and 6 May in West Lafayette. Therefore, we are not able to answer the question of how early an application of Defendor can be made and still provide optimum flower suppression. In an average year, mid-February is 30 to 45 days before lawn care professionals begin making applications. This data suggest that applications of Dimension® 2EW plus Defendor should be applied at or before the accumulated growing degree days reach 75. All applications prior to 75 accumulated growing degree days provided similar results for dandelion flower suppression. Further research will be needed in 2014 to validate this suggested GDD window.

SEED PRODUCTION OF *CUCUMIS MELO* INVASIVE WEED IN SOYBEAN FIELD. S. Sohrabi[1], A. Ghanbari[1], M. Rashed Mohassel[1], M. Nassiri Mahalati[1], J. Gherekhloo[2], A.M. Rojano[3], R. De Prado*[4]; [1]Faculty of Agriculture, Ferdowsi University of Mashhad, Mashhad, Iran, [2]2- Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, Iran, [3]Universidad de Córdoba, Córdoba, Spain, [4]University of Cordoba, Cordoba, Spain (46)

ABSTRACT

Seed production from weeds can affect future of weed populations and management decisions. A field study was conducted in a randomized complete block design with four replications to investigate seed production of C*ucumis melo* in competition with soybean and in monoculture condition. The number of fruits, seeds, the length and width of fruits were measured at the end of season. The result showed that each surviving plant of *C. melo* produced 70 fruits with up to 160 seeds per fruit. No significant difference was observed between number of fruits and seeds between the two treatments. The number of seeds depended on fruit size. The width and length of fruits were about 2.5 and 3.7 cm, respectively. This research demonstrates that each plant of *C. melo* produces up to 11200 seeds in competition with soybean and in monoculture condition. Results also revealed that soybean could not affect seed production in *C. melo*. It seems that crops with more competitive ability and forages could suppress and affect negatively seed production in *C. melo*.

IMPACT OF WEED MANAGEMENT SYSTEMS ON GREENHOUSE GAS EMISSIONS. A.M. Knight*[1], W. Everman[2], S. Reberg-Horton[2], S. Hu[1]; [1]North Carolina State University, Raleigh, NC, [2]NC State University, Raleigh, NC (47)

ABSTRACT

Worldwide, agriculture accounts for the greatest portion of land with the U.S. having 45% of its land used for agricultural purposes.Â In addition, agriculture is estimated to contribute greatly to the output of two of the main greenhouse gases suspected of contributing most largely to climate change with methane and nitrous oxide contributing 37 and 59 percent to emissions, respectively. These large percentages are suspected to partially be due to the fact that only one-third of nitrogen applied to cropping systems is actually utilized by the system while the additional two-thirds are lost to the environment.Â With different agricultural practices contributing differently to these greenhouse gas emissions, finding how different practices contribute to greenhouse gas emissions will help in the recommendation of best management practices for minimal gas emission contributions by agriculture in the southeastern U.S.Â Field studies were conducted in 2013 at the Center for Agricultural Farming Systems at the Cherry Research Farm in Goldsboro, NC.Â Long-term plots of conventional no-till, conventional-tillage, conventional crop-hay, organic tillage, organic minimal tillage, and organic crop-hay systems were all used with subplot treatments of weedy and weed-free to measure the flux of the greenhouse gases CO_2, CH_4, and N_2O, 24 to 48 hours after ~1.25 cm or more of rainfall following USDA-ARS GRACEnet Project Protocols. Much greater differences were observed between different systems than between subplots. Â Minimal differences could likely be attributed to low weed densities in the organic system treatments.

***CHLORIS POLYDACTYLA* RESISTANT TO GLYPHOSATE FROM BRAZIL: THE FIRSTÂ DESCRIBED CASE WORLDWIDE.** F. Gonzalez-Torralva[1], H. Fabricio Placido[2], A. Arrobas Martins Barroso[3], A.J. Paiola Albretch[3], J. Menendez[4], R. De Prado*[1]; [1]University of Cordoba, Cordoba, Spain, [2]UFPR- Palotina, Palotina, Brazil, [3]Esalq, USP, Piracicaba, Brazil, [4]Huelva University, Huelva, Spain (48)

ABSTRACT

Glyphosate herbicide has been used to control weeds for many years because of its high efficacy and low cost. However, its indiscriminate use is increasing the selection pressure, leading to the appearance of resistant biotypes. With the aim of characterizing the glyphosate resistance level in a *Chloris polydactyla* biotype collected in citrus orchards from Brazil, dose-response assays at two different growth stages were carried out. Results showed a Resistance Index (RI= GR_{50} (R)/GR_{50} (S)) of 2.3 and 2.1 for first and second growth stage, respectively. These results confirmed the resistance to glyphosate in *C. polydactyla* representing the first report of this worldwide.

PLANT COMMUNITY RESPONSE TO STOCKER CATTLE PRODUCTION SYSTEMS. S. Lancaster*[1], P. Lancaster[1], B. Wallis[2], G. Horn[2]; [1]University of Florida, Ona, FL, [2]Oklahoma State University, Stillwater, OK (49)

ABSTRACT

Successful production of perennial grass pastures is dependent on the addition of nitrogen (N) fertilizer However; only 11% are retained in the harvested animal. Recent research suggests that feeding dried distillers grains with solubles (DDGS) to stocker cattle, rather than applying synthetic N fertilizer improves the N use efficiency (NUE) of grazing systems utilizing cool-season grasses. It is likely that DDGS supplementation will also improve the NUE of grazing systems utilizing warm-season grasses. The botanical composition of improved pastures responds rapidly to changes in management, such as nutrient management. Therefore, the objectives of this research were to determine the influence of N source on plant community composition.

Experiments were established in 12 Plains Old World Bluestem pastures (4-10 ha each) during 2010, 2011, and 2012. Four treatments were replicated three times during each year: 1) 90 kg nitrogen ha^{-1}, N); 2) 90 kg nitrogen ha^{-1} plus 39 kg phosphorus ha^{-1}, NP; 3) dried distillers grains with solubles fed at 0.75 % body weight d^{-1}, DDG; 4) no fertilizer and no supplement (CONT). Fertilizer applications were made in early May each year of the study. Picloram+2,4-D was applied to all pastures at the initiation of the study. All pastures were stocked with mixed-breed calves in mid-May of each year. Cattle were allowed to graze as long as adequate forage was available (135, 63, and 119 days in year 1, 2, and 3, respectively).

Canopy cover was estimated using a modified Daubenmire scale with 7 cover classes during July or August 2010, 2011, and 2012. Estimates were recorded from 1-m^2 quadrats at 10 randomly selected locations within each pasture. Canopy cover data were subjected to analysis of variance using the mixed procedure in SAS. Species richness was determined using the rich package in R.

Canopy cover and species richness were influenced by drought conditions during 2011 and 2012. A total of 19 unique plants species were found in the pastures during the study. The plant species most frequently observed included: Plains bluestem (*Bothriochloa ischaemum* L. Keng), common bermudagrass (*Cynodon dactylon* L.), knotroot foxtail (*Setaria parviflora* (Poir.) Kerguélen), snow on the mountain (*Euphorbia marginata* Pursh), and western ragweed (*Ambrosia psilostachya* DC). The dominance of introduced grasses was similar for all treatments in all years. However, native grass cover declined in 2011 and 2012 relative to 2010. There were no differences in the percent cover of forbs during 2010. During 2011, annual forb cover increased in DDG pastures and perennial forb cover increased in CON pastures relative to other treatments. Additionally, perennial forb cover increased in DDG pastures relative to CON pastures during 2012. When pooled over years, fewer species were identified in N, NP, and DDG pastures than in CON pastures.

PERSISTENCE OF CORN HERBICIDES FOR CLOVER ESTABLISHMENT. W.K. Vencill*; University of Georgia, Athens, GA (50)

ABSTRACT

AT PLANTING WEED CONTROL PROGRAMS IN LIBERTY LINK SOYBEAN PRODUCTION SYSTEMS IN LOUISIANA. D.K. Miller & M.S. Mathews; LSU AgCenter Northeast Research Station, St. Joseph, LA (51)

ABSTRACT

A field study was conducted at the Northeast Research Station near St. Joseph, La in 2013 to evaluate residual herbicide programs applied at planting for control of weeds commonly found in Louisiana Liberty Link soybean production systems and potential for crop phytotoxicity. Study design was a randomized complete block with 4 replications. Soil was a silt loam with pH 6.8. Hornbeck HBKLL 4950 soybean was planted on April 30. Preemergence soil (PRE) treatments were applied on April 30 and postemergence (POST) treatment occurred on May 29. Approximately 6.33" of rainfall was received in the interval between PRE and POST application. PRE treatments evaluated included Authority XL at 4 oz/A, Anthem at 6 oz/A + Authority XL at 4 oz/A, Authority Maxx at 5 oz/A, Anthem at 6 oz/A + Authority Maxx at 5 oz/A, Authority MTZ at 14 oz/A, Anthem at 6 oz/A + Authority MTZ at 14 oz/A, Authority Elite at 28 oz/A, Fierce at 3 oz/A, Zidua at 2 oz/A, Valor XLT at 3 oz/A, and Prefix at 32 oz/A. Ignite at 29 oz/A was applied POST to all treatments. To preserve treatment effects, a maintenance treatment of Liberty at 22 oz/A + Select at 16 oz/A was applied on 7/31/13. Parameter measurements included visual crop injury and weed control 14 d after PRE application, 7 and 19 d after POST application, and soybean yield.

At 15 d after PRE application, all treatments resulted in complete control of weeds evaluated. At 7 d after POST application, control of redroot pigweed, sickelpod, yellow nutsedge, barnyardgrass, large crabgrass, pitted morninggoory, entireleaf morningglory, hemp sesbania, broadleaf signalgrass, and goosegrass was at least 78, 67, 100, 78, 87, 88, 100, 95, 95, and 88%, respectively, and equal for all treatments. At 19 d after POST, control was at least 55, 52, 93, 40, 87, 90, 100, 83, 95, and 85% for the respective weeds listed above and equal for all treatments. Soybean injury was not noted at any of the treatment intervals. All treatments resulted in equal soybean yield ranging from 26 to 45 bu/A.

In Liberty Link soybean production systems in Louisiana, residual soil applied herbicides evaluated in this study provide an excellent PRE foundation for weed management.

ENVIVE, CANOPY, FIERCE, BOUNDARY, AUTHORITY MTZ, AND ZIDUA WEED CONTROL PROGRAMS IN LIBERTY LINK SOYBEAN PRODUCTION SYSTEMS IN LOUISIANA. D.K. Miller & M.S. Mathews; LSU AgCenter Northeast Research Station, St. Joseph, LA (52)

ABSTRACT

A field study was conducted at the Northeast Research Station near St. Joseph, La in 2013 to evaluate residual herbicide programs that included Envive, Canopy, Fierce, Boundary, Authority MTZ, and Zidua for control of weeds commonly found in Louisiana Liberty Link soybean production systems and potential for crop phytotoxicity. Study design was a randomized complete block with 4 replications. Soil was a silt loam with pH 6.8. Hornbeck HBKLL 4950 soybean was planted on April 30. Preemergence soil (Pre) treatments were applied on May 1. Postemergence (POST) treatments were applied on May 29. Approximately 6.33" of rainfall was received for the interval between PRE and POST treatment application. Treatments evaluated included Envive @ 3.5 oz/a PRE fb Liberty @ 29 oz/A + Cinch @ 16 oz/A POST, Canopy @ 4 oz/A PRE fb Liberty @ 29 oz/A + Cinch @ 16 oz/A POST, Canopy @ 4 oz/A + Cinch @ 16 oz/A PRE fb Liberty @ 29 oz/A + Cinch @ 16 oz/A POST, Canopy @ 6 oz/A PRE fb Liberty @ 29 oz/A + Cinch @ 16 oz/A POST, Canopy @ 6 oz/A + Cinch @ 16 oz/A PRE fb Liberty @ 29 oz/A + Cinch @ 16 oz/A POST, Fierce @ 3.5 oz/A PRE fb Liberty @ 29 oz/A + Cinch @ 16 oz/A POST, Boundary @ 1.5 pt/A PRE fb Liberty @ 29 oz/A + Cinch @ 16 oz/A POST, Authority MTZ @ 12 oz/A PRE fb Liberty @ 29 oz/A + Cinch @ 16 oz/A POST, Zidua @ 2.5 oz/A PRE fb Liberty @ 29 oz/A POST, Zidua @ 2.5 oz/A + Sharpen @ 1 oz/A PRE fb Liberty @ 29 oz/A POST, Zidua @ 2 oz/A PRE fb Zidua @ 1 oz/A + Liberty @ 29 oz/A POST, and Zidua @ 2.5 oz/A + Verdict @ 5 oz/A PRE fb Liberty @ 29 oz/A POST. To preserve treatment effects, a maintenance treatment of Liberty @ 22 oz/A + Select @ 16 oz/A was applied on 7/31/13 over the entire test area. Parameter measurements included weed control 14 and 28 d after PRE application, 14 d after POST application, soybean injury 28 d after PRE application and 14 d after POST application, and yield.

At 14 d after PRE application, all treatments resulted in complete control of all weeds evaluated. At 28 d after PRE application and prior to POST application, control was at least 85, 80, 70, 78, 68, 82, 95, 98, 90, and 87% for redroot pigweed, sicklepod, yellow nutsedge, barnyardgrass, large crabgrass, pitted morningglory, entireleaf morninglgory, hemp sesbania, braodleaf signalgrass, and goosegrass, respectively, and equivalent for all treatments. At 14 d after POST application, all treatments resulted in equivalent control of redroot pigweed (83-100%), sicklepod (72-100%), yellow nutsedge (92-100%), large crabgrass (100%), pitted morninglgory (85-100%), entireleaf morningglgory (100%), hemp sesbania (88-100%), broadleaf signalgrass (98-100%) and goosegrass (87-100%). Barnyardgrass control was at least 97% with all treatments with the exception of Zidua PRE applied alone at 2.5 oz/A (53%) or with Sharpen (58%) or Verdict (62%) fb Liberty alone and Zidua PRE at 2 oz/A fb Liberty + Zidua (83%). Soybean injury was not observed. Differences in weed control were not reflected in soybean yield as yield ranged from 32 to 45 bu/A with no differences noted between treatments.

In Liberty Link soybean production systems in Louisiana, residual soil applied herbicides evaluated in this study provide an excellent PRE foundation for weed management.

SOYBEAN TOLERANCE AND FALL/SPRING BURNDOWN WEED CONTROL WITH CANPY EX, LEADOFF, AND VALOR SX. D.K. Miller & M.S. Mathews; LSU AgCenter Northeast Research Station, St. Joseph, LA (53)

ABSTRACT

A field study was conducted at the Northeast Research Station near St. Joseph, La in 2013 to evaluate fall and spring winter weed burndown, residual activity, and soybean tolerance with Canopy EX, Leadoff, and Valor SX. Study design was a randomized complete block with 4 replications. Soil was a silt loam with pH 6.8. Pioneer 94Y82RR soybean was planted on April 29. Fall burndown treatments were applied on 12/19/12 (135 DBP) and included Abundit at 32 oz/A + 2,4-D at 1.5 pt/A. Spring burndown treatments were applied on 3/1/13 (60DBP) and included Abundit at 32 oz/A + 2,4-D at 2 pt/A. Approximately 26.59" of rainfall was received from fall burndown to spring burndown and 8.23" from spring burndown to planting. Fall treatments evaluated included Canopy EX at 2 oz/A, Leadoff at 1.5 oz/A, Valor SX at 2 oz/A. Spring treatments included Canopy EX at 1.5 oz/A, and Leadoff and Valor at the same rate as applied in fall. Parameter measurements included visual weed control 60 d after fall application, 14 d after spring application, and at planting. Soybean injury was evaluated 21 d after planting.

Complete control (100%) of winter weeds evaluated was observed for treatments applied in fall at 60 DAT. At 14 d after spring applications, control of hairy bittercress was 79 and 75% for Leadoff applied in fall at 1.5 and 2.0 oz/A, respectively, and lower than for all other treatments (96 to 100%). Control of shepherd's purse, marestail, annual bluegrass, swimecress, henbit, and cutleaf evening primrose was at least 100, 100, 100, 94, 100, and 100% respectively. At planting, control of henbit, shepherd's purse, and common chickweed was at least 99, 96, and 95% and equal for all treatments. Annual sowthistle control with Canopy EX and Leadoff at 1.5 oz/a applied in fall was 89 and 91%, respectively, and lower than all other treatments (99-100%). Marestail control was at least 95% for all treatments with only minor differences noted. Canopy EX at 2 oz/A and Leadoff at 1.5 or 2 oz/A applied in fall resulted in 71, 31, and 56% control of cudweed, respectively, and was lower than all other treatments, which provided equivalent control ranging from 94 to 100%. Leadoff at the lower rate applied in fall controlled cutleaf evening primrose 88%, which was equal to the 95% control with the higher rate applied in the fall and lower than all other treatments (96 to 100%). Swinecress control was maximized (86-100%) by all treatments with the exception of Leadoff at 1.5 (76%) or 2 (68%) oz/A applied in the fall. At 21 DAP, soybean injury was not observed for any of the treatments evaluated.

Based on results obtained in this study, at 90 d after fall application, with the exception of Leadoff and hairy bittercress control, Canopy EX, Leadoff, and Valor can provide excellent control of a number of common winter weeds in Northeast Louisiana. At 135 d after fall application, the most consistent control of all weeds evaluated was observed with Valor SX at 2 oz/A. Spring applications of these herbicides can result in excellent control of winter weeds evaluated 60 d after treatment.

CONFIRMATION OF GLYPHOSATE-RESISTANT COMMON RAGWEED IN NORTH ALABAMA.
M.L. Flessner*[1], J.S. McElroy[1], C.H. Burmester[2], A.J. Price[3], J.T. Ducar[4]; [1]Auburn University, Auburn, AL, [2]Auburn University, Belle Mina, AL, [3]National Soil Dynamics Lab, Auburn, AL, [4]Auburn University, Crossville, AL (54)

ABSTRACT

Glyphosate resistant common ragweed (*Ambrosia artemisiifolia*) was first reported in Arkansas and Missouri in 2004 and has since been reported across the mid-west from the Dakotas to Pennsylvania[1, 2]. The mechanism of resistance is not fully understood but both target site mutation and reduced absorption and translocation mechanisms do not appear responsible. Common ragweed with suspected glyphosate resistance was reported in Madison County, in north Alabama. Objectives of this research was to evaluate common ragweed populations collected from Madison County for glyphosate resistance and compare their tolerance level to a known susceptible population.

Common ragweed was collected from the suspect glyphosate resistant population, which was named 'original field,' and transplanted in the greenhouse. Glyphosate was applied at 1.12 kg ae ha^{-1} to the transplants, and seed from plants with the quickest recovery were collected for a population named 'suspected one' (S1). Common ragweed from a different field in Madison County was also collected, and this population was named 'barn-field.' Lastly, common ragweed seed was purchased from Azlin Seed Service (Leland, Mississippi) and used for a glyphosate-susceptible population named 'common.' Populations used for tolerance determination were established from seed in 10 cm^2 pots with soil collected from a Wickham sandy loam (pH 6.3; 1.7% organic matter). Two maturity levels were evaluated. The 'small' stage characterized by 2 to 4 mature nodes above the cotyledons, 4 to 7 cm in height, and averaged 5 cm in width. The 'large' stage had > 6 nodes mature above the cotyledons and averaged 15 cm in height and 12 cm in width.

Glyphosate tolerance was evaluated using rate response studies in the greenhouse with conditions suited for common ragweed growth. Treatments included 0, 0.14, 0.28, 0.56, 1.12, 2.24, 4.5, 9.0, 18.0, and 36.0 kg ae ha^{-1} glyphosate (Roundup ProMax®; Monsanto Co., St. Louis MO) applied at 280 L ha^{-1} (30 GPA). Irrigation was withheld for 24 hours after treatment. Three replications per treatment were applied and the experiment was repeated in time. Data were collected 28 days after treatment and included percent visual control on a 0 to 100 scale where 0 corresponds to no injury and 100 corresponds to plant necrosis and above ground biomass (fresh weight). Mass data were transformed to a percent reduction relative to the nontreated mean for analysis. ANOVA indicated that maturity level was a significant factor, so subsequent analysis was conducted separately for each level. Nonlinear regression analysis was conducted with the four parameter log-logistic model. I_{50} values (glyphosate rate resulting in 50% visual control or fresh weight reduction) were compared between populations using 95% confidence intervals.

Visual control data for the small growth stage was not able to separate populations' glyphosate tolerance; however, data from the large growth stage indicate that original field, barn-field, and S1 were 24, 17, 12 times more tolerant to glyphosate than the common (susceptible) population, respectively. Fresh weight reduction data from the small growth stage indicate that original field and barn-field were 3 to 4 times more tolerant than the common (susceptible) population; the S1 population had a similar tolerance to all other populations. Fresh weight reduction data from the large growth stage indicate that original field and barn-field were approximately 3.4 and 7.9 times as tolerant to glyphosate as the common (susceptible population), respectively, while S1 and common were similar in tolerance. Previous reports of glyphosate resistance report a 10 to 21 fold tolerance increase. These results confirm common ragweed resistance to glyphosate in Madison County, AL, with a 3.4 to 24 fold increase in tolerance. While the level of glyphosate resistance varied with population and growth stage, it can be clearly surmised that all populations are highly resistant to glyphosate applied alone.

On average, original field and barn field had I_{50} values of 1.1 and 0.71 kg ae ha^{-1} while the large growth stage had I_{50} values of 4.8 and 1.8 kg ae ha^{-1}, as estimated by visual and mass reduction data types, respectively. Therefore, if glyphosate is applied at the small growth stage compared to the large, 2.5 to 4.6 times less glyphosate may be necessary for control.

GLYPHOSATE-RESISTANT HORSEWEED ALSO APPEARS DICAMBA-RESISTANT. M.L. Flessner*[1], J.S. McElroy[1], J.N. Toombs[2], C.H. Burmester[3], A.J. Price[4], J.T. Ducar[5]; [1]Auburn University, Auburn, AL, [2]Auburn University, Auburn University, AL, [3]Auburn University, Belle Mina, AL, [4]National Soil Dynamics Lab, Auburn, AL, [5]Auburn University, Crossville, AL (55)

ABSTRACT

Glyphosate resistant horseweed (*Conyza canadensis*) was first reported in the Delaware in 2000 and has since been reported across the U.S. Two mechanism of resistance have been reported: non-target site resistance via reduced translocation to meristematic tissues and target site resistance via overexpression of the EPSPS mRNA. Horseweed with suspected glyphosate resistance was reported in north Alabama and was also suspected to be resistant to dicamba. The objective of this research was to evaluate horseweed populations collected from north Alabama for glyphosate and dicamba resistance and compare their tolerance level to a known susceptible population.

Horseweed was collected from three suspected glyphosate resistant populations in north Alabama. The populations were named according to their location of origin—Cherokee County, DeKalb County, and Tennessee Valley (TVS; from Limestone County, Alabama). A known susceptible population was collected from Lee County and named Auburn. Populations used for tolerance determination were established from seed in soil collected from a Wickham sandy loam (pH 6.3; 1.7% organic matter). Two maturity levels were evaluated—rosette and bolt. Rosette and bolt growth stages were evaluated in 100 cm^2 and 180 cm^2 pots, respectively.

Two greenhouse experiments were conducted to determine glyphosate and dicamba resistance, respectively. Glyphosate tolerance evaluation treatments included 0, 0.56, 1.12, 2.24, 4.5, 9.0, 18.0, and 36.0 kg ae ha^{-1} glyphosate (Roundup ProMax®; Monsanto Co., St. Louis MO) applied at 280 L ha^{-1}. Dicamba tolerance determination treatments included dicamba (Banvel; Arysta LifeScience North America, LLC; Cary, NC) at 0, 0.035, 0.07, 0.14, 0.28, 0.56, and 1.12 kg ai ha^{-1} with and without glyphosate at 1.12 kg ae ha^{-1}. All treatments were applied in 280 L ha^{-1} spray volume. Irrigation was withheld for 24 h after treatment. Treatments were replicated three times and the experiment was repeated. Data were collected 6 weeks after treatment for glyphosate tolerance determination and 9 weeks after treatment for dicamba tolerance determination. Data included percent visual control on a 0 to 100 scale where 100 corresponds to total plant necrosis as well as shoot fresh weight. Biomass data were transformed to a percent reduction relative to the nontreated mean for analysis. Maturity level was significant, so subsequent analysis was conducted separately for each level. Nonlinear analysis using a plateau model was conducted using Prism® (GraphPad Software, La Jolla, CA). I_{50} values (herbicide rate resulting in 50% visual control or fresh weight reduction) were compared between populations using 95% confidence intervals.

Glyphosate resistance was confirmed in Cherokee, DeKalb, and TVS. Visual control at the rosette growth stage indicate that Cherokee, DeKalb, and TVS were 38, 8.1, and 3.9 times more tolerant than the Auburn population, respectively; however, TVS was not significantly different than Auburn. Cherokee, DeKalb, and TVS were 11, 5.9, and 8.5 times more tolerant than the Auburn population, as indicated by fresh weight reduction at the rosette stage; however, TVS was not significantly different than Auburn. Visual control at the bolt growth stage indicates that Cherokee, DeKalb, and TVS were 38, 3.0, and 5.2 times more tolerant than the Auburn population, respectively; however, DeKalb was not significantly different than Auburn. Fresh weight reduction at the bolt stage indicates that Cherokee, DeKalb, and TVS were 12, 14, and 5.1 times more tolerant than the Auburn population, respectively, and all populations were significantly different than Auburn.

All populations had similar tolerance to dicamba, when comparing similar growth stages for both data types, with the exception of Cherokee at the rosette growth stage as indicated by visual data, which did result in slightly higher tolerance (~2 fold greater) than the Auburn population. When glyphosate was tank-mixed with dicamba, the response of glyphosate resistant populations (Cherokee, DeKalb, and TVS) was similar to that of dicamba alone within population at both growth stages, with the exception of Cherokee at the rosette growth stage as indicated by fresh weight reduction data. Therefore, adding glyphosate to dicamba did not enhance control of glyphosate resistant horseweed populations (Cherokee, DeKalb, and TVS). Conversely, adding glyphosate to dicamba greatly enhanced control of the Auburn population at both growth stages. Therefore, we conclude that glyphosate-resistant horseweed populations are now so resistant to glyphosate that applying glyphosate plus dicamba is equivalent to applying dicamba alone.

EVALUATION OF FLUMIOXAZIN AND PYROXASULFONE FOR RESIDUAL WEED CONTROL. H. Jordan*, P. McCullough; University of Georgia, Griffin, GA (56)

ABSTRACT

Piper 76WG contains flumioxazin 33.5% plus pyroxasulfone 42.5% and is registered for PRE and POST weed control in vegetation management. Field experiments were conducted in Griffin, GA to evaluate residual control of broadleaf and grassy weeds in a noncrop area. Treatments were made on April 16, 2013 with CO_2 pressured sprayers calibrated at 234 L/ha with three flat fan nozzles. Treatments included glyphosate IPA salt at 1.8 kg ai/ha plus V-10336 at 0.7 kg ai/ha, glyphosate + V-10336 + imazapic at 0.2 kg ai/ha, glyphosate at + Piper at 0.5 kg ai/ha, glyphosate at + Piper + imazapic, glyphosate + Piper + prodiamine at 1.7 kg ai/ha, glyphosate + diuron at 5.4 kg ai/ha + sulfometuron-methyl at 0.16 kg ai/ha, and an untreated check. The experimental design was a randomized complete block with four replications of 1.5 x 6-m plots. From May to October, all combinations provided excellent (≥90%) control of horseweed, common vetch, common chickweed, hop clover, cudweed, and buckhorn plantain. Johnsongrass control was erratic from July to October and residual control was poor (<70%) from all treatments. The combination of glyphosate + diuron + sulfometuron-methyl provided excellent control of southwestern cupgrass, but all other treatments provided poor control from August to October. By October, goosegrass had emerged in plots but no treatment provided control. Overall, Piper in combination with glyphosate or prodiamine applied in spring may provide excellent residual control of broadleaf weeds but efficacy on annual grasses may be inconsistent by late summer and fall.

INFLUENCING PALMER AMARANTH (*AMARANTHUS PALMERI*) EMERGENCE IN SOYBEAN WITH ROW SPACING, PLANTING DATE AND RESIDUAL HERBICIDES. B.H. Lawrence*[1], T.W. Eubank[2], C.B. Edwards[2], J.P. Mangialardi[1], J.A. Bond[2]; [1]Mississippi State University, Starkville, MS, [2]Mississippi State University, Stoneville, MS (57)

ABSTRACT

Glyphosate resistant Palmer amaranth is currently considered one of the most troublesome weeds to farmers across the southern United States. It has been suggested that cultural practices accompanied with a preemergence (PRE) herbicide can be useful in Palmer amaranth control. Germination and emergence of Palmer amaranth can occur as early as March and as late as November. Palmer amaranth typically germinates at temperatures ≥ 25ËšC and at depths ≥ 2.5 cm depending upon rainfall**.** Palmer amaranth emergence is minimal due to soybean (*Glycine max*) canopy closure and the availability of photosynthetically active radiation (PAR). Field experiments were conducted at Mississippi State University, Delta Research and Extension Center in Stoneville, MS The objectives of this study were to evaluate the effect of soybean planting date, row spacing, and residual herbicides on the emergence of Palmer amaranth.

Experiments were arranged in factorial arrangement of treatments in a randomized complete block design. Factors included: none and 65 g ai/ha flumioxazin + pyroxasulfone (Fierce); planting dates of April 1, April 15 and May 1; and row spacing's of 19, 38 and 76 cm. Plots were conventional tilled with an application of paraquat applied to all plots prior to planting. Weekly evaluations of Palmer amaranth emergence was taken throughout the growing season in three m^2 quadrats. Plot size was 3 x 30 m. Soybean (Asgrow 5433) were planted at a seeding rate of 370,000 seed/ha across all row spacing's.

There was no effect of row spacing on Palmer amaranth emergence. However, there was a main effect of herbicide in that none herbicide plots saw an average of 71 plants/m2 as compared to Fierce treated plots at 5 plants/m2. An interaction between planting date and herbicide treatment was observed where April 1 planted and none herbicide plots averaged 142 plants/m2. There were no differences between other planting dates or herbicide treatments. A main effect of herbicide was observed on soybean yield where Fierce treated plots yielded 3,494 kg/ha as compared to none herbicide of 3,091 kg/ha. Main effects of planting date on soybean yield were observed with the April 1 planting date providing the highest yields of 3,830 kg/ha. There was also a main effect of row spacing on soybean yield with highest yields being observed in the 19 cm spacing at 3,696 kg/ha and was better than 38 and 76 cm spacing's at 3,427 and 2,688 kg/ha, respectively.

DISTRIBUTION OF HERBICIDE RESISTANT ITALIAN RYEGRASS (*LOLIUM MULTIFLORUM*) IN NORTH CAROLINA. Z.R. Taylor*[1], W. Everman[2]; [1]North Carolina State University, Raleigh, NC, [2]NC State University, Raleigh, NC (58)

ABSTRACT

Italian ryegrass (Lolium multiflorum) has become a major weed problem in winter wheat in the southeast, particularly as herbicide resistant biotypes have developed and spread. While we know resistant Italian ryegrass is a problem, little is known about what types of resistance are out there and what areas are affected. In the spring of 2012, a survey was conducted across the major wheat growing areas of North Carolina. Italian ryegrass seed was sampled from fields found in a grid pattern spaced approximately 10 latitude and longitude minutes. Seed samples were taken from 136 field sites. Those seeds were grown in a greenhouse and then treated with postemergence herbicides commonly used for Italian ryegrass control in winter wheat production. The treatments consisted of Powerflex (pyroxsulam) at 3.5 oz/A plus non-ionic surfactant at 0.5% v/v, Hoelon (diclofop-methyl) at 2.66 pt/A, Axial XL (pinoxaden) at 16.4 fl oz/A, and Osprey (Mesosulfuron) at 4.75 oz/A plus methylated seed oil at 1.5 pt/A. We defined resistance as being less than 50% injury, rated visually, after 4 weeks. Initial results indicate resistance to Powerflex in 52% of the tested population, Hoelon in 93% of the tested population, and Axial in 6% of tested populations. Osprey data has not yet been determined and studies are continuing. We found that in all of the locations that showed resistance to Axial, there was also resistance to all other herbicides. This is important to note because it shows that these populations are likely to have resistance to multiple modes of action. Results from this study can help growers determine if resistance is likely in their area, and tailor management strategies to both control and avoid resistant populations.

DETERMINING THE EFFECT OF 2,4-D AMINE CONCENTRATION AND APPLICATION TIMING ON SOYBEAN (*GLYCINE MAX*) GROWTH AND YIELD. Alanna R. Blaine[1], Daniel B. Reynolds[1], Tom W. Eubank[1], and L. Thomas Barber[2]; [1] Mississippi State University, Mississippi State, MS, [2] University of Arkansas, Little Rock, AR (59)

ABSTRACT

With the development of cropping systems containing the new auxin-resistant traits, producers will have additional weed control options. These traits will offer many benefits to producers but will require precautions to ensure they do not injure susceptible crop and non-crop species. Trace amounts of dicamba or 2,4-D on sensitive species can result in severe injury or even death to the plant. Susceptible plant species could be subjected to trace concentrations from spray drift, contaminated spray equipment, and volatility from applications applied to other crops.

The objectives of this research were to determine how reduced rate concentrations of 2,4-D would affect soybean growth and yield, as well as determining which growth stage is most sensitive to 2,4-D. The dimethylamine (DMA) salt of 2,4-D was used for these experiments. Separate experiments for each objective were conducted over six site years (in four different locations). Soybean varieties varied among locations but a late 4 or early 5 indeterminate variety was utilized at all locations. For the first objective, Factor A was application timing and Factor B consisted of application rates. For Factor A, each rate was applied to soybeans at two stages of growth. One was applied at the vegetative stage (V3) and one was applied at the reproductive stage (R1). For Factor B, an X rate for each herbicide was set as 0.56 kg ae/ha. Applications of 2,4-D were applied at a 1X, 1/4X, 1/16X, 1/256X, and 0X rate. For the second objective, an application of 1/4X (0.14 kg ae/ha) 2,4-D was applied. Applications were made weekly until the soybeans reached physiological maturity. Soybean growth stage was recorded at each application in order to determine the most sensitive application timing. Each experiment contained four replicates and experimental units consisted of 4 rows 97 m wide by 12.1 m in length. The center two rows of each experimental unit were treated and evaluated visually and harvested for yield determinations. Treatments were applied in a total delivery volume of 140 liters per hectare.

Visual injury estimates, plant heights, and yield data were collected for all experiments. For objective 1, at 28 days after application, significant visual injury occurred from all 2,4-D treatments (4-58%). Soybean yield reductions did not exhibit an interaction; however, both rate of application and application timing were significant. 2,4-D applied at 1X , 1/4X, 1/16X, 1/64X, and 1/256X rate resulted in a 48, 16, 7, 8, and 5% yield reduction, respectively, when averaged over both application timings. When averaged over all rates of application, the R1 application timing resulted in a 18% yield loss as compared to the 11% from the application at the V3 growth stage. For the second objective, at 28 days after application, the greatest injury (21%) was observed at 7 weeks after soybean emergence, corresponding with the R1 growth stage. No significant visual injury was observed for applications made after 8 weeks of growth, and no significant height reductions were recorded for applications made after 10 weeks. Yield reductions were variable; however, the greatest yield reductions were observed when 2,4-D was applied three to seven weeks after soybean emergence (7-11%), corresponding with the V3 through R3 growth stages.

TEMPORAL EMERGENCE PATTERN OF AMARANTHUS SPP. FROM NATURAL SEEDBANKS IN THE MIDWEST AND MIDSOUTH AS EXPLAINED BY TILLAGE PRACTICES, SOIL TEMPERATURE, AND SOIL MOISTURE. C.J. Meyer[1], J. K. Norsworthy[1], B. W. Schrage[1], H. D. Bell[1], B.G. Young[2], L. X. Franca[2], L. E. Steckel[3], K. W. Bradley[4], W. G. Johnson[5], M. M. Loux[6], V. M. Davis[7], T. W. Eubank[8], G. R. Kruger[9]; [1]University of Arkansas, Fayetteville, AR; [2]Southern Illinois University, Carbondale, IL; [3]University of Tennessee, Knoxville, TN; [4]University of Missouri, Columbia, MO; [5]Purdue University, West Lafayette, IN; [6]Ohio State University, Columbus, OH; [7]University of Wisconsin, Madison; WI; [8]Mississippi State University, Starkville, MS; [9]University of Nebraska, Lincoln, NE (60)

ABSTRACT

Palmer amaranth (Amaranthus palmeri) and common waterhemp (Amaranthus tuberculatus) have become increasingly troublesome weeds throughout the United States. Both species are highly adaptable, dioecious, exhibit rapid growth and are highly fecund, capable of producing hundreds of thousands of seeds per plant. These weedy characteristics contribute to the competitiveness of Amaranthus spp. with agronomic crops and facilitates the rapid spread of herbicide resistance. To further understand the biology of Amaranthus spp., research trials were established in southern Illinois (IL), Arkansas (AR), Tennessee (TN), Indiana (IN), and Wisconsin (WI) in 2013 to characterize Palmer amaranth and waterhemp emergence throughout the growing season from a natural seedbank across geographies as influenced by tillage, soil temperature, and soil moisture. At each location, Palmer amaranth or waterhemp emergence was counted and removed throughout the year from one m2 quadrat for each of three tillage treatments: no-tillage, tillage on May 1, and tillage on May 1 followed by tillage on June 1. Additionally, data loggers connected to soil moisture and soil temperature probes were used to record the respective measurements in each plot. Both species at all locations exhibited an extended emergence pattern with a few periods of extremely high emergence. Peak emergence periods generally occurred early in the growing season (June-July) during periods of adequate soil moisture and soil temperatures between 20-30 C. By the second week in July, 90% of the total seedling emergence of Palmer amaranth seedlings had emerged at all four locations. Similarly, most waterhemp seedlings emerged by the last week of June in IL and by early August in WI. Tillage treatments had slightly different effects depending upon the species and location In IL, Palmer amaranth emergence was decreased following tillage but a subsequent increase in emergence was observed two weeks after tillage compared to no-till. Peak emergence of Palmer amaranth was not influenced by tillage in IN and AR, however, in IL and TN, peak emergence occurred following respective tillage treatments. For waterhemp, duration of emergence was longer in IL (May – October) compared with WI (June – September). Peak waterhemp emergence was observed on June 20 in WI for all tillage systems. In summary, the emergence patterns of these species need to be further characterized across locations and years so that timing of control measures can be effective and herbicide resistance in these species can be appropriately managed.

LIMPOGRASS [HEMARTHRIA ALTISSIMA] TOLERANCE TO HERBICIDE APPLICATIONS. C.A. Lastinger, B. A. Sellers, and J. A. Ferrell; Department of Agronomy, University of Florida-IFAS, Gainesville, FL (61)

ABSTRACT

Limpograss is a warm-season C4 perennial that is well adapted to the poorly drained soils of south Florida. There have been four cultivars released but the only one that remains in production is ‘Floralta’. Past research suggested that limpograss tolerance to 2,4-D amine is the result of the regrowth height at the time of herbicide application. Dicamba has been the industry standard for weed control in limpograss, but it is relatively expensive, so it is important to investigate the effects of other herbicides on limpograss tolerance. This project examined the effects of fertilizer timing and regrowth height on limpograss tolerance to herbicides. Experiments were conducted, both at the Range Cattle Research and Education Center near Ona, FL in July, 2013 using a split-plot design with the whole plot representing herbicide treatment and the sub-plot representing either fertilizer timing or regrowth height. Whole plots were 3 by 12 m and the subplots were 3 by 3 m. Each treatment was replicated four times. Ten herbicide treatments were applied on the same day to whole plots: dicamba at 840 g/ha, 2,4-D amine at 2,130 g/ha, dicamba + 2,4-D amine at 430 + 1,250 g/ha, aminopyralid + 2,4-D at 86 + 699 g/ha, metsulfuron at 13 g/ha, fluroxypyr + triclopyr at 210 + 630 g/ha, aminopyralid + metsulfuron at 130 + 20 g/ha, hexazinone at 560 and 1,120 g/ha, and aminoclopyrachlor at 70 g/ha. Dicamba is considered the industry standard for weed control in limpograss and was used as the check. In the fertilizer timing experiment 56, 28, and 56 kg/ha of nitrogen, phosphorous, and potassium were applied to sub-plots two weeks before, the same day as, and two weeks after herbicide application. In the regrowth height experiment herbicides were applied on the same day to sub-plot treatments 7 to 10 days post clipping, 30, 60, and 90 cm of regrowth, which were obtained by clean-mowing each sub-plot at three week intervals. Limpograss tolerance was evaluated by visual injury at 30 days after treatment (DAT), with 0 equaling no injury and 100 being complete death, and by harvesting the center 1 by 2 m of each sub plot 90 DAT. Dry weight was recorded after seven days of drying in a forced-air dryer at 60 C. Data were analyzed using PROC MIXED and means separated using Fisher’s Protected LSD at P = 0.05 where appropriate. Herbicide treatment by fertilizer timing was not significant, and only the main effect of herbicide treatment was significant for both visual response and biomass data. Hexazinone resulted in at least 1.5-times greater visual injury than all other treatments 30 DAT and the high rate resulted in at least 42% less biomass compared to all other treatments 90 DAT. Fluroxypyr + triclopyr and aminocyclopyrachlor injury was approximately 2-times greater than all other treatments except for hexazinone, but only aminocyclopyrachlor resulted in a significant reduction (26%) in biomass compared to dicamba (7,800 kg/ha). All other treatments were similar to dicamba with regards to biomass production. As in the fertilizer experiment, only the main effect of herbicide treatment was significant for the regrowth experiment. The high rate of hexazinone resulted in injury at least 2.5-times greater than all other treatments 30 DAT. At 90 DAT, hexazinone at 560 and 1,120 kg/ha resulted in at least 24 and 64% less biomass, respectively, compared to all other treatments. Biomass of 2,4-D amine-treated plots was approximately 26% less than dicamba-treated plots (5,800 kg/ha). Limpograss biomass in all other treatments was similar dicamba-treated plots. This research indicates that fertilizer application may have more of an influence on limpograss biomass following herbicide treatment than regrowth height. Additionally hexazinone causes significant injury to limpograss, which may be of concern to ranchers who need to control smutgrass.

BURNDOWN PROGRAMS FOR TROUBLESOME SOYBEAN WEEDS IN NORTH CAROLINA. W. J. Vincent*, W. J. Everman, R. E. Paynter, Z. R. Taylor and B. A. Hicks; North Carolina State University, Raleigh, NC (62)

ABSTRACT

The use of a burndown program before planting soybeans is a critical weed management strategy to control emerged weeds and provide a residual effect to suppress weed pressure as soybean seedlings emerge, particularly in Palmer amaranth (*Amaranthus palmeri) and Horseweed (*Conyza canadensis). Both of these weed species have become particularly tough for producers to control because of their prolific and unique growth habits. Palmer amaranth has become increasingly popular due to its growing abundance across the agricultural landscape, especially in the Southeast. A dioescious amaranthus species, Palmer amaranth adapts quickly, produces hundreds of thousands of seed and has been found to be resistant to several herbicidal modes of action making them one of the toughest weeds to manage. Horseweed is an annual weed, which can have a winter or summer annual life cycle and also possesses a large number of viable seed. In its winter annual cycle, horseweed matures uncharacteristically late into the fall allowing it to compete more aggressively than other winter annuals. Four studies were conducted, two in 2012 and two in 2013 in order to evaluate the level of weed control of several burndown herbicides. Trials were conducted at three locations across North Carolina; Edgecombe County, at the Peanut Belt Research Station near Lewiston-Woodville, and at the Upper Coastal Plain Research Station near Rocky Mount. The list of select herbicides evaluated in the studies includes; 2,4-D, glyphosate, Canopy, Classic, Envive, Express, Leadoff, Sharpen, and Valor at various rates and timings. The aforementioned herbicides were followed with pre-emergence herbicides and post emergence herbicides in a season long weed management program. Ratings of visual weed control were taken periodically throughout the growing season with yield data collected at the end of the season to determine effective weed management of Palmer amaranth and horseweed with various treatment combinations.

WEED MANAGEMENT SYSTEMS IN DICAMBA AND 2,4-D TOLERANT COTTON. C.H. Sanders* and M.W. Marshall; School of Agriculture, Forestry, and Environmental Sciences, Clemson University, Blackville, SC (63)

ABSTRACT

Palmer amaranth has become a problem weed in cotton in South Carolina, especially the herbicide resistant biotypes. New herbicide tolerant crop technologies in cotton currently being developed are dicamba and 2,4-D tolerant cotton. Research studies were initiated to determine the effectiveness of dicamba-based herbicide programs and 2,4-D based programs for control of Palmer amaranth and other important broadleaf weeds and yield response of cotton. Field experiments were conducted at the Clemson University Edisto Research and Education Center located near Blackville, SC in 2013. Experimental design consisted of a randomized complete block design with 3 replications with individual plot sizes of 6.3 by 25 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 29, 2013 using a 4-row Almaco cone planter with a final seed spacing of 3 seed per row ft. Fomesafen at 0.25 lb ai/A, dicamba at 0.5 lb ai/A, acetochlor at 1.125 lb ai/A, and diuron at 1 lb ai/A were applied preemergence (PRE) shortly after planting with at a carrier volume of 15 GPA with a pressure of 34 PSI. Approximately 30 early-postemergence (EP), 37 mid-postemergence (MP), and 49 late-postemergence (LP) days after planting, various combinations of dicamba at 0.5 lb ai/A, glyphosate at 1 lb ai/A, glufosinate at 0.53 lb ai/A, and acetochlor at 1.125 lb ai/A were applied postemergence (POST) with the same application parameters discussed above. 2,4-D tolerant cotton was planted on June 21,2013 using a 4-row Almaco cone planter with a final seed spacing of 3 seed per row ft. Fomesafen at 0.25 lb ai/A was applied preemergence (PRE) shortly after planting in water at a carrier volume of 15 GPA with a pressure of 34 PSI. Approximately 20 (EP) and 45 (LP) days after planting, various combinations of 2,4-D choline at 1.0 lb ai/A, glyphosate at 0.75lb ae/A, glufosinate at 0.53 lb ai/A, metolachlor at 0.95 lb ai/A, and acetochlor at 1.125 lb ai/A were applied postemergence with the same application parameters discussed above. Palmer amaranth, pitted morningglory, and large crabgrass percent visual control were measured for dicamba tolerant cotton 23 days after PRE, 7 days after (EP), 7 days after (MP), and 9 days after (LP) applications. Palmer amaranth, pitted morningglory, and large crabgrass percent visual control were measured for 2,4-D tolerant cotton 20 days after PRE, 15 days after (EP), and 25 days after (LP) applications. Seed cotton yield and weed control data were analyzed using ANOVA and means separated at the P=0.05 level. Fomesafen PRE treatments in 2,4-D tolerant cotton provided excellent control of Palmer amaranth, but did not provide control of pitted morningglory and large crabgrass. All the early post treatments in 2,4-D tolerant cotton except for glufosinate EP provided greater than 95% control of Palmer amaranth, pitted morningglory, and large crabgrass. Variation in Palmer amaranth, pitted morningglory, and large crabgrass control was observed in the late post treatments. In the dicamba tolerant cotton variations was observed in the PRE treatments for Palmer amaranth, pitted morningglory and large crabgrass. The EP, MP, and LP treatments showed good to excellent control of the weeds (>90% control). Evidence of residual control from the dicamba was observed because treatments that lacked a LP were not significantly different than those with a LP. The seed cotton yield differences were observed across the treatments and the cause for the very low yield was due to environmental factors (high rainfall amounts) and late planting date in 2,4-D tolerant cotton. The results show evidence that using dicamba or 2,4-D combined with either glyphosate or glufosinate based herbicide provided an effective control for small glyphosate and ALS resistant Palmer amaranth biotypes and other important weeds in cotton.

FATE OF ARSENIC FOLLOWING MSMA APPLICATIONS. D. J. Mahoney*, M. D. Jeffries, M. L. Polizzotto, and T. W. Gannon; North Carolina State University, Raleigh, NC (64)

ABSTRACT

In 2006, the Environmental Protection Agency (EPA) proposed a phase-out of organic arsenical herbicides including monosodium methylarsonate (MSMA). MSMA has commonly been used as postemergence herbicide in cotton production and turfgrass since the 1960s. The phase-out was enacted because of groundwater contamination concerns via the addition of arsenic (As) from MSMA applications. Public pressure hastened the phase-out before thorough experimentation was conducted; however, MSMA use is currently allowed and will continue until the review conducted by the National Academy of Sciences is completed end of 2015. Research was conducted to determine the fate of As following MSMA applications in vegetation, soil, and porewater. Field lysimeters (18 gauge steel; 15.2 cm diameter x 90 cm length) were installed at the Sandhills Research Station (Jackson Springs, NC, USA) on a Candor sand (sandy, siliceous, thermic, Arenic Paleudult) containing 84, 11, and 5%, sand, silt, and clay, respectively. The high sand content represented a worst-case scenario for pesticide and nutrient leaching. A modified split plot experimental design was used to compare the fate of As in a bareground and turfgrass system following MSMA applications. MSMA was applied to all treated lysimeters at 2.25 kg ha^{-1} on August 13 and 20, 2012. Lysimeters were exhumed 0, 30, 60, 120, or 365 days after initial treatment (DAIT) and divided into the following depths: 0-2, 2-4, 4-8, 8-15, 15-30, 30-45, 45-60, or 60-90 cm. Foliage was also retained from turfgrass plots. Samples were digested via wet digestion (EPA protocol 3050B). Background As levels were measured in nontreated lysimeters and subtracted from treated lysimeters, which allowed for increased As concentrations presumably from MSMA applications. Data were subject to ANOVA ($P = 0.05$) and means were separated according to Fisher's Protected LSD ($P < 0.05$). Differences in soil As concentrations were not detected between bareground and turfgrass systems; therefore, data are pooled across systems. Treated bermudagrass foliage As contents were 123, 43, and 26 µg at 30, 60, and 120 DAIT, respectively. The decline of As in plant foliage may be due in part to translocation of nutrients and solution to roots as the plant enters dormancy. Increased soil As concentrations were observed at 0-2 cm 30 DAIT and 0-4 cm 60 and 120 DAIT, suggesting As was bound in shallow soil depths. Porewater samples from 30 cm had highest As concentrations 7 DAIT with 84 and 56 µg L^{-1} measured in treated bareground and turfgrass lysimeters, respectively. These concentrations are greater than the maximum As drinking water contamination level (10 µg L^{-1}) set by the EPA. At 4 DAIT, porewater As concentrations from turfgrass (0.9 µg L^{-1}) were indistinguishable from background levels (0.9 µg L^{-1}) at 76 cm; however, As concentrations in bareground porewater (5 µg L^{-1}) was significantly increased. Results indicate that turfgrass coverage may help prevent As leaching through soil, which may be due to root and shoot absorption, evapotranspiration, and increased organic matter that sorbs As, reducing the mobility in the dissolved phase. These findings indicate the potential for groundwater As contamination from MSMA applications is minimal, especially turfgrass systems.

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WINTER WHEAT TOLERANCE AND WEED MANAGEMENT WITH PYROXASULFONE IN NC. L.A. Grier, W.J. Everman; Department of Crop Science, North Carolina State University, Raleigh, NC (65)

ABSTRACT

Pyroxasulfone, an active ingredient in Zidua (85% pyroxasulfone) and Fierce (42% pyroxasulfone + 34% flumioxazin), is active on a wide range of weeds species including annual grasses and many broadleaf weeds. A field study was conducted at two NCSU research stations evaluating residual weed control and winter wheat (*Triticum aestivum*) tolerance to pyroxasulfone. The field studies were conducted in Goldsboro, NC in a conventional tillage field with loamy sand and in Salisbury, NC in a no-till field with a clay loam soil. PRE treatments included Zidua at 74 g a.i. ha^{-1}. Split treatments included Zidua at 74 g a.i. ha^{-1} applied preemergence (PRE) followed by either Axial at 60 g a.i. ha^{-1} or Osprey at 15 g a.i. ha^{-1} applied postemergence (POST). POST treatments included Zidua+Axial at 74+60 g a.i. ha^{-1}, Zidua+Osprey at 74+15 g a.i. ha^{-1}, Axial at 60 g a.i. ha^{-1}, and Osprey at 15 g a.i. ha^{-1}. Crop injury, Italian ryegrass (*Lolium multiflorum*) control in Goldsboro and henbit (*Lamiaceae amplexicaule*) control in Salisbury were rated at 7 and 12 weeks after POST and yield was assessed. At 7 and 12 weeks after POST application, all treatments except Axial POST showed greater than 90% and 80% control of Italian ryegrass, respectively. At 7 weeks after POST application Zidua PRE + Osprey POST showed greater than 70% control of henbit. At 12 weeks after POST application treatments containing Osprey showed greater than 80% control. No crop injury or yield differences were observed at either location.

EFFECT OF WEED SIZE ON THE EFFICACY OF SELECTED HERBICIDES. D.D. Joseph* and M.W. Marshall; School of Agriculture, Forestry, and Environmental Sciences, Clemson University, Blackville, SC (66)

ABSTRACT

Soybean weed control programs are in South Carolina are faced with glyphosate- and ALS-resistant Palmer amaranth. Dicamba and 2.4-D toleranant programs in soybean and cotton are in the near future with cotton weed control programs. Glyphosate and glufosinate will complement current herbicide programs. Therefore, research studies were initiated to evaluate the effectiveness of combinations of 2,4-D, glyphosate, glufosinate, and dicamba for control of Palmer amaranth, pitted morningglory and goosegrass. Greenhouse experiments were conducted in 2013 at Clemson University Edisto Research and Education Center (EREC) located near Blackville, SC. Experimental design consisted of a randomized complete block with 4 replications. Palmer amaranth, sicklepod, and pitted morningglory were sprayed with postemergence herbicides were applied in water at a carrier volume of 15 GPA with a pressure of 34 PSI. Palmer amaranth, pitted morningglory, and goosesgrass dry weights were collected 28 days after herbicide treatments. Treatments included dicamba at 1.0 lb ai/A, 2,4-D at 1.0 lb ae/A, glufosinate at 0.53, and glyphosate at 0.75 lb ae /A. Dry weight data were analyzed using ANOVA and means separated at the P = 0.05 level. Study was repeated in time. Gufosinate plus dicamba or 2,4-D programs provided excellent control of 2, 4, and 6 inch Palmer amaranth. At the 12 inch Palmer amaranth dry weights with dicamba was better than 2,4-D alone. Palmer amaranth and goosegrass dry weights was similar with dicamba and 2,4-D at 28 DAT. Variation in Palmer amaranth was observed in the glyphosate plus 2,4-D treatments. Dicamba improved the consistency of large Palmer amaranth control with glufosinate compare to glyphosate. In summary, glufosinate plus dicamba or 2,4-D based combinations provided excellent control of small to mid-size Palmer amaranth. Palmer amaranth control declined significantly with dicamba-alone treatment as size increased compared to dicamba combined.

A PUTATIVE PRODIAMINE-RESISTANT ANNUAL BLUEGRASS (*POA ANNUA*) POPULATION IS CONTROLLED BY INDAZIFLAM. E.H. Reasor*, J.T. Brosnan, J.J. Vargas, G.K. Breeden, D.A. Kopsell; University of Tennessee, Knoxville, TN (67)

ABSTRACT

Annual bluegrass (Poa annua L. var. annua) is a problematic grassy weed of golf course, athletic fields, and home lawn turf. Prodiamine, a mitotic inhibiting herbicide, is registered for preemergence (PRE) control of annual bluegrass in warm- and cool-season turf. A population of annual bluegrass not controlled by prodiamine at 1120 g ha^{-1} was identified on a golf course in Alcoa, TN in 2012. A whole-plant hydroponics bioassay was used to screen this biotype (PR) for prodiamine resistance compared to a known susceptible population (SS). Multi-tiller (i.e., > 4 tillers) PR and SS annual bluegrass plants were established in hydroponic culture and exposed to prodiamine at 0, 0.001, 0.01, 0.10, 1.0, and 10.0 mM. Exposure to prodiamine at 0.001 mM reduced the root length of the SS biotype to 26% of the non-treated check (i.e., 0.000 mM prodiamine) but had no effect on the PR biotype. When exposed to 10 mM prodiamine, root length of the PR biotype was reduced to 24% of the non-treated check compared to 9% for the SS biotype. I_{50} values for the PR and SS biotypes were 0.04 and 2.8 x 10^{-6} mM, respectively. In field trials, prodiamine at 560, 840, 1120, and 1400 g ha^{-1} only controlled the PR biotype 0 to 22%. PRE applications of the cellulose biosynthesis inhibitor indaziflam at 35, 52.5, and 70 g ha^{-1} controlled this PR biotype 70 to 97%. This marks the second instance of annual bluegrass developing resistance to prodiamine in Tennessee during the past five years. Future research should evaluate indaziflam efficacy for control of other prodiamine-resistant biotypes of annual bluegrass as well as annual bluegrass biotypes resistant to herbicidal inhibitors of 5-enolpyruvylshikimic acid-3-phosphate synthase, acetolactate synthase, and photosystem II.

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THE EFFECT OF BEST MANAGEMENT PRACTICES WITH ENGENIA ON DICAMBA DRIFT. J.L. Cobb[1], D.B. Reynolds[1], B. Guice[2], W. Thomas[2]; [1]Mississippi State University, [2]BASF Corporation (68)

ABSTRACT

New transgenic crops are currently being developed which will be tolerant to applications of dicamba herbicide. This technology could greatly benefit producers who are impacted by weed species that have developed resistance to other herbicides, like glyphosate-resistant Palmer Amaranth. The adoption of this new technology is likely to be rapid and widespread. This would lead to an increase in the amount of dicamba herbicide which is applied each season. It is well-documented that dicamba is very injurious to soybeans, and the increased use of dicamba herbicide brings along an increased chance for occurrences of physical spray drift onto susceptible crops. Because of these risks, research is being conducted on new herbicide formulation/spray nozzle combinations to determine management options which may minimize physical spray drift.

In 2013, an experiment was designed to determine the effectiveness of Best Management Practices (BMP) in reducing the effects of herbicide drift. The experiment was conducted at the MSU Blackbelt Branch Experiment Station in Brooksville, MS. Non-transgenic soybean were utilized as a bio-indicator because of their sensitivity to dicamba. The treated area measured 300 ft long and 102 ft wide (32 rows) with a 200 ft buffer area between treatments. The “Standard” treatment was a combination of Banvel® herbicide and Roundup Powermax® at 16 fl oz/A and 28.4 fl oz/A, respectively, applied with Turbo Teejet 11004 spray nozzles. The Best Management Practice (BMP) treatment was a combination of Engenia herbicide, Roundup Powermax®, and Interlock® drift retardant applied at 12.8 fl oz/A, 28.4 fl oz/A, and 4 fl oz / A, respectively. This treatment was applied using Turbo Teejet Induction 11004 spray nozzles. Treatment was applied during a cross wind with target speeds between 7 and 10 MPH to allows herbicide to drift onto the sensitive crop. The treatments were applied with a custom-built spray system calibrated to deliver 10 GPA at a ground speed of 12 MPH. Each treated area had 8-9 transects oriented generally perpendicular to the spray direction and in the direction of prevailing wind patterns and data were collected at set distances from the sprayed field edge. Check plots were set up on the upwind side of the affected area for comparison.

Visual estimates of injury and plant heights were collected from each experimental unit 14 and 28 days after treatment. Yield data was collected using a yield monitor in order to assess any potential drift effects. Plant malformation data, plant heights, and yield data were fitted as a function of log(distance) using a segmented regression model where a linear response described distances where herbicide effects were observed and a plateau with zero slope described a distance where “no herbicide effects” were observed. At 14 DAT, the distances beyond which malformation was less than 15 % were 79 ft and 29 ft for the Standard and BMP treatments, respectively. At 28 DAT, these distances had increased to 113 ft for the Standard treatment and 51 ft for the BMP treatment. Reductions in plant heights were found at 28 DAT out to distances of 65 ft and 46 ft for the Standard and BMP treatments, respectively. Natural spatial variability of the field precluded an accurate assessment of treatment effects on soybean yield. These data indicate Best Management Practices can reduce the distance to which soybean injury and plant heights are affected by dicamba herbicide drift when compared to standard application practices.

SYNERGISM WITH IMIDAZOLINONE HERBICIDE WITH PROPANIL BASED PRODUCTS IN RICE.
J.C. Fish*, E.P. Webster, D.C. Blouin, B.M. McKnight; LSU AgCenter, Baton Rouge, LA (69)

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 herbicide mixtures and their impact on several weed species. Previous data indicates a potential for synergism between propanil and imazethapyr when mixed for control of red rice (*Oryza sativa* L.) and other weed species.

Two studies were established to evaluate the potential synergism between propanil and imazethapyr or imazamox. The experimental design was a randomized complete block with four replications in a two-factor factorial arrangement of treatments. In the first study, factor A consisted of imazethapyr at 0 and 70 g ai ha^{-1}. Factor B consisted of propanil at 0, 1.12, 2.24, 3.36, and 4.48 kg ai ha^{-1}. In the second study imazamox at 0 and 44 g ai ha $^{-1}$ was substituted for imazethapyr for factor A.

Red rice control at 14 days after treatment (DAT) provided a synergistic response when imazethapyr was added in a mixture with propanil at 2.24, 3.36, and 4.48 kg ha^{-1}. Control was increased from an expected value of 75, 76, and 76% control of red rice to the observed control of 81, 85, and 87%, respectively. When imazamox was substituted for imazethapyr, a synergistic response occurred when mixed with propanil at 3.36 and 4.48 kg ha $^{-1}$. Barnyardgrass [*Echinochloa crus-galli* (L.) P. Beauv] control with all imazethapyr plus propanil mixtures resulted in an additive response.

At 21 DAT, imazethapyr plus propanil at 4.48 kg ha^{-1}, increased red rice control from 87 to 93%, while all other mixtures resulted in an additive response. Similar results where shown with imazamox by increasing red rice control from an expected control of 84 to an observed control of 90% with propanil at 3.36 kg ha^{-1} and from an expected control of 81% to an observed control of 89% control with propanil at 4.48 kg ha^{-1}, and an additive response for control with all other mixtures. Barnyardgrass control with all treatments including imazethapyr or imazamox plus propanil resulted in an additive response.

At 49 DAT, imazethapyr mixed with propanil at 4.48 kg ha^{-1} increased red rice control from an expected control of 82 to an observed control of 93%. Imazamox plus propanil at 1.12, 2.24, 3.36, and 4.48 kg ha^{-1} increased red rice control from an expected control of 73 to an observed control of 80, 84, 83, and 84% control, respectively. Barnyardgrass control with imazethapyr plus propanil at 1.12 kg ha^{-1} was antagonistic by decreasing control from an expected control of 78 to an observed control of 64%. All rates of propanil when mixed with imazamox resulted in additive response for barnyardgrass control. All herbicide mixtures resulted in higher yields compared with imazethapyr or imazamox alone.

A mixture of propanil at 4.48 kg ha-1 plus imazethapyr at 70 g ha-1 or imazamox at 44 g ha-1 provided a synergistic response for control of red rice throughout the growing season. Mixtures of propanil at 1.12 kg ha-1 resulted in an antagonistic response for barnyardgrass at 49 DAT with imazethapyr; however, this decrease did not translate into a yield reduction. This research indicated that propanil added to imazethapyr at 2.24, 3.36, or 4.48 kg ha-1 resulted in an additive or synergistic response for red rice and barnyardgrass. A slight decrease in control was observed for browntop millet; however, control only decreased from 98 to 95%. This slight drop in control did not translated into a yield reduction. Similar results were observed for imazamox plus propanil mixtures. However, the addition of propanil at 4.48 kg ha-1 increased yield compared with a program with no propanil. The increased weed control of red rice is a valuable response when used in the Clearfield system to help manage or delay the development of herbicide resistant red rice and prolong the life of the technology for producers.

EVALUATION OF PLANTING DATE, COTTON VARIETY, AND PRE HERBICIDE ON THRIPS INFESTATION IN COTTON. J.D. Copeland*[1], D.M. Dodds[1], T.H. Dixon[1], D.Z. Reynolds[1], C.A. Samples[2], A. Catchot[1], J. Gore[3], D.W. Wilson[4]; [1]Mississippi State University, Starkville, MS, [2]Mississippi State University, Mississippi State, MS, [3]Mississippi State University, Stoneville, MS, [4]Monsanto, St. Louis, MO (70)

ABSTRACT

Planting cotton at the most optimal time is crucial for successful production. However, planting cotton in inclement conditions that are often present early in the season can reduce plant populations as well as seedling vigor. In addition to weather conditions at planting, early season thrips infestation and weed control can impact early season growth and development. From 2008 to 2012 the number of cotton bales lost due to thrips damage in Mississippi increased from 152 to 5,057. With cotton being naturally slow to develop in the early stages, proper protection from thrips is essential for optimum early season development. Insecticidal seed treatments are utilized on almost every acre in Mississippi. Simultaneously, the use of preemergence (PRE) herbicides has drastically increased across the state due to the proliferation of glyphosate-resistant Palmer amaranth. PRE herbicides can cause injury on seedling cotton and intesify damage from other environmental factors. However, previous research evaluating the effect of planting date and PRE herbicides on cotton growth, development, and yield is lacking. Therefore, this research was conducted to determine the effect of planting date, PRE herbicide, and cotton variety on thrips infestation as well as cotton growth, development, and yield.

This study was conducted at three locations in Mississippi which included the Black Belt Branch Experiment Station near Brooksville, the R.R. Foil Plant Science Research Center near Starkville, and Delta Research and Extension Center in Stoneville. Two different levels of varieties were used in this study which included DP 0912 B2RF (short season) and DP 1252 B2RF (long season). Planting dates utilized were May 15th (Early), June 1st (Middle), and June 15th (Late). Inclement weather conditions prevented earlier planting dates in 2013. Acceleron N seed treatment (thiamethoxam + pyraclostrobin +abamectin) was utilized on each variety. Fluometuron + S-metolachlor was applied preemergence at 1.12+ 1.07 kg ai/ha, respectively. In addition, an untreated check (with respect to herbicides) was included for comparison purposes. This experiment was arranged as a factorial arrangement of treatments in a randomized complete block design, with the three factors being planting date, variety, and PRE herbicide. All data were subjected to analysis of variance and means were separated using Fishers Protected LSD at p = 0.05.

Cotton planted May 15 had significantly less biomass at the 2-leaf stage and the 4-leaf stage than cotton planted June 1 and June 15. DP 0912 B2RF had significantly more biomass than DP 1252 B2RF at the 2-leaf stage and the 4-leaf stage. Cotton planted June 1 had significantly greater infestation of immature thrips at the 2-leaf stage and the 4-leaf stage compared to cotton planted May 15 and June 15. DP 1252 B2RF was taller at harvest than DP 0912 B2RF within each planting date. PRE herbicide had no impact on plant height at harvest for cotton planted May 15 and June 1. Cotton planted June 15 and treated with fluometuron + S-metolachlor was significantly shorter than cotton with no PRE herbicide planted the same day. DP 0912 B2RF had significantly greater seed cotton yields than DP 1252 B2RF when planted June 1 or June 15; however, when planted on May 15 yields were similar between DP 0912 B2RF and DP 1252 B2RF.

IMPACT OF LACTOFEN ANDPLANTING DATE ON GROWTH, DEVELOPMENT AND YIELD OF INDETERMINATE SOYBEAN. J.P. Mangialardi*[1], T.W. Eubank[2], C.B. Edwards[2], B.H. Lawrence[1], J.A. Bond[2]; [1]Mississippi State University, Starkville, MS, [2]Mississippi State University, Stoneville, MS (71)

ABSTRACT

Maximized and sustainable soybean (*Glycine max*) yields are the ultimate goal of producers on a perennial basis. However, environmental conditions which expose soybean to weather extremes such as heat and drought stress sometimes limit producer's abilities to achieve these goals. Following the Early Soybean Production System (ESPS) could help a producer minimize the many environmental risk associated with production. It is hypothesized that lactofen applications could force late-planted, indeterminate soybean to expend less energy in excessive vegetative growth and more emphasis into reproductive growth and pod set thus increasing soybean yield. This practice could potentially widen the planting window for early maturing, indeterminate soybean in Mississippi while maintaining yields consistent with ESPS. The objective of this study is to determine if lactofen influences plant height, node count and yield when applied to early maturing, indeterminate soybean.

Field studies were conducted in 2013 at Delta Research and Extension Center in Stoneville, MS to evaluate the impact of lactofen and planting date on growth, development, and yield of indeterminate soybeans (*Glycine max)*. Soybean variety was a Progeny 4819LL planted on a 76 cm row spacing at a seeding rate of 370,000 seed/ha. Plot size was 3 x 60 m. Trial was established as a factorial arrangement of treatments in a randomized complete block design with four replications. Factors included: Planting dates of April 15th, May 1st, May 15th, and June 1st; and herbicide treatment of 0, 0.22 and 0.33 kg/ha lactofen. All treatments included the addition of a 1% v/v COC. Treatments were triggered at the V2 soybean growth stage which corresponded to the first fully emerged trifoliate leaf. Applications were made with a tractor mounted sprayer calibrated to deliver 140 L/ha through XR 11002 TeeJet nozzles at 248 kPa using. Visual ratings were taken at 7, 14, 21 and 28 days after treatment (DAT). Plant heights, node counts and yields were taken at harvest. Visual ratings for necrosis present after application was transient and only persisted up to 21 DAT (data not presented). There were no effects of lactofen application on soybean node number, heights or yield. There were differences observed for planting date on plant heights, node number and soybean yield. Soybean heights from the April 15 and May 1 planting dates were 94 and 99 cm, respectively and significantly less than May 15 and June 1 planting dates of 109 and 114 cm, respectively. Soybean node counts increased from 19 nodes for April 15 and May 1 plantings to 21 nodes for May 15 plantings and 20 nodes for June 1 plantings. Highest soybean yields were observed with April 15 and May 1 planting dates of 5,645 kg/ha and yields decreased by 15 and 27% for the May 15 and June 1 planting dates, respectively.

WEED MANAGEMENT IN COTTON WITH FLURIDONE. Lewis R. Braswell*, Alan C. York, David L. Jordan, Travis W. Gannon, and Charles W. Cahoon; North Carolina State University, Raleigh, NC (72)

ABSTRACT

Preemergence herbicides are critical for managing glyphosate-resistant Palmer amaranth. PPO-inhibiting herbicides are widely used in cotton and most rotational crops, leading to concerns over potential resistance in Palmer amaranth. Fluridone, registered for use in aquatic systems, is a phytoene desaturase inhibitor (WSSA Group 12) being developed for use in cotton. No Group 12 herbicides are currently used in agronomic crops, hence fluridone could be a useful tool in resistance management programs. A study was conducted at four locations in 2013 across eastern North Carolina on varying soil types to evaluate cotton response and Palmer amaranth control with fluridone applied PRE alone and in combination with other herbicides. Treatments included a factorial arrangement of three rates of fluridone (0, 224, 336 g ai/ha) by the following: no additional herbicide, diuron (560 g ai/ha), pendimethalin (1100 g ai/ha), two rates of fomesafen (140, 280 g ai/ha), and acetochlor (1260 g ai/ha). Additional treatments included grower standards of acetochlor (1260 g/ha) or diuron (560 g/ha) mixed with two rates of fomesafen (140 or 280 g/ha). All treatments, except the checks, included two POST applications of glufosinate and a directed layby application of diuron plus MSMA. Prior to the first POST application, cotton was injured less than 6% by all herbicides and combinations except pendimethalin. Pendimethalin alone and in combination with fluridone injured cotton 12 to 13%. Other than pendimethalin, where some stunting lingered, no injury was noted later in the season. Palmer amaranth control prior to POST herbicide application was excellent with all PRE herbicide combinations (98 to 100%). When herbicides were applied individually, there were no differences in Palmer amaranth control with the two rates of fluridone and fomesafen at 280 g/ha (97 to 99%). Fluridone was more effective than diuron, acetochlor, or fomesafen at 140 g/ha (91 to 95%). Pendimethalin was the least effective, controlling Palmer amaranth only 79%. Glufosinate applied twice was very effective on Palmer amaranth, and no differences in control among treatments were noted later in the season. Except for the checks, which were inundated with weeds and could not be harvested, no differences among treatments were noted for cotton yield. This research demonstrates that fluridone effectively controls Palmer amaranth with minimal injury to cotton. With its unique mode of action, fluridone gives growers another tool to aid in resistance management.

ABSTRACT

INFLUENCE OF VINASSE AND BIOCHAR ON ATRAZINE AND PENDIMETHALIN *IN-VITRO* HERBICIDAL ACTIVITY. N. Soni*[1], R.G. Leon[1], J.E. Erickson[2], J.A. Ferrell[2], and Maria Silveira[3]. [1]University of Florida, Jay, FL 32565, [2]University of Florida, Gainesville, FL 3261, [3]University of Florida, Ona, FL (73)

Vinasse and biochar are by-products of bioenergy production that has been proposed as as a soil amendment for nutrient cycling in biofuel cropping systems. Due to their chemical properties (e.g. high organic matter and extreme pH), it was hypothesized that the addition of vinasse and biochar to the soil could affect the efficacy of preemergence (PRE) herbicides. Therefore, the objective of this study was to determine the influence of vinasse and biochar on the efficacy of atrazine and pendimethalin in *in vitro* conditions. A sandy loam soil was mixed with different rates of vinasse (0, 2.6, 5.3, and 10 L m^{-2}), biochar (0, 0.5, 1, and 2 kg m^{-2}), atrazine (0 and 2.81 kg ai ha^{-1}) and pendimethalin (0 and 1.27 kg ai ha^{-1}) to establish a factorial experiment. Common lambsquarter (*Chenopodium album*), palmer amaranth (*Amaranthus palmeri*), southern crabgrass (*Digitaria ciliaris*) and sicklepod (*Senna obtusifolia*) were used as indicators of injury to assess herbicide activity. Vinasse treatments did not influence atrazine and pendimethalin PRE activity. Conversely, biochar addition greatly reduced herbicide action of atrazine and pendimethalin in all weed species. Atrazine activity was reduced approximately 30% across species when biochar was added to the soil. In the presence of biochar, pendimethalin activity was reduced 86, 93, 100 and 5 % for common lambsquarter, palmer amaranth, southern crabgrass and sicklepod respectively when compared with the treatment with pendimethalin without biochar. These results suggest that the incorporation of biochar as a soil amendment into cropping systems could decrease PRE herbicide efficacy. Therefore, higher rates PRE herbicide and/or other control practices might be necessary to ensure proper weed control.

RESIDUAL EFFECTS OF ARSENAL ON WHITE CLOVER, CRIMSON CLOVER AND 'KOBE' LESPEDEZA. M.L. Zaccaro*; Mississippi State University, Mississippi State, MS (74)

ABSTRACT

The use of nitrogen-fixing plants in pastures is an important component to provide valuable nutrients to the animal diet and supply nitrogen to the forage system. The objective of this experiment was to evaluate the residual effects of imazapyr on the early development of ‘Durana’ white clover, crimson clover and ‘Kobe’ lespedeza. Herbicide treatments were applied May 31, 2013 with a spray chamber that delivered 25 GPA to 0.11 ft^2 greenhouse containers filled with a mixture of 2:1 sand and silty clay loam soil. The herbicide treatments were Arsenal 2L (imazapyr) at 0, 4, 8 and 16 fl oz/A. Nonionic surfactant at 0.25% (v/v) was added to each herbicide mixture. Containers were arranged as a complete randomized block design with 4 replications. White clover (*Trifolium repens* L.) ‘Durana’ (WC), crimson clover (*T. incarnatum* L.) (CC) and lespedeza (*Kummerowia stipulacea* (Maxim.) Makino) ‘Kobe’ (LZ) were planted 0, 1 and 3 MAT, to produce 36 treatments. The number of emerged seedlings, average seedling height, fresh and dry weight measurements were taken six weeks after each planting. Data were analyzed as a randomized complete block design with a factorial arrangement of treatments in PROC GLM in SAS v. 9.3, to test main effects and interactions, then means were separated by the LSD and Duncan with α=0.05. In general, all legume types planted 0 MAT (PRE), were injured by imazapyr applied at rates equal to or higher than 4 fl oz/A. Injury occurred as failed emergence or early death just as seedlings were emerging, but all plantings at that time negatively affected plant development, regardless of legume species. For the number of seedlings, ‘Durana’ white clover planted 0 MAT with imazapyr at either 4, 8 or 16 fl oz/A, ‘Kobe’ lespedeza planted 0 MAT with imazapyr at 4, 8, or 16 fl oz/A, crimson clover planted 0 MAT with imazapyr applied at 4, 8, or 16 fl oz/A weren’t different from each other, but resulted in means lower than the rest of the treatments. Also, ‘Durana’ white clover and ‘Kobe’ lespedeza had significantly higher total seedlings emerged than crimson clover, regardless of imazapyr rate or planting interval after herbicide application. Lespedeza treatments showed significantly higher average height than the rest of the treatments, especially those planted 1 MAT, which could be due to difference in growing conditions in the summer (1 MAT) and fall (3 MAT) treatments. Fresh and dry weight showed similar tendencies, where lespedeza treatments showed significantly higher mean fresh weight than the other treatments, although ‘Durana’ white clover and crimson clover fresh and dry weights were not different from each other. Therefore, for better early development of legume species in forage systems, it is wise to delay planting at least 1 month after imazapyr herbicide applications between 4 and 16 fl oz/A to avoid significant injury to the seedlings that could affect the stand establishment.

RESULTS FROM THREE YEARS OF A LONG-TERM STUDY DESIGNED TO DETERMINE WEED POPULATION DYNAMICS IN DICAMBA-TOLERANT COTTON. M. Inman*[1], D. Jordan[1], A. York[1], W. Everman[1], K. Jennings[1], J. Soteres[2], R. Cole[2], J. Fowler[2], S. Bollman[2]; [1]NC State University, Raleigh, NC, [2]Monsanto Co., St. Louis, MO (75)

ABSTRACT

Selection for herbicide-resistant biotypes, especially Palmer amaranth (*Amaranthus palmeri S.* Wats) has made managing weeds in cotton challenging. Cotton with traits expressing tolerance to dicamba, glufosinate, and glyphosate is being developed for the US market and has shown promise in managing weeds that are resistant to glyphosate and other herbicides. The majority of weed management trials focus on comparing the effectiveness of cultural practices and herbicides during a single season at many locations. Due to limitations in resources, fewer trials are conducted to compare long term impacts of weed management programs. The effectiveness of dicamba in controlling Palmer amaranth over multiple growing seasons has not been determined in cotton. Research was conducted to monitor changes in the Palmer amaranth populations over four years when herbicide programs including residual herbicides and total postemergence herbicides including glyphosate and dicamba in dicamba-tolerant cotton were used.

The experiment was established during 2011 in North Carolina at the Upper Coastal Plain Research Station located near Rocky Mount in two fields with different histories of cropping systems, weed management programs, weed populations, and soil characteristics. Nine herbicide treatments were imposed on the experiment with five of these treatments maintained in the same plot for the duration of the experiment (2011-2014) and included: 1) glyphosate applied 2, 4, and 6 weeks after planting (WAP); 2) diuron plus pendimethalin applied preemergence (PRE) followed by glyphosate applied 2, 4, and 6 WAP; 3) glyphosate plus dicamba applied 2, 4, and 6 WAP; 4) diuron plus pendimethalin PRE followed by glyphosate plus dicamba 2, 4, and 6 WAP; and 5) glyphosate plus dicamba plus acetochlor applied 2 WAP followed by 1 or 2 sprays of glyphosate plus dicamba depending on weed emergence. The remaining four treatments involve rotations of herbicide mode of action in different years with the impact not apparent until completion of the experiment in 2014. In the field, density of Palmer amaranth from the center four rows of each plot was determined in late August of all years. Data for Palmer amaranth population were converted to plants per acre and log transformed for analysis. Data for Palmer amaranth density, frequency of glyphosate resistance in the greenhouse, and density in the field during late-August were subjected to ANOVA by year. In the analysis for Palmer amaranth populations in the field during late August, data were transformed to the natural log prior to analysis. Means were separated using Fisher's Protected LSD at $p \leq 0.05$.

Results from this research were expected. The rapid increase in Palmer amaranth population and frequency of resistance to glyphosate when glyphosate was the only herbicide applied are consistent with observations in other research trials and in grower fields. Including dicamba, a herbicide with a MOA different than glyphosate, was effective in preventing the frequency of glyphosate resistance from increasing during the three years of the experiment at levels noted for glyphosate alone. The residual herbicides with a MOA different from glyphosate (diuron, pendimethalin) contributed to reductions in Palmer amaranth population throughout the experiment and the frequency of glyphosate resistance early in the experiment. The benefit of acetochlor in managing resistance could not be documented because of the treatment design with confounding effects of dicamba as a part of the treatment containing acetochlor. Although these results indicate that dicamba can have a positive impact on herbicide resistance in cotton, weed management programs with dicamba-tolerant cotton will require multiple tactics to preserve this technology.

EVALUATION OF DICAMBA DRIFT IN COTTON WHEN APPLIED UNDER FIELD CONDITIONS.
Graham Oakley[1], Jasper L. Cobb[1], Daniel B. Reynolds[1], Stanley Culpepper[2], Luke M. Etheridge[3], John D. Everitt[3], Anthony Mills[3], Bob Montgomery[3], Joe Sandbrink[3], and Kirk Redmund[3], [1]Mississippi State University, Mississippi State, MS, [2]University of Georgia, Tifton, GA, [3]Monsanto, St. Louis, MO (76)

ABSTRACT

The development of herbicide resistance coupled with the lack of new modes of action has resulted in a need for new weed management options. One such option that would allow the control of many herbicide resistant and other hard to control broadleaf weed species is dicamba tolerant crops. This technology can greatly benefit producers engaged in the management of resistant species, such as glyphosate-resistant Palmer Amaranth. Adoption of this new technology will likely be swift and extensive, leading to an increase in the amount of dicamba applied each year. As dicamba usage increases, the potential for spray drift onto sensitive non-transgenic crops will increase.

Due to this increased risk, new herbicide formulation/spray nozzle combinations are being evaluated to determine management options which may minimize physical spray drift. In 2013, an experiment was designed to evaluate the potential for off-target deposition of dicamba in cotton when applied under field conditions utilizing a new herbicide formulation and spray nozzle combination. The experiment was conducted in: Brooksville, Mississippi; Tifton, Georgia; St. Lawerence, Texas; and Snook, Texas. Roundup Ready® Flex Cotton® was utilized as a bio-indicator at all locations. Application timing was designated to be at the pinhead square growth stage; however, weather conditions delayed application at the Brooksville location until first bloom. Treated areas ranged from 122 to 183 m long x 18 m wide (one sprayer pass) on the upwind side of each field. There were five evaluation transects located downwind from the treated area where leaf malformation, plant height and yields were determined, with 10 check plots located upwind of the treated area and on each end of the field. The herbicide treatment applied was a combination of M-1750 (320 g ae glyphosate and 160 g ae dicamba per liter of product) applied at 1.68 kg ae/ha, dipotassium phosphate at 2% v:v, and Interlock® drift retardant at 0.3 L/ha. Applications were made using TeeJet AIXR or Turbo Teejet Induction (TTI) nozzles calibrated to deliver 93 or 140 L/ha. An on-site weather station at each location collected wind speed during and following application. Wind speed range and average for each location are as follows: Brooksville 5.8 to 11.7 with an average of 9.0 KPH; Tifton 11.9 to 18.7 with an average of 15.3 KPH;. St. Lawerence 9.7 to 17.7 with an average of 13.7 KPH; and Snook 9.7 to 22.5 with an average of 14.6 KPH.

Visual estimates of injury and plant heights were collected 14 and 28 days after treatment. Downwind experimental units harvested to assess yield were 9 m long and 1.5 m wide. Plant malformation data, plant heights, and yield data were fitted as a function of log(distance) using a segmented regression model where a linear response described distances where herbicide effects were observed and a plateau with zero slope described a distance where “no herbicide effects” were observed. The distance to which at least 15% malformation was observed 28 DAT was 15, 11, 6, and 4 meters at the Tifton, St. Lawerence, Snook, and Brooksville locations, respectively. At 28 DAT, plant heights were reduced to 28 and 6 m at the St. Lawerence and Tifton locations, respectively, while no height reductions could be detected at either of the other locations utilizing the plateau analysis. The only location to show a significant yield reduction was the Tifton location with yields being reduced to a distance of 6 m.

EVALUATION OF SEEDHEAD CONTROL IN ZOYSIA JAPONICA. M.D. Carlton*1, L.B. McCarty2, W. Totten1; 1The University of Tennessee at Martin, Martin, TN, 2Clemson University, Clemson, SC (77)

ABSTRACT

Research was conducted from 8 May to 10 October, 2012 and 13 May to 11 October 2013, at the Plant Science Complex at The University of Tennessee at Martin to evaluate seedhead suppression efficacy of various plant growth regulators on ‘Empire’ zoysiagrass (Zoysia japonica). Experimental design was randomized complete block with four replications. Plots were mowed and debris cleared before each application, then remained unmowed during the 4 week application duration.

Atrazine, ethephon, and mefluidide were applied alone and combined at 0.73, 5, and 6 fl. oz./1000 ft², respectively. Combinations of atrazine plus flurprimidol at 0.73 and 0.32 fl. oz./1000 ft², ethephon plus trinexapac-ethyl at 0.73 and 0.11 fl. oz./1000 ft², and mefluidide plus trinexapac-ethyl at 6 and 0.11 fl. oz./1000 ft² were also applied. Seedhead populations, seedhead height, turfgrass quality, and turfgrass injury measurements were rated 7 days for 4 weeks. Mefluidide at 6 fl. oz./1000 ft² and mefluidide + trinexapac-ethyl at 6 and 0.11 fl. oz./1000 ft² yielded the greatest seedhead suppression efficacy, no presence of seedheads 12-17 weeks after initial treatment (WAIT) in 2012 and 7-17 WAIT in 2013. Mefluidide applied alone and coupled with trinexapac-ethyl also resulted in significant reductions in turfgrass quality and injury ratings, unacceptable 5-12, WAIT in 2012 and 2, 3, and 5 WAIT in 2013.

INFLUENCE OF GLUFOSINATE APPLICATION TIMING ON JOHNSONGRASS (*SORGHUM HALEPENSE*) CONTROL IN GLUFOSINATE-RESISTANT COTTON (*GOSSYPIUM HIRSUTUM*).

R.L. Landry, D.O. Stephenson, IV, B.C. Woolam; Louisiana State University Agricultural Center Alexandria, LA (78)

ABSTRACT

Experiments were conducted at the LSU AgCenter Dean Lee Research and Extension Center near Alexandria, LA in 2011, 2012, and 2013. These experiments assessed glufosinate timings for control of johnsongrass [*Sorghum halepense* (L.) Pers.] in glufosinate-resistant cotton (*Gossypium hirsutum* L.). A three-way factorial arranged in a randomized complete block with four replications was utilized. Factors consist of: (1) 2 or 3 total glufosinate applications; (2) initial application timing of 2, 3, or 4 wk after planting (WAP); (3) sequential application timings of 2 or 3 wk after the initial application timing. Application rates for two applications are 0.8 kg ai ha^{-1} followed by 0.5 kg ai ha^{-1}; three applications are initial at 0.5 kg ai ha^{-1}followed by 0.5 kg ai ha^{-1}.Johnsongrass control and heights (converted to percent of nontreated) collected 4 wk after each treatment and weekly, respectively, but only at harvest data and cotton yield are presented. All data were subject to ANOVA in SAS and means were separated with Tukey's HSD at the 0.05 level

Two and three applications of glufosinate controlled johnsongrass 64% and 89% respectively, 4 WAT. Following 3 applications of glufosinate, a 25% increase in johnsongrass control over 2 applications was observed at harvest. Similarly, johnsongrass heights at harvest were reduced to 87% and 33% of the nontreated following 2 or 3 glufosinate applications, respectively; a 54% reduction in johnsongrass heights was observed when applying 3 vs. 2 applications. No differences in cotton yield were observed following 2 total applications of glufosinate initiated either 2 or 3 WAP (620 and 650 kg ha^{-1}, respectively); however, cotton yields were increased to 990 kg ha^{-1} following 2 total applications initiated 4 WAP. Furthermore, cotton yield following 2 total applications initiated 4 WAP did not differ from treatments containing 3 total glufosinate applications regardless of timing, which may be due to johnsongrass size at the initial 4 WAP application. Johnsongrass height and leaf number when the 4 WAP application was applied were 41 cm and 8 lf, respectively, compared to 6 lf and 23 to 38 cm in size for initial 2 and 3 WAP glufosinate applications. Cotton yields following 3 total glufosinate applications initiated 2, 3, and 4 WAP were 1090, 1200, and 1060 kg ha^{-1}, which were not different. These data indicate that glufosinate applications are a viable tool for management of johnsongrass in glufosinate-resistant cotton. However, more research is needed to incorporate glufosinate into a weed management program for glufosinate-resistant cotton.

COMPARISON OF 2,4-D FORMULATIONS ON VOLATILITY WHEN APPLIED UNDER FIELD CONDITIONS C.A. Hayden, D.B. Reynolds, Mississippi State University, Mississippi State, MS (79)

ABSTRACT

Auxin mimicking herbicides have been used for over 65 years to control broadleaf weeds in monocot crops. Vapor drift can be an issue for some synthetic auxin herbicides such as 2,4-D. The volatility of a herbicide is important and herbicide vapors may result in an economic loss to sensitive crops. Cotton is one of the most sensitive agronomic crops to 2,4-D. With the development of auxin herbicide tolerant crops, the need for decreased volatility is essential to prevent injury to non-tolerant crops.

Dow AgroSciences has developed a new low volatile quaternary ammonium salt formulation of 2,4-D. Enlist Duo™ herbicide with Colex-D™ Technology is a proprietary blend of the new 2,4-D choline salt with the dimethylamine (DMA) salt of glyphosate. Two experiments were conducted in 2013, using cotton injury as an indicator, to compare the volatility and movement of herbicide vapor treatments with Enlist Duo™ versus 2,4-D DMA, 2,4-D ethylhexylester (EHE), and the diglycolamine (DGA) salt of dicamba, each tank-mixed with glyphosate.

Treatments included 2,4-D EHE, 2,4-D DMA and Enlist Duo™ (premix of new 2,4-D choline + glyphosate) compared to an untreated check and a DGA salt of dicamba. 2,4-D was applied at a rate of 2.13 kg ae/ha in combination with 2.24 kg ae/ha of glyphosate for all 2,4-D treatment combinations. Each treatment was applied to a silty clay loam soil wetted to field capacity. All treatments were applied to flats filled with soil and then placed between a row of cotton and soybeans in the center of each 15.2 m plot. A 4.6 x 1.5 m dome covered with plastic was placed in the center of each plot and was not removed until 48 hours after application. Visual injury (%), plant heights and hand-harvested cotton weights were recorded in 30.48 cm increments in both directions out to 762 cm from the treated area 7, 14, 21, and 28 day after treatment (DAT). Data were subjected to analysis with PROC GLIMMIX and means were separated by LSMEANS (α=0.05).

2,4-D EHE generally exhibited the greatest amount of visual injury and injury within the treated area ranged from 13 to 20%. Low visual injury from 2,4-D DMA, Enlist Duo™ and Clarity was present but did not differ from that of the untreated check 14 DAT and was significantly less than that observed with 2,4-D EHE. By 28 DAT, injury by Enlist Duo™ and Clarity did not differ from that of the untreated check, while 2,4-D DMA and 2,4-D EHE caused injury from152 to 305 cm and out to 427 cm from the treated area, respectively. There were no significant differences in plant heights or hand harvested cotton weights between treatments.

CONTROLLING A PRODIAMINE-RESISTANT GOOSEGRASS (*ELEUSINE INDICA) BIOTYPE WITH* TOPRAMEZONE. S.M. Breeden, J.T. Brosnan, G.K. Breeden, J. J. Vargas, D.A. Kopsell, S.A. Senseman, and T.C. Mueller; University of Tennessee, Knoxville, TN (80)

ABSTRACT

Goosegrass (*Eleusine indica*) is a summer annual weed commonly controlled with PRE applications of dinitroaniline herbicides. However, goosegrass resistance to dinitroaniline herbicides has been reported throughout the southeastern United States. In the summer of 2013, poor goosegrass control was reported in golf course roughs in Maryville, TN following prodiamine treatment at 1120 g ha^{-1}. Prodiamine had been exclusively applied for residual weed control for over 11 consecutive years at this location. Our objective was to determine if this goosegrass biotype was resistant to prodiamine and to evaluate options for POST control in the field.

Suspected prodiamine-resistant (PR) and prodiamine-susceptible goosegrass (SS) biotypes were harvested from the field and exposed to 0, 0.001, 0.01, and 1.0 mM of prodiamine in hydroponic culture. Root growth was measured 10 days after treatment (DAT) and expressed as a percentage of the non-treated check. Experiments were replicated three times and repeated in time during July 2013. Exposure to prodiamine at 0.001 mM reduced root growth of the SS biotype to 15% of the non-treated check. Comparatively, root growth of PR plants was 96% of the non-treated check following exposure to the same 0.001 mM rate of prodiamine. Using log-logistic regression, I_{50} values for the PR and SS biotypes were 8.42 x 10^{-3} and 3.22 x 10^{-10} mM prodiamine, respectively. Our results indicate the presence of a PR goosegrass biotype in Tennessee.

Field trials were conducted at two locations at Lambert Acres Golf Course (Maryville, TN) infested with PR goosegrass: a rough site maintained at 4.5 cm and a collar site mowed at 1 cm. Turf at each site was hybrid bermudagrass (*C. dactylon* x *C. transvaalensis* Burtt-Davey) and plot size at both locations measured 1.2 by 1.8 m. The rough site received no supplemental nutrition or irrigation aside from rainfall. An in-ground irrigation system was used on the collar site to supplement rainfall and nutrients were applied at 53 kg N ha^{-1} from a slow release fertilizer (32 N – 0 P_2O_5 – 10 K_2O) once annually. Both the rough and collar sites had been treated with prodiamine at 1120 g ha^{-1} for 11 consecutive years before initiating research. POST treatments included topramezone (12.3, 24.5, or 36.8 g ha^{-1}) and foramsulfuron (29.0 or 43.6 g ha^{-1}) applied via a CO_2-powered backpack sprayer at 281 L ha^{-1} utilizing four, flat-fan, 8002 nozzles at 124 kPa. Topramezone treatments included a methylated seed oil surfactant at 0.625 %v/v. Treatments at both locations were arranged in a randomized complete block with three replications and applied on 25 July 2013. Goosegrass control and hybrid bermudagrass injury were visually evaluated in all trials utilizing a 0 (i.e., no weed control or turf injury) to 100 % (i.e., complete weed control or turf injury) scale at 7, 14, 21, 28, 35, 42, and 50 DAT.

Topramezone injured hybrid bermudagrass 38 to 60% at 14 DAT but no injury was observed from 28 to 50 DAT. Goosegrass control with topramezone was greater than foramsulfuron. Topramezone at 24.5 and 36.8 g ha^{-1} controlled PR goosegrass 85 to 89% 50 DAT compared to only 66% for the 12.3 g ha^{-1} rate. Comparatively, PR goosegrass control with foramsulfuron never exceeded 19% and only ranged from 10 to 18% by 50 DAT. Despite the transient hybrid bermudagrass injury observed in these trials, our findings suggest that topramezone may be an important tool for controlling PR goosegrass POST. Future research should determine options for PRE control of this PR biotype utilizing alternative modes of action, as well as investigate efficacy of sequential applications of topramezone to control this PR biotype while minimizing hybrid bermudagrass injury.

TOLERANCE PROFILE OF GLYPHOSATE-RESISTANT PALMER AMARANTH TO MESOTRIONE IN ARKANSAS. S. Singh*, N.R. Burgos, R.A. Salas, V. Singh; University of Arkansas, Fayetteville, AR (81)

ABSTRACT

Palmer amaranth is an economically challenging and difficult-to-control weed in the United States. Chemical control options are limited due to rapid resistance evolution, especially to glyphosate. Therefore, studying the response of Palmer amaranth populations to alternative herbicides in HR (herbicide-resistant) crops will help improve resistance management recommendations. A greenhouse experiment was conducted at the Arkansas Agricultural Research Station, Fayetteville, Arkansas in 2013 to assess the tolerance of glyphosate-resistant Palmer amaranth populations to mesotrione. Seeds were collected from crop fields across Arkansas between 2008 and 2012. The accessions were treated with mesotrione, 1x rate (105 g ai ha^{-1}) or glyphosate 1x rate (840 g ae ha^{-1}) at 7-10 cm height. The experiment was conducted twice with two replications, with 50 seedlings sprayed per replication. Injury was recorded at 3 WAT on a scale of 0-100% where 100% is complete death. With mesotrione, 37 of 51 accessions were killed 100% while the remaining 14 accessions showed different levels of injury ranging from 53% - 82%. Among 21 accessions treated with glyphosate, 7 were killed 100%, 5 showed 74% - 89% injury, and 9 showed 27% - 69% injury. Mesotrione controlled the glyphosate-resistant accessions 87% - 98%. It is a viable supplemental tool for managing glyphosate-resistant Palmer amaranth and should be used in conjunction with other herbicides to eliminate or avoid escapes. In some populations, the risk of escapes is high.

NOVEL HERBICIDE COMBINATIONS OF HPPD INHIBITORS WITH PLANT GROWTH REGULATORS FOR IMPROVING PALMER AMARANTH CONTROL. R.E. Paynter*[1], W. Everman[2], J.D. Burton[1], T. Gannon[2]; [1]North Carolina State University, Raleigh, NC, [2]NC State University, Raleigh, NC (82)

ABSTRACT

One of the most problematic and influential weed species on research in agriculture is Palmer amaranth (*Amaranthus palmeri*). As of late, Palmer amaranth has taken over southern row crop fields and is moving northward. Further exacerbating the Palmer amaranth issue, certain biotypes are resistant to multiple modes of action, therefore new technologies and formulations are needed to properly deal with the problem at hand. The research in this study was conducted by using the HPPD- inhibiting herbicides topramezone, isoxaflutole, or mesotrione applied at 4.63 g ai/ ha, 21.56 g ai/ ha, and 26.36 g ai/ha, respectively, in combination with transport inhibitors diflufenzopyr (DFF), cyclanilide (CYC), or napthalam (NPA). The study was conducted in a greenhouse at North Carolina State University with application applied via a spray chamber. Each herbicide rate evaluated is lower than typical field rates and was tested with a range of concentrations of additives. DFF was added to each herbicide at 2.5 g ai/ ha, 5 g ai/ ha, 7.5 g ai/ ha, or 10 g ai/ ha; while CYC or NPA were added at rates of 52.7 g ai/ ha, 105.42 g ai/ ha, 158 g ai/ha, or 210.9 g ai/ ha). Significant increases in herbicide activity were observed where isoxaflutole was applied with DFF and mesotrione was combined with NPA when compared to the individual herbicide alone. Furthermore, significant effects of fresh weight reductions were observed for topramezone plus DFF, mesotrione plus NPA, Isoxaflutole plus CYC, and topramezone plus CYC when compared to herbicides with no additives. Although further research is needed to refine combinations and optimize formulations this study shows the potential for additives to play an important role in managing resistant palmer amaranth in the future.

EVALUATION OF WEED CONTROL PROGRAMS IN ENLIST™ COTTON IN THE MID-SOUTH. T.H. Dixon, D.M. Dodds[1], J.D. Copeland[1], D.Z. Reynolds[1], D.B. Reynolds[1], C.A. Samples[1], L.T. Barber[2], J.A. Bond[3], D.O. Stephenson IV[4], D. Miller[4], Larry C. Walton[5]; [1]Mississippi State University, Mississippi State, MS, [2]University of Arkansas, Little Rock, AR, [3]Mississippi State University, Stoneville, MS, [4]LSU AgCenter, Alexandria, LA, [5]Dow AgroSciences, Tupelo, MS (83)

ABSTRACT

Experiments were conducted in 2013 to evaluate weed control programs in Enlist™ cotton in the Mid-South. Experiments were conducted at Hood Farms in Dundee, MS; the R.R. Foil Plant Science Research Center in Starkville, MS; the Delta Research and Extension Center in Stoneville, MS; and Rohwer Experiment Station in Little Rock, AR. The following POST herbicide programs in conjunction with fluometuron as a PRE were utilized to evaluate Palmer amaranth control: 1) two applications of GF-2726 (2,4-D choline + glyphosate DMA) at 2.2 kg ae/ha + glufosinate at 0.5 kg ae/ha; 2) GF-2726 at 2.2 kg ae/ha followed by (FB) GF-2726 at 2.2 kg ae/ha; 3) GF-2726 at 2.2 kg ae/ha FB glufosinate at 0.5 kg ae/ha); 4) glufosinate at 0.5 kg ae/ha FB GF-2726 at 2.2 kg ae/ha; 5) glufosinate at 0.5 kg ae/ha + S-metolachlor at 1.1 kg ai/ha FB GF-2726 at 2.2 kg ae/ha; 6) two applications of glyphosate at 1.1 kg ae/ha and 7) fluometuron at 0.8 kg ai/ha PRE only. The first applications were made when Palmer amaranth reached 10cm in height with the second applications being made 14-21 days after this. All plots received fluometuron at 0.8 kg ai/ha PRE. All applications were made with a CO_2-powered backpack sprayer equipped with Turbo Teejet Induction spray tips utilizing 324kPa pressure. Visual ratings of Palmer amaranth control were taken one to two weeks after each application. All data were subjected to analysis of variance and means were separated using Fishers Protected LSD at $p = 0.05$.

Greater than 90% control was observed one to two weeks after the 10cm application (all of which received fluometuron PRE at 0.8 kg ai/ha) after the following treatments: GF-2726; GF-2726 + glufosinate; and GF-2726 + S-metolachlor. Glyphosate alone applied to 10 cm Palmer amaranth resulted in 88% control; however, fluometuron PRE resulted in 72% control indicating glyphosate provided an additional 16% control over fluometuron PRE. Palmer amaranth control in excess of 96% was observed 1-2 weeks after the second application with following herbicide treatments (all of which received an application of fluometuron PRE): two applications of GF-2726 + glufosinate; two applications of GF-2726; GF-2726 FB glufosinate; glufosinate FB GF-2726; and glufosinate + S-metolachlor FB GF-2726. Glyphosate alone provided 81% Palmer amaranth control; however, fluometuron alone provided 51% Palmer amaranth control indicating two applications of glyphosate provided an additional 30% control over fluometuron PRE. These results demonstrate glyphosate-resistant Palmer amaranth can be effectively controlled through planned PRE/POST weed management programs comprising multiple modes of action. Sequential applications containing GF-2726 provided consistently high levels of control of glyphosate-resistant Palmer amaranth; however residual herbicides will be recommended as part Enlist™ weed control programs to promote herbicide resistance management. Prior research has demonstrated the importance of PREs and these experiments further demonstrate that systems comprised of PREs + POST are highly effective.

BIOASSAY TECHNIQUES FOR DETECTING ROOT LEAKAGE OF AUXINIC HERBICIDES. E.T. Parker*[1], J.S. McElroy[1], G.R. Wehtje[1], A.J. Price[2]; [1]Auburn University, Auburn, AL, [2]National Soil Dynamics Lab, Auburn, AL (84)

ABSTRACT

EVALUATION OF HERBICIDE EFFICACY AND APPLICATION TIMING ON MISCANTHUS. D.N. Barksdale*; Mississippi State University, Starkville, MS (85)

ABSTRACT

In 2013, Mendel Bioenergy Seeds provided a location in Louisville, MS to evaluate *Miscanthus* control using different herbicide treatments. Twenty- two herbicide or herbicide mixtures plus an untreated were evaluated for control: glyphosate @ 2, 4, 6.5 lb ae/A, 2% (v/v), imazapyr @ 0.25, 0.5 lb ae/A, 1% (v/v), clethodim @ 0.25 lb ai/A, 0.25% (v/v), fluaziflop @ 0.38 lb ai/A, metsulfuron @ 0.075 lb ai/A, 1 oz/100 gallons, imazapic @ 0.18 lb ai/A, imazapic + glyphosate @ 0.12 + 0.24 lb ai/A, hexazinone @ 0.5, 1 lb ai/A, MSMA @ 3.3 lb ai/A , diuron @ 2 lb ai/A, sulfosulfuron @ 0.07 lb ai/A, sulfometuron @ 0.09 lb ai/A, nicosulfuron + metsulfuron @ 0.05 + 0.01 lb ai/A, and quinclorac @ 0.75 lb ai/A. Nonionic surfactant or crop oil concentrate was mixed with treatments as specified on the product label. There were two trials put out to determine the effect of application timing on efficacy. Treatments for trial one were applied June 25, 2013. Treatments for trial two were applied one month prior to frost on September 25, 2013. For each trial, treatments were applied to separate plots replicated four times with a CO2 backpack sprayer and plot size averaged 10 by 20 ft. *Miscanthus* was mowed to stubble height of 6 inches on June 5, 2013 and herbicide treatments applied June 25, 2013 after plants regrew to a stubble height of 24 inches. Initial plant response was visually evaluated 1 month after herbicide treatment (MAT). Glyphosate applied at 4 and 6.5 lb ae/A provided 60% and 80% control, respectively, at 1 MAT. At that evaluation interval, none of the other treatments provided more than 50% control. Six treatments (Escort .075 lb ai/A and 1 oz/100 gal, Velpar S 0.5 lb ai/A, Direx 2 lb ai/A, Outrider 0.07 lb ai/A, and Drive 0.75 lb ai/A) provided 0 visual control. On August 24, 2013, *Miscanthus* was mowed to stubble height of 6 inches and herbicide treatments applied September 25, 2013 after plants regrew to a stubble height of 22 inches. Initial plant response was visually evaluated 1 month after herbicide treatment (MAT). Clethodim at 0.25 lb ai/A, Fluaziflop at 0.38 lb ai/A, and glyphosate at 4 lb ae/A provided 58%, 55%, and 50% control, respectively, 1 MAT. At that evaluation interval, none of the other treatments provided more than 50% control. These data indicate that *Miscanthus* can withstand a variety of herbicide treatments. Further visual and physical observations, such as rhizome biomass, will be evaluated after greenup this spring to determine control levels.

THE EFFECT OF LOW CONCENTRATIONS OF LEADOFF ON WHEAT GROWTH AND YIELD. A.N. Eytcheson*, G.T. Cundiff, D.B. Reynolds; Mississippi State University, Mississippi State, MS (86)

ABSTRACT

LeadOff® is comprised of rimsulfuron (16.7%) and thifensulfuron-methyl (16.7%), both belonging to the sulfonylurea herbicide family. A major feature of the sulfonylurea herbicide family is the ability to be biologically active at extremely low use rates. Currently, LeadOff® is labeled for use as a burndown herbicide in early spring for corn (*Zea mayes* L.), cotton (*Gossypium hirsutum* L.), peanut (*Arachis hypogaea* L.) and soybean [*Glycine max* (L.) Merr.]. LeadOff® has shown to provide excellent burndown control of many spring and winter weeds. However, due to the inability to control existing horseweed [*Conzya Canadensis* (L.) Cronq.], it is recommended to tank-mix with glyphosate and 2,4-D. Previous research reported that wheat (*Triticum aestivum* L.) exhibited severe injury and yield reductions when exposed to sub-leathal doses of glyphosate. Wheat exposed to glyphosate early in development, has been found to be more sensitive than wheat in later growth stages.

Due to the increased number of herbicide active ingredients used in burndown applications, tank contamination issues have become frequent over the past several growing seasons. Therefore, an experiment was conducted to evaluate the level of wheat injury from simulated tank contamination using titrated rates of LeadOff®, glyphosate, and 2,4-D, while applying a labeled rate of Harmony® Extra. The experiment was established as a randomized complete block design, with a factorial arrangement of treatments. Factor A consisted of the sprayer contaminates Leadoff® (0.31 kg ai/ha), tankmixed with or without 2,4-D (0.8 kg ai/ha) + glyphosate (0.58 kg ae/ha). Factor B consisted of 1/2x, 1/4x, 1/16x, 1/64x, 1/256x and 0x of the labeled rates of Leadoff®, 2,4-D, and glyphosate, simulating titrated tank contamination rates. All treatments included Harmony® Extra (0.369 kg ai/ha) + NIS (0.25% v/v). Treatments were applied to wheat, which had been drilled into preformed raised beds. At the time of application, wheat was at the elongation, pre-boot growth stage. Visual estimates of injury and plant heights were collected 7, 14, 21 and 28 days after application, and yield (kg/ha) was collected at harvest.

Initial results showed an interaction of the tank-mix of LeadOff® + 2,4-D + glyphosate by contaminate rate occurring at the 7, 14 and 21 DAT visual injury ratings. The 1/2x rate of LeadOff® + 2,4-D + glyphosate caused the greatest injury (48 to 50%), regardless of evaluation interval. LeadOff® (1/16x) with or without 2,4-D + glyphosate resulted in 16 to 21% injury 14 and 21 DAT. By 28 DAT, contaminate rate was the only significant factor with visual injury following a clear rate response pattern, with visual injury decreasing from 55% at the 1/2x rate down to 19% at the 1/16x rate. When evaluating wheat height reduction 28 DAT, contaminate rate was the only significant factor. Wheat height reduction followed a clear rate response pattern, with height reduction decreasing from 58% at the 1/2x rate down to 39% at the 1/16x rate. Although no visual injury and height reduction were detected at the 1/64x nor 1/256x rate at any evaluation interval, an 18 to 20% yield reduction occurred, which may indicate an extreme sensitivity of wheat to the combination of LeadOff® + 2,4-D + glyphosate, respectively.

These data show that LeadOff® + 2,4-D + glyphosate spray tank contamination caused severe plant injury and significantly reduced wheat height and yield. Wheat has shown to be particularly sensitive at extremely low contamination rates, regardless of the spray tank contaminates. Future research will be conducted, replicating the effects of low concentrations of LeadOff® on wheat growth and yield.

BARNYARDGRASS CONTROL PROGRAMS IN CONVENTIONAL RICE. C.B. Edwards, J.A. Bond, T.W. Eubank, G.B. Montgomery, and H.M. Edwards; Mississippi State University, Stoneville, MS (87)

ABSTRACT

Barnyardgrass (*Echinochloa crus-galli*) is the most common and troublesome weed of rice in Mississippi. Although the Clearfield® system has provided a tool to help manage barnyardgrass, sustainability of this technology is a growing concern. Four Mississippi counties are known to contain populations of barnyardgrass resistant to ALS-inhibiting herbicides, including Newpath, Beyond, Regiment, and Grasp. Barnyardgrass populations resistant to propanil and/or quinclorac are also common in Mississippi. Furthermore, one Mississippi population of barnyardgrass exhibits multiple resistance to propanil, quinclorac, ALS-, and ACCase-inhibiting herbicides. Conventional herbicide programs provide an opportunity to rotate herbicide modes of action to help alleviate selection pressure on barnyardgrass with ALS-inhibiting herbicides used in Clearfield® rice production. Research is conducted annually in Mississippi to evaluate barnyardgrass control with conventional herbicide programs.

Research was conducted from 2009 to 2013 at the Mississippi State University Delta Research and Extension Center in Stoneville, MS, to evaluate barnyardgrass control in conventional (non-Clearfield®) rice production systems. The experiment was designed as a randomized complete block with four replications. Herbicide treatments were chosen to avoid selection pressure on barnyardgrass with ALS- and ACCase-inhibiting herbicides. Bolero, Command, Facet, Prowl H_2O, RiceBeaux, and SuperWham were utilized in different combinations and at different application timings. Application timings included preemergence (PRE), delayed-preemergence (DPRE), early-postemergence (EPOST) to rice in the two- to three-leaf stage, mid-postemergence (MPOST) to rice in the three- to four-leaf stage, and late-postemergence (LPOST) to rice in the four-leaf to one-tiller stage. Visual estimates of rice injury and barnyardgrass control were recorded 7, 14, and 28 days after each application. Rough rice yield was adjusted to 12% moisture content. Data were subjected to ANOVA and estimates of the least square means were used for mean separation.

Although rice injury up to 16% was observed 7 days after LPOST applications, the injury was transient, and no injury was observed at the next evaluation. Herbicide application timing was critical for barnyardgrass control. For example, control was reduced when Prowl H_2O plus Facet were applied EPOST followed by SuperWham LPOST compared with the same treatments applied DPRE followed by MPOST (76 vs. 90% at 28 days after LPOST application). Total postemergence programs without Command controlled barnyardgrass less than those that included Command EPOST. Rough rice yields were lower following Facet EPOST followed by RiceBeaux LPOST and Prowl H_2O plus Facet EPOST followed by SuperWham LPOST compared with other sequential herbicide programs.

Data indicated that barnyardgrass can be managed in rice, even if it is resistant to ALS- and ACCase-inhibiting herbicides. However, multiple applications of postemergence and residual herbicides were required to achieve adequate control of barnyardgrass. Postemergence herbicide application timing is critical for barnyardgrass control in conventional rice. A postemergence herbicide application should include premixes or tank mixtures of herbicides with multiple modes of action. Should barnyardgrass with multiple resistance to propanil, quinclorac, ALS-, and ACCase-inhibiting herbicides spread across the rice-producing area, control options will be severely limited.

MOLECULAR INVESTIGATION OF GLUFOSINATE TOLERANCE IN PALMER AMARANTH FROM ARKANSAS. R.A. Salas*[1], N.R. Burgos[1], R.C. Scott[1], F. Dayan[2], A. Lawton-Rauh[3], S. Singh[1]; [1]University of Arkansas, Fayetteville, AR, [2]USDA, University, MS, [3]Clemson University, Clemson, SC (88)

ABSTRACT

Palmer amaranth (*Amaranthis palmeri* S Wats.) is an economically troublesome weed threatening the sustainability of crop production in the US. The rapid increase in glyphosate-resistant weeds prompted a shift in weed management strategies. Glufosinate, in glufosinate-resistant crops, is an alternative tool for controlling glyphosate-resistant weeds. A study was conducted to investigate the tolerance mechanism to glufosinate in a Palmer amaranth population from Arkansas. Lee-08-C population was tested for tolerance using 0.55 kg ai ha^{-1} glufosinate. The progenies of Lee-08-C glufosinate survivors were used for tolerance mechanism experiments. Six confirmed susceptible plants from the original Lee-08-C population and six confirmed tolerant plants from the F1 population were used for ammonia accumulation assay and glutamine synthetase 2 (*GS2*) gene copy number determination. The susceptible plants accumulated two times more ammonia than the tolerant plants. Less ammonia reduces inhibition of GS activity. *GS2* copy number between tolerant and susceptible plants did not differ, with *GS2* copies ranging from 1 to 3 in both tolerant and susceptible plants. Therefore, the tolerance mechanism to glufosinate in Lee-08-C population is not due to amplification of *GS* gene. Other potential mechanisms will be investigated. Meanwhile, we know that some individuals in this population or other similar populations can escape glufosinate treatment when application conditions or plant growth stage is suboptimal. The survivors should be prevented from producing seeds using supplemental weed control practices and best management strategies should be practiced to delay the evolution of a resistant population and conserve the utility of glufosinate.

THE EFFECT OF A DEACTIVATION AGENT ON VARIOUS CONCENTRATIONS OF DICAMBA. G.T. Cundiff*1,D.B. Reynolds1, D.A. Morgenstern2, and J.W. Taylor2, 1Mississippi State University, Mississippi State, MS, 2Monsanto Company, St. Louis, MO (89)

ABSTRACT

The introduction of new herbicide tolerant crops may provide many benefits for producers such as alternative control options for resistant weed species, decreased costs, and different modes of action. Along with these benefits, the use of auxin containing herbicides may also increase concern for issues such as herbicide drift, volatilization, and tank contamination. The adjuvant and solvent system utilized in several commercial herbicides often result in the release of herbicides which have been sequestered within the spray system thus resulting in injury to sensitive crops.

Preliminary experiments were conducted to develop a method for assessing auxin herbicide activity after a chemical cleaning solution was added to an active auxin solution. This study focused on determining if Clarity (diglycolamine salt of dicamba) persistence would differ with respect to different rates and no cleanout vs. a chemical cleanout procedure and to determine if soybean could be used as a bio-indicator to assess cleanout efficiency.

Treatments were arranged as a split plot design with four replications. Each experimental unit consisted of 4-91cm rows 12.2 m in length. The center two rows of each experimental unit were treated. Factor A main plots consisted of seven rates of dicamba (0.56, 0.14, 0.035, 0.009, 0.00218, 0.000549, and 0 kg ae/ha). Factor B sub-plots consisted of two cleanout procedures (none and a chemical deactivation procedure). The soybeans were sprayed at the R5 growth stage with applications made at 140 L/ha using a two row boom with TTI 80015.

Each rate of dicamba was mixed in a spray solution of 3.785 liters and applied to soybean. The remaining solution for each rate was adjusted to a volume of 1.875 liters and then the deactivation treatment was added to the spray solution. Following the deactivation reaction, the resulting solution was sprayed to plots adjacent to experimental units previously sprayed with the corresponding rates. The deactivation treatment consisted of ferrous sulfate added to the original spray solution and agitated for one minute and then 30% H_2O_2 was added and allowed to react for 20 minutes. Each dicamba solution treated with the cleanout method was then applied. Weekly visual ratings were taken 7, 14, 21, and 28 days after treatment (DAT), yield was taken and percent yield reductions were calculated.

Initial results showed significant differences for all injury observations (7, 14, 21, and 28 DAT) based on a significant Rate X Cleanout Procedure interaction. Without the cleanout reaction occurring, the observed level of injury at the 1X rate of 0.56 kg ae/ha is almost tenfold at 28 DAT when compared to the 1X rate where the cleanout reaction did occur. Soybean yield showed significant differences based on a Rate X Cleanout Procedure interaction. Yields at the 1X and 1/4X (0.56 and 0.14 kg ae/ha) significantly differed from all other rates when dicamba was applied alone. Percent yield reduction showed significant differences based on rate by cleanout method interaction when compared to the check. Percent yield reduction at the 1X and 1/4X (0.56 and 0.14 kg ae/ha) significantly differed from all other rates when dicamba was applied alone.

These data show that the Cleanout Procedure significantly reduced the injury potential from dicamba. Further testing is needed to better assess and understand the potential of this technology in a commercial setting. The test needs to be repeated with soybean that are just beginning reproductive growth stages as this growth stage has been demonstrated to be the most sensitive to various concentrations of dicamba.

SWEET POTATO [*IPOMOEA BATATAS* (L.) LAM.] RESPONSE TO *S*-METOLACHLOR AND RAINFALL. I.A. Abukari*[1], M.W. Shankle[2], R.K. Reddy[1]; [1]Mississippi State University, Starkville, MS, [2]Mississippi State University, Pontotoc, MS (90)

ABSTRACT

A NEW LIQUID FORMULATION OF QUINCLORAC FOR SMOOTH CRABGRASS CONTROL IN COOL-SEASON TURF. S.S. Rana*[1], J. Corbett[2], S.D. Askew[1]; [1]Virginia Polytechnic Institute and State University, Blacksburg, VA, [2]Quali-Pro, Raleigh-Durham, NC (91)

ABSTRACT

Currently, many herbicides are labeled for preemergence control of smooth crabgrass in both warm- and cool-season turf; however, postemergence control options for smooth crabgrass are limited, especially since the loss of MSMA in sports turf and restrictions placed for golf and sod production. Quinclorac is among the most effective postemergent herbicides for smooth crabgrass control and has only been offered as a dry formulation throughout its entire patent life. Recently, a liquid formulation of quinclorac has become available by BASF Corporation under the trade name Drive® XLR8. To date, Quali-Pro has only offered a dry formulation of quinclorac. Although dry formulations require "softer" packaging, have less shipping weight, and impart less exposure risk to handlers, recent market analyses continue to indicate that liquid formulations of sprayable pesticides are most desirable among turf managers. Quali-Pro has developed a liquid formulation of quinclorac (Quali-Pro Quinclorac 1.5 L) that uses new formulation technology, allowing faster dispersion, better cold-water mixing, and safer inert materials and surfactants. Field trials were initiated July 25, 2013 on a perennial ryegrass fairway (1.5-cm height) at the Turfgrass Research Center (TRC) at Virginia Tech in Blacksburg, VA to evaluate smooth crabgrass control efficacy and perennial ryegrass sensitivity to the liquid formulation of quinclorac [Quali-Pro Quinclorac 1.5 L (QPQ 1.5 L)] compared to the dry formulation [Quali-Pro Quinclorac 75 DF (QPQ 75 DF)] and the industry standards, Drive® XLR8 (quinclorac) (DXQ 1.5 L) and Acclaim Extra® (fenoxaprop) (AEF 0.57 EW). The study was a randomized complete block design with three replications and five treatments, including a non-treated check. The herbicide treatments included QPQ 1.5 L, QPQ 75 DF, and DXQ 1.5 L at 840 g ai ha^{-1} and AEF 0.57 EW at 105 g ai ha^{-1}. All herbicide treatments included methylated seed oil (MSO) at 0.25% v/v to simulate conditions of limited absorption, a common problem while using dry formulations of herbicides. Percent visual cover, control, and injury ratings were taken for perennial ryegrass and smooth crabgrass at 0, 7, 14, 21, and 28 days after treatment (DAT). None of the herbicide treatments injured perennial ryegrass. Injury to smooth crabgrass peaked at 7 and 14 DAT for treatment containing quinclorac and AEF 1.5 L, respectively. At 14 DAT, QPQ 1.5 L, AEF 0.57 EW, and DXQ 1.5 L controlled smooth crabgrass 93, 97, and 95%, respectively, which was greater than QPQ 75 DF (63%). At 28 DAT, QPQ 1.5 L, AEF 0.57 EW, and DXQ 1.5 L controlled smooth crabgrass 93, 96, and 92%, respectively, which was greater than QPQ 75 DF (47%). Results from this study indicate that the liquid formulation of quinclorac controls smooth crabgrass better than the dry formulation, especially under conditions of limited absorption, but equivalent to the industry standards Drive® XLR8 and Acclaim Extra®.

USING FLUE-CURED TOBACCO IN A CROPPING ROTATION TO REDUCE PALMER AMARANTH POPULATIONS. M.C. Vann*[1], D. Jordan[2], L.R. Fisher[1]; [1]North Carolina State University, Raleigh, NC, [2]NC State University, Raleigh, NC (92)

ABSTRACT

In recent years, the glyphosate resistant weed Palmer amaranth (*Amaranthus palmeri*) has become a major production issue in agricultural systems in the southeastern United States. The continual use of glyphosate tolerant crops, such as corn, cotton, and soybeans, in succession has allowed the weed to spread with little to no control. However, it has been observed that when flue-cured tobacco is used in a cropping rotation the populations of Palmer amaranth are greatly reduced. Tobacco, in general, is considered to be a useful tool for the reduction of certain weed species populations because of field preparation methods which differ from other agronomic crops, the implementation of post-transplanting cultivation, differing herbicide chemistries, and the implementation of hand labor which can be utilized to manually remove large weeds not adequately controlled with other management strategies.

Research was initiated in 2012 and continued in 2013 to quantify the effects of tillage (no deep tillage vs. deep tillage) in field preparation, herbicide combinations (clomazone verses clomazone+sulfentrazone), and hand weeding (hand weeding verses no hand weeding) in flue-cured tobacco production, and how those weed control programs impact Palmer amaranth populations in subsequent agronomic crops. After transplanting tobacco in 2012, weed identification and population counts were taken multiple times, each time prior to in-season cultivation using a 1.23 m x 1.23 m sampling square. Cured tobacco yield, quality, and value were also assessed. Tillage and herbicide treatments were implemented in tobacco only; however, similar measurements for Palmer amaranth densities were made in cotton in 2013. Palmer amaranth populations were reduced when sulfentrazone was used regardless of tillage system; however, deep tillage provided better weed control than no deep tillage when clomazone was the only herbicide utilized. Yield was increased by deep tillage and sulfentrazone. Palmer amaranth populations were reduced in cotton the following season when sulfentrazone was applied compared to when it was not. Cost of production for tobacco increased when deep tillage or hand weeding occured. Economic return for tobacco was increased by $2400/ha when deep was used. The cost of production and the economic return for cotton was not influenced by treatments imposed in the previous tobacco crop. Cumulative economic return for the two crops was increased when deep tillage was implemented, which is likely a result of increased tobacco yield.

The effects of each treatment will be measured in a subsequent crop of cotton in 2014 utilizing the same sampling methodology.

USE OF TOPRAMEZONE (PYLEX) FOR BERMUDAGRASS (CYNODON DACTYLON SPP.) AND SMOOTH CRABGRASS (DIGITARIA ISCHAEMUM) CONTROL IN BENTGRASS (AGROSTIS STOLONIFERAÂ 'CRENSHAW'). P.C. Aldahir*, J.S. McElroy, M.L. Flessner; Auburn University, Auburn, AL (93)

ABSTRACT

Topramezone can be used in turf to control or suppress several annual and perennial grassy weeds, including crabgrass (*Digitaria* spp.), bermudagrass (*Cynodon dactylon*), and creeping bentgrass (*Agrostis stolonifera*). According to the label, crabgrass control is obtained with topramezone applied alone, but triclopyr ester should be added to the mixture for successful control of bermudagrass and creeping bentgrass. Such label recommendations may indicate that topramezone alone can control smooth crabgrass in creeping bentgrass putting greens while maintaining safety to the creeping bentgrass.

Research was conducted at the Auburn University Turfgrass Research Unit in Auburn, AL to evaluate smooth crabgrass (*Digitaria ischaemum*) control in creeping bentgrass putting greens. Plots were 1.5 by 3 m including the surrounding creeping bentgrass at rough height (25 mm) and the creeping bentgrass at putting green height (3.175 mm). Treatments included topramezone (Pylex, BASF Corp. Research Triangle Park, NC) at 12.3 g ai ha^{-1}, topramezone + triclopyr ester (Turflon Ester, Dow AgroSciences LLC. Indianapolis, IN) at 12.3 + 560 and 24.5 + 560 g ai ha^{-1}, topramezone + siduron (Tupersan, PBI/Gordon Corp. Kansas City, MO) at 12.3 + 736 g ai ha^{-1}, topramezone + fenoxaprop (Acclaim Extra, Bayer Environmental Science. Research Triangle Park, NC) at 12.3 + 15 g ai ha^{-1}, fenoxaprop at 15 g ai ha^{-1}, and a nontreated control. Methylated seed oil (MSO) was added to all treatments at 0.5% vol vol^{-1}. Treatments were applied sequentially 4 times on a 3-week interval (first application on 10 Apr 2013). Applications were made with a hand-held sprayer with four TeeJet 8002VS nozzles spaced at 25 cm and calibrated to deliver 280 L ha^{-1}. Treatments were arranged in a randomized complete block with 4 replications.

Smooth crabgrass emergency on the putting green was first observed between 49 to 56 DAIA in the nontreated plots. Percent smooth crabgrass control and creeping bentgrass injury were rated for 98 days after initial application (DAIA), where 0 corresponds to no visual injury and 100 corresponds to complete plant necrosis or death. Data were subjected to ANOVA and means separated using adjusted 95% confidence intervals at P = 0.05.

In general, topramezone alone at 12.3 g ai ha^{-1} provided excellent smooth crabgrass control (> 95%) with the least creeping bentgrass injury (< 5%) at putting green mowing height. Topramezone (12.3 and 24.5 g ai ha^{-1}) + triclopyr ester at 560 g ai ha^{-1} resulted in unacceptable creeping bentgrass injury in the putting green (≥ 40%). At rough height, all treatments resulted in acceptable creeping bentgrass injury (< 20%). Bleaching symptomology across all species occurred in the last application (mid-June). In conclusion, though topramezone + triclopyr ester is labeled to control creeping bentgrass, topramezone alone at 12.3 g ai ha^{-1} can be used to control smooth crabgrass in creeping bentgrass greens with relative safety. Future research should focus on PRE/POST activity for crabgrass control, duration of activity, and causes for mid-summer bleaching.

TOLERANCE OF EDAMAME SOYBEAN VARIETIES AND ADVANCED LINES TO SELECTED HERBICIDES. V.Singh*, N.R. Burgos, S. Sathuwijarn, L.Estrninos, D.R.Motes, P. Chen, L.W. Martin; University of Arkansas, Fayetteville, AR (94)

Edamame is a specialty soybean (*Glycine max L. Merrill*) harvested as a vegetable when the seeds are immature. Only few herbicides have been tested for edamame. With new varieties being commercialized, and several in the pipeline, it is necessary to test additional herbicides that are already labeled in grain soybean, to expand the weed management options for edamame. Among the herbicides that edamame growers desire to have is fomesafen. A field experiment was conducted at the Vegetable Research Station, Kibler, AR (Dardanelle silt loam, overwash soil) and Arkansas Agricultural Research and Extension Centre, Fayetteville, AR (Captina silt loam soil) in the summer of 2013 to determine the effect of preemergence herbicides (sulfentrazone, flumioxazin, pyroxasulfone, metribuzin) and the postemergence herbicide fomesafen on edamame soybean lines. Eleven edamame lines were planted in June, 2012 in single-row plots, 0.91 m apart and 6.1 m long. The treatments were arranged in a split-plot design (herbicide treatment as whole plot and edamame lines as subplot) with four replications. Each line had a corresponding nontreated plot. Visual ratings for injury were recorded at 3 weeks after planting (WAP) and 5 WAP for the soil-applied treatments. Crop injury was evaluated at 6 WAP for fomesafen only. “R04-1250” showed poor stand and low vigor at both locations. In Kibler, sulfentrazone and metribuzin caused higher injury (33% and 35%, respectively) than the other soil-applied herbicides, but not in Fayetteville. At 1 wk after application, fomesafen caused 18% foliar burn in Kibler and 14% in Fayetteville. As in grain soybean, this foliar burn was transient. Postemergence application of fomesafen resulted in similar yield as the non-treated check across all edamame lines.

THE USE OF CEREAL COVER CROPS AND RESIDUAL HERBICIDES FOR WEED CONTROL IN MISSISSIPPI SOYBEANS. R.J. Edwards[1], D.B. Reynolds[2]; [1]Mississippi State University, Starkville, MS, [2]Mississippi State University, Mississippi State, MS (95)

ABSTRACT

Cover crops are intentionally-planted vegetation crops that are terminated to provide a mat of vegetation that higher cash value crops can be planted into. However, cover crops alone cannot provide season long weed control and use of residual herbicides is necessary. One trial was performed in 2013 at the Black Belt Experiment Station in Brooksville, Mississippi. The experiment was conducted in a randomized complete block design with a factorial arrangement of treatments. Factor A consisted of four cover types (elbon rye (*Secale cereale*), wheat (*Triticum aestivum*), common oats (*Avena sativa*) and a no cover. Factor B consisted of seven residual herbicides Boundary (S-metolachlor + metribuzin at 0.085 kg ai/ha), Prefix (S-metolachlor + fomesafen at 0.093 kg ai/ha), Prowl (pendimethalin at 0.049 kg ai/ha), Valor (flumioxazin at 0.004 kg ai/ha, Fierce (flumioxazin + pyroxasulfone at 0.009 kg ai/ha), Authority MTZ (metribuzin + sulfentrazone at 0.023 kg ai/ha and an untreated control.Cover types were drilled the previous fall at 120kg/ha, grown through the winter and spring and desiccated with a foliar application of 1262 g ae/ha glyphosate. Once dried, all cover crops were rolled using a 3.758m tractor mounted roller, followed by a 3 day "rest" period. Pioneer 95Y70 Soybeans (*Glycine max*). were planted at 338,390 s/ha using a vacuum planter with 13.2 cm coulters to cut into the straw. All residual herbicides were applied with a CO_2 backpack sprayer (262 kpa at 140 l/ha using a 2 nozzle boom with AIXR 11002 tips) and in-season application of 1262 g ae/ha glyphosate applied 28 DAP using a JD highcycle sprayer, 186 l/ha (*20 GPA*). Data for visual percent control of large crabgrass (*Digitaria sanguinalis*), percent regrowth of cover crops (0.5 m^2 quadrat) and soybean yields were collected and subjected to ANOVA and means separated by Fishers Protected LSD (α=0.05). Our results show that the combination of cereal cover crops and residual herbicides was an effective means of controlling weeds without negatively impacting soybean yields. There was no interaction present between cover varieties and herbicide applications in response to yield. When analyzed separately, there was NSD between cover varieties and NSD between herbicide applications in response to yield, as well. Large crabgrass was effectively controlled (>90%) with several combinations of residual herbicides and cover varieties. Following in season applications of glyphosate, regrowth of all cover varieties was observed, with both wheat and oats showing the highest potential for regrowth.

WEED CONTROL AND CROP TOLERANCE OF FOMESAFEN AND S-METOLACHLOR IN SQUASH AND WATERMELON PLASTICULTURE PRODUCTION. S.M. Sharpe*, P.J. Dittmar; University of Florida, Gainesville, FL (96)

ABSTRACT

Pre-emergence weed control for Florida squash production is limited to ethalfluralin + clomazone and bensulide. The study objective was to establish crop safety and effectiveness of fomesafen and *S*-metolachlor within the squash plasticulture system. Treatments were fomesafen at 0.21, 0.28, 0.42 and 0.56 kg ha^{-1}, *S*-metolachlor at 1.07 kg ha^{-1}, fomesafen + *S*-metolachlor at 0.28 + 1.07 kg ha^{-1} and 0.28 + 0.80 kg ha^{-1}, ethafluralin + clomazone at 0.45 + 0.14 kg ha^{-1}, a weed-free control and a weed control. Treatments were in a randomized complete block design with four replications. Herbicides were applied on March 21, 2013 and squash was planted March 28, 2013. Weed control and squash injury (stunting and visual injury) were measured weekly, flower number, plant height and yield were measured. There was a significant reduction in plant height for the fomesafen + *S*-metolachlor at 0.28 + 1.07 kg ha^{-1} compared to the controls and the ethafluralin + clomazone at 31 and 41 days after planting (DAP). At both the onset of flowering (34 DAP) and during full floral bloom (41 DAP) there was no significant effect of herbicides on flower number. There was a significant increase in squash injury for rates of fomesafen above 0.28 kg ha^{-1} as well as fomesafen + *S*-metolachlor at 0.28 + 1.07 kg ha^{-1} at 13 DAP. This injury was not significant at 41 DAP. Nutsedge (*Cyprus* sp.) was the primary weed found within the plots. There was no significant effect of time on weed control. Highest significant weed control was achieved with *S*-metolachlor (67%), fomesafen + *S*-metolachlor at 0.28 + 1.07 kg ha^{-1} (54%) and fomesafen at 0.28 kg ha^{-1} (48%). Harvest was measured over eight harvests (twice a week) and there was no significant effect of treatment on the number of fruit harvested, nor the weight of the harvest. Fomesafen at 0.21 and 0.28 and *S*-metolachlor at 1.07 kg ha^{-1} provide adequate nutsedge control with the least crop injury.

EFFECT OF GRAFTING ON CRITICAL PERIOD FOR WEED CONTROL IN FRESH MARKET PLASTICULTURE TOMATO. S. Chaudhari*[1], K. Jennings[2], D. Monks[2], F. Louws[3]; [1]NCSU, Raleigh, NC, [2]NC State University, Raleigh, NC, [3]NCSU, Raleigh, SC (97)

ABSTRACT

The critical period for weed control (CPWC) is an important component when developing integrated weed management strategies in tomato. One possible approach to reduce CPWC could be to use grafted tomato plants that may have enhanced competitive ability against weeds for utilizing resources and hence improved crop yield and quality. The objective of these studies was to determine the effect of grafting on critical timing of weed control in fresh market plasticulture tomato. Field studies were conducted in summer 2013 at the Horticultural Crops Research Station, Clinton, NC. The removal and establishment studies was conducted to determine maximum period of weed competition and minimum weed-free period, respectively after tomato planting to measure CPWC. Tomato plants used in the study include nongrafted Amelia and Amelia grafted onto Maxifort tomato rootstock. In the establishment study, weeds were transplanted at 1, 2, 3, 4, 5, 6 and 12 wk after tomato transplanting (WATT) and remained until tomato harvest. In the removal study, weeds were transplanted on the same day of tomato transplanting and removed at 2, 3, 4, 5, 6, 8, and 12 WATT. Weed removal at 12 WATT was the weedy all-season treatment and weed establishment at 12 WATT represented the weed-free treatment. Each planting hole contained one grafted or non-grafted tomato plant and six weed seedlings [2 yellow nutsedge (*Cyperus esculentus*), 2 common purslane (*Portulaca oleracea*) and 2 large crabgrass (*Digitaria sanguinalis*)]. The experimental design in each study was randomized complete block with four replications.

In both grafted and nongrafted tomato, plant biomass increased as establishment of weeds was delayed and grafted tomato had higher biomass at 4 and 12 WATT. However, tomato biomass decreased when removal of weeds was delayed and no difference was observed between grafted and nongrafted plants at any removal time. In both grafted and nongrafted plants, the delay in establishment and removal of weeds resulted in weed biomass decrease and increase of same magnitude, respectively. To avoid 5% yield losses, it is sufficient to keep grafted and nongrafted tomato plants weed free for the first 3.3 WATT. Overall, results show that the grafting does not have a positive effect in reduction of CPWC. The study will be repeated to confirm these findings.

PRE-EMERGENT GOOSEGRASS CONTROL IN BERMUDAGRASS WITH SUREGUARD. K. Koh*, J.Q. Moss; Oklahoma State University, Stillwater, OK (98)

ABSTRACT

TOLERANCE OF LOBLOLLY PINES TO GROUND APPLICATIONS OF AMINOCYCLOPYRACHLOR. A.W. Ezell*[1], J.l. Yeiser[2]; [1]Mississippi State University, Mississippi State, MS, [2]University of Arkansas at Monticello, Monticello, AR (99)

ABSTRACT

BASAL CONTROL OF UNDERSTORY BOXELDER AND TRIFOLIATE ORANGE IN EAST TEXAS. J.l. Yeiser*[1], A.W. Ezell[2], J. Grogan[3]; [1]University of Arkansas at Monticello, Monticello, AR, [2]Mississippi State University, Mississippi State, MS, [3]Stephen F Austin State University, Nacogdoches, TX (100)

ABSTRACT

The purpose of this study was to investigate rates of MAT28 OL 1 lb/gal herbicide applied as a basal stem treatment for trifoliate orange (Poncirus trifoliate) and boxelder (Acer negundo) efficacy.

The boxelder site was located near Kennard, TX and trifoliate orange near Lovelady, TX. Both sites are in the hilly upper coastal plain of Houston County. Herbicides were applied with a 5500 adjustable conejet with a 08 adjustable solid fan nozzle using 11psi on 6-August-2012 to boxelder and trifoliate orange 12-August-2012. 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.

Herbicides were mixed with Basal Oil Blue by UAP. Test treatments were: (1) MAT28 (360 SL) 6.67%, (2) MAT28 (360 SL) 10%, (3) MAT28 (360 SL) 13.3%, (4) MAT28 (SL 2.0) 10%, (5) Garlon 4 (EC) 25%, and (6) untreated check.

Treatments were evaluated for efficacy on 10-May-13 approximately 9-months after treatment (MAT). Percent control was computed as the ((initial pre-treatment height - height at a measurement date)/initial pre-treatment height)*100. In May, many stems of boxelder were already on the ground. Efficacy of trifoliate was confirmed on August 13, 2013.

Basal bark control of boxelder was 100% for all herbicide treatments and 8% for the untreated check.

Trifoliate orange control was similar for MAT28-360 and Garlon 4 treatments. Numerically, the MAT28-360 (6.67%), MAT28-360 (10%), and MAT28-360 (13.3%) provided 90%, 99%, and 92% control, respectively. When GLD of the dominate stem in the rootstock was considered, control for 1-in and 2-in stems were similar. For 3-in stems, Garlon 4 and MAT28-360 (10%) were similar and best at 100% and 98% control, respectively.

SITE PREPARATION USING TANK MIXTURES CONTAINING MAT-28. A.W. Ezell*1, J.l. Yeiser2; 1Mississippi State University, Mississippi State, MS, 2University of Arkansas at Monticello, Monticello, AR (101)

ABSTRACT

MAT28 BLENDS WITH GLYPHOSATE FOR SUMAC AND OAK CONTROL IN SE OKLAHOMA. J.l. Yeiser*[1], A.W. Ezell[2], J. Grogan[3]; [1]University of Arkansas at Monticello, Monticello, AR, [2]Mississippi State University, Mississippi State, MS, [3]Stephen F Austin State University, Nacogdoches, TX (102)

ABSTRACT

Streamline contains aminocyclopyrachlor (MAT28) and metsulfuron while Viewpoint contains the former two actives plus imazapyr. The purpose of this study was to screen rates of Streamline and Viewpoint in combination with Accord XRT II for control of smooth sumac (Rhus glabra) and mixed oaks (Quercus stellate, falcata, velutina).

This study was installed in a former clearcut on company land near Broken Bow (McCurtain County), Oklahoma. The site was broadcast burned and ripped during fall 2011. Pine seedlings were planted during the winter of 2011 on a 10-ft by 20-ft spacing.

Herbicides were applied on 20-Sep-12 to unwanted hardwoods growing between rips. Test treatments were: (1) MAT28+Escort+Accord+NIS (5.9+1.6+128+.5%), (2) MAT28+Escort+Accord+NIS (7.5+2+128+.5%), (3) MAT28+Escort+Accord+NIS (9.02+2.4+128+.5%), (4) MAT28+Escort+Accord+NIS (5.94+1.58+16.52+.5%), (5) MAT28+Escort+Arsenal+Accord+NIS (7.5+2+20.8+.5%), (6) MAT28+Escort+Arsenal+Accord+NIS (9.04+2.41+25.16+.5%), (7) MAT28+Escort+Arsenal+Accord+NIS (7.5+2+265+.5%), (8) MAT28+Escort+Arsenal+Krenite+NIS (7.5+2+20.8+128+.5%), (9) Milestone+Arsenal+Accord+NIS (7+16+128+.5%) and (10) untreated check. Formulations were: MAT28 as SG 50%, Escort as XP 60%, Arsenal PowerLine as 2SL, Accord as XRT II 5.4SL, Krenite as 4SL and Milestone as SL2. Induce was the NIS. Rates are expressed in ounces of product per acre.

Test plots were established between the middles of rips with one-year-old loblolly pine seedlings planted in the rips. Herbicides were applied using a backpack CO_2 aerial simulator to treatment plots 12-ft by 120-ft.

Treatments were analyzed according to a randomized complete block design. The treatment variable was percent control. At least 10 rootstocks of sumac, oak, winged elm, and all (sumac+oaks+black hickory (Carya texana)+blackgum (Nyssa sylvatica)+blueberry (Vaccinnium spp)+common persimmon (Diospyros virginiana)+red maple (Acer rubrum)) species were monitored in each treatment plot in each of 3 blocks. Elms (Ulmus alata) were severely browsed by deer just before treatment and dropped from the study.

Treatments were evaluated for efficacy on 11-Oct-13 approximately 1-year-after treatment (1 YAT). Percent control was computed as the ((initial pre-treatment height - height at a measurement date)/initial pre-treatment height)*100.

Control of sumac was 100% for all herbicide treatments. Checks exhibited -2% control, that is, checks were 2% taller on evaluation day than when the study was initiated.

Oak herbicidal control ranged from a numerical low of 39% ((Sreamline+Accord+NIS (5.9+1.6+128+.5%)) to a numerical high of 78% (Viewpoint+Accord (7.5+2+20.8+.5%)). Lowest rates of Streamline+Accord achieved significantly less control than the two highest rates of Viewpoint+Accord. The two highest rates of Streamline+Accord, all three rates of Viewpoint+Accord, Viewpoint+Krenite, and Milestone treatments all provided highest and similar oak control. Check oaks increased in height 48% during this period.

Control of all species was similar for all herbicide treatments. Control ranged from a numerical low of 75% (Streamline+Accord+NIS (9.02+2.4+128+.5%)) to a high of 93% (Viewpoint+Accord (7.5+2+20.8+.5%)). Checks were 35% taller during this period.

MAT28 BLENDS WITH KRENITE FOR CONTROL OF OAKS AND ELM IN SE OKLAHOMA. J.l. Yeiser*1, A.W. Ezell2, J. Grogan3; 1University of Arkansas at Monticello, Monticello, AR, 2Mississippi State University, Mississippi State, MS, 3Stephen F Austin State University, Nacogdoches, TX (103)

ABSTRACT

Streamline contains aminocyclopyrachlor (MAT28) and metsulfuron while Viewpoint contains the former two actives plus imazapyr. The purpose of this trial was to screen Streamline (aminocyclopyrachlor (39.5%) and metsulfuron (12.6%)) and Viewpoint (aminocyclopyrachlor (22.8%), metsulfuron (7.3%), and imazapyr (31.6)) mixed with reduced rates of Krenite (fosamine) for control of selective brush species. Test species were: oak (Quercus stellata, alba, rubra, falcata, velutina), winged elm (Ulmus alata), and all (the above plus tupelo (Nyssa sylvatica), blueberry (Vaccinium spp), black hickory (Carya texana), persimmon (Diospyros virginiana), hawthorn (Crataegus spp), and green ash (Fraxinus pennsylvanica).

Herbicides were applied on 21-Sep-12 and rootstocks measured for live height before application and again on 1-Nov-13 (1-YAT). Test treatments were: (1) MAT28+Escort+Krenite+NIS (7.52+2+96+1%), (2) MAT28+Escort+Krenite+NIS (7.52+2+128+1%), (3) MAT28+Escort+Krenite+NIS (7.52+2+192+1%), (4) MAT28+Escort+Krenite+Arsenal PowerLine+NIS (5.94+1.58+96+8.26+1%), (5) MAT28+Escort+Krenite+Arsenal PowerLine +NIS (5.94+1.58+128++8.26+1%), (6) MAT28+Escort+Krenite+Arsenal PowerLine +NIS (5.94+1.58+192+8.26+1%, (7) Milestone+Arsenal PowerLine+Accord XRT II+NIS (7+16+128+1%, (8) MAT28+Escort+Accord XRT II+NIS (7.52+2+128+1%, (9) MAT29+Escort+Arsenal PowerLine, Accord XRT II+NIS (5.94+1.58+8.26+128+1%), and (10) untreated check. The rates for all treatments are expressed in ounces of product/acre. The NIS was Induce. Test formulations were: Escort as XP 60%; MAT28 as 50% SG; Milestone as 2SL; Arsenal PowerLine as 2SL; Accord XRT II as SL5.4; Krenite as SL4.

Test plots were established between row middles of one year old loblolly pine seedlings planted in a clearcut near Broken Bow (McCurtain County) OK. Herbicides were applied using a backpack CO_2 aerial simulator to treatment plots 12-ft by 120-ft.

Treatments were analyzed according to a randomized complete block design. The treatment variable was percent control. At least 10 rootstocks of oak and winged elm were monitored in each treatment plot in each of 3 blocks. All species were recorded in whatever numbers they occurred in the plot.

Oak control ranged from 17% (check) to 80% (Viewpoint+Krenite+NIS 5.94+1.58+8.26+128+1%). The least herbicidal control was 47% and achieved with Milestone+Arsenal Powerline+Accord+NIS (7+16+128+1%). This is a range for herbicide treatments of 33%. Statistical differences were detected between treated and untreated treatments. Treatments 2, 5 and 8 were similar and better than other herbicide treatments that were all similar.

Elm control ranged from 7% (check) to 95% (Streamline+Krenite+NIS 7.52+2+128+1%). For herbicide treatments, the least control was recorded at 57% for (Milestone+Arsenal PowerLine+Accord XRT II+NIS 7+16+128+1%) providing a range for herbicide treatments of 38%. Significantly less control was observed for the Milestone+Arsenal Powerline+Accord+NIS (7+16+128+1%) treatment than other herbicide treatments. Statistical differences were detected between treated and untreated treatments.

When all woody species in plots were evaluated, control ranged from 6% (check) to 97% (Streamline+Krenite+NIS (7.52+2+128+1%). Statistical differences were detected between treated and untreated treatments only.

Streamline+Krenite+NIS (7.52+2+128+1%) provided numerically best control of elm, oak and all species.

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AMINOPYRALID RESEARCH SUMMARY FOR AQUATIC LABELING. V.B. Langston*[1], V.F. Peterson[2], P.L. Havens[3], L.A. Brinkworth[3], B. Kline[4], W.T. Haller[5], J.L. Troth[6]; [1]Dow AgroSciences LLC, The Woodlands, TX, [2]Dow AgroSciences LLC, Mulino, OR, [3]Dow AgroSciences LLC, Indianapolis, IN, [4]William N Kline, LLC, Ball Ground, GA, [5]University of Florida, Gainsville, FL, [6]Dow AgroSciences, Indianapolis, IN (104)

ABSTRACT

Aminopyralid is a member of the pyridinecarboxylic acid family of herbicides and controls noxious and invasive broadleaf weeds in rangeland, permanent grass pastures, Conservation Reserve Program (CRP) acres, non-cropland areas including industrial sites, rights-of-way (such as roadsides, electric utility and communication transmission lines, pipelines, and railroads), non-irrigation ditch banks, natural areas (such as wildlife management areas, wildlife openings, wildlife habitats, recreation areas, campgrounds, trailheads and trails), and grazed areas in and around these sites. It is currently registered in products either alone (Milestone®) or with other active ingredients such as metsulfuron, clopyralid, triclopyr, or 2,4-D (for example, Opensight®, Sendero®, Capstone®, or ForeFront® HL/GrazonNext® HL , respectively). The current labels state, "*It is permissible to treat non-irrigation ditch banks, seasonally dry wetlands (such as flood plains, deltas, marshes, swamps, or bogs) and transitional areas between upland and lowland sites. Milestone can be used to the water's edge. Do not apply directly to water and take precautions to minimize spray drift onto water*." The labels also state, "*Do not contaminate water intended for irrigation or domestic purposes. Do not treat inside banks or bottoms of irrigation ditches, either dry or containing water, or other channels that carry water that may be used for irrigation or domestic purposes.*" Aminopyralid degradation rate in water in sunlight (photolytic half-life of 0.6 days) is similar to triclopyr, an active ingredient registered for aquatic uses (half-life of 0.5 days). .

Therefore, to expand the utility of aminopyralid containing products, research was conducted in 2010 to gather data for a submission to support the addition of aquatic uses to aminopyralid product labels. Research studies in ponds and in moving water generated residue data in order to establish tolerances for fish, shellfish and crustaceans and define the dissipation kinetics in water and sediment over time. Pond studies were conducted in Texas and Indiana and moving water studies in Oregon and Florida. Data were used in submissions to support aquatic uses for Milestone, GrazonNext® HL, ForeFront® HL/GrazonNext® HL, Capstone, and PasturAll® HL. Following approval labels are expected to have no restrictions on recreational or livestock use of water after applications but use will not be permitted on the inside banks of irrigation ditches. Use precautions and restrictions on use of water treated with Milestone for irrigation will likely be included on the new label. Registration is anticipated for the use season in 2014.

DO ROADSIDE HERBICIDE APPLICATIONS SELECT FOR RESISTANCE IN JOHNSONGRASS POPULATIONS? M.V. Bagavathiannan*, J.K. Norsworthy; University of Arkansas, Fayetteville, AR (105)

ABSTRACT

Johnsongrass (*Sorghum halepense* L. Pers.) is a problematic weed in row-crop production systems in the midsouthern US. In Arkansas, johnsongrass resistance has already been confirmed for glyphosate and fluazifop. Johnsongrass is also an invasive weed commonly present in roadsides, right-of-ways, and other non-cultivated areas in the agricultural landscape. In several regions, weed managers spray herbicides along roadsides to control a number of noxious weeds including johnsongrass. Sometimes practitioners spot spray herbicides specifically targeting johnsongrass populations. Whether roadside herbicide applications could contribute to resistance evolution in johnsongrass is not clear. Herbicide resistance in roadside johnsongrass has implications for the management of this species in production fields, because resistance could spread to nearby fields through seed and/or rhizome movement. To understand the prevalence of herbicide resistance in roadside johnsongrass, a total of 186 populations were surveyed across the Mississippi Delta region of eastern Arkansas, spanning inter-state highways, state highways, county roads, and rural farm roads. Samples (rhizomatous plants) were screened for resistance to a field application (1X) rate of glyphosate (870 g ai/ha), fluazifop (213 g ai/ha), and nicosulfuron (35 g ai/ha), some of the common herbicides used in row crops with activity on johnsongrass. Survivors were allowed to regrow and sprayed again with 4X the field rate of these herbicides. Dose-response analyses were carried out on selected populations surviving 4X applications to confirm and quantify resistance. Compared to a susceptible standard, the roadside johnsongrass populations used in the dose-response assay required 2.8-fold more glyphosate, 36-fold more fluazifop, and 4.1-fold more nicosulfuron to achieve 50% control. It was difficult to conclude with certainty whether resistance originated from roadsides or nearby fields, but it was certain that herbicide applications increased the frequency of resistance in roadside habitats. The occurrence and persistence of resistance in roadside johnsongrass populations need to be considered in making management decisions for preventing resistance in production fields. Strategies must also be put in place to minimize selection for herbicide resistance in roadside habitats.

TIMING BARE GROUND GUARDRAIL APPLICATIONS. J.W. Boyd. University of Arkansas, Little Rock AR (106)

ABSTRACT

Herbicides were applied at three dates, March 12, April 9, and May 24, 2013. Treatments were applied with a CO2 pressurized backpack sprayer calibrated at 15 gallons per acre. Plot size was 10 by 30 feet with three replications. Adequate rainfall for activation (> 0.5 inch) fell within 6 days of application for each date. Visual weed control and percent bare ground ratings were taken at various intervals throughout the study with 0% representing no weed control and 100% being complete weed control. For the bare ground ratings, 100% was equal to no vegetation present and 0% equal to complete ground cover. All herbicides rates are presented as ounces product per acre. All treatments contained Accord XRT II (50 fl oz). Treatments included Accord XRT II, Accord XRT II + Oust Extra 4.0 oz + Barricade 65WG 32 oz, Accord XRT II + Oust Extra 4.0 oz + Plateau 10 oz, Accord XRT II + Oust Extra 4 oz + Esplanade 3.5 oz, Accord XRT II + Oust Extra 4.0 oz + Esplanade 5.0 fl oz, Accord XRT II + Oust Extra 4.0 oz + Esplanade 5.0 fl oz + Milestone 7 fl oz, Accord XRT II + Esplanade 3.5 fl oz + Streamline 4.75 oz + Oust 3.0 oz, Accord XRT II + Esplanade 5.0 fl oz + Streamline 8.0 oz and Accord XRT II + Esplanade 5.0 fl oz + Perspective 8.0 oz. The most uniformly distributed weeds were slender snake cotton (*Froelichia gracilis*), trailing wild bean (*Strophostyles umbellata*) and partridge pea (*Chamaecrista fasiculata*). The most common grasses were rattail fescue (*Vulpia myuros*) and prairie three-awn (*Aristida oligantha*). An end of season percent bare ground rating of all application dates was taken on November 8, 2013. This amounted to 241 DAT (days after treatment) for the March timing, 213 DAT for April and 168 DAT for May. In general all treatments that contained Accord XRT II plus residual herbicides provided acceptable weed control for 120 to 150 DAT. In the March trial, at 150 DAT, wild bean control began to decline in treatments that contained Barricade or Plateau. For the March timing, treatments that contained Milestone, Perspective or Streamline were providing greater than 80% control of trailing wild bean at 150 DAT. All March treatments, with the exception of Plateau and Accord XRT II alone, were providing good control of partridge pea at 150 DAT. End of season percent bare ground ratings for all residual treatments applied in April ranged from 83 to 100%. Only the percent bare ground for the control (37%) and the Accord XRT II treatment (57%) were significantly different from the residual treatments. For the May timing, the Accord XRT II + Oust Extra + Plateau combination was providing significantly less bare ground (50%) at 168 DAT than the other residual treatments. The 50% bare ground rating for Plateau was due to a late breakthrough of prairie three-awn. The percent bare ground ratings for other May treatments with residual herbicides, at 168 DAT, ranged from 93 to 100%. The most noticeable effects of timing were greater late season weed breakthrough in the March applied trial and temporary standing dead vegetation in the May study. Standing dead vegetation in the May timing trial was largely decomposed by 90 DAT. The average percent bare ground rating at the end of the season for all the treatments that contained residual herbicides for the March, April and May timings was 60, 95 and 90%, respectively. These results were affected by the relative density of the weed population among sites and the duration of each trial. The overall ranking in weed density from lowest to highest for the three timings was April, May and March. The ranking is based on the average percent bare ground in the untreated and Accord only plots for each timing location. The averages were April (47%), May (23%) and March (9%). At the final rating date, the March treatments had been in place 28 days longer than the April application and 73 days longer than the May application.

EFFECT OF SIMULATED DRIFT RATES OF INDAZIFLAM ON VARIOUS CROPS. T. Gannon*[1], M. Jeffries[1], D. Spak[2]; [1]NC State University, Raleigh, NC, [2]Bayer Crop Science, Research Triangle Park, NC (107)

ABSTRACT

Indaziflam is a PRE herbicide for control of annual grasses and broadleaf weeds in numerous settings including managed roadsides, railroads, non-croplands, and municipalities. The North Carolina Department of Transportation (DOT) maintains approximately 130,000 km roadside miles with state funds. There is a need for additional herbicides for herbaceous vegetation management along roadsides; however, off-target injury via spray drift is a concern for DOT personnel due to the close proximity of applications to the wide array of crops grown in the state. Greenhouse research (Method Road Greenhouse; Raleigh, NC, USA) was conducted to evaluate the effect of PRE and POST simulated indaziflam spray drift rates on the growth of various plant species. A 2 x 6 x 9 factorial treatment arrangement comprised of two application timings (PRE or POST), six plant species (cotton, bell pepper, soybean, squash, tobacco, or tomato), and nine simulated spray drift treatments (five indaziflam rates, sulfometuron, aminocyclopyrachlor + metsulfuron, triclopyr + clopyralid, or aminopyralid) were evaluated over two experimental runs. Four replicates of each treatment, including a nontreated control, were arranged in a randomized complete block design. Indaziflam was applied at 100, 20, 10, 5, or 2.5% of a 73 g ai ha^{-1} application rate, while other herbicide treatments included for comparative purposes were applied at 10% of their maximum single application rate. These included sulfometuron (4 g ai ha^{-1}), aminocyclopyrachlor + metsulfuron (15 g ai ha^{-1}), triclopyr + clopyralid (87 g ai ha^{-1}), or aminopyralid (12 g ai ha^{-1}). Plant injury was visually estimated on a 0-100% scale (0 = no effect on plant, 100 = complete plant death) 18, 35, and 70 days after treatment (DAT). At 70 DAT, plant height was measured and above- and below-ground biomass were harvested. Plant harvest data were converted to percent reduction relative to the nontreated within a replicate. Data were subject to ANOVA ($P = 0.05$) and means were separated according to Fisher's Protected LSD ($P < 0.05$). In general, plant growth responses varied among herbicides and application timings. Across all evaluated parameters, indaziflam at the 10% simulated drift rate provided comparable or superior plant safety to all other herbicides when applied PRE (squash and tomato), POST (bell pepper and soybean), and PRE or POST (cotton and tobacco). No clear trends were observed regarding indaziflam application timing, as PRE cotton, squash, tobacco, and tomato, and POST bell pepper and soybean applications were safer than their respective alternate timing. Across application timings, plant susceptibility to indaziflam simulated spray drift rates ranked cotton > tobacco > tomato > squash > pepper > soybean. Finally, it should be noted that the lowest indaziflam drift rate (2.5%) caused > 20% root mass reduction on cotton (POST), bell pepper (PRE and POST), soybean (PRE and POST), squash (PRE), and tomato (POST). While this research supports indaziflam use along roadsides, precaution should be used to manage drift. Future research should evaluate techniques to minimize spray drift from roadside pesticide applications.

CURRENT AND FUTURE STEWARDSHIP TRAINING FOR ENGENIA™ HERBICIDE. L. Bozeman*[1], D. Pepitone[2], S. Wilson[2], R.E. Wolf[3]; [1]BASF Corporation, Research Triangle Park, NC, [2]BASF, RTP, NC, [3]Wolf Consulting and Research, Mahomet, IL (108)

ABSTRACT

The goal of herbicide application is to remove weeds that may compete with the crop and reduce crop yield. A diverse approach to herbicide use coupled with targeted spray application are key stewardship components of an effective weed management program. Ineffective weed control may result from applications that do not use a diverse approach to herbicide use and a herbicide spray that moves off target may cause unintended effects on contacted non-target plant species. A new herbicide currently in development is Engenia™ herbicide, an advanced formulation of dicamba for use in dicamba-tolerant soybeans and cotton. It is important that applicator training programs be made available that provide information on diverse herbicide systems for improved weed control, as well as proper spray application systems to mitigate off-target sensitive plant damage. Training efforts currently underway and in development will be discussed.

MOBILE WEED MANUAL: A NEW TOOL FOR HERBICIDE SELECTION IN TURF & ORNAMENTALS. J.T. Brosnan*[1], G.K. Breeden[1], G.R. Armel[2], J.J. Vargas[1]; [1]University of Tennessee, Knoxville, TN, [2]BASF Corporation, Research Triangle Park, NC (109)

ABSTRACT

Mobile Weed Manual (MWM) is a new Extension resource developed to assist green industry professionals in selecting herbicides for use in turf and ornamentals. MWM is a web-based platform optimized for use on mobile devices such as smartphones and tablet computers; however, MWM will function on desktop and laptop computers as well. The site provides users with weed control efficacy information for 90 different herbicides, tolerance information for over 2300 turf and ornamental species, as well as direct links to label and material safety data sheet information for herbicides used for turf and ornamental weed management. MWM provides users with several search options for selecting herbicides to manage weeds either pre- or postemergence. Individuals can indicate the desirable turf or ornamental species in which weeds are present and MWM will provide a list of herbicides labeled for use in that desirable species. Moreover, users can further refine searches by indicating both a desirable species and target weed; MWM will provide a list of herbicides labeled for control of the target weed in the desirable species indicated. Since debuting online in May 2013, MWM has allowed Extension specialists to reach over 12,000 individuals from 99 different countries, all 50 United States, and 166 different municipalities throughout Tennessee. MWM will be updated annually to reflect the release of new herbicides labeled for use in turf and ornamentals, as well as to satisfy any stakeholder requests for efficacy and tolerance data.

EDUCATIONAL EFFORTS TO REDUCE THE IMPACT OF OFF-TARGET, AUXINIC HERBICIDES IN HIGH VALUE CROPS. G. N. Rhodes, Jr. and T.D. Israel; University of Tennessee, Knoxville, TN (110)

ABSTRACT

Tennessee is similar to most other southern states in that both crops and livestock are of great value to our agricultural economy. Beef cattle producers in our state are heavily dependent on grass pastures and hay fields for forage production. Management of numerous herbaceous and woody weeds is a constant challenge. Fortunately, a number of highly effective broadleaf herbicides, most of which are synthetic auxins, are available. The oldest of these are various formulations of 2,4-D and dicamba. Both herbicides have relatively short half-lives, and therefore, are relatively non-persistent. Over the years, Extension agents and specialists, agribusiness personnel and consultants have spent much time investigating cases of reported damage by these herbicides to high value, non-target crops such as tobacco, cotton, tomato and grape. These occurrences are often the result of drift (vapor or physical) or contaminated sprayers. Fortunately due to the short half-lives of these herbicides, rotational restrictions are relatively minimal.

In 2000, a premix of picloram + 2,4-D (Grazon P+D) for use in pastures was introduced to a limited geography in Tennessee; a few years later a new active ingredient, aminopyralid, was registered and likewise introduced into the pasture market (ForeFront R&P, Milestone, GrazonNext). The introduction of picloram and aminopyralid greatly improved the ability of cattle producers to manage troublesome perennials such as horsenettle (*Solanum carolinense L.*), tall ironweed (*Vernonia gigantea (Walt.) Trel*.), honeylocust (*Gleditsia triacanthos L.*), and many others. Aminopyralid has also been widely utilized in the right-of-way vegetation market under other trade names. While aminopyralid and picloram are relatively low in volatility compared to many formulations of 2,4-D and dicamba, they have much longer half-lives and are therefore relatively persistent. While these two materials are extremely safe to cattle and other animals, the long persistence has implications for grazing and movement of cattle from treated pastures, feeding of treated hay, rotation of treated fields, and use of manure or treated grass in composting (both herbicides are stable in compost). And unlike 2,4-D and dicamba, cases of drift or use of contaminated sprayers can complicate rotations for the next year or longer. Registration of aminocyclopyrachlor, a new herbicide active ingredient, is expected for the pasture market in late 2014. This highly effective broadleaf herbicide is similar to aminopyralid in chemistry, behavior, and persistence.

In 2011, we began a comprehensive educational program that stresses the importance of proper stewardship with the use of pasture and right-of-way herbicides. The program has two fundamental goals: to help reduce the occurrence and impact of off-target damage to tobacco and other sensitive, high value crops; and to help with the diagnosis of suspected cases of off-target damage. The initial work began with tobacco and later expanded to include cotton, tomato and grape. Funding was obtained via grants from Philip Morris International, Altria Client Services, Dow AgroSciences and DuPont Crop Protection. Herbicides we are addressing include 2,4-D, dicamba, aminopyralid, aminocyclopyrachlor and picloram. Plants of each crop were grown in a greenhouse, and then they were treated foliarly with low rates of each herbicide to induce symptoms. Treated (and untreated) plants were photographed at various times following treatment to produce a library of still images for use as diagnostic aids. Also, time-lapse photography was used to create videos for each crop and herbicide combination to show the development of symptomology over a 14 day period. At the center of this effort is the program website, herbicidestewardship.utk.edu. At this website, visitors can find the still images, time lapse videos and fact sheets, and other useful information.

ROUNDUP READY LEARNING XPERIENCE - A NEW TRAINING TOOL. T.D. White*, J. Fowler, S. Allen, J. Sandbrink, S.Seifert-higgins, M. Vigna; 1Monsanto Company, St. Louis, MO (111)

ABSTRACT

Many growers are currently seeking new ways to effectively control weeds in soybean and cotton. The Roundup Ready® Xtend Crop System, which is pending regulatory approval, is designed to give cotton and soybean farmers another tool to manage glyphosate-resistant weeds and improve their crop yield. Once commercially available, this will be the first time trait and chemistry products will be launched simultaneously as part of the same weed management system. Therefore, proper education and training around effective system use is important. In the summer of 2013, Monsanto successfully held Roundup Ready® Learning Xperience events in major soybean and cotton production areas. These events aimed at educating seed dealers, retailers, and other key stakeholders about the Roundup Ready Xtend Crop System. Sites included various trial types to allow participants to see the performance of the system, including trait, herbicide, and application technology components. In addition, training on the value of basic weed science principles, such as using multiple herbicide modes of action for weed control and how to maximize on-target applications, was integrated into the events. In the future, the Learning Xperience will be expanded to include a broader group of participants.

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DOVEWEED (*MURDANNIA NUDIFLORA* L.) BIOLOGY. J.L. Atkinson, L.B. McCarty, F. Yelverton, and J.S. McElroy; Clemson University, Clemson SC (112)

ABSTRACT

Doveweed [*Murdannia nudiflora* (L.) Brenan] is a problematic weed of golf course roughs, fairways, and tees that is rapidly increasing in geographic distribution. The invasiveness of doveweed stems from its ability to reproduce both vegetatively and sexually. Its characteristic late germination period often exceeds the residual activity of preemergence herbicides applied early in the growing season to target traditional summer annual weeds such as crabgrass (*Digitaria spp.*) and goosegrass [*Eleusine indica* (L.) Gaertn.]. Little information is available regarding effects of cultural practices on doveweed growth and development. Field and greenhouse experiments were conducted at Clemson University in Clemson, SC between 2011 and 2013 to evaluate effects of soil-water availability, light availability, and mowing height on doveweed growth and morphological characteristics.

The effect of soil moisture was determined by growing doveweed in pots irrigated to 12.5%, 25%, 50%, 75%, and 100% field capacity (FC) every 3 d on a gravimetric basis. At maturity, plants were harvested, washed free of soil and debris, dried, then shoot and root weights measured. The effect of light availability was determined by growing doveweed in pots under 100%, 70%, 50%, and 30% of full sunlight. At maturity, plants were harvested, washed free of soil and debris, dried, then shoot and root weights measured. Additionally, length between the second and third node away from the original crown of a randomly selected plant in each pot was measured during harvest to detect any morphological response to varying light conditions. The effect of mowing height was evaluated by mowing 2x wk^{-1} at four heights (2, 4, or 8 cm, and unmown), then spread measured weekly by determining percent coverage of a 1.5 m x 1.5 m grid using the line intersect method. Additionally, length between the second and third node away from the original crown of four randomly selected plants in each plot was measured weekly to identify any morphological response to various mowing heights.

Significant treatment effects were detected in each experiment. Shoot production decreased significantly if soil moisture was maintained below 50% FC. Root weight decreased significantly if maintained below 75% FC. Further, 25% and 12.5% FC treatments had significantly lower root weights than doveweed maintained at 50% FC. A difference in shoot production in response to light availability was not detected, however internode length increased and root production decreased in plants grown under shade compared to plants grown in full sunlight. Lower mowing heights (2 and 4 cm) significantly reduced doveweed spread compared to doveweed left unmown. Only doveweed mown at 2 cm reduced doveweed spread compared to doveweed mown at 8 cm. Mowing at 2 or 4 cm significantly reduced internode length compared to doveweed left unmown.

Future research should continue to evaluate the effect of environmental conditions on doveweed growth, and determine the response of doveweed fecundity to these parameters.

GOOSEGRASS [*ELEUSINE INDICA (L.)* GAERTN.] AND BERMUDAGRASS [*CYNODON DACTYLON (L.)* PERS.] CONTROL IN CREEPING BENTGRASS PUTTING GREENS. N.J. Gambrell, A.G. Estes and L.B. McCarty. Clemson University, Clemson, SC (113)

ABSTRACT

The purpose of this study was to determine the efficacy of Pylex (topramezone) in combination with other postemerge herbicides for control of goosegrass and bermudagrass in creeping bentgrass putting greens. Goosegrass is a summer annual most identifiable by its whitish crown. Due to its compressed or flattened growth habit, goosegrass has the ability to withstand low mowing heights, making it very competitive within a bentgrass putting green. Bermudagrass is a warm season perennial which spreads laterally through stolons and rhizomes. When used for putting green collars, these runners often encroach bentgrass putting surfaces. Infestations of both goosegrass and bermudagrass within creeping bentgrass putting surfaces disrupt appearance, uniformity, and playability. Currently, there is no single product that offers postemergence control of both weeds in bentgrass putting greens.

A study with five treatments was initiated August 12, 2013 with rating dates on September 4, September 19, and October 18 which corresponded to 23, 38, and 67 days after initial treatment (DAIT), respectively. Treatments included: Plyex 2.8SC @ 0.5 oz/a + Velocity 17.6SC @ 1.0 oz/a; Plyex 2.8SC @ 0.5 oz/a + Velocity 17.6SC @ 1.0 oz/a + Turflon Ester 4L @ 8.0 oz/a; Plyex 2.8SC @ 0.5 oz/a + Acclaim Extra 0.94L @ 3.0 oz/a; Acclaim Extra 0.94L @ 3.0 oz/a + Turflon Ester 4L @ 8.0 oz/a; and Acclaim Extra 0.94L @ 6.0 oz/a. A follow-up study containing three additional treatments was initiated September 5, 2013, with rating dates on September 27 and October 18 at 22 and 43 days after initial treatment, respectively. Treatments included: Plyex 2.8SC @ 0.5 oz/a + Acclaim Extra 0.94L @ 6.0 oz/a; Plyex 2.8SC @ 0.75 oz/a + Acclaim Extra 0.94L @ 6.0 oz/a; Plyex 2.8SC @ 1.0 oz/a + Acclaim Extra 0.94L @ 6.0 oz/a. All treatments were applied twice in both studies, August 26 (Study 1) and September 19 (Study 2), both corresponding to 14 days after initial treatment. Studies were conducted at Clemson University on a 'Crenshaw' creeping bentgrass research green, infested with goosegrass and bermudagrass. Applications were made using a COâ‚‚ powered sprayer calibrated at 20 GPA. Three treatment replications were applied on 1x2 meter plots, using a randomized complete block design. Visual ratings evaluated percentage control of goosegrass and bermudagrass and turf injury of bentgrass. Ratings were based on a 0-100% scale. 0% indicating no control or injury and 100% indicating complete control or plant death. ANOVA was evaluated with alpha at 0.05.

On the October 18 rating date, six treatments provided > 95% goosegrass control: Plyex 2.8SC @ 0.5 oz/a + Velocity 17.6SC @ 1.0 oz/a; Plyex 2.8SC @ 0.5 oz/a + Velocity 17.6SC @ 1.0 oz/a + Turflon Ester 4L @ 8.0 oz/a; Plyex 2.8SC @ 0.5 oz/a + Acclaim Extra 0.94L @ 3.0 oz/a at 67 DAIT and Plyex 2.8SC @ 0.5 oz/a + Acclaim Extra 0.94L @ 6.0 oz/a; Plyex 2.8SC @ 0.75 oz/a + Acclaim Extra 0.94L @ 6.0 oz/a; Plyex 2.8SC @ 1.0 oz/a + Acclaim Extra 0.94L @ 6.0 oz/a at 43 DAIT, respectively. All treatments provided < 20% bermudagrass control on the October 18 rating date. Plyex 2.8SC @ 0.5 oz/a + Velocity 17.6SC @ 1.0 oz/a; and Plyex 2.8SC @ 0.5 oz/a + Acclaim Extra 0.94L @ 3.0 oz/a were the only treatments to provide < 20% turf injury throughout both studies.

Repeat applications and screening of additional combinations and products will be continued in the future for timing and control of goosegrass and bermudagrass in creeping bentgrass putting greens.

SOYBEAN HERBICIDE PROGRAMS FOR PRICKLY SIDA CONTROL. J.T. Copes, R.K. Godara, J.L. Griffin, and D.K. Miller; School of Plant, Environmental, and Soil Sciences, Louisiana State University Agricultural Center, Baton Rouge, LA (114)

ABSTRACT

A field study was conducted in 2011 and 2012 to evaluate herbicide programs for prickly sida (*Sida spinosa* L.) control in soybeans. The experimental design was a three-factor factorial in a randomized complete block design with four replications. Factor A consisted of preplant treatments applied in early March and included glyphosate (22 oz/A) plus 2,4-D ester (24 oz/A) and glyphosate (22 oz/A) plus 2,4-D ester (24 oz/A) plus Canopy EX (2 oz/A). Factor B consisted of at-planting treatments applied in late April to early May and included none, glyphosate alone (22 oz/A), and glyphosate (22 oz/A) plus Envive (3.5 oz/A). Factor C consisted of postemergence (POST) treatments and included glyphosate followed by (fb) glyphosate (22 oz/A), Prefix (2 pt/A) plus glyphosate fb glyphosate (22 oz/A), Classic (0.5 oz/A) plus glyphosate fb glyphosate (22 oz/A), and glyphosate (22 oz/A) fb Classic (0.5 oz/A) plus glyphosate (22 oz/A). The first POST application was made in mid-May to early June and the second application in early to late June. Weed control ratings were made just prior to each herbicide application corresponding to 38 to 43 days after preplant treatment, 30 days after at-planting treatment, 13 to 22 days after the first POST application, and 21 days after the second POST application. Plots were harvested to determine yield.

Prickly sida control for the preplant treatments prior to at-planting application was 4% for glyphosate plus 2,4-D and 62% for glyphosate plus 2,4-D plus Canopy EX. When herbicide was not applied at-planting, prickly sida control was 2% for glyphosate plus 2,4-D applied preplant, but was 24% for glyphosate plus 2,4-D plus Canopy EX preplant. When glyphosate plus 2,4-D or glyphosate plus 2,4-D plus Canopy EX was applied preplant, prickly sida control was equivalent for glyphosate alone or glyphosate plus Envive applied at-planting (89 to 95%). Averaged across POST treatments and preplant treatments, prickly sida control 3 weeks after the second POST application was 74% when herbicide was not applied at-planting compared with 90% when glyphosate was applied at-planting and 93% when glyphosate plus Envive was applied at-planting. Averaged across at-planting and POST treatments prickly sida control was 84% for preplant application of glyphosate plus 2,4-D and 88% for glyphosate plus 2,4-D plus Canopy EX. Soybean yield averaged across POST treatments was 40 bu/A when glyphosate plus 2,4-D was applied preplant and herbicide was not applied at planting; soybean yield was increased 9 bu/A when Canopy EX was included preplant. When either glyphosate plus 2,4-D or glyphosate plus 2,4-D plus Canopy EX was applied preplant and when glyphosate or glyphosate plus Envive was applied at-planting, soybean yield averaged across POST treatments was 54 to 57 bu/A; 8 to 14 bu/A greater than when herbicide was not applied at-planting.

Results show the importance of including the residual herbicide, Canopy EX, preplant when herbicide is not applied at planting. Even though POST herbicides can be effective in controlling prickly sida, the early season weed competition due to lack of a preplant residual herbicide resulted in significant yield loss. When Canopy EX was applied preplant, prickly sida control and soybean yield was maximized for glyphosate alone or glyphosate plus Envive applied at-planting and followed by an effective POST treatment. A decision concerning program selection for prickly sida and other weeds would be dependent on grower preference and cost, and the desire to include herbicides with different modes of action for resistance management.

PALMER AMARANTH DEVELOPMENT AND SEED PRODUCTION AS INFLUENCED BY EMERGENCE DATE IN COTTON. B.W. Schrage, J.K. Norsworthy, Z.T. Hill, H.D. Bell, M.V. Bagavathiannan, M.T. Bararpour, and D.S. Riar, University of Arkansas, Fayetteville, AR (115)

ABSTRACT

Palmer amaranth, because of its prolific seed production, high water efficiency, and resistance to herbicides, is one of the most problematic weeds in cotton. To gain an understanding into the ecological characteristics that could potentially assist in control, our objective was to determine how emergence date of Palmer amaranth affects biomass development and seed production, and its resulting effect on cotton biomass and yield. The split-plot experiment was conducted in Fayetteville, Arkansas in 2012 and 2013. The main plot factor was various planting dates of glyphosate-resistant Palmer amaranth seeded (0, 2, 4, 6, 8, and 10 weeks after cotton seeding). The subplot factor was the presence or absence of cotton to simulate competition. Established Palmer amaranth populations were thinned to 1 plant/m of row and weekly assessments of cotton and Palmer amaranth heights were taken. At reproductive maturity, Palmer amaranth plants were collected, dried, weighed, and seeds were counted. Seedcotton was harvested and weighed. Palmer amaranth seed production decreased as the weed-free period in cotton lengthened. Palmer amaranth emerging 5 to 6 weeks after cotton emergence did not significantly affect seedcotton yields; albeit, later-emerging Palmer amaranth plants were able produce seed beneath the cotton canopy. Late season production of 3,500 seeds per female plant could potentially increase the soil seedbank. Based on these results, season-long control of Palmer amaranth and a zero-tolerance strategy for emergence is required to ensure maximum yields and reduced weed seed densities in the soil seedbank.

EFFECTS OF DICAMBA ON PEANUT APPLIED DURING VEGETATIVE GROWTH STAGES. B.H. Blanchett[1]*, T.L. Grey[1], E.P. Prostko[1], T.M. Webster[2]; [1]University of Georgia, Tifton, GA; [2]USDA-ARS, Tifton, GA (117)

ABSTRACT

Peanut (*Arachis hypogaea* L.) is an important crop in the southern US. Peanuts are often grown in close proximity to other row crops. The use of herbicide-resistant crops and repeated applications of glyphosate and ALS herbicides have contributed to an increase in the evolution of herbicide-resistant weeds. Agricultural chemical and seed companies have responded with new technologies to help solve the problem of herbicide-resistant weeds. Monsanto and BASF have developed programs that use dicamba in combination with resistant crop cultivars for POST weed control. It is predicted that this system will be available in cotton and soybean within the near future. There is concern that auxin herbicides will increase the occurrence of accidental crop injury to sensitive broadleaf species when used at amplified quantities and throughout the growing season. Thus, field trials were conducted in Georgia at three locations in 2012 and 2013 to determine injury and yield loss from various rates of dicamba on peanut (cv. Georgia-06G). Dicamba (35-560 g ae/ha) was applied pre-emergence (PRE), 10, 20, or 30 d after planting (DAP). Dicamba caused significant injury with all treatment timings and more injury as rates increased. Yield loss correlated with injury, and the 20 and 30d treatment timings had the most yield reduction overall. These data indicate that growers should be cautious when applying dicamba in the proximity of peanut, especially around the R1 (beginning bloom) stage of reproductive growth.

INFLUENCE OF CULTURAL TREATMENTS ON PUTTING GREEN RECOVERY FOLLOWING METHIOZOLIN APPLICATIONS. K.A. Venner*[1], S.D. Askew[2], S. Koo[3]; [1]Virginia Tech, Blacksburg, VA, [2]Virginia Polytechnic Institute and State University, Blacksburg, VA, [3]Moghu Research Center, Daejeon, South Korea (118)

ABSTRACT

Methiozolin (PoaCure®), has demonstrated ability to completely control annual bluegrass (AB) with the utmost safety to creeping bentgrass (CB) when applied at appropriate rates. Sometimes, however, methiozolin removes AB more quickly than desired, resulting in a voided turfgrass canopy. Previous research determined that methiozolin rate does not affect CB recovery and increased fertility may speed CB recovery of artificially voided areas. Biostimulant manufacturers market claims that products can increase lateral turf recovery more than traditional fertilizers. Studies are needed to evaluate methods to increase CB recovery rates when voids are left by dying AB. Studies were conducted to compare increased fertility via soluble fertilizer (SF), SF + trinexapac-ethyl (TE) and Floratine® biostimulants (FB).

Two trials were initiated on March 22, 2012. Trial 1 was conducted at the Virginia Tech Golf Course and repeated on two separate, push-up style, practice greens maintained at 0.39 cm. Trial 1 was a randomized complete block design with 3 replications for each study site. Each study site was treated with methiozolin at 3000 g ai ha^{-1} fb 500 g ai ha^{-1} twice at a 2 week interval in order to facilitate rapid removal of AB. Trial 2 was conducted at the Turfgrass Research Center (TRC) on a USGA specification 'L-93' green that is maintained at 0.32 cm. This trial was aerated to remove 30% of the turfgrass canopy on May 5, 2013. Trial 2 was a split-plot design with 4 cultural treatments as main plots and two rates of methiozolin as sub-plots. Sub-plots contained either no methiozolin or methiozolin applied at 500 g ai ha^{-1} 6 times at a 2 week interval. All cultural treatments were the same between trials and were as follows: no cultural treatment, increased fertility using a commercially available SF product, SF plus TE at 0.048 g ai ha^{-1} and increased fertility via FB. All fertility treatments were applied every two weeks beginning on April 14, 2013 in addition to the normal fertility regime administered by a golf course.

Results: Trial 1: There were no interactions between trials, therefore data were pooled. At trial initiation, turfgrass was dormant and CB cover ranged from 15 to 19%. One week after initiation of cultural treatments, FB plots were significantly greener than SF alone and the untreated, but not SF plus TE. By 6 weeks after initial treatment (WAIT), all increased fertility treatments were significantly greener than the untreated, but not different from one another. At the conclusion of the trial (12 WAIT), cover in treated plots ranged from 95 to 96%, and 90% in the untreated. These data suggest that increasing fertility following rapid AB removal will aid turfgrass recovery. Initially, FB seem to assist recovery better than SF alone or with TE.

Trial 2: At trial initiation, turfgrass was dormant, and percent green cover ranged from 11 to 20% across the trial area. One week after initiation of fertility, percent green tissue on treated plots ranged from 72 to 78%, whereas the untreated plot was 54%. At 2 weeks after aeration (WAA), FB recovered more than all other treatments. SF alone increased green cover more than the untreated but not equal to SF plus TE. At 3 WAA, all increased fertility treatments increased green cover relative to the untreated. At the conclusion of the study, approximately 8 WAA, there were no significant differences between treatments. These data suggest that methiozolin applications do not influence turfgrass recovery following an intensive aeration event. Initially, FB increased green cover compared to fertilizers.

TOLERANCE OF MISCANTHUS X GIGATEUS TO PRE AND POST HERBICIDE APPLICATIONS.
B.A. Hicks*[1], W. Everman[2], T. Hamblin[3]; [1]North Carolina State University, Raleigh, NC, [2]NC State University, Raleigh, NC, [3]REPREVE Renewables, Greensboro, NC (119)

ABSTRACT

The cultivation of Miscanthus x giganteus as a cellulose feedstock for bioenergy production has created a demand for exploration of Preemergence (PRE) and Postemergence (POST) herbicides that can reduce or eliminate the impact of weed competition. Weed control is particularly important in the establishment years of Miscanthus x giganteus. With this in mind, field and greenhouse studies were conducted in 2013 to assess the tolerance of Miscanthus x giganteus to PRE and POST herbicides that have activity on grass and broadleaf species. Greenhouse studies were conducted in Raleigh NC using rhizome pieces planted into 10 cm square pots with PRE herbicide applications. The study was conducted with treatments from benzoic acid, chloroacetamide, dinitroaniline, imadazolinone, isoxazole, isoxazolidinone, n-phenylphthalimide, triazine, triazinone, triazolinone, triazolone, and triketone chemical families. Plants were rated for injury on a 0 to 100% scale at 7, 14, 21 and 28 days after application with harvest of above and below ground biomass 28 days after emergence. Visible injury ranged from 0 to 62% for all treatments. Field studies using POST herbicides were conducted at three different field locations in Clinton, Magnolia and Mt. Olive, North Carolina during 2013. The experiment was conducted using treatments from the following families of chemistry aryloxyphenoxy-porpionate, benzoyl pyrazole, cyclohexanedione, diphenylether, imidazolinone, phenylpyrazole, phosphinic acid, pyrimidinyloxybenzoic acid, quinoline carboxylic acid, sulfonylurea, triazine, triazolinone, triazolone, and triketone. Miscanthus x giganteus was rated for injury on a 0 to 100% scale at 7, 14, 21, 28 and 52 days after application. Injury ratings at the 52 day rating ranged from 6 to 79% for products with grass activity and 2 to 12% for products with broadleaf activity.

DIFFERENT NITROGEN SOURCES, RATES, AND WEED REMOVAL HEIGHT IMPACT NITROGEN FATE IN CORN AND WEEDS. A.M. Knight*1, W. Everman2, D. Jordan2, R. Heiniger1, T.J. Smyth1; 1North Carolina State University, Raleigh, NC, 2NC State University, Raleigh, NC (120)

ABSTRACT

Two of the greatest factors, following genetics, impacting production and yield in agronomic crops are fertility and weed management. The uptake efficiency of nitrogen is dependent upon many factors including tillage system, soil type, crop, weeds, and the amount and type of nitrogen fertilizer applied. The relationship and interaction between crops and weeds is important, and determining how North Carolina corn production may be impacted by different fertilizers could improve nitrogen use efficiency and overall corn yields. Field studies were conducted in 2011 and 2012 at the Upper Coastal Plains Research Station near Rocky Mount, NC and at the Central Crops Research Station in Clayton, NC. Treatment factors included N source, N rate, and weed removal time with a factorial treatment arrangement. The N sources included urea ammonium nitrate (UAN), chicken litter (CCL) and sulfur coated urea (SCU) with rates of 0 kg N/A, 68 kg N/ha, 135 kg N/ha, and 202 kg N/ha. Weed removal times were at 0 (weed free), 8, and 16 cm heights. Significant year, nitrogen source, and weed removal height effects were observed for corn yield. Differences based on year are not surprising considering the differences in weather patterns between the two seasons. Significance based on source could also have been predicted due to the different sources being used with an organic source, and two synthetic sources one of which was a time release fertilizer. When weeds were allowed to remain in the field with corn, the weeds were able to compete with the corn for nitrogen over a greater time period therefore reducing corn yield potential which showed the importance of the critical period of weed removal.

THE EFFECT OF FORMULATION ON DICAMBA VOLATILITY WHEN APPLIED UNDER FIELD CONDITIONS C.A. Hayden[1], D.B. Reynolds[1], J.W. Hemminghaus[2], and A. MacInnes[2], [(1)]Mississippi State University, Mississippi State, MS, [(2)]Monsanto Company, St. Louis, MO (121)

ABSTRACT

Volatilization and vapor drift from some auxin herbicides may result in an economic loss to sensitive crops. Monsanto is currently developing a new low volatile diglycolamine (DGA) salt formulation of dicamba. M1769 Premix herbicide is a proprietary blend of the DGA salt of dicamba mixed with the monoethalanoamine salt (MEA) of glyphosate. The premix also includes a proprietary VaporGrip™ technology to lower volatility. Four experiments were conducted in 2013, using soybeans as a bio-indicator, to compare the volatility and vapor movement of dicamba as affected by soil texture and soil moisture content.

Tests to evaluate the effect of soil moisture content or soil texture consisted of an untreated check, the dimethylamine (DMA) salt of dicamba + the K salt of glyphosate, and M1769. Dicamba and glyphosate concentrations were 1.12 and 2.24 kg ae/ha, respectively. In order to evaluate the effect of soil moisture, an air dried silty clay loam soil was adjusted to a moisture content of 1/3 bar (field capacity), 15 bars (saturated), or left unadjusted and then treated with each herbicide combination. To evaluate the effect of soil texture a sand, silt, and clay soil were each adjusted to field capacity and then treated with each herbicide combination.

All treatments were applied to flats filled with soil and then placed between a row of cotton and soybeans in the center of each 15.2 m plot. A 4.6 x 1.5 m dome covered with plastic was placed in the center of each plot and was not removed until 48 hours after application. Visual injury (%), plant heights and yield data were recorded in 30.48 cm increments in both directions out to 762 cm from the treated area 7, 14, 21, and 28 day after treatment (DAT). Data were subjected to analysis with PROC GLIMMIX and means were separated by LSMEANS (α=0.05).

Plant heights and yield were unaffected in all experiments, regardless of treatment. Plant heights ranged from 80 to 100 cm, and yields ranged from 2,218 to 3,226 kg/ha. Greater crop injury was observed out to 579 cm with the DMA salt of dicamba than with M1769 and injury within the treated area ranged from 42 to 23%. Neither soil texture or soil moisture content had a significant effect on volatility, and no differences in soybean injury were observed between M1769 and the untreated check past 305 cm. Cotton injury and plant height reductions were negligible and did not differ from the untreated check in both experiments.

EVALUATION OF PREEMERGENCE APPLIED WARRANT TANK MIXES FOR CONTROL OF PALMER AMARANTH IN COTTON. C.W. Cahoon*, A.C. York, D.L. Jordan, W.J. Everman, and L.R. Braswell; Department of Crop Science, North Carolina State University, Raleigh, NC (122)

ABSTRACT

Glyphosate- and ALS-resistant Palmer amaranth (*Amaranthus palmeri)* has transformed weed control strategies throughout the Southeast. One such change includes the use of residual herbicides applied early preplant and at planting. Furthermore, it is often a PPO-inhibiting herbicide applied at each of these application timings. With the mounting selection pressure on PPO inhibitors, growers and extension personnel should be concerned over the potential for PPO-resistant Palmer amaranth. Therefore, to avoid resistance to this valuable mode of action, new modes of action should be explored for preemergence (PRE) control of Palmer amaranth. Encapsulated acetochlor (Warrant) received a supplemental label for PRE application in cotton and soybean in 2013. This herbicide is a member of the chloroacetamide family and inhibits very long chain fatty acid synthesis. It is a seedling shoot inhibitor, providing PRE control of both annual grasses and some broadleaf weeds. At the time of Warrant PRE registration, research on its use in this manner was limited. Therefore, the objective of this study was to evaluate tank mixes of Warrant applied PRE in cotton for crop tolerance and control of Palmer amaranth and other weeds.

Field experiments were conducted at four sites in North Carolina in 2013. Three sites were no-till and one was conventional tillage. No-till sites received a preplant burndown application of glyphosate plus 2,4-D 3 to 4 weeks before planting. Either ST 4946GLB2 or FM 1944GLB2 cotton variety was planted at each location in early May. The PRE herbicides, applied immediately after planting, were in a 3 by 7 factorial arrangement. Design of the experiment was a randomized complete block with treatments replicated four times. Factor A (base herbicide) consisted of no herbicide, pendimethalin (Prowl H_2O) at 1100 g ai ha^{-1}, and Warrant at 1260 g ai ha^{-1}. Factor B (tank mix partner) included no herbicide, fluometuron (Cotoran) at 1120 g ai ha^{-1}, diuron (Direx) at 560 g ai ha^{-1}, fomesafen (Reflex) at 180 and 270 g ai ha^{-1}, and diuron plus both rates of fomesafen. In addition to these PRE herbicides, all plots at no-till sites received 840 g ai ha^{-1} of paraquat at planting. Except for checks, all plots received glufosinate ammonium at 600 g ae ha^{-1} applied 22 to 27 (POST 1) and 38 to 40 (POST 2) days after planting. At layby (55 to 64 days after planting), all plots except checks received a directed application of diuron plus MSMA at 1120 plus 1800 g ai ha^{-1}. Percent cotton injury and percent control of Palmer amaranth and large crabgrass (*Digitaria sanguinalis*) were estimated visually at time of POST 1 application, at time of layby application, and late in the season (mid-September). Seed cotton yield was determined by mechanical harvest. Data were subjected to analysis of variance using the PROC MIXED procedure of SAS (version 9.2). Herbicide treatments were a fixed factor, whereas locations and replications were treated as random. Means were separated using Fisher's Protected LSD at $p < 0.05$.

At time of POST 1 application, averaged over tank mix partners, Warrant controlled Palmer amaranth 94% compared with 71 and 84% control by no base herbicide and Prowl H_2O, respectively. When averaged across base herbicides, Reflex at 270 g ha^{-1}, Direx plus 180 g ha^{-1} Reflex, and Direx plus Reflex at 270 g ha^{-1} controlled Palmer amaranth 93 to 96%. No tank mix partner, Cotoran, Direx, and Reflex at 180 g ha^{-1} were less effective (47 to 88%). Interestingly, when there was no base herbicide, only the combinations of Direx plus Reflex provided greater than 90% control. Also, in the absence of a base herbicide, the high rate of Reflex was more effective than the low rate. With Prowl H_2O as the base herbicide, control was somewhat improved but only combinations of Direx and Reflex and the high rate of Reflex alone controlled Palmer amaranth greater than 90%. However, all tank mix partners controlled greater than 90% of Palmer amaranth when Warrant was the base herbicide. In addition, when Warrant was the base herbicide, there was no difference in control of Palmer amaranth between the two rates of Reflex. Averaged over tank mix partners, Warrant controlled large crabgrass 94% at time of POST 1 application compared with 90 and 69% control by no base herbicide and Prowl H_2O, respectively. Averaged over base herbicides, control of large crabgrass by tank mix partners ranged from 85 to 92%, except when no partner was used (58%). Because two POST applications of glufosinate and an effective layby program were utilized, differences in late-season weed control and seed cotton yield were not observed. Seed cotton yield ranged from 3200 to 3380 lb acre^{-1}. Cotton injury was minimal throughout the season. The main effect tank mix partner was not significant for growth reduction. Furthermore, there was a base herbicide by location interaction, therefore, data for growth reduction is presented by location and pooled over tank mix partner. At Rocky Mount, both Prowl H_2O (14%) and Warrant (13%) stunted cotton greater than no base herbicide (9%). At Mount Olive, no growth reduction was observed.

However, at both locations near Clayton, Prowl H_2O caused greater than 24% growth reduction. This was greater than both Warrant and no base herbicide, which caused approximately 6 and 2% growth reduction, respectively. The main effect of base herbicide was not significant for chlorosis or necrosis, therefore, data for these parameters was pooled over base herbicide. Chlorosis caused by all tank mix partners ranged 0 to 4%. Necrosis was similar across all tank mix partners (1%).

Warrant offered the greatest flexibility in choice of tank mix partner. Regardless of tank mix partner with Warrant, control of Palmer amaranth was greater than 90%. And, with Warrant included, control was similar with the two rates of Reflex. This could reduce cotton injury often noted with Reflex. Furthermore, Warrant provides growers with an additional PRE herbicide offering Palmer amaranth control. Therefore, if concerned over PPO-resistance and using Warrant, growers can use tank mix partners other than PPO-inhibitors. Likewise, growers can utilize Reflex in combination with Warrant or other PRE herbicides, effectively reducing selection pressure.

EVALUATION OF PRE AND POST WEED CONTROL PROGRAMS FOR PALMER AMARANTH CONTROL IN ROUNDUP READ XTEND COTTON. C.A. Samples1, D.M. Dodds1, D.B. Reynolds1, T.H. Dixon1, D.Z. Reynolds1, J.A. Bond2, J.A. Mills3; 1Mississippi State University, Starkville, MS, 2Mississippi State University, Stoneville, MS, 3Monsanto Company (123)

Palmer amaranth has quickly become one of the biggest problems for cotton producers in the Southern U.S. Due to Palmer amaranth's growth and development characteristics, it adapts very well to the heat of the Southern U.S. and has spread very quickly (Sosnoskie et al. 2011). Given the development and spread of glyphosate-resistant Palmer amaranth, Monsanto is currently developing Roundup Ready XtendFlex® technology which will confer resistance to glyphosate, glufosinate, and dicamba. The objective of this experiment was to evaluate efficacy of PRE and POST herbicides for Palmer amaranth control in Roundup Ready XtendFlex® cotton.

This experiment was conducted in Robinsonville and Dundee, MS in 2012 and 2013. Applications were made at early pre-plant, preemergence, and postemergence. Two different postemergence applications were made when weeds were 10 cm and 25 cm. Pre-plant applications included fomesafen @ 0.28 kg ai ha^{-1} and MON100111 (mix of glyphosate and dicamba) @ 0.6 kg ae ha^{-1} and 1.12 kg ae ha^{-1}, respectively. Preemergence applications included fluometuron @ 1.12 kg ai ha^{-1}, acetochlor @ 1.26 kg ai ha^{-1}, prometryn @ 1.12 kg ai ha^{-1}. MON100111 @ 0.6 kg ae ha^{-1} and 1.12 kg ae ha^{-1} was also tank mixed with each of these treatments. MON100111 was also applied alone at 0.6 kg ae ha^{-1} and 1.12 kg ae ha^{-1} as well as 2,4-D LV Ester at 1.13 kg ai ha^{-1}. Postemergence treatments included the following (initial rate listed used in all applications): glufosinate @ 0.6 kg ai ha^{-1}, glufosinate + dicamba @ 0.6 kg ae ha^{-1} each, glufosinate + acetochlor @ 1.3 kg ai ha^{-1}, glufosinate + dicamba + acetochlor, glufosinate + glyphosate @ 1.1 kg ae ha^{-1}, glyphosate + dicamba, glyphosate + dicamba + acetochlor. All POST applications were made when Palmer amaranth were 10 cm and 25cm in height. Applications were made with a CO_2 backpack with calibrated at 15 GPA and 47 psi. Each week after application, weed heights (in a square meter), weed counts (in a square meter), cotton heights, and cotton nodes were recorded.

Results indicate PRE applications containing fomesafen and MON 100111 resulted in greater than 92% control of Palmer amaranth and greatly reduced the number of plants in a square meter four weeks after application in 2012. In 2013, tank mixes containing MON100111 increased Palmer amaranth control when compared to acetochlor, prometryn, MON100111 @ 0.6 kg ae ha^{-1}, and 2,4-D LV Ester. Differences in Palmer amaranth control among years may be due to differences in rainfall observed in 2012 and 2013. Postemergence applications including glufosinate + dicamba; glyphosate + dicamba; glyphosate + dicamba + acetochlor; glufosinate + dicamba + acetochlor resulted in greater than 80% control and significant reductions in Palmer amaranth height. Palmer amaranth plants from these treatments also produced significantly less biomass. Across all herbicides applications made to 10 cm Palmer amaranth, plants produced significantly less biomass than treatments made at the 25 cm timing.

Preemergence applications containing dicamba provided greatest control of Palmer amaranth. Roundup Ready XtendFlex® technology was very tolerant to PRE and POST applications of dicamba. Single POST applications did not provide adequate control and sequential applications are needed for adequate control.

PALMER AMARANTH CONTROL WITH SEQUENTIAL PPO HERBICIDE APPLICATIONS IN PEANUT. H.C. Smith*[1], J.A. Ferrell[1], C. Smith[2]; [1]University of Florida, Gainesville, FL, [2]UPI, Marianna, FL (124)

ABSTRACT

A trial was conducted the summer of 2013 in Citra, FL to investigate the efficacy of sequential PPO herbicide applications on Palmer amaranth (Amaranthus palmeri). Palmer amaranth is known to be one of the most difficult weed species to control due to its growth characteristics and the development of herbicide resistance. PPO-inhibiting herbicides are effective on Palmer amaranth, but only if the weed is <4” in height. If plants are >4” in height, regeneration of Palmer amaranth is common. Therefore, it was questioned if sequential applications of PPO-inhibiting herbicides could prevent regrowth on larger Palmer amaranth plants. To test this, five sequential herbicide treatments were evaluated for Palmer amaranth control (in a fallow field) and peanut foliar injury (weed free). Herbicide treatments included a single application of Ultra Blazer (2lb/gal acifluorfen) at 1.5pt (420g/ha), Ultra Blazer at 1pt (280g/ha) fb Ultra Blazer at 1pt (280g/ha) 5 days apart (DA), Ultra Blazer at 1pt/A (280g/ha) fb Ultra Blazer at 1pt/A (280g/ha) 15 DA, Storm (2.67lb/gal bentazon + 1.33lb/gal acifluorfen) applied at 1.5 pints/A (561g/ha bentazon + 280g/ha acifluorfen) plus 2,4-DB (1.75lb/gal) at 1pt/A (245g/ha) fb Strom (1.5pt/A) plus 2,4-DB (1pt/A) sprayed 15 DA, Cobra (2lb/gal lactofen) at 12.5fl oz/A (219g/ha) fb Cobra at 12.5fl oz/A (219g/ha) applied 15 DA, and Gramoxone (2lb/gal paraquat) at 12 fl oz/A (210g/ha) fb Ultra Blazer at 1.5pt/A (420g/ha) sprayed 15 DA. All herbicides were applied at 187 l/ha and included crop oil at 1% v/v. Peanuts (GA-06G) were planted on April 30th, 2013 and the initial herbicide applications were applied on June 13th. Sequential applications of Storm (1.5pt/A) plus 2,4-DB (1pt/A) sprayed 15 DA, Cobra (12.5fl oz/A) fb Cobra applied 15 DA, and Gramoxone (12 fl oz/A) fb Ultra Blazer (1.5pt/A) applied 15 DA, all provided > 90% control of Palmer amaranth 15 days after the treatment (DAT). Sequential applications of Ultra Blazer (1pt/A) applied 15 DA provided significantly better control (70%) compared to Ultra Blazer (1pt/A) applied 5 DA (57%). All treatments displayed < 5% peanut foliage injury 15 DAT except for the sequential applications of Cobra (15%). Compared to the untreated control, peanut yields were significantly reduced in only two treatments: Cobra (15 DA) and Gramoxone fb Ultra Blazer (15 DA). These POST herbicide applications are commonly made during the mid-season and Gramoxone was applied 43 days after planting (DAP) which is much later than the <28 DAP restriction established by the label. The Gramoxone treatment was included to evaluate its Palmer amaranth control but the late application date may have resulted in the reduction of peanut yield. Yield reduction from Cobra was also expected since the sequential application was made near 60 days after planting, which has been shown to reduce peanut yield. Applying the Gramoxone and Cobra treatments prior to 28 and 60 days after planting, respectively, would likely result in no yield reduction from either. Overall, our results suggest that sequential applications of PPO herbicides can be made to control Palmer amaranth without compromising peanut yields.

ABSORPTION AND FATE OF AMINOCYCLOPYRACHLOR IN BERMUDAGRASS, BAHIAGRASS, COGONGRASS, AND TALL FESCUE. E.T. Parker, G.R. Wehtje, J.S. McElroy, A.J. Price, and P. McCullough, Auburn University, Auburn, AL (125)

ABSTRACT

Aminocyclopyrachlor (ACPC) is a synthetic auxin herbicide that controls broadleaf weeds in tolerant graminaceous species. Little is known about the fate of ACPC applied at labeled rates in graminaceous species. Studies were performed to evaluate ACPC foliar uptake, translocation, and metabolism using radiolabeled ACPC in the following species listed from most to least tolerant: tall fescue (*Schedonorous arundinaceus*), bermudagrass (*Cynodon dactylon*), bahiagrass (*Paspalum notatum*), and cogongrass (*Imperata cylindrica*).

Plants for absorption, translocation and metabolism studies were established from seed in potting mix then treated when they reached approximately 10cm in height. ^{14}C radiolabeled ACPC was applied as a single 10µL drop totaling approximately 22,000 disintegrations per minute (DPM) to the adaxial side of a fully mature leaf. Plants were harvested at 1, 2, 4 and 8 days after treatment (DAT) and separated into target area, treated leaf, remainder foliage and crown plus roots. These plant parts were then dried and oxidized. Radiation was detected using liquid scintillation spectroscopy. Metabolism studies were conducted in a similar fashion except two 10µ drops totaling approximately 336,000 DPM were applied to two separate leaves. Harvest intervals were changed to 7 and 14 DAT to allow adequate time for metabolism to occur. Plants were divided into target area and remainder foliage to prevent interference of unabsorbed herbicide in data analysis. Plant parts were homogenized then solutions were placed onto silica-gel chromatography plates and scanned for metabolites. Only peaks of 5% or greater of total radiation recovered were considered significant. Data were subjected to ANOVA and means were separated using adjusted 95% confidence intervals.

Data indicate that absorption varied from 1 to 8 DAT but was similar across all species. ACPC absorption was greatest at 8 DAT and did not exceed 68% in cogongrass, the most sensitive species. Translocation did not vary significantly from 1 to 8 DAT indicating that translocation was nearly complete by 1 DAT. However, translocation did vary by species. Translocation moving out of the treated area ranged from 59% of applied ACPC in bermudagrass to 71% in cogongrass at 8 DAT. Translocation data indicates that ACPC moves within evaluated species when applied to the foliage in a manner consistent with other synthetic auxin herbicides. Metabolism studies indicate that no metabolites exist at 7 DAT, which is consistent with previous research. Metabolism studies were also carried out to 14 DAT. These studies indicate two possible metabolites of ACPC with retardation factor (RF) values less than those of the parent compound.

Neither the absorption and translocation nor the metabolism studies offer a definitive conclusion to the differing response of evaluated graminaceous species to ACPC application. Due to persistence within the soil, future research should focus on utilizing longer time intervals to determine if metabolism of ACPC in treated plants is a gradual process. Studies should also look at the possibility that anatomical and not physiological responses are the reason for differing levels of grass tolerance.

EFFICACY OF HERBICIDES FOR VOLUNTEER RICE CONTROL WITH AND WITHOUT WINTER FLOODING. Vijay Singh**, Nilda R. Burgos, Larry D. Earnest, Robert C. Scott, Randy Spurlock, Shilpa Singh; University of Arkansas, Fayetteville, AR (126)

ABSTRACT

Volunteer rice is a problem in rice production when a substantial amount of seed is dropped in the field from the previous crop, either from the combine or shattering before harvest, and the seeds emerge with the succeeding rice crop. The problem arises when the succeeding crop is of a grain type that should not be contaminated with the volunteer rice grain. Herbicide-resistant rice or F_1 hybrid rice volunteers would be an even more difficult problem than conventional rice volunteers. F_1 hybrid volunteers segregate into several weedy type plants that would compete with the rice crop and would have questionable grain yield and quality. Twelve herbicide and rate combinations were tested for the control of volunteer rice in flooded and non-flooded paddies. Some herbicides were applied in the fall of 2012 and others at 35 days prior to planting rice in the spring of 2013. The experiments were conducted at the Rice Research and Extension Center (RREC), Stuttgart, AR and the Southeast Research and Extension Center (SEREC), Rohwer, AR. The experiment was setup with a split-plot arrangement within a randomized complete block design with flooding as main plot and herbicide treatments as subplot in three replicates. Commercially harvested Clearfield (CL152) inbred rice was broadcasted at 175 kg/ha and lightly incorporated in Oct. 2012. The herbicide treatments were sprayed 15 days later. Pre-plant herbicides were applied in April, 2013, 35 d prior to planting rice. "Jupiter" (inbred, conventional rice) was planted in May, 2013. Pyroxasulfone (0.123 kg ai ha^{-1}; 35 d pre-plant) reduced rice crop stand substantially (18 to 47%). Sulfentrazone (0.336 kg ai ha^{-1}; fall application) and 2,4-D (2.24 kg ai ha^{-1}; 35 d pre-plant) reduced the volunteer rice emergence by 41 to 58% and 63 to 67%, respectively, but also reduced crop yield by 22 to 44% and 11 to 18%. Pyroxasulfone (0.123 kg ai ha^{-1}; fall application) reduced volunteer rice density by 76 to 81% and resulted in rice yield similar to the no-herbicide treatment. Pyroxasulfone (0.123 kg ai ha^{-1}; fall application) fb 2,4-D (1.12 kg ai ha^{-1}; 35 d pre-plant) is a good potential herbicide combination for controlling volunteer rice because it was effective and did not cause any yield loss. The experiment will be repeated in 2014 with the addition of other sequential (fall followed by spring) herbicide programs.

COMPETITION OF INDIANGRASS WITH JOHNSONGRASS DURING ESTABLISHMENT. C. Johnston*, D. Shilling, P. McCullough; University of Georgia, Griffin, GA (127)

ABSTRACT

Johnsongrass (*Sorghum halepense*) is one of the most aggressive perennial weeds in the southeastern United States, and control is often challenging due to its competitive nature. One possible alternative method of control is restoring land invaded by Johnsongrass with a native, non-invasive grass species. Greenhouse studies in the form of replacement series were conducted in Griffin, GA to evaluate the ability of native indiangrass (*Sorghastrum nutans*) to compete with and/or displace Johnsongrass. The two grasses were planted by seed and thinned to the density of four plants per 40.3 cm^2 pot in five different ratios from 100% Johnsongrass to 100% indiangrass in 25% increments. Root and shoot biomass harvests were done at 30 and 60 days after seeding both species. Once the 60 day harvests were completed, all plants were mowed to a typical roadside height of approximately 15 centimeters to determine if any shifts in competitive ability occurred. Shoot biomass harvests were then conducted 15 and 30 days after mowing. Throughout the experiment, data illustrates that Johnsongrass was more affected by intraspecific competition whereas indiangrass was more affected by interspecific competition. Relative yields of both species suggest that Johnsongrass produces the same shoot biomass yield with one plant that indiangrass produces with three plants. This trend did not appear to change significantly after mowing. Shoot biomass data in the form of total biomass production and per plant biomass production suggest that indiangrass was somewhat released from heavy interspecific competitive pressure after mowing.

MANAGEMENT OF COVER CROPS FOR A NO-TILL SOYBEAN SYSTEM. M.S. Wiggins*, R.M. Hayes, & L.E. Steckel; University of Tennessee, Jackson, TN (128)

ABSTRACT

Producers in the Mid-South region of the United States continue to make the majority of their weed management decisions based off of the presence of glyphosate-resistant (GR) weeds. Tennessee currently has six confirmed weed species that are GR. Of these, Palmer amaranth (Amaranthus palmeri S. Wats) is the most difficult of to control. This dioecious, broad-leaf species has a robust growth habit, a wide germination window, and will out compete crops for essential resources. This prolific weed pest has led area producers to adopt an integrated-systems approach to weed control. These systems include the use of PRE-emergence (PRE) herbicides, overlaying residual chemistries, making timely applications of POST-emergence (POST) herbicides and integrating cultural control methods. One cultural control method of current interest is the use of cover crops as a weed suppression technique. Unfortunately, research on cover crop management techniques is limited. Therefore, this trial was conducted during the 2013 growing season to assess cover crop management techniques in a no-till soybean system. In this trial treatments of cover crops, termination timings, and termination products were evaluated. The cover crops evaluated were crimson clover (Trifolium incarnatum L.), hairy vetch (Vicia vilosa L.), winter wheat (Triticum aestivum), and cereal rye (Secale cereal L.). Seeding rates were 17 kg ha-1, 22 kg ha-1, 67 kg ha-1, and 67 kg ha-1 of viable seed for crimson clover, hairy vetch, winter wheat and cereal rye, respectively. Cover crops were established in the autumn of the previous year using a no-till drill and were allowed to over winter to accumulate biomass. Plots were terminated using either paraquat + NIS (851 g ai ha-1+ 0.25% V/V) or glyphosate (1262 g ae ha-1) at one of five termination timings (Mar-8, Mar-15, Mar-28, Apr-12, or Apr-26). Prior to chemical termination of cover crops, biomass yields were obtained by clipping a 0.1 m2 quadrat above the ground. Burndown ratings 21 days after application (21DAA), Palmer amaranth control 21DAA, and soybean yield were also assessed in this study. Experimental design was a randomized complete block design with four replications and a factorial arrangement of treatments. Factors evaluated were cover crop specie, termination product, and termination timing. Means were separated using Fisher's Protected LSD at $P \leq 0.05$. Results indicate that winter wheat and cereal rye accumulated the greatest amount of biomass, which directly influenced early season weed control. Likewise, terminating cover crops after the Mar-15 timing allowed for additional biomass accumulation. Results of the evaluation of termination product indicated that glyphosate proved to be the best option for burndown when applied early in the growing season. However, later in the season (Apr-12 – Apr-26) as temperatures increased and the cover crops were readily growing, both products provided adequate control (>90%). Soybean yield differed among cover crop treatments. Yield was higher when soybeans were grown in the grass cover crop species, when compared to the legumes. In summary, these results indicate that using high residue cover crops can offer some benefits in a no-till soybean system, including early season weed control. Moreover, moving forward research on cover crop management will need to continue to aid producers in making effective and sustainable weed control decisions

WEED CONTROL PROGRAMS FOR EDAMAME SOYBEAN. R.A. Salas*, N.R. Burgos, R.C. Scott, J. Dickson, H. Tahir, L. Estorninos; University of Arkansas, Fayetteville, AR (129)

ABSTRACT

Edamame is a vegetable soybean that is gaining popularity in the US. Although many herbicides are labeled for grain soybean, only few herbicides are registered for edamame, limiting domestic, commercial production. Field experiments were conducted in Fayetteville and Newport in 2012 and 2013 to evaluate the effectiveness of various herbicide programs and the tolerance of edamame to different herbicides. Herbicide programs included various combinations and sequences of Dual Magnum (S-metolachlor), 1.12 kg ai/ha; Flexstar (fomesafen), 0.33 kg ai/ha; Sencor (metribuzin), 0.43 kg ai/ha; Linex (linuron), 1.12 kg ai/ha; Blazer (acifluorfen), 0.28 kg ai/ha; Basagran (bentazon), 0.56 kg ai/ha; Prefix (fomesafen, 0.27 kg ai/ha + S-metolachlor, 1.21 kg ai/ha), Spartan Charge (carfentrazone, 0.0303 kg ai/ha + sulfentrazone, 0.273 kg ai/ha); Broadaxe (sulfentrazone, 0.154 kg ai/ha + S-metolachlor, 1.38 kg ai/ha); Pursuit (imazethapyr), 0.067 kg ai/ha; Valor XLT (flumioxazin, 0.109 kg ai/ha + chlorimuron, 0.0376 kg ai/ha); Zidua (pyroxasulfone), 0.123 kg ai/ha; and a nontreated weedy check. There were 9 treatments in 2012; with additional 6 treatments in 2013. The experimental design was randomized complete block with 4 replications. The field was overseeded with morningglory, hemp sesbania, prickly sida, and Palmer amaranth In Fayetteville. There was a natural population of Palmer amaranth in Newport. Postemergence (POST) herbicides were applied to V3 soybean and 5- to 8-cm Palmer amaranth. Season-long control of Palmer amaranth (88-96%) was achieved with Dual/Linex + Sencor PRE fb Prefix/Flexstar in Newport. Crop injury was minimal (5% at most) at 2 WAT PRE with Linex and Sencor PRE treatment. In 2012, all herbicide treatments controlled Palmer amaranth 94-100%. In Fayetteville. Morningglory was controlled (>92%) by Dual Magnum PRE fb Flexstar POST and Linex + Sencor PRE fb Prefix POST. All herbicide treatments, except Dual Magnum PRE fb Blazer + Basagran POST, controlled hemp sesbania and prickly sida >90%. In 2013, morningglory control (50-89%) was similar among treatments. Season-long control of hemp sesbania (>90%) was achieved by Linex + Sencor PRE fb Prefix POST followed by Zidua PRE fb Flexstar POST. All herbicide treatments controlled prickly sida (>90%) except for Dual Magnum PRE fb Blazer + Basagran POST. Palmer amaranth failed to get established in 2013. The preemergence herbicides did not affect crop stand, however moderate crop injury (8-21%) was observed at 3 WAT PRE with Spartan Charge and Linex + Sencor treatments. Soybean injury was highest at 1 WAT POST with Prefix (50%), followed by Flexstar (30-43%) treatments; however the crop recovered at 4 WAT POST in both years. Grain yield (2229-3079 kg/ha) was relatively similar among herbicide treatments in both years. Edamame has tolerance to the herbicides used in the program. Effective overall weed control can be achieved with Linex + Sencor PRE fb Prefix POST, Dual + Sencor PRE fb Flexstar POST, Linex PRE fb Prefix POST, Zidua PRE fb Flexstar POST, and Zidua + Linex PRE fb Pursuit POST.

FORAGE TOLERANCE TO AMINOCYCLOPYRACHLOR. D. G. Abe, B. A. Sellers, J. A. Ferrell, R. G. Leon, and D. C. Odero; Department of Agronomy, University of Florida-IFAS, Gainesville, FL (130)

ABSTRACT

Traditionally, ranchers in Florida grow warm season grasses to feed beef cattle, either through grazing or hay production. Bahiagrass (*Paspalum notatum*) cultivars ('Argentine' and 'Pensacola') are widely used for grazing in south Florida, with some cured for hay in north Florida. 'Jiggs' and 'Florakirk' bermudagrass (*Cynodon dactylon*) and 'Florona' and 'Florico' stargrass (*Cynodon nlemfuensis*) are used primarily for hay production in south Florida. Two experiments were conducted in south-central Florida (Ona) to evaluate the tolerance of forage cultivars to aminocyclopyrachlor (ACP) in 2010 and 2012; and ACP premixes in 2012 and 2013. Prior to initiating the experiments, each experimental area was clean-mowed, with all grass clippings removed. Herbicide treatments were applied to bermudagrass and stargrass within seven days after mowing, and applied to bahiagrass when regrowth measured 15 cm using a randomized complete block design. In the first study, ACP was applied at 35, 70, 140 and 280 g/ha. The second study evaluated the effect of ACP and ACP premixes: ACP alone at 70 and 140 g/ha, ACP + chlorsulfuron at 69 + 27 and 138 + 54 g/ha; ACP + 2,4-D amine at 70 + 532 g/ha and 140 + 1,064 g/ha; ACP + triclopyr-amine at 70 + 140 g/ha and 140 + 280 g/ha; ACP + metsulfuron at 78 + 12 and 168 + 26 g/ha. An untreated check was included in both experiments for comparison. A non-ionic surfactant 0.25% v/v was included in all herbicide treatments. All treatments were applied with an air-pressurized ATV sprayer calibrated to deliver 281 L/ha on 3 by 5 m plots. Plots were harvested 30 and 60 days after treatment (DAT). Dry weight measurements were recorded after drying at 60^{o} C for four days, and were converted to percent of the untreated check prior to analysis. Data were combined over cultivar for each forage species, except bahiagrass. Regression analysis revealed that ACP at 67.8 and 30.6 g/ha in bermudagrass and stargrass resulted in 10% yield loss. There were no differences among bahiagrass cultivars when ACP was applied alone. Aminocyclopyrachlor and premixes had a negative effect on bermudagrass and stargrass biomass 30 DAT. For bermudagrass, all treatments, except for ACP + 2,4-D at 70 + 532 g/ha and ACP + metsulfuron at 46 + 7 g/ha, resulted in at least 18% yield reduction. There were significant differences among treatments in bermudagrass at 60 DAT, however, yields ranged from 95 to 132% of the untreated. All treatments resulted in at least a 10% stargrass yield reduction. However, by 60 DAT, there were no differences in stargrass yields among treatments, and yield ranged from 92 to 115% of the untreated. The two highest rates of the ACP + metsulfuron premix resulted in 50% less 'Argentine' bahiagrass biomass at 30 DAT; however, there were no differences among treatments at 60 DAT. 'Pensacola' bahiagrass was reduced by at least 27% by ACP premixes containing chlorsulfuron and metsulfuron 30 DAT. By 60 DAT, no yield reduction was recorded for the ACP + chlorsulfuron premixes; however, the metsulfuron premixes resulted in at least a 72% reduction in biomass. These data indicate that 'Argentine' bahiagrass is among the most tolerant forage species, while 'Pensacola' is tolerant to most all premixes except those containing metsulfuron, and is initially sensitive to the chlorsulfuron premix. Bermudagrass appears to be more tolerant to ACP premixes than stargrass as stargrass is less tolerant to ACP alone. However, both bermudagrass and stargrass yields will likely recover within 60 DAT.

ADDITION OF SPRAY ADJUVANTS TO ENHANCE FALSE DANDELION CONTROL WITH CELSIUS.
R. Grubbs*, K. Tucker, C. Straw, T. Burch, G. Henry; University of Georgia, Athens, GA (131)

ABSTRACT

THE EFFECT OF RICEBEAUX® ON THE TRANSLOCATION AND ABSORPTION OF ^{14}C-IMAZAMOX IN RED RICE (*ORYZA* SPP.). T.N. Jones*[1], S.A. Senseman[2], G.N. McCauley[3], K.H. Carson[4], B. Wherley[4], M.O. Way[5]; [1]Texas A&M AgriLife Research, College Station, TX, [2]University of Tennessee, Knoxville, TN, [3]Texas A&M AgriLife Research, Eagle Lake, TX, TX, [4]Texas A&M University, College Station, TX, [5]Texas A&M AgriLife Research, Beaumont, TX (132)

ABSTRACT

The Clearfield® rice production system has been increasingly used by rice growers to control troublesome weeds such as red rice. Newpath® (imazethapyr) and Beyond® (imazamox) are imidazolinone herbicides that are commonly utilized in this system. These herbicides have historically exhibited excellent control of red rice. However, multiple cases of red rice resistance to imidazolinone herbicides have been observed in the United States and Brazil. RiceBeaux® is a registered herbicide produced by RiceCo that is comprised of two familiar rice herbicides, propanil and thiobencarb. Used alone, RiceBeaux® provides no control of red rice; however, when tank-mixed with imazamox or imazethapyr, enhanced red rice control has been observed. This study was established to characterize the interaction of RiceBeaux® on the translocation and absorption of imazamox using 14C-imazamox. TX-4 red rice plants were treated with 1 µl of 14C-imazamox and plants were harvested at 8 separate timings. 6 samples were harvested from each plant and were analyzed using Liquid Scintillation Spectrometry in order to quantify radioactivity. Significantly more 14C-imazamox was recovered from the cuticle when imazamox was applied alone at all timings. Imazamox+RiceBeaux® resulted in significantly higher absorption of 14C-imazamox at 24, 48, and 96 hours after treatment. Results indicate RiceBeaux® may allow more imazamox to cross the lipophilic cuticle to reach the sites of action, resulting in enhanced red rice control. This interaction may explain the enhanced red rice control seen in field studies when RiceBeaux® is tank-mixed with imidazolinone herbicides.

MOVEMENT OF METHIOZOLIN THROUGH SOIL AS PREDICTED BY THIN-LAYER SOIL CHROMATOGRAPHY. M.L. Flessner*, J.S. McElroy, G.R. Wehtje; Auburn University, Auburn, AL (133)

ABSTRACT

Methiozolin effectively controls annual bluegrass (*Poa annua*) in golf course putting greens through timely, sequential applications, with the most efficacious control resulting from root exposure. However, little is known about the availability of methiozolin for root uptake in a soil environment. Previous research indicates methiozolin soil sorption is relatively moderate (K_d = 13.8 mL g^{-1}) and approximately 28% of applied remains available for root uptake in sand-based rooting substrates. Generally, high soil sorption is indicative of limited soil mobility, but this has not been evaluated for methiozolin. The objective of this research was to evaluate methiozolin movement through soil, with particular interest to sand-based rooting substrates.

Thin-layer soil chromatography was used to evaluate ^{14}C-methiozolin (benzyl-^{14}C-methiozolin; Moghu Research Center, Daejeon, Korea) movement in nine rooting substrates and compare methiozolin movement to ^{14}C-isoxaben (pyrimidine-2-^{14}C-isoxaben; Ag-tracers, Dow Chemical, Midland, MI); a herbicide with a potentially similar mode-of-action. Substrates evaluated were: United States Golf Association (USGA) grade sand with 0, 2.5, 5.0, 10 or 20% (w w^{-1}) peat, USGA specified root-zone material for putting greens that were 0, 10, and > 15 years in use, and a Wickham sandy loam (locally collected field soil). Rooting substrates were deposited on 20 by 20 cm glass plates as a water slurry with an approximate thickness of 3 mm. Plates were then air dried. Three, 10 µL drops of spotting solution were individually placed 3 cm from the base of each plate for each herbicide. Three replications of each herbicide were included per plate and four plates per rooting substrate were analyzed. Spotting solution used was a 1:1 water:methanol (vol vol^{-1}) solution with ^{14}C-labeled herbicide added such that the radioactivity was ~580 Bq mL^{-1}. Plates were developed in water, dried and scanned for radioactivity. Distance from the origin to the wetting front was divided into 10 equal increments, and the amount of radioactivity detected in each portion was quantified. Distance from the origin to the center of the displaced peak was used to determine retardation factors (R_f). Statistical analysis was conducted separately by herbicide since herbicide by soil was a significant interaction ($P < 0.001$). Means were separated using 95% confidence intervals adjusted for multiple comparisons.

Soil mobility of methiozolin was very limited; R_f were < 0.05 for all soils, except sand where R_f = 0.464, approximately 10 times greater than the next highest R_f (0.046) in USGA root-zone that was > 15 years in use. Averaged across all substrates evaluated, R_f for methiozolin was 0.072. Soil mobility of methiozolin is consistent with its chemical properties of low water solubility (3.4 mg L^{-1}) and a hydrophobic $logK_{ow}$ value (3.9). Isoxaben was also found to have limited soil mobility. The highest R_f observed was 0.103 in USGA root-zone that was > 15 years in use, which was similar to sand with an R_f of 0.063. All other soils resulted in $R_f \leq 0.030$. Averaged across all soils evaluated, R_f for isoxaben was 0.039. Isoxaben has low water solubility (1 mg L^{-1}) and a hydrophobic $logK_{ow}$ value (2.6), which are consistent with limited soil mobility. Previous research indicates slight leaching of isoxaben in soil columns and in field studies.[2] Therefore these results are consistent with previous research. Both methiozolin and isoxaben were class 1 (least mobile) herbicides according to the Helling and Turner (1968) soil mobility classification system.[1] Overall, methiozolin has limited soil mobility such that it is resistant to leaching from the root-zone. Future research needs to investigate methiozolin degradation in the soil environment, which has important consequences relative to soil mobility and weed control longevity.

[1] Helling, CS and BC Turner (1968) Pesticide mobility: determination by soil thin-layer chromatography. Science 162:562–563
[2] Jamet, P and JC Thoisy-Dur (1988) Pesticide mobility in soils: assessment of the movement of isoxaben by soil thin-layer chromatography. Bull Environ Contam Toxicol 41:135–142

INFLUENCE OF ROW WIDTH, SEEDING RATE, AND HERBICIDE PROGRAM ON PALMER AMARANTH CONTROL IN LIBERTYLINK® SOYBEAN. H.D. Bell***,** J.K. Norsworthy, Z.T. Hill, , B.W. Schrage, M.V. Bagavathiannan, C.J. Meyer, D.S. Riar, M.T. Bararpour and J.R. Brennan. Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR (134)

ABSTRACT

Wide spread glyphosate-resistant Palmer amaranth, the most troublesome weed in Arkansas row crop production, has led to a heavy reliance on preemergence (PRE) herbicides in addition to postemergence (POST) residual herbicides in soybean. In 2012 and 2013, a field experiment was conducted at the University of Arkansas Research and Extension Center in Fayetteville, AR, to determine the influence of row spacing, seeding rate, and herbicide program in LibertyLink® soybean on Palmer amaranth control and survival. This experiment was arranged in a split-split plot design replicated four times. The main plot factor was row width [7.5- (drilled) and 36- (wide row) in.]. The subplot factor was seeding rate (100,000 and 175,000 seed $acre^{-1}$) and the sub-subplot factor was herbicide programs [*S*-metolachlor + metribuzin (Boundary®) applied PRE followed by (fb) glufosinate (Liberty®) + *S*-metolachlor + fomesafen (Prefix^{TM}) applied at 21 days after planting (DAP) (PRE fb POST at 21 DAP), *S*-metolachlor + metribuzin applied PRE fb glufosinate + *S*-metolachlor + fomesafen applied 21 DAP fb glufosinate + acetochlor (Warrant^{TM}) applied 42 DAP (PRE fb POST at 21 and 42 DAP), glufosinate + *S*-metolachlor + fomesafen applied 21 DAP fb glufosinate + acetochlor applied 42 DAP (POST-only), and an untreated control] applied at labeled field rates. Palmer amaranth control was evaluated at 21 DAP, 42 DAP, and harvest. Soybean canopy formation was measured throughout the growing season to determine the length of time to reach a critical level of soybean canopy (90%). At 21 DAP, POST-only applications had not been applied and all herbicide programs with a PRE application had 100% control. At 42 DAP, greater control (≥98% both years) was observed in PRE + POST herbicide programs compared to POST-only herbicide programs (≥48% both years), regardless of seeding rate and row spacing. At harvest, PRE + POST herbicide programs had greater control (≥93% in 2012 and ≥98% in 2013) than POST-only herbicide programs (≥8% in 2012 and ≥44% in 2013), regardless of seeding rate and row spacing. Soybean achieved 90% groundcover in drilled plots in <50 DAP in 2012 and <80 DAP in 2013 and in the wide row plots <55 DAP in 2012 and <95 DAP in 2013. Herbicide application had more of an impact on control than either row spacing or seeding rate for both years. Inclusion of PRE + POST residual herbicides in weed control programs was vital in reducing Palmer amaranth density and ultimately Palmer amaranth seed production, which in turn lessens the selection for new cases of resistance.

GROWTH AND FITNESS OF ALS-INHIBITING HERBICIDE RESISTANT ANNUAL BLUEGRASS (*POA ANNUA*Â L.) WITH A TRP_{574}-LEU MUTATION. R.B. Cross*[1], L.B. McCarty[1], J.S. McElroy[2], N. Tharayil[1], T. Whitwell[1]; [1]Clemson University, Clemson, SC, [2]Auburn University, Auburn, AL (135)

ABSTRACT

Annual bluegrass (Poa annua L.) is one of the most widely distributed and highly variable plant species in the world and is a problematic weed in commercial turfgrass. Acetolactate synthase- (ALS) inhibiting herbicides are frequently used to control annual bluegrass in managed turfgrass. Recently an increase in the number of golf course populations of annual bluegrass not controlled after applications of ALS-inhibiting herbicides has increased and many of these populations are confirmed resistant. Numerous amino acid substitutions at six main residues in plant ALS are known to confer resistance to ALS-inhibiting herbicides. These substitutions differ in their effects on plant growth and function. This research investigated the effect a Trp574 to Leu substitution has on growth and enzyme functionality in annual bluegrass. An ALS-resistant (R) annual bluegrass population containing a mutation resulting in a Trp574 to Leu substitution was obtained from Grand National Golf Course in Opelika, AL and compared with a susceptible (S) population. At the whole-plant level, GR50 estimates were 42.7 and 346.7 g trifloxysulfuron ha-1 for S and R populations, respectively, resulting in a resistance ratio of 8.1. Differences in relative growth rate between populations were not observed for any harvest intervals. The R population was similar to the S population in response to trifloxysulfuron in vitro, likely due to at least two distinct forms of ALS present in this allotetraploid species. Additionally, differences between populations in Km (pyruvate) or ALS specific activity were not observed. ALS in both populations was feedback inhibited by all branched-chain amino acids, but inhibition was increased in the R population. This research suggests little, if any, negative effect of a Trp574 to Leu substitution in ALS-inhibitor resistant annual bluegrass. Therefore, this mutation may have little influence on R ALS allele frequency in the absence of herbicide selection. Future research should focus on investigations into differential levels of ALS gene expression and amino acid pool concentrations in S versus R annual bluegrass populations.

EVALUATION OF PRE HERBICIDE AND SEED TREATMENT ON THRIPS INFESTATION IN COTTON. J. Copeland*[1], D.M. Dodds[2], T.H. Dixon[2], D.Z. Reynolds[2], C.A. Samples[1], A. Catchot[2], J. Gore[3], D.W. Wilson[4]; [1]Mississippi State University, Mississippi State, MS, [2]Mississippi State University, Starkville, MS, [3]Mississippi State University, Stoneville, MS, [4]Monsanto, St. Louis, MO (136)

ABSTRACT

Since 2011, foliar treatments for thrips in cotton have increased to nearly two applications per acre on 75% of total acres in spite of these acres being planted with seed treated with an insecticidal seed treatment. Additionally, glyphosate-resistant Palmer amaranth has become problematic for Mississippi producers. As a result, the use of preemergence herbicides has increased dramatically since 2008. From 2008 to 2012 the number of cotton bales lost due to thrips damage increased from 152 bales lost in 2008 to 5,057 bales lost in 2012. In cotton, both thrips damage and PRE herbicides can interfere with emergence and early season growth. Previous research on thiamethoxam and imidacloprid has shown both to be effective in controlling thrips in cotton. Given the increased use of PRE herbicides in Mississippi cotton production, it has been suggested that PRE herbicides may be contributing to the increase in thrips populations over the past several growing seasons. Therefore, the objective of this research was to evaluate the use of PRE herbicides and seed treatments on thrips populations as well as cotton development and yield.

This study was conducted at three locations in Mississippi which included the Black Belt Branch Experiment Station near Brooksville, the R.R. Foil Plant Science Research Center near Starkville, and the Delta Research and Extension Center in Stoneville. Seed treatments included thiamethoxam + fungicide, imidacloprid + fungicide, and fungicide only. PRE herbicides included fluometuron at 1.12 kg ai/ha, diuron at 1.12 kg ai/ha, fomesafen ay 0.28 kg ai/ha, S-metolachlor at 1.07 kg ai/ha, S-metolachlor at 1.07 kg ai/ha + fluometuron at 1.12 kg ai/ha, respectively as well as an untreated check. This experiment was conducted using a factorial arrangement of treatments in a randomized complete block design, with the two factors being PRE herbicide and seed treatment. All data were subjected to analysis of variance and means were separated using Fishers Protected LSD at p = 0.05.

Cotton seed treated with imidacloprid had significantly less injury from thrips than cotton seed treated with thiamethoxam and fungicide only treatments. Thrips counts at the four leaf stage indicated significantly greater infestation on cotton treated with thiamethoxam compared to cotton treated with imidacloprid. Cotton seed treated with imidacloprid resulted in significantly taller cotton plants throughout the season than those grown from thiamethoxam treated seed. Averaged across all seed treatments, cotton treated with fomesafen was significantly shorter than all other PRE herbicide treatments at the 4 leaf stage, pinhead square, first bloom, and harvest.

Cotton treated with imidacloprid produced the highest yields. Averaged over all PRE herbicides, cotton seed treated with imidacloprid yielded 6648 kg/ha whereas cotton seed treated with thiamethoxam producing yields of 6455 kg/ha. PRE herbicide also had an effect on seed cotton yields, with cotton treated with fomesafen yielding significantly lower than all other PRE herbicides. Cotton treated with diuron, fluometuron, and S-metolachlor + fluometuron yielded 6461 to 6665 kg/ha whereas cotton treated with fomesafen yielded 6088 kg/ha.

NEW LIQUID FORMULATION OF METSULFURON FOR BROADLEAF WEED CONTROL IN WARM-SEASON TURF. S.S. Rana*1, J. Corbett2, S.D. Askew1; 1Virginia Polytechnic Institute and State University, Blacksburg, VA, 2Quali-Pro, Raleigh-Durham, NC (137)

ABSTRACT

Metsulfuron-methyl, marketed as MSM 60 DF by Quali-Pro, is an important herbicide for broadleaf weed control and grassy weed suppression in warm-season turfgrasses. Metsulfuron is currently available in a dry formulation only. Although dry formulations require “softer” packaging, have less shipping weight, and impart less exposure risk to handlers, recent market analyses continue to indicate that liquid formulations of sprayable pesticides are most desirable among turf practitioners. Quali-Pro has developed a liquid formulation of metsulfuron (MSM 25 OD) that uses new formulation technology, allowing faster dispersion, better cold-water mixing, and safer inert materials and surfactants. Celsius™ WG, a combination of thiencarbazone, iodosufluron-methyl-sodium, and dicamba, is a primary competitor with metsulfuron for broadleaf weed control in the southern U.S. Field trials were initiated July 26, 2013 on bermudagrass fairway (1.5-cm height) at the Turfgrass Research Center (TRC) at Virginia Tech in Blacksburg, VA to compare weed control efficacy and bermudagrass selectivity from the liquid formulation of metsulfuron (Quali-Pro MSM 25 OD) against the dry formulation of metsulfuron (Quali-Pro MSM 60 DF) and the industry standard broadleaf herbicide, Celsius™ WG. The study was a randomized complete block design with three replications and six treatments, including a non-treated check. The herbicide treatments included MSM 60 DF and MSM 25 OD at 21 and 42 g ai ha^{-1}, and Celsius™ WG at 176 g ai ha^{-1}. All herbicide treatments included a non-ionic surfactant at 0.25% v/v. Percent visual cover, control, and injury ratings were taken for bermudagrass, dandelion, and white clover at 0, 7, 14, 28, and 35 days after treatment (DAT). None of the metsulfuron treatments injured bermudagrass. Celsius™ WG injured bermudagrass 7 DAT; however, injury was transient and bermudagrass recovered within one week of symptom development. At 14 DAT, MSM 25 OD at 42 g ha^{-1} controlled dandelion and white clover equivalent to MSM 60 DF at 42 g ha^{-1} and Celsius™ WG, 98% each. All treatments controlled dandelion and white clover 100%, 35 DAT. Results from this study indicate that the liquid formulation of metsulfuron controls dandelion and white clover equivalent to the dry formulation and Celsius™ WG.

EVALUATION OF DICAMBA DRIFT IN SOYBEAN WHEN APPLIED UNDER FIELD CONDITIONS. J. L. Cobb[1], D. B. Reynolds[1], J.T. Irby[1], J. K. Norsworthy[2], L. E. Steckel[3], A. Mills[4], R. Montgomery[4], J. Sandbrink[4], and K. M. Remund[4]; [1]Mississippi State University, Starkville, MS, [2]University of Arkansas, Fayetteville, AR, [3]University of Tennessee, Jackson, TN, [4]Monsanto, St. Louis, MO (138)

ABSTRACT

New transgenic crops are currently being developed by Monsanto which will be tolerant to applications of dicamba herbicide. This technology could greatly benefit producers who are impacted by weed species that have developed resistance to other herbicides, like glyphosate-resistant Palmer Amaranth. The adoption of this new technology is likely to be rapid and widespread. This would lead to an increase in the amount of dicamba herbicide which is applied each season. It is well-documented that dicamba is very injurious to soybeans, and the increased use of dicamba herbicide brings along an increased chance for occurrences of physical spray drift onto susceptible crops. Because of these risks, research is being conducted on new herbicide formulation/spray nozzle combinations to determine management options which may minimize physical spray drift.

In 2013, an experiment was designed to evaluate the potential for off-target deposition of dicamba when applied under field conditions. The experiment was conducted in Brooksville, MS, Jackson, TN, Keiser, AR, Rohwer, AR, and Scott, MS. Non-transgenic soybean were utilized as a bio-indicator because of their sensitivity to dicamba. The treated area measured 183 m long and 18 m wide (one sprayer pass). The herbicide treatment applied was a combination of MON-1750 (320 g ae glyphosate and 160 g ae dicamba per liter of product) applied at 1.68 kg ae/ha, Dipotassium phosphate at 2% v:v, and Interlock® drift retardant at 0.3 L/ha. The treatment was applied during a cross wind with target speeds between 9.6 and 16 KPH to allow herbicide drift onto the sensitive crop. Average wind speeds for Brooksville, Jackson, Keiser, Rohwer, and Scott locations were 13.4, 10.2, 7.3, 7.9, and 6.9 KPH, respectively. The application was applied to soybean at the R1 - R2 growth stage at all locations, except Keiser, where weather conditions delayed application until the R4 to R5 stage of growth. Applications were made using Turbo Teejet Induction (TTI) nozzles calibrated to deliver 140 L/ha. Each location had 3-5 transects oriented generally perpendicular to the spray direction and in the direction of prevailing wind patterns and data were collected at set distances from the sprayed field edge. Check plots were set up outside of the affected area for comparison.

Visual estimates of injury and plant heights were collected from each experimental unit 14 and 28 days after treatment. Yield plots measuring 9 m long and 1.5 m wide were set up in the same locations in order to assess any potential drift effects. Plant malformation data, plant heights, and yield data were fitted as a function of log(distance) using a segmented regression model where a linear response described distances where herbicide effects were observed and a plateau with zero slope described a distance where “no herbicide effects” were observed. No distances of plant malformation or reductions in plant heights or yield were found at the Keiser location. This could be attributed to the soybean growth stage at which the herbicide treatment was applied. At 28 DAT, the distances beyond which malformation was less than 15% were 41, 19, 33, and 29 m for Brooksville, Jackson, Rohwer, and Scott, respectively. Distances beyond which malformation was less than 5% were 78, 29, 63, and 61 m for Brooksville, Jackson, Rohwer, and Scott, respectively. Reductions in plant height at 28 DAT were found at distances of 21, 7, 14, and 12 m at Brooksville, Jackson, Rohwer, and Scott, respectively. Soybean yields were reduced out to 17, 18, and 19 m for Jackson, Scott, and Brooksville, respectively. Yield reductions at the Rohwer location were not detected.

PHYSIOLOGICAL AND ANATOMICAL BASIS FOR PALMER AMARANTH COMPETITIVENESS. S. Berger*1, J.A. Ferrell1, T.M. Webster2, D. Rowland1; 1University of Florida, Gainesville, FL, 2USDA-ARS, Tifton, GA (139)

ABSTRACT

Palmer amaranth (*Amaranthus palmeri*) continues to be a troublesome weed in the southeast. While crop yield loss due to Palmer amaranth competition has been widely documented, the basis for this has not been explored. The authors hypothesize that on the sandy soils of the southeast, the main factor driving competition is water and that Palmer amaranth has anatomical features that allow for increased water movement. To test this hypothesis, experiments were carried out in Citra, FL and Tifton, GA in 2012 and 2013. Photosynthesis and stomatal conductance measurements were taken on Palmer amaranth and weed-free cotton with a Licor 6400. Also, a sap flow system was installed at each location to determine water movement in the stems of individual Palmer amaranth and cotton plants. No differences were found in photosynthesis between Palmer amaranth and cotton. However, in Palmer amaranth water moved at a rate more than two times that of cotton (1.16 g water cm^{-2} day^{-1} and 0.41 g water cm^{-2} day^{-1}). Conversely, stomatal conductance rates were more than two times less than those of cotton (0.38 mol H_2O m^{-2} s^{-1} and 1.08 mol H_2O m^{-2} s^{-1}). These findings lead to an analysis of the tissue composition and anatomical features of Palmer amaranth to determine what, if any, features exist that enhance water use and increase water movement. These analyses were also carried out on spiny amaranth (*A. spinosus*), a close genetic relative of Palmer amaranth, as a comparison. Tissue analysis indicated that Palmer amaranth had a higher dry weight than spiny amaranth on a per unit volume basis (0.25 g cm^{-3} and 0.15 g cm^{-3}), despite the fresh weight being the same (1 g cm^{-3}). Lignin content of Palmer amaranth was double that of spiny amaranth, likely accounting for the differences in dry weight per unit volume. Finally, xylem number and percent of stem area occupied by xylem was significantly greater in Palmer amaranth (3.9%) than in spiny amaranth (1.2%). Palmer amaranth has anatomical features and tissue composition that allow this increased water movement throughout the plant, thus allowing it to be competitive in cropping situations.

EVALUATION OF AMINOCYCLOPYRACHLOR MIXTURE PLACEMENT FOR TOTAL VEGETATION MANAGEMENT IN EARLY FOREST SUCCESSION. J.J. Vargas*[1], J.T. Brosnan[1], G.K. Breeden[1], J.L. Belcher[2], D.J. Smith[3], G.R. Armel[4]; [1]University of Tennessee, Knoxville, TN, [2]DuPont Land Management, Auburn, AL, [3]DuPont Crop Protection, Madison, MS, [4]BASF Corporation, Research Triangle Park, NC (140)

ABSTRACT

Timber stand improvement is an important component in pulp or wood production. Selective chemical control of unwanted competitive species can improve stand composition, reduce maintenance costs, improve site aesthetics and accessibility, and ultimately increase timber yield. American sweetgum (Liquidambar styraciflua L.) is a persistent competitor of hardwood and softwood timber stands. Four separate studies were conducted from 2012 to 2013 in forested areas at the University of Tennessee Forest Resource and Education Center (Oak Ridge, TN). These experiments evaluated efficacy of aminocyclopyrachlor (AMCP) alone and in mixtures for control of American sweetgum via basal bark application, cut stump treatment, stem injection, or treating foliage of individual plants (IPT). All experiments were arranged as completely randomized designs with four replications. Herbicide treatments in all studies were applied on 28 May 2012.

Basal bark treatments included AMCP + basal oil (95 +5 , 92 + 8, and 90 + 10% v/v), triclopyr + basal oil (30 + 70% v/v), and AMCP + triclopyr + basal oil (5 + 5 + 90, 5 + 10 + 85, and 5 + 7 + 88% v/v). Herbicide treatments were applied with a hand-held spray bottle to completely cover the bark of each tree from the soil surface to a height of 38 cm. At application, trees ranged 1.5 to 4.6 m in height.

To apply cut stump treatments, trees that were 1.5 to 4.6 m tall were cut to a height of 15 cm. Herbicides were applied with a hand-held spray bottle to fully cover the cambium layer. Treatments included AMCP + basal oil (97.5 + 2.5, 95 + 5, and 92.5 + 7.5% v/v), triclopyr + basal oil (30 + 70% v/v), and AMCP + triclopyr + basal oil (95 + 2.5 + 2.5, 94.2 + 3.3 + 2.5, and 92.5 + 2.5 + 5% v/v).

To apply stem injection treatments, trees that were 4.6 to 7.6 m tall were wounded with a hatchet. Trees with trunks of 5 to 13 cm in diameter received one hatchet strike, while those measuring 10 to 18 cm in diameter were struck twice. The herbicide treatments were injected into the wound. Herbicide treatments included AMCP at (0.25, 0.50, 1 ml/tree) and imazapyr at (1.0 ml/tree).

Treatments for the IPT study were applied to trees ranging in height from 1.2 to 2.1 m using a CO2 backpack sprayer calibrated to deliver 215 L ha^{-1} via a single 6504E nozzle. Herbicides were applied to completely wet the foliage. Treatments included AMCP + metsulfuron (124 + 32, 225 + 61, 404 + 108 g/100 L), AMCP + imazapyr + metsulfuron (87 + 79 + 23, 180 + 159 + 48, 346 + 320 + 92 g/100 L), AMCP + triclopyr (0.5 + 0.6% v/v) and triclopyr (20% v/v).

In the basal bark study, triclopyr and mixtures of AMCP + triclopyr (containing ≥ 7% triclopyr) controlled American sweetgum 95 to 100% by 351 DAT. Basal bark applications of AMCP only provided 30 to 57% control on the same date. No significant differences were detected in American sweetgum control following cut stump applications of AMCP, triclopyr, and AMCP + triclopyr mixtures by 351 DAT. Stem injection applications of AMCP at 0.25 and 0.50 mL controlled American sweetgum less than imazapyr by 45 and 87 DAT. However, all treatments provided 91 to 100% control at 351 DAT. Similarly, no significant differences in American sweetgum control were detected with IPT applications of AMCP and mixtures of AMCP with metsulfuron and imazapyr by 351 DAT; these applications controlled American sweetgum 97 to 100% 87 DAT but reduced to 83 to 100% by 351 DAT with re-growth noted for all rates of AMCP + metsulfuron. Mixtures containing AMCP may provide a tool for control of American sweetgum and other unwanted vegetation in timber production at lower application rates than current standards. Additional research is needed to evaluate tolerance of adjacent desirable species to these applications over time.

ASSESSMENT OF HERBICIDES FOR MANAGEMENT OF A GLYPHOSATE-RESISTANT PALMER AMARANTH (*AMARANTHUS PALMERI*) POPULATION IN SOYBEAN. K.M. Vollmer*, H.P. Wilson, T.E. Hines; Virginia Tech, Painter, VA (141)

ABSTRACT

Palmer amaranth (Amaranthus palmeri) is a recent introduction to the Eastern Shore of Virginia and Maryland. In 2011, a suspected glyphosate-resistant Palmer amaranth population was reported in Hebron, MD. A dose-response analysis was conducted to determine the level of glyphosate-resistance in this population. In addition, the analysis was repeated on two other Palmer amaranth populations; a known resistant population from Virginia, and a susceptible one from Oklahoma for comparison. The studies were conducted as a randomized complete block design with 10 replications per treatment with an individual plant representing a single replication. Glyphosate was applied at 0.22, 0.43, 0.87, 1.7, 3.5, 6.9, and 14 kg ae ha-1 in combination with 2.2 kg ha-1 ammonium sulfate (AMS). Plant mortality was recorded on a 0-100 scale, with 0 being alive and 100 being complete necrosis of the plant, 28 days after treatment. LD50 values were then calculated using probit maximum likelihood analysis. The Maryland and Virginia populations had LD50 values of 1.4 and 2.8 kg ae ha-1respectively, while the Oklahoma population had an LD50 value of 0.84 kg ae ha-1. This confirms that there is glyphosate resistance in the Maryland population. In 2012 and 2013, a field study was performed at the same site in Hebron, MD to evaluate different herbicide modes-of-action alone or in tank mix combinations for PRE control of Palmer amaranth. The study was conducted as a randomized complete block design with 3 (2012) and 4 (2013) replications. Herbicides evaluated in the field study consisted of the following PRE treatments: flumioxazin (0.07), flumioxazin (0.08) + chlorimuron (0.03), chlorimuron (0.04), chlorimuron (0.01) + thifensulfuron (0.004), sulfentrazone (0.29) + imazethapyr (0.01), pendimethalin (1.6), s-metolachor (1.4), metribuzin (0.042), sulfentrazone (0.2) + metribuzin (0.3), linuron (0.7), fomesafen (0.42), and s-metolachor (1.2) + fomesafen (0.3) kg ai ha-1. Glyphosate (1.1 kg ai ha-1) + AMS (2.1 kg ha-1) was applied 12 and 26 days after initial treatment (DAIT) to all PRE plots regardless of the presence of Palmer amaranth in order to remove additional weeds. A treatment of imazamox (0.044 kg ai ha-1) + non-ionic surfactant (25% v/v) + urea ammonium nitrate (1.25% v/v) was applied 12 DAIT as a separate POST application. Plots were visually evaluated for percent control 12 and 40 DAIT on a scale of 0-100, with 0 being no control and 100 being complete control of Palmer amaranth. The study was terminated with the application of chlorimuron (0.01) + thifensulfuron (0.004) kg ai ha-1 42 DAIT to prevent any remaining Palmer from going to seed. Data were analyzed using ANOVA and means separated using Fisher's LSD (α=0.05). The majority of herbicides evaluated provided 90% control or greater 40 DAIT in both 2012 and 2013. In 2012, both flumioxazin and pendimethalin failed to provide any control of Palmer amaranth by 40 DAIT. However, in 2013, flumioxazin provided 94% and pendimethalin provided 93% control. In 2012, linuron and metribuzin both provided 92% control, but in 2013 only provided 66% and 52% control respectively. Both years s-metolachor only provided up to 65% control by 40 DAIT. POST applications of imazamox provided 99% control by 40 DAIT both years. These studies show that while this population may be glyphosate-resistant, there are still a wide variety of PRE treatments that can be used for control. While ALS-inhibiting herbicides, such as imazamox, remain effective POST options, mixing different herbicide modes-of-action will be an essential management strategy in preventing additional resistance issues.

GLYPHOSATE RESISTANCE IN RAGWEED PARTHENIUM BIOTYPE FROM SOUTH FLORIDA. J.V. Fernandez*[1], D. Odero[1], G.E. MacDonald[2], J.A. Ferrell[2], L. Gettys[3]; [1]University of Florida, Belle Glade, FL, [2]University of Florida, Gainesville, FL, [3]University of Florida, Fort Lauderdale, FL (142)

ABSTRACT

Ragweed parthenium is an aggressive annual weed commonly found in noncrop areas in the Everglades Agricultural Area (EAA) of south Florida. Growers have observed lack of control of ragweed parthenium with glyphosate at 0.84 kg ae ha^{-1}, which is commonly used for weed control in noncrop areas and fallow fields in the EAA. Greenhouse and laboratory experiments were conducted to confirm whether ragweed parthenium in the EAA has evolved glyphosate resistance and to determine if reduced absorption and translocation are the mechanisms of resistance to glyphosate. The response of rosette ragweed parthenium biotype from the EAA and a susceptible biotype from Stoneville, Mississippi to glyphosate at 0.105 to 107.52 kg ae ha^{-1} was evaluated using a dose-response bioassay. The dose-response bioassay showed that the EAA biotype was 40-fold more tolerant to glyphosate when compared to the susceptible biotype. Rosette plants of both biotypes were sprayed with glyphosate and then spiked with ^{14}C-glyphosate in the adaxial side of one fully expanded leaf of each plant. Plants were harvested 24, 72, and 168 hours after treatment (HAT) and divided into treated leaf, above treated leaf, below treated leaf and root sections to quantify ^{14}C absorption and translocation. No significant differences were observed in absorption or translocation between biotypes 24 and 72 HAT. However, significantly higher ^{14}C-glyphosate accumulation in the roots was observed in the EAA biotype compared to the susceptible biotype. These results indicate that reduced absorption and translocation were not mechanisms of ragweed parthenium from the EAA resistance to glyphosate. Therefore, further studies should be conducted to determine if altered target site or metabolism are the mechanisms of resistance of ragweed parthenium from the EAA to glyphosate.

QUANTITATIVE ANALYSIS OF ADSORPTION, DESORPTION AND FIELD DISSIPATION OF FOMESAFEN IN THREE SOILS OF GEORGIA. X. Li*[1], T.L. Grey[2], W.K. Vencill[1]; [1]University of Georgia, Athens, GA, [2]University of Georgia, Tifton, GA (143)

ABSTRACT

Fomesafen effectively controls glyphosate-resistant Palmer Amaranth when applied PPI and PRE. But its soil properties and field dissipation have not been sufficiently studied in the Southeast and carry over injury to susceptible crops is possible. Therefore, the objective of this research was to measure fomesafen adsorption, desorption from 7 soils, and to evaluate its field dissipation in two locations of Georgia (Athens and Tifton). Fomesafen adsorption coefficient (Kd) ranged from 0.4 to 11.36 and was negatively related to soil pH and CEC ($p<0.001$). Desorption was negatively related to Kd and soil organic matter but positively related to pH and CEC. Field study indicated that fomesafen dissipation varied significantly between locations: residue lasted over 120 days in Athens but was not detectable 28 days after treatment in Tifton. Half-life (DT50) of 280 g ai/ha rate were 47 and 6 days for Athens and Tifton, respectively. DT50 for 560 g ai/ha rate were 34 and 4.2 days, respectively, for Athens and Tifton. The results of this study indicated fomesafen dissipated at different rates between locations.

RESIDUAL WEED MANAGEMENT AND TOLERANCE TO PYROXASULFONE IN WINTER WHEAT.

L.A. Grier, W.J. Everman; Department of Crop Science, North Carolina State University, Raleigh, NC (144)

ABSTRACT

Pyroxasulfone, an active ingredient in Zidua (85% pyroxasulfone) and Fierce (42% pyroxasulfone + 34% flumioxazin), is active on a wide range of weeds species including annual grasses and many broadleaf weeds. A field study was conducted to evaluate weed control efficacy of and crop tolerance to pyroxasulfone in winter wheat (Triticum aestivum). This study was conducted in the fall/winter of 2011 in Clayton, NC in a no-till field with a loamy sand soil type. Preplant (PPL) treatments included Fierce at 161 g a.i. ha-1 and Zidua+Sharpen at 74+ 50 g a.i. ha-1, respectively. Preemergence (PRE) treatments included Fierce at 161 g a.i. ha-1 and Zidua+Sharpen at 74+50 g a.i. ha-1, respectively, and Prowl H2O at 1064 g a.i. ha-1. Treatments at wheat spike included Fierce at 161 g a.i. ha-1 and Zidua+Sharpen at 74+50 g a.i. ha-1, respectively, Prowl H2O at 1064 g a.i. ha-1 and Axiom at 381 g a.i. ha-1. Crop injury and henbit (Lamiaceae amplexicaule) control were rated at 1, 5, 8 and 15 weeks after wheat spike. At 1 and 8 weeks after wheat spike crop injury was greater than 60% in Fierce PRE and Fierce PPL treatments, 30% in Zidua+Sharpen PRE treatment, and 0-15% for all other treatments. At 5 weeks after wheat spike all PPL and PRE treatments and Fierce at spike showed 85% control or greater. At 15 weeks after spike, all treatments (except Prowl) provided greater than 80% control. Fierce PPL and PRE treatments showed greater than 30% reduction in yield. To further understand winter wheat tolerance to pyroxasulfone, a greenhouse variety trial was conducted with 22 varieties of winter wheat treated with 60 or 120 g a.i. ha-1 of pyroxasulfone PRE. Germination rate was recorded and height measurements were taken at 7, 14, 21 and 28 days after application. Wheat class (at 28 DAT) and wheat variety (at 7 and 28 DAT) had a significant effect on height reduction, ranging from 50-80% reduction 7 DAT and 15-65% reduction 28 DAT. At 28 DAT, the lowest injury was shown in the soft white wheat class (26%) while soft red, hard red and hard white averaged between 40-50%.

INFLUENCE OF AMINOCYCLOPYRACHLOR PLUS METSULFURON ON SEED HEAD DEVELOPMENT AND FORAGE QUALITY IN TALL FESCUE. Trevor D. Israel*, G. Neil Rhodes, Jr., Thomas C. Mueller, Gary E. Bates, John C. Waller; Department of Plant Sciences, University of Tennessee, Knoxville, TN (145)

ABSTRACT

Tall fescue (*Lolium arundinaceum*) is the major grass species found in pastures in the mid-South. Most tall fescue is infected with a fungal endophyte, *Neotyphodium coenophialum*, which imparts certain advantages to the plant such as drought tolerance, insect feeding deterrence, and enhanced mineral uptake. However, the endophyte also produces ergot alkaloids that are harmful to livestock and contribute to fescue toxicosis. Common symptoms of fescue toxicosis include increased body temperature, rough hair coats, nervousness, and reduced average daily gain (ADG). Since the alkaloids are highly concentrated in seeds and stems, a potential way to reduce the likelihood of fescue toxicosis is by suppressing seed heads with herbicides. Metsulfuron is an acetolactate synthase (ALS) inhibitor and is well documented to limit seed head formation, but also injures tall fescue. Aminocyclopyrachlor, hereafter abbreviated MAT28, a new synthetic auxin herbicide, has been registered for use in non-cropland and right-of-way applications; registration in pastures is expected in 2014. The first MAT28 pasture herbicide product to be registered will be a premixture containing metsulfuron.

Research was conducted in 2012 and 2013 using metsulfuron applied alone and in combination with other herbicides to determine the growth response of tall fescue, effects on forage quality, and potential to reduce the impact of fescue toxicosis by reducing ergot alkaloid concentration. Trials were conducted on endophyte-infected tall fescue pastures in Alcoa and Crossville, Tennessee. Experimental design was a randomized complete block with four replications and all herbicide treatments included non-ionic surfactant at 0.25%. In addition to the anticipated use rates of MAT28 plus metsulfuron, other treatments were metsulfuron alone, aminopyralid plus metsulfuron, and MAT28 plus 2,4-D. Clipping at early boot stage was also included to compare effects of herbicide applications versus mechanical removal. Visual ratings were performed monthly to evaluate fescue discoloration and stunting on a 0-99% scale. Plots were harvested in late spring and summer to determine yield, seed head density, and stem/leaf ratio. Forage quality measurements were determined using NIRS. Alkaloid concentrations were determined by ELISA.

MAT28 plus metsulfuron (78 + 12 g ai/ha), metsulfuron alone (12 g ai/ha), and aminopyralid plus metsulfuron (65 + 12 g ai/ha) stunted tall fescue more than 50% at four weeks after treatment in 2012. Tall fescue was stunted more than 45% by those same treatments in 2013. Clipping or metsulfuron applied alone or in combination with MAT28 or aminopyralid reduced seed head density by 33% or more compared to the untreated control. Clipping, MAT28 plus metsulfuron (78 + 12 g ai/ha) and metsulfuron alone (12 g ai/ha) reduced stem/leaf ratio in tall fescue at first harvest. Combined over years, yields from the spring harvest ranged from 49 to 65% of untreated for all treatments containing metsulfuron. No differences in yield were observed in the summer harvest. In 2012, forage quality was improved in treatments containing metsulfuron applied alone or in combination with MAT28 or aminopyralid, as shown by increased crude protein and total digestible nutrients (TDN) and decreased acid detergent fiber (ADF). Similar improvements in forage quality were observed in the 2013 spring harvest, but no differences were observed in the summer harvest. Metsulfuron applied alone or in combination with MAT28 or aminopyralid reduced total ergot alkaloid concentration 30 to 51% from untreated forage in the 2012 spring harvest.

When applied alone or in combination with MAT28 or aminopyralid, metsulfuron reduced seed heads and improved forage quality in tall fescue, but also caused injury and reduced spring yield. Also, metsulfuron applied alone or in combination with MAT28 or aminopyralid reduced total ergot alkaloid concentration and therefore can potentially reduce the severity of fescue toxicosis. Follow-up ratings and measurements will be performed in spring 2014. Additional research includes determining effects of application timing on tall fescue growth and yield.

CONFIRMATION OF ALS-RESISTANT RICE FLATSEDGE (CYPERUS IRIA) IN LOUISIANA. B.C. Woolam*, D.O. Stepehenson, IV, R.L. Landry; LSU AgCenter, Alexandria, LA (146)

ABSTRACT

In 2010, the recommended field rate application of halosulfuron (53 g ha^{-1}) failed to control rice flatsedge in a rice field in Louisiana. A dose response study was conducted to characterize the level of halosulfuron resistance in the greenhouse at the LSU AgCenter Dean Lee Research and Extension Center near Alexandria, LA. The experiment was arranged in as a completely random design with four replications and was repeated. Treatments included nine halosulfuron rates that included the recommended field rate, and rates above and below the recommended field application use rate. The susceptible biotype was sprayed with 1/128-, 1/64-, 1/32-, 1/16-, 1/8-, 1/4-, 1/2-, 1-, and 2-times the recommended field application use rate. The resistant biotype was sprayed with 1/4-, 1/2-, 1-, 2-, 4-, 8-, 16-, 32-, and 64-times the recommended field application use rate. All rates were applied to 8 to 10 cm rice flatsedge and included 0.25% v/v nonionic surfactant. Percent control and fresh weights were collected 28 d after treatment.

Halosulfuron, regardless of rate, did not control of the resistant rice flatsedge biotype (0% mortality). Fresh weight of the treated resistant rice flatsedge biotype ranged 10.2 to 11.7 g, which was not different than the nontreated control of 10.9 g. The susceptible biotype was controlled at least 90% and fresh weight was reduced to less than 0.25 g following application of halosulfuron at 1/32-times the recommended field use rate. Unfortunately, a resistant-to-susceptible ratio could not be determined the resistant rice flatsedge biotype was not controlled by any halosulfuron rate. Data indicates that halosulfuron-resistant rice flatsedge is present in Louisiana at rates up to 64-times the recommended field use rate.

RESPONSE OF *ECHINOCHLOA* TO HERBICIDES UNDER AEROBIC AND FLOODED CONDITION.
S.E. Abugho*, N.R. Burgos; University of Arkansas, Fayetteville, AR (147)

ABSTRACT

Rice is consumed by more than 50% of world's population as staple food and ranks second most consumed cereal. *Echinochloa spp.* is a major weed problem in rice culture because it closely resembles the crop and has evolved many ecotypes in different environments. Different methods are explored to control these species. A greenhouse study was conducted from October 2013 to January 2014 at the University of Arkansas-Fayetteville using 10 accessions from four species commonly found in Arkansas to determine its response to water availability and herbicide. Water regimes included aerobic, flooded and water-seeded treatments. Herbicide (thiobencarb) was applied at 4 lb ai acre^{-1} and 2 lb ai acre^{-1} at 4 wk after sowing (WAS). A check without herbicide was included. Emergence count and plant height were recorded. Flooded treatments reduced the emergence of the majority of accessions regardless of herbicide treatment. Thiobencarb at 4 lb ai acre^{-1} controlled all *Echinochloa spp.* regardless of water treatment, but some species had survivors at the half rate. Survivors were observed from accession 6 (*E. colona*), 7 (*E. colona*), and 8 (*E. walteri*) at the sublethal dose. Accessions 1 (*E. colona*) and 7 (*E. colona*) were the tallest plants. Accession 5 (*E. colona*) and 7 (*E. colona*) had the highest germination capacity at 50% and 55%, respectively. This was observed when no herbicide was applied and the soil was not flooded. The lowest emergence (6-10%) was observed when *Echinochloa* was water-seeded and treated with thiobencarb. Thus, we learned that all *Echinochloa* species and ecotypes tested were sensitive to thiobencarb, but some ecotypes could escape a sublethal dose, which can potentially occur at any time in the field due to environmental, edaphic, and plant variability. Flooding, in itself, significantly reduces *Echinochloa* emergence. Follow-up experiments will be conducted to determine how species, herbicide, and water regime interaction is modified by soil and environmental conditions.

Nomenclature: aerobic; flooded; water-seeded; thiobencarb; Echinochloa

GLYPHOSATE, GLUFOSINATE AND 2,4-D COMBINATIONS FOR THE CONTROL OF GLYPHOSATE-RESISTANT PALMER AMARANTH (*AMARANTHUS PALMERI*). B.H. Lawrence*[1], T.W. Eubank[2], C.B. Edwards[2], J.P. Mangialardi[1], J.A. Bond[2]; [1]Mississippi State University, Starkville, MS, [2]Mississippi State University, Stoneville, MS (148)

ABSTRACT

Glyphosate–resistant (GR) Palmer amaranth (*Amaranthus palmeri*) has become one of the more prolific and troublesome weeds in Midsouth production agriculture. Alternative herbicide options are needed to help manage GR Palmer amaranth. 2,4-Dichlorophenoxyacetic acid (2,4-D) is the oldest and one of the most widely used systemic herbicides. In Mississippi soybean (*Glycine max*), 2,4-D is primarily used for the control of broadleaf weed species during winter burndown applications prior to planting. Emerging technologies, such as 2,4-D- tolerant soybean, offer new opportunities to manage GR weeds. Research is needed to determine the most efficacious programs for the control of GR Palmer amaranth with 2,4-D. The objective of this study was to evaluate the efficacy of glyphosate, glufosinate and 2,4-D combinations on the control of GR Palmer amaranth.

Field experiments were conducted at Mississippi State University, Delta Research and Extension Center in Stoneville, MS. Studies were established as a factorial arrangement of treatments within a randomized complete block design. Factors included: glyphosate at 0 and 0.86 kg ae/ha; glufosinate at 0 and 0.59 kg ai/ha; and 2,4-D at 0, 0.56, and 1.14 kg ae/ha. Treatments were applied when Palmer amaranth reached a uniform size of 5 and 15 cm using a tractor mounted sprayer fitted with XR11002 TeeJet nozzles, calibrated to deliver 140 L/ha water at 248 kPa. Visual control estimates were taken 7, 14, 21 and 28 days after treatment (DAT). Palmer amaranth densities were taken and above ground plant portions were harvested within two m^2 areas of each plot at 28 DAT. Plants were oven dried at 60ËšC for 7 days. Percent biomass reductions were calculated as compared to the nontreated from each replicate.

For visual estimates a three way interaction was observed between the three factors for the 5 cm timing. Glyphosate alone provided only 28% control of 5 cm Palmer amaranth and was not better than 0.56 kg/ha 2,4-D alone at 33% control. The highest rate of 2,4-D alone provided only 48% control of 5 cm Palmer amaranth. Glufosinate alone provided 63% control of 5 cm Palmer amaranth and was comparable to the combination of glyphosate plus 1.12 kg/ha 2,4-D at 60% control. It is the authors’ opinion that the poor control with glufosinate alone was due to an early morning application. Highest levels of 5 cm Palmer amaranth control were observed when glufosinate was combined with 0.56 and 1.12 kg/ha 2,4-D providing 80 and 78% control, respectively, or the three way combination of glufosinate plus glyphosate plus 0.56 and 1.12 kg/ha 2,4-D providing 80 and 85% control, respectively. There was an interaction between glufosinate and 2,4-D on the reduction of Palmer amaranth counts with the combination of glufosinate plus 0.56 and 1.12 kg/ha 2,4-D reducing populations 76 and 83%, respectively. However, for percent biomass reduction of 5 cm Palmer amaranth there was only a main effect of 2,4-D where biomass was reduced 48 and 56% at the 0.56 and 1.12 kg/ha 2,4-D rate, respectively. For the control of 15 cm Palmer amaranth there was an interaction between the combination of glyphosate and 2,4-D in that the combination of glyphosate plus 0.56 and 1.12 kg/ha 2,4-D provided 81 and 87% control, respectively. Interactions were also observed with the combination of glufosinate plus either rate of 2,4-D providing 93% control. Similarly, interactions were observed for 15 cm Palmer amaranth populations in that combinations of glyphosate plus 2,4-D reduced populations at least 72% but were not significantly different from glyphosate alone of 74%. Additionally, glufosinate plus 2,4-D reduced populations at least 84% but was not significantly different from glufosinate alone at 81%. Only the combination of glufosinate plus 0.56 and 1.12 kg/ha 2,4-D significantly reduced plant biomass at 97 and 98% reduction, respectively.

INFLUENCE OF VINASSE AND BIOCHAR ON THE GERMINATION AND GROWTH OF THREE WEED SPECIES. N. Soni*[1], R.G. Leon[1], J.E. Erickson[2], J.A. Ferrell[2], and Maria Silveira[3]. [1]University of Florida, Jay, FL, [2]University of Florida, Gainesville, FL, [3]University of Florida, Ona, FL (149)

ABSTRACT

Vinasse and biochar are by-products produced in large quantities in biofuel production. The incorporation of those materials back to the field can contribute to nutrient cycling and soil quality improvement. Benefits of vinasse and biochar on soil properties are well documented. However, little is known about vinasse and biochar impact on weed communities. We hypothesized that weed seed germination and growth could be influenced by the addition of vinasse and biochar to the soil, and that different weed species would show different responses to vinasse and biochar. Weed conducted laboratory and growth chamber experiments to determine the influence of vinasse and biochar on the germination and growth of palmer amaranth, southern crabgrass and sicklepod. Seeds and seedlings of these weed species were incubated in a sandy loam soil mixed with four rates of vinasse (0, 10, 20, and 40 L m-2) and biochar (0, 0.5, 2.5, and 12.5 kg m-2). Overall, the addition of biochar to the soil did not affect the germination of any of the studied species. However, the highest biochar rate decreased growth (10-20% reduction) of sicklepod and southern crabgrass compared to the non-treated control. Germination was negatively affected for all three species by the addition of vinasse. Southern crabgrass and palmer amaranth decreased seed germination and viability as the rate of vinasse increased. Vinasse at the highest rate (40 L m-2) reduced germination in 91, 71 and 89 % for palmer amaranth, southern crabgrass and sicklepod, respectively compared to the non-treated control. Germination reduction was mainly due to seed death. Sicklepod was more tolerant than palmer amaranth and southern crabgrass to vinasse. Vegetative growth parameters were negatively influenced in the three weed species when vinasse was applied at the highest rate (40 L m-2). Vinasse at 10 L m-2 increased biomass, leaf number and leaf area of southern crabgrass. These results suggest that the incorporation of vinasse as a soil amendment into current cropping systems could favor weed community shifts due differential effects in germination and growth of weed species.

INFLUENCE OF SPRAY TIP AND HERBICIDE PROGRAM ON PALMER AMARANTH CONTROL.
D.Z. Reynolds*1, D.M. Dodds1, C.A. Samples2, T.H. Dixon1, J.D. Copeland1, J. Mills3; 1Mississippi State University, Starkville, MS, 2Mississippi State University, Mississippi State, MS, 3Monsanto Company, Collierville, TN (150)

ABSTRACT

Experiments were conducted in 2012 and 2013 at Dundee, MS and Robinsonville, MS to determine the effect of spray tip and herbicide program on glyphosate-resistant Palmer amaranth control. Experiments were initiated in grower fields with heavy natural infestations of glyphosate-resistant Palmer amaranth. Applications were initiated when Palmer amaranth plants were 10 to 15 cm in height. Applications were made with a CO_2 pressurized backpack sprayer with 324 kPa pressure and an application volume of 140 L/ha. Treatments utilized in these experiments included: dicamba at 0.6 kg ai/ha; glufosinate at 0.6 kg ai/ha; dicamba + glufosinate at 0.6 kg ai/ha; dicamba + glufosinate at 0.3 kg ai/ha each; and glyphosate + dicamba at 0.75 kg ae/ha and 0.6 kg ai/ha, respectively. All herbicide treatments were applied using each of the following spray tips: Extended Range Flat Fan, Greenleaf Asymmetric Dual Fan, Extended Range Air Induction, and Turbo Teejet Induction. All tips utilized in these studies delivered 0.06 liters per minute (0.015 GPM) at 276 kPa. At application, water sensitive spray cards were placed in plots to determine percent coverage from the spray solution. Visual estimates of weed control, the number of Palmer amaranth plants per square meter, and height of Palmer amaranth plants in each square meter were collected weekly following herbicide application. In addition, above ground plant biomass from a one square meter area in each plot was collected four weeks after application and dried in a forced air dryer for one week. Experiments were conducted using a factorial arrangement of treatments in a randomized complete block design with four replications. Visual estimates of weed control, number of plants per square meter, plant height, and plant biomass were subjected to analysis of variance and means were separated using Fisher's Protected LSD at $p = 0.05$.

Two weeks after application, dicamba + glufosinate at 0.6 kg ai/ha provided greater than 80% reduction in total plants compared to the untreated check. Glufosinate alone, glyphosate + dicamba, dicamba + glufosinate at 0.3 kg ai/ha, and dicamba alone provided 70, 56, 61, and 46% reduction in the total number of plants per square meter, respectively, two weeks after treatment. Dicamba + glufosinate at 0.6 kg/ai significantly reduced plant heights compared to all other treatments. Visual estimates of control indicated that dicamba + glufosinate at 0.6 kg ai/ha provided 90%control two weeks after application. Similar control was observed following application of glufosinate alone and glyphosate + dicamba two weeks after treatment. Four weeks after treatment, dicamba + glufosinate at 0.6 kg ai/ha reduced the total number of plants and plant height approximately 80% compared to the untreated check. In addition, glyphosate + dicamba reduced the total number of plants by 60%. Visual estimates of weed control and reduction in above ground biomass were similar in that dicamba + glufosinate at 0.6 kg ai/ha and glyphosate + dicamba each provided greater than 50 to 80% reductions compared to the untreated check.

While spray tip selection did not affect efficacy of herbicides, tip selection did affect coverage. Spray card data revealed that Extended Range Flat Fan had significantly higher percent coverage than the other tips. The Greenleaf Asymmetric Dual Fan, Extended Range Air Induction, and the Turbo Teejet Induction tips were all significantly different and provided 62, 53, and 34% coverage, respectively. Herbicide programs did not significantly affect the coverage from a given spray tip.

The Turbo Teejet Induction tip produced the largest spray droplets, regardless of herbicide. Less than 10% of the total droplets produced were less than 450 microns in size. Depending on herbicide, 40 to 60% of the total droplets produced by the Turbo Teejet Induction spray tip were greater than 730 microns in size. However, approximately 50% of the total droplets produced by an extended range flat fan tip where less than 200 microns in size.

Spray tip selection did not impact efficacy of the herbicides tested on Palmer amaranth. The most consistent treatments were dicamba + glufosinate at 0.6 kg ai/ha and glyphosate + dicamba. However, no single treatment provided adequate control four weeks after application. A combination of herbicide applications and timings is recommended for season long control of glyphosate resistant Palmer amaranth.

EFFECT OF VEGETATION-FREE STRIP WIDTH IN ESTABLISHED 'NAVAHO' BLACKBERRY ON GROWTH, YIELD, AND FRUIT QUALITY N.T. Basinger[1], K.M. Jennings[1], D.W. Monks[1], W.E. Mitchem[1], S.L. Meyer[2]; [1]North Carolina State University, Raleigh, NC 27695 [2]Mississippi State University, Mississippi State, MS (151)

ABSTRACT

A field study was conducted at three locations in North Carolina to determine the influence of vegetation-free strip width (VFSW) on blackberry growth, yield, and individual berry quality in three-year-old established 'Navaho' blackberry plantings.

At three field locations, two at the Sandhills Research Station near Jackson Springs, NC and one at Killdeer Farm near Kings Mountain NC, VFSW treatments were established in Fall of 2011 and Spring of 2013 respectively. VFSW treatments consisted of 0, 0.6, 1.2 and 1.8 m and were established with a tank-mix of terbacil and paraquat. The experiments were randomized complete block design with four replications. Vegetative growth measurements were taken after harvest and included primocane and floricane number, length and diameter and floricane weight. At the Killdeer site at berry set, berries were counted in 5 ft sections of each plot and multiplied by the average individual berry weight over the season. At the Sandhills site at final harvest, remaining unripe berries were counted and weight estimated by multiplying average berry weight over the season. To measure berry quality, berries were hand harvested weekly from late June to late July 2013. Fifty berries were harvested from each plot: twenty-five at a minimum ripeness of 'shiny black' and 25 at a ripeness of 'dull black', transported on ice and stored at -18^{o}C until berry analysis was conducted. To measure berry quality, berries were thawed and homogenized. Soluble solids concentration (SSC) was measured using a digital refractometer. Titratable acidity (TA) and pH were measured using a 2 g aliquot puree in 60 ml of deionized water. Berries were titrated to an endpoint pH of 8.2 using 0.95N, NaOH and results are expressed in percent citric acid. Data was subjected to ANOVA analysis by SAS Proc GLM.

Location by treatment effect was not significant; therefore data was combined over locations. Primocane number increased from 2.99 to 4.36 with VFSW at 0 and 1.8 m. Yield data was analyzed as percent of check (VFSW 0 m). Greater yield was observed at VFSW 0.6 and 1.2 m with percent of check yield 132.4 and 134.7 respectively. Individual berry weight decreased from 4.04 g (VFSW 0) to 3.57 g (VFSW 1.8 m).

These observations indicate that berry size decreased and primocane number increased as VFSW increased.

COTTON INJURY BY AUXIN HERBICIDES AS AFFECTED BY GROWTH STAGE. G. Oakley, A. Blaine, D. Reynolds; Mississippi State University, Mississippi State, MS (152)

ABSTRACT

New herbicide tolerant crops technologies may provide many benefits for producers such as alternative control options, resistance management with the incorporation of alternative modes of action, and an increase in yields. However, their introduction may also increase concern for issues such as herbicide drift, volatilization, and tank contamination. Research has been conducted with application of low concentrations of various herbicides to a variety of crop species to assess their effect on growth and yield. Some of these herbicides have shown differences in potential for injuring a crop in relation to the crop's development stage at the time of application.

An experiment was conducted to assess the effect of application timing on the injury potential of dicamba and 2,4-D to cotton growth and yield. The dimethylamine salt of 2,4-D and the diglycolamine salt of dicamba was applied at a rate of 1 fl oz/ A from one to fourteen weeks after cotton emergence. Crop growth stage and height were recorded at each application along with environmental data. The experiment was conducted at two locations (Starkville & Brooksville, MS) in a randomized complete block design with four replications. Plots were 4 rows (12.66 ft) wide by 40ft long. The center two rows of each plot received the herbicide treatments and yields were taken from these 2 center rows.

Visual injury was assessed for each plot 7, 14, 21, and 28 days after treatment (DAT). Plant heights were taken prior to harvest. Results showed cotton treated with Dicamba exhibited the greatest visual injury 5 to 7 weeks after emergence (WAE), between the development of the first square and the first bloom. Cotton treated with 2, 4-D exhibited the greatest injury from 3 to 5 WAE. In general, cotton yields were decreased with both herbicides regardless of when it was applied. Cotton yields were reduced the greatest amount (48-60%) with 2,4-D when applications occurred 4 - 7 WAE. For dicamba, yield losses were the greatest (27-41%) when applied at 5, 7, and 8 WAE. The data concludes that the growth stage of cotton is an important factor in its susceptibility to low dose concentrations of 2,4-D and dicamba.

RICE CULTIVAR RESPONSE TO SAFLUFENACIL. G.B. Montgomery*, J.A. Bond, T.W. Eubank, T.W. Walker, H.M. Edwards; Mississippi State University, Stoneville, MS (153)

ABSTRACT

Saflufenacil is a protoporphyrinogen IX oxidase (PPO)- inhibiting herbicide first labeled for use in 2009. Saflufenacil exhibits both postemergence and residual control of broadleaf weed species and is labeled in several crops. Saflufenacil labeling was updated to include burndown for rice in 2011, but applications are restricted to 15 days prior to planting. The label will be updated to allow in-season applications to rice in 2014. Rice cultivar and growth stage can impact rice tolerance to herbicides, and long-grain cultivars typically exhibit greater tolerance than medium-grain and hybrid cultivars. Research was conducted to evaluate the tolerance of five commercial rice cultivars to in-season applications of saflufenacil and carfentrazone.

The study was conducted once in 2012 and twice in 2013 at the Delta Research and Extension Center in Stoneville, MS. Treatments were arranged as a two-factor factorial within a randomized complete block design with four replications. The first factor was rice cultivar and consisted of inbred long-grain cultivars ‘CL151’ and ‘Cheniere’, inbred medium-grain cultivars ‘CL261’ and ‘Caffey’, and hybrid long-grain cultivar ‘CLXL745’. The second factor was herbicide and consisted of no herbicide, saflufenacil at 0.0445 lb ai/A, and carfentrazone at 0.313 lb ai/A. Crop oil concentrate at 1% (v/v) was included with each herbicide treatment. Treatments were applied when rice had reached the three- to four-leaf stage with a CO_2 pressurized backpack sprayer calibrated to deliver 15 gallons per acre. Rice injury was visually estimated at 3, 7, 14, and 28 days after treatment (DAT). The number of days to 50% heading was recorded as an indication of rice maturity. Mature height and rice yield (rough, total, and whole milled rice) were determined at the end of the season. All data were subjected to ANOVA and estimates of the least square means were used for mean separation with $\alpha = 0.05$.

The main effects of cultivar and herbicide and all interaction containing these variables were not significant for days to 50% heading, mature height, and rice yield (rough, whole, and total milled rice). A main effect of cultivar was detected for rice injury. Pooled across herbicide treatments and evaluation intervals, CLXL745 (13%) was injured more than CL151 or Cheniere (10% and 9%, respectively). Rice injury was similar at 3 and 7 DAT regardless of cultivar or herbicide treatment. Injury declined to 5% at 14 DAT, and by 28 DAT, injury was only 1%.

Although differences in injury were noted among the cultivars evaluated, injury following saflufenacil was similar to that following carfentrazone, which is currently labeled for in-season applications. Moderate injury was observed following applications of saflufenacil at two times the proposed labeled rate. Rice was able to recover from injury observed following herbicide application with no negative impact on maturity or rough, total, whole, and milled rice yield. Results indicate that, even though rice injury occurs following application, saflufenacil is safe for application to rice cultivars currently grown in the south U.S. rice belt.

POST CORN HARVEST PALMER AMARANTH CONTROL. W.D. Crow*, L.E. Steckel, and R. M. Hayes. University of Tennessee, Jackson, TN (154)

ABSTRACT

Palmer amaranth is one of the most problematic weed species in Southern US corn production. Recent increases in the prevalence of glyphosate resistant (GR) palmer amaranth mandate that new control strategies be developed to optimize weed control and crop performance. To this end, field studies were conducted using small plots to evaluate post-corn harvest weed management programs for prevention of seed production from glyphosate resistant (GR) palmer amaranth, and to evaluate herbicide carryover to winter wheat. Treatments were applied post-harvest to corn stubble, with two treatments followed by a preemergence herbicide application of chlorsulfuron or pyroaxsulfone at wheat planting. Post-corn harvest herbicide were applied to corn stubble containing 6 to 50 cm palmer amaranth. Paraquat at a rate of 840 g ai ha -1 alone controlled 83% of existing palmer amaranth but did not prevent emergence of new plants. Paraquat tank-mixed with a residual herbicide of metribuzin, s-metolachlor, pyroaxsulfone, saflufenacil, or flumioxazin controlled regrowth and new emergence not controlled by paraquat. Addition of residual herbicides provided 10 to 15% more control than paraquat alone. There was some early wheat stand reduction due to preemergence herbicide injury that ranged from 8 to 15%. However, this injury had no adverse effect on wheat yield. These data would suggest that all residual herbicide treatments were equivalent in terms of GR palmer amaranth control. Future research should be conducted to determine the best weed management program for controlling GR palmer amaranth after corn harvest.

SHARPEN FOR WEED CONTROL IN RICE. J.C. Fish*, E.P. Webster, B.M. McKnight; LSU AgCenter, Baton Rouge, LA (155)

ABSTRACT

Saflufenacil is a new protoporphyrinogen IX oxidase (PPO) inhibiting herbicide for preplant burndown and selective PRE dicot weed control in multiple crops. Herbicides that inhibit PPO control weeds, by inhibiting the synthesis of chlorophylls, hemes, and cytochromes in the chloroplasts. The aim of these studies was to evaluate the potential uses of saflufenacil when mixed with other herbicides commonly used in rice production.

Three studies were established to evaluate saflufenacil when mixed with multiple propanil and propanil containing products. All three studies had a randomized complete block arrangement design in a two factor factorial. In the first study, Factor A consisted of saflufenacil at 0 and 0.355 kg ai ha^{-1}, factor B consisted of propanil (EC) at 0, 1.12, 2.24, 3.36, and 4.48 kg ai ha^{-1}. In the second study, factor B was changed to propanil (SL) at 0, 1.12, 2.24, 3.36, and 4.48 kg ai ha^{-1}. In the third study, factor B was changed to a propanil plus thiobencarb prepackage mix at 0, 1.51, 3.02, 4.54, and 6.05 kg ai ha^{-1}. All treatments were applied mid-postemergence (MPOST) to 3- to 4-leaf rice. The entire research area received clomazone at 0.336 kg ha^{-1} applied preemergence.

At 7 days after treatment (DAT), alligatorweed [*Alternanthera philoxeroides* (Mart.) Griseb.], yellow nutsedge (*Cyperus esculentus* L.), and rice flatsedge (*Cyperus iria* L.) control increased with mixtures containing saflufenacil mixed with propanil (EC) at 4.48 kg ha^{-1} and propanil (SL) at 3.36 kg ha^{-1} compared with all herbicides applied alone. At 21 DAT, no differences were observed for weed control. At 35 DAT, alligatorweed control was increased in mixtures containing propanil (EC) at 3.36 kg ha^{-1} mixed with propanil plus thiobencarb at 3.02 kg ha^{-1} compared with herbicides applied alone.

At 7 DAT, crop injury increased in mixtures containing saflufenacil compared with propanil applied alone by increasing injury from 19 to 22% without saflufenacil to 30 to 38% with saflufenacil. At 21 DAT, crop injury increased in mixtures containing saflufenacil compared with propanil applied alone by increasing injury from 16 to 19% without saflufenacil to 25 to 26% with saflufenacil. At 35 DAT, crop injury increased in mixtures containing saflufenacil compared with propanil applied alone by increasing injury from 10 to 14% without saflufenacil to 16 to 20% with saflufenacil. There was no difference in yield with rice treated with saflufenacil plus propanil (SL) or propanil plus thiobencarb compared with the nontreated.

THE EFFECT OF DICAMBA CONCENTRATION AND APPLICATION TIMING ON SOYBEAN (*GLYCINE MAX*) GROWTH AND YIELD. Alanna R. Blaine[1], Daniel B. Reynolds[1], Tom W. Eubank[1], and L. Thomas Barber[2]; (1) Mississippi State University, Mississippi State, MS, (2) University of Arkansas, Little Rock, AR (156)

ABSTRACT

With the development of cropping systems containing the new auxin-resistant traits, producers will have additional weed control options. These traits will offer many benefits to producers but will require precautions to ensure they do not injure susceptible crop and non-crop species. Trace amounts of dicamba or 2,4-D onto sensitive species can result in severe injury or even death to the plant. Susceptible plant species could be subjected to these trace concentrations from spray drift, contaminated spray equipment, and volatility from applications applied to other crops.

The objectives of this research were to determine how reduced rate concentrations of dicamba would affect soybean growth and yields, as well as determining which growth stage is most sensitive to dicamba. The diglycoamine formulation of dicamba (Clarity 4L) was used for these experiments. Separate experiments for each objective were conducted over six site years (in four different locations). Soybean varieties varied among locations but a late 4 or early 5 indeterminate variety was utilized at all locations. For the first objective, Factor A was application timing and Factor B consisted of the rates of application. For Factor A, each rate was applied to soybeans at two stages of growth. One was applied at the vegetative stage (V3) and one was applied at the reproductive stage (R1). For Factor B, an X rate for each herbicide was set as 0.56 kg ae/ha. Dicamba was applied at a 1X, 1/4X, 1/16X, 1/256X, 1/1024X, and 0X rate. For the second objective, an application of 1/16X (.00875 kg ae/ha) dicamba was applied to soybeans. The applications were made weekly until the soybeans reached physiological maturity. Soybean growth stage was recorded at each application in order to determine the most sensitive application timing. Each experiment contained four replicates and experimental units consisted of 4 rows 97 m wide by 12.1 m in length. The center two rows of each experimental unit were treated and evaluated visually and harvested for yield determinations. Treatments were applied in a total delivery volume of 140 liters per hectare.

Visual injury estimates, plant heights, and yield data were collected for all experiments. For objective 1, at 28 days after application, significant visual injury occurred from all dicamba treatments (26-98%). Soybean height and yield reductions did not exhibit an interaction; however, both rate of application and application timing were significant. Dicamba applied at 1X, 1/4X, 1/16X, 1/64X, 1/256 X, and 1/1024X rate resulted in a 99, 86, 59, 30, 20, and 10% yield reduction, respectively, when averaged over both application timings. When averaged over all rates of application, the R1 application timing resulted in an 46% yield loss as compared to the 41% from the application at the V3 growth stage. For the second objective, at 28 days after application, the greatest injury (38- 42%) was observed at three to six weeks after soybean emergence, corresponding with the V6, R1, and R2 growth stages. No significant visual injury or height reductions were recorded after the 8 week application was made (R4 growth stage). Yield reductions were greatest at weeks 3, 4, 5, and 6 (41-51%), corresponding with the V4, V6, R1, and R2 growth stages.

EFFECT OF IRRIGATION TIMING ON CREEPING BENTGRASS (*AGROSTIS STOLONIFERA* L.) TOLERANCE TO AMICARBAZONE APPLICATIONS. D.J. Mahoney*, M.D. Jeffries, F.H. Yelverton, and T.W. Gannon; North Carolina State University, Raleigh, NC (157)

ABSTRACT

Amicarbazone is a triazolinone herbicide that inhibits photosystem-II in susceptible species. In 2012, amicarbazone was registered for annual grass and broadleaf weed control in established cool- and warm-season turfgrass systems, including creeping bentgrass. Currently, amicarbazone use on creeping bentgrass golf course putting greens (GCPG) is allowed; however, there is concern of unacceptable injury following application. Past research has shown that irrigation following an herbicide application may allow for adequate weed control while reducing crop injury. Research to date has not evaluated the effect of irrigation timing following an amicarbazone application on creeping bentgrass GCPG injury. Field research was conducted in North Carolina in the fall of 2011 and spring of 2012 on three creeping bentgrass cultivars (*Agrostis stolonifera* L. 'A4', 'Crenshaw', or 'Penncross') maintained at 0.32 cm. A factorial arrangement of three amicarbazone rates (98, 196, or 294 g ai ha^{-1}) with a nonionic surfactant (0.25% v v^{-1}) and four 0.3 cm irrigation timings (no irrigation, immediately irrigated, 1 hr, or 24 hr after application) were evaluated. Visual bentgrass injury (0-100%; where 0 = no injury and 100 = complete plant death) and bentgrass color (1-9; where 1 = no green foliage, 7 = nontreated, and 9 = dark-green foliage) were visually estimated. Four replicates, including a nontreated control, were arranged in a randomized complete block design. In agreement with previous research, fall applications were more injurious than spring applications. Irrigation timing had an effect on injury; however, irrigation did not consistently reduce injury following application across cultivars and rates. At 9 DAT, no injury was observed across all treatments and cultivars. At 16 DAT, irrigation 1 and 24 hr after application provided more injury (11%) than immediate or no irrigation (7 and 8%, respectively). A cultivar by rate interaction was detected with injury increasing with rate. 'Penncross' was the most injured at 196 and 294 g ha^{-1} (13 and 25%, respectively) compared to 'A4' (8 and 12%, respectively) and 'Crenshaw' (8 and 12%, respectively). Similar trends were observed 23 DAT with injury increasing with rate. 'Crenshaw' (10%) was more injured than 'A4' (7%) at 294 g ha^{-1} while 'Penncross' (8%) was similar to both aforementioned cultivars. A cultivar by irrigation timing was detected with irrigation 24 h after application providing least injury (3%) to 'Crenshaw' and immediate irrigation causing the least injury (3%) on 'Penncross'. No differences in irrigation timing were observed on 'A4' with ≤ 5% injury across all timings. Injury was not observed on 'Penncross' 30 DAT; however, injury was observed on 'A4' and 'Crenshaw' at 294 g ha^{-1} with immediate irrigation (6 and 4%, respectively). Further, 'A4' and 'Crenshaw' turf quality data supported this with the lowest rating (6.6) observed at the same rate and irrigation timing. After 30 DAT, all species had recovered. Results suggest that irrigation 1 or 24 hr after treatment may be more injurious than irrigating immediately after treatment. Further, a fall application of amicarbazone for annual bluegrass (*Poa annua* L.) control may be viable as injury never exceeded 13% (excluding 294 g ha^{-1}16 DAT on 'Penncross'). Future research should investigate the effects of irrigation timing on weed control in creeping bentgrass.

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FLURIDONE CARRYOVER FROM COTTON TO MULTIPLE CROP SPECIES A YEAR AFTER APPLICATION. Z.T. Hill, J.K. Norsworthy, H.D. Bell, B.W. Schrage, C.J. Meyer, and M.T. Bararpour; University of Arkansas, Fayetteville, AR (158)

ABSTRACT

Currently, the University of Arkansas recommends that cotton producers apply seven herbicide applications throughout the season; which consists of four to five preemergence herbicides tank-mixed with a number of postemergence herbicides. To ensure that we sustain the effectiveness of the currently recommended herbicides we must look at other options. Although it was never marketed for use in cotton, the herbicide fluridone is known to have a high tolerance in cotton, to provide a high level of extended control of redroot pigweed, and to be highly persistent in soils. Due to the specific tolerance of fluridone exhibited by cotton and the high persistence in soils, the risk of crop injury may be high for crops rotated with cotton treated with fluridone. In 2012, a cotton research trial was initiated at research centers in Fayetteville, AR, Pine Tree, AR, Keiser, AR, and Rohwer, AR; consisting of two soil textures silt loam locations and two clay locations. This trial was setup as a randomized complete block design, with four replications. Herbicide treatments consisted of fluridone at 0.2, 0.4, 0.6, 0.8, and fluometuron at 1.0 lb ai/A applied preemergence. In 2013, grain sorghum, rice, wheat, corn, soybean, and sunflower cultivars were planted into the treated plots from 2012. Only the two silt loam locations Fayetteville, AR, and Pine Tree, AR, were analyzed in this experiment due to injury from fluridone being greater in silt loam soils than clay soils. Wheat had the highest injury level from fluridone compared to other crops due to being planted closer to the application date with greater than 20% injury, while no more than 12% injury was observed in the five remaining crops at both silt loam locations. The observed injury quickly dissipated in all crops as the crops matured throughout the season. Crop yields in fluridone-treated plots were always comparable to fluometuron, except for wheat at Fayetteville and grain sorghum at Pine Tree. In conclusion, residual carryover can be observed from fluridone on crops that are typically in rotation with cotton the year after application, albeit the rates for which carryover were observed are four to six times the likely labeled rate.

POSTEMERGENCE CONTROL OF GLYPHOSATE-RESISTANT *AMARANTHUS PALMERI* WITH COMBINATIONS OF MESOTRIONE, FOMESAFEN AND GLYPHOSATE. J.P. Mangialardi*[1], T.W. Eubank[2], C.B. Edwards[2], B.H. Lawrence[1], J.A. Bond[2], B.R. Golden[2]; [1]Mississippi State University, Starkville, MS, [2]Mississippi State University, Stoneville, MS (159)

ABSTRACT

Mesotrione is an HPPD (4-hydroxyphenylpyruvate dioxygenase)-inhibiting herbicide that has been shown to provide preemergence and postemergence control of annual broadleaf and grass species. Glyphosate-resistant (GR) Palmer amaranth has become one of the most problematic weeds to growers in the southeastern United States. Alternative herbicide options are needed in the management of GR Palmer amaranth. Novel herbicide tolerance to mesotrione in soybean (*Glycine max*) is planned for launch in the near future. The objectives of this study were to identify optimum use rates of mesotrione for the postemergence control of Palmer amaranth and to determine if control may be improved when applied in combination with glyphosate or fomesafen.

Field and greenhouse studies were conducted in 2013, at Mississippi State University, Delta Research and Extension Center in Stoneville, MS. In greenhouse trials, Palmer amaranth was seeded into trays and then transplanted to 10 cm pots once plants reached 1 cm in height. Herbicide treatments were initiated when plants uniformly reached 5 and 10 cm in height which corresponded to leaf numbers of 2 to 3 leaves and 4 to 6 leaves, respectively. Trials were set up in a randomized complete block (RCB) design with four replications. Each study was repeated three times. Herbicide treatments were mesotrione at 0, 40, 70, 110, 140, and 170 g/ha. All treatments included a COC at 1% v/v. Treatments were applied with XR TeeJet 8002E nozzles calibrated to deliver 140 L/ha at 220 kPa. Visual ratings were taken at 7, 14, and 21 DAT, and plant heights and biomass were taken 21 DAT. Biomass reductions were calculated as a percent reduction of each treatment compared to the nontreated control. Mesotrione at 40 and 70 g/ha provided only 48% control of 5 cm Palmer amaranth 21 DAT. Mesotrione at 110 g/ha provided 77% control of 5 cm Palmer amaranth 21 DAT and was not different than rates of 140 and 170 g/ha at 78 and 80% control, respectively. The highest level of % biomass reduction was observed with 140 g/ha mesotrione reducing 5 cm Palmer amaranth by 96% but was comparable to 110 g/ha mesotrione at 85%. Control of 10 cm Palmer amaranth 21 DAT was variable in that the 110 and 170 g/ha mesotrione rates provided 49 and 48% control, respectively but were only significantly different than 40 g/ha mesotrione at 35%. All treatments reduced 10 cm Palmer amaranth biomass at least 38% as compared to the nontreated but there were no differences across mesotrione rates.

For field experiments, trials were set up as a factorial arrangement of treatments in a RCB design with four replications. Factors included: glyphosate at 0 and 860 g/ha; fomesafen at 0 and 260 g/ha; and mesotrione at 0, 50, 110, and 160 g/ha. Treatments were applied with a tractor mounted sprayer calibrated to deliver 140 L/ha through XR TeeJet 11002 nozzles at 248 kPa. Visual ratings were taken at 7, 14, 21, and 28 DAT. Weed density counts and plant biomass were taken within an m2 from each plot at 28 DAT. Biomass reductions were calculated as mentioned previously. Fomesafen alone provided 96% control of 5 cm Palmer amaranth 28 DAT and the addition of mesotrione, regardless of rate, did not significantly improve control. Mesotrione rate of 110 g/ha reduced 5 cm Palmer amaranth populations 63% as compared to the nontreated 28 DAT. The combination of fomesafen plus 110 g/ha mesotrione removed 100% of 5 cm Palmer amaranth but was not different from fomesafen alone at 100%. Fomesafen alone provided 99% reduction of plant biomass at the 5 cm Palmer amaranth timing and was not different than all other combinations of fomesafen plus mesotrione providing at least 97% biomass reduction. No herbicide treatments significantly controlled 10 cm Palmer amaranth in field studies.

IMPACT OF VERTICUTTING ON HERBICIDE EFFICACY FOR THE CONTROL OF DALLISGRASS.
C. Straw*, K. Tucker, R. Grubbs, T. Burch, G. Henry; University of Georgia, Athens, GA (160)

ABSTRACT

TOLERANCE OF DGT COTTON TO GLUFOSINATE AND DICAMBA. T.H. Dixon[1], D.M. Dodds[1], J.D. Copeland[1], D.Z. Reynolds[1], C.A. Samples[1]; L.T. Barber[2], C.L. Main[3], J.A. Mills[4];[1]Mississippi State University, Mississippi State, MS, [2]University of Arkansas, Little Rock, AR,[3]University of Tennessee, Jackson, TN, [4]Monsanto Company, Collierville, TN (161)

ABSTRACT

Experiments were conducted in 2012 and 2013 to evaluate tolerance of cotton containing Roundup Ready® Xtend Flex technology to dicamba and glufosinate. Experiments were conducted at the Black Belt Branch Experiment Station near Brooksville, MS; the West Tennessee Research and Education Center in Jackson, TN; and at the Lon Mann Cotton Research Center in Marianna, AR in 2012; however, only the Brooksville location was repeated in 2013. Six experimental varieties provided by Monsanto Company were planted during the third week of May at each location for 2012. In 2013, four new varieties plus two varieties from 2012 were May 24. All agronomic and pest management practices were conducted according to University recommendations in each respective state. All plots were maintained weed free using preemergence herbicides, postemergence-directed herbicides, and hand weeding. The following herbicide programs were utilized to evaluate crop tolerance: 1) dicamba at 2.2 kg ai/ha PRE followed by (FB) dicamba at 1.1 kg ai/ha to four-leaf cotton FB dicamba at 1.1 kg ai/ha to 12-leaf cotton; 2) dicamba at 2.2 kg ai/ha PRE FB glyphosate (1.7 kg ae/ha) + dicamba (1.1 kg ai/ha) to four-leaf cotton FB glyphosate (1.7 kg ae/ha) + dicamba (1.1 kg ai/ha) to 12-leaf cotton; 3) glufosinate at 1.1 kg ai/ha applied to four-, eight-, and 12-leaf cotton, and 4) untreated check. All applications were made with a CO_2-powered backpack sprayer equipped with Turbo Teejet Induction spray tips utilizing 324kPa pressure. Visual evaluations of cotton injury as well as cotton height, total nodes, nodes above cracked boll, and seed cotton yield were collected. All data were subjected to analysis of variance and means were separated using Fishers Protected LSD at p = 0.05.

Visual injury following application of glyphosate + dicamba to four-leaf cotton was approximately 13% one week after treatment whereas injury following application of glufosinate and dicamba was 10% and 7%, respectively, in 2012. Also, in 2012 visual injury following the eight-leaf application was significantly greater from glyphosate + dicamba (~8%) than from dicamba alone (~6%). One week after glyphosate + dicamba was applied to 12-leaf cotton, 13% visual injury was observed; however, by four weeks after application injury was less than 5% during 2012. Visual injury in 2013 one week after glyphosate + dicamba was applied to 12-leaf cotton was similar to 2012 with approximately 13% injury observed; however, like the previous year visual injury decreased to ~6% four weeks after application. Plant height of each variety at the end of the season was unaffected by herbicide application for either year. Seed cotton yields were not affected by herbicide application in 2012; however, significant differences due to variety were observed. Seed cotton yields ranged from 2975 to 3900 kilograms of seed cotton per hectare. In 2013 significant differences were observed in seed cotton yields due to herbicide application and variety. Seed cotton yields ranged from 2965 to 3720 kilograms of seed cotton per hectare. These results indicate that while visual injury may appear after application of glyphosate + dicamba, this injury is typically transient in nature as herbicide application had no impact on final plant heights and minimal effect on yield.

INVESTIGATING SYNTHETIC AUXIN COMBINATIONS WITH PLANT GROWTH REGULATORS TO ENHANCE CONTROL OF PALMER AMARANTH. R.E. Paynter*1, W. Everman2, J.D. Burton1, T. Gannon2; 1North Carolina State University, Raleigh, NC, 2NC State University, Raleigh, NC (162)

ABSTRACT

Palmer amaranth (Amaranthus palmeri) is a weed species that is found in almost all row crops in the southern United States farmland and is one of the driving forces in research for weed science.Â Due to resistance across many herbicides/ modes of action (for example glyphosate and ALS) in Palmer amaranth, new technologies and formulations are needed to properly deal with the problem at hand that many growers struggle with on a daily basis.Â The research in this study was conducted by using auxin growth regulator herbicides dicamba at 69.5 g ai/ ha and 2,4- D at 55.6 g ai/ ha in combination with transport inhibitors diflufenzopyr (DFF), cyclanilide (CYC), or napthalam (NPA) at various rates.Â The study was conducted in a greenhouse at North Carolina State University and repeated in time. The herbicides were applied using a spray chamber. Additive rates applied with each herbicide were: DFF at 2.5 g ai/ ha, 5 g ai/ ha, 7.5 g ai/ ha, or 10 g ai/ ha; CYC or NPA at 52.7 g ai/ ha, 105.42 g ai/ ha, 158 g ai/ha, or 210.9 g ai/ ha. A significant increase in herbicide activity was observed, when compared to the individual herbicide applied alone for both dicamba and 2,4-D when combined with DFF at 5 g ai/ ha and 7.5 g ai/ ha.Â Also, a significant increase in activity was observed in dicamba plus cyclanilide at 210.9 g ai/ha 24 hours after treatment and dicamba plus napthalam at 52.7 g ai/ ha or 105.42 g ai/ ha when compared to dicamba applied alone.Â Fresh and dry weights were recorded at 7 days after treatment. Significant differences in fresh weight and dry weight were noted for the dicamba plus napthalam compared to herbicides with no additives.Â These combinations have in the potential to expand the tools necessary to combat the growing herbicide resistance problem.

ENLIST™ WEED MANAGEMENT SYSTEMS IN THE TEXAS HIGH PLAINS. M. R. Manuchehri*[1], P. A. Dotray[1,2], T. S. Morris[2], J. W. Keeling[2]; [1]Texas Tech University, Lubbock, TX, [2]Texas A&M AgriLife Research and Extension Center, Lubbock, TX (163)

Enlist™ technology, utilizing 2,4-D + glyphosate (Enlist Duo™) crop tolerance, has the potential to effectively manage Palmer amaranth (*Amaranthus palmeri* S. Wats.), Russian-thistle (*Salsoga tragus* L.), and other difficult-to-control weeds in Texas High Plains cotton. System and efficacy trials were conducted in 2013 near Lubbock, TX to evaluate Enlist Duo™ alone and in combination with glufosinate and several soil-residual herbicides for postemergence control of glyphosate-susceptible Palmer amaranth, Texas Millet (*Urochloa texana* Buckl.), Russian-thistle, and kochia (*Kochia scoparia* L.). Visual control of target weed species was recorded at 14, 21, and 28 days after application (DAA). For the Systems I trial 28 days after the mid-postemergence (MPOST) application, Palmer amaranth was controlled at least 95% for the following herbicide systems: trifluralin preplant incorporated (PPI) followed by (fb) Enlist Duo™ (.75X) early-postemergence (EPOST) fb Enlist Duo™ (.75X) MPOST; trifluralin PRE fb Enlist Duo™ (2.2 kg ae ha^{-1}, 1X) + glufosinate EPOST fb Enlist Duo™ (1X) MPOST; trifluralin PRE fb *S*-metolachlor + glufosinate EPOST fb glufosinate MPOST; trifluralin PRE fb acetochlor (Warrant™) + glufosinate EPOST fb Enlist Duo™ (1X) MPOST; trifluralin PRE fb acetochlor + Enlist Duo™ (1X) EPOST fb Enlist Duo™ (1X) MPOST; and trifluralin PRE fb acetochlor + glufosinate EPOST fb glyphosate MPOST. For the Systems II trial 28 days after the MPOST application, Palmer amaranth was controlled greater than 90% by all treatments with the exception of glyphosate alone EPOST. Control of Texas Millet was 90% or greater with trifluralin PRE fb Enlist Duo™ (1X) EPOST fb Enlist Duo™ (1X) MPOST; trifluralin PRE fb glufosinate EPOST fb Enlist Duo™ (1X) MPOST; and Enlist Duo™ (1X) EPOST fb Enlist Duo™ (1X) MPOST. For the efficacy trials 28 DAA, Palmer amaranth was controlled at least 90% when sprayed at the 3- to 5-centimeter growth stage with Enlist Duo™ (.75X), Enlist Duo™ (1X), Enlist Duo™ (1X) + *S*-metolachlor, and Enlist Duo™ (1X) + acetochlor. Kochia was controlled at least 90% when sprayed at the 10- to 15-centimeter growth stage with Enlist Duo™ (1X), Enlist Duo™ (1X) + glufosinate, and Enlist Duo™ (1X) + acetochlor and Russian-thistle was controlled at least 90% when sprayed at the 10- to 15-centimeter growth stage with Enlist Duo™ (1X) and Enlist Duo™ (1X) + acetochlor. No treatments achieved greater than 90% control of Palmer amaranth, kochia, or Russian-thistle when sprayed at the 20- to 30-centimeter growth stage. Overall, several effective treatments were identified in the Systems and efficacy trials; however, treatments were most effective when used as part of weed management system. Consistent, effective, and sustainable treatments will likely result from a systems approach that involves soil residual herbicides preplant, at-plant, and/or postemergence.

WEED MANAGEMENT IN ROUNDUP READY XTEND COTTON. T. Barber*[1], J.A. Bond[2], D. Miller[3], D.B. Reynolds[4], L.E. Steckel[5], D.O. Stephenson, IV[6]; [1]University of Arkansas, Little Rock, AR, [2]Mississippi State University, Stoneville, MS, [3]LSU AgCenter, St. Joseph, LA, [4]Mississippi State University, Mississippi State, MS, [5]University of Tennessee, Jackson, TN, [6]LSU AgCenter, Alexandria, LA (164)

ABSTRACT

EVALUATION OF F9312 HERBICIDE FOR PREEMERGENCE WEED CONTROL IN UPLAND COTTON. D. Akin*[1], H. Mitchell[2], D. Johnson[3], J. Wilson[4]; [1]FMC Corporation, Monticello, AR, [2]FMC Corporation, Louisville, MS, [3]FMC Corporation, Madison, MS, [4]FMC Corporation, Cary, NC (165)

ABSTRACT

Field trials evaluating a new herbicideÂ premixture (F9312, pyroxasulfone+carfentrazone) were conducted at several locations in the mid-southern U.S.Â This new herbicide provided excellent weed control and good overall crop safety when applied PRE in medium-fine soils.Â This product should be registered for use for the 2015 season.

EVALUATION OF RESIDUAL HERBICIDES IN BOLLGARD II XTENDFLEX COTTON. R.M. Hayes, R. Montgomery, D.B. Reynolds, D.M. Dodds, W.D. Crow, M.S. Wiggins, M. Goddard and L.E. Steckel, University of Tennessee, Mississippi State University, and Monsanto Company, Jackson, TN (166)

ABSTRACT

Management of glyphosate-resistant weeds, especially palmer amaranth (*Amaranthus palmeri*) in cotton is necessary for a sustainable production system. Field research was conducted on a Lexington silt loam near Jackson (Madison County), TN, and in Mississippi on an Oaklimeter silt loam near Eupora (Webster County) and a Dundee silt loam near Dundee, (Tunica County) on fields infested with palmer amaranth ($\geq$10 m^{-2}) to evaluate weed control with some herbicide combinations that may be effective in Bollgard II XtendFlex® cotton (resistant to glyphosate, glufosinate and dicamba). Due to lack of seed availability and regulatory limitation, trials were conducted in the absence of cotton on bare ground achieve by applying paraquat at 84 g ha^{-1}. Treatments evaluated included fomesafen 280 g ha^{-1}, acetachlor 1260 g ha^{-1}, prometryn 1160 g ha^{-1}, and flurometuron 1120 g ha^{-1} alone and in combination with dicamba 560 or 1120 g ae ha^{-1}, the latter also being applied alone. Treatments were replicated four times with plots 2 m by 9 m with the center 1.5 m by 9 m treated. Evaluations were made at 7, 14, 21 and 28 days after application (DAA). No treatment controlled palmer amaranth >96%. Maximum control with dicamba alone was 85% at the high rate. Fomesafen and acetachlor had similar control of palmer amaranth alone and in combination with dicamba. Prometryn and flurometuron had similar control of palmer amaranth (84 and 83%) alone, but in combination with dicamba control was similar to that of fomesafen plus dicamba or acetacholor plus dicamba. While these combinations provide a foundation for palmer amaranth control where rainfall or irrigation occurs soon after application, management of escapes and other species must also be implemented to realize the yield potential. Rotation of residual herbicides with different site of actions in combination with dicamba offers opportunities for resistance management with the new Bollgard II XtendFlex® cotton production systems.

COMPAIRISON OF ACETOCHLOR, METOLACHLOR, AND PYROXASULFONE APPLICATION TIMINGS ON COTTON INJURY AND WEED CONTROL. L.M. Collie, T.L. Barber, R.C. Doherty, and J.R. Meier; University of Arkansas, Little Rock, AR (167)

ABSTRACT

Applications of pyroxasulfone, acetochlor, and metolachlor were evaluated to determine crop injury and residual weed control when tank mixed with glufosinate and applied post emergence to cotton. These applications were made in a Liberty Link system using Stoneville cultivar 4946 GLB2.

Palmer amaranth (Amaranthis palmeri L.), pitted morningglory (Ipomoea lacunose L.), barnyardgrass (Echinochloa crus-galli L.), and broadleaf signalgrass (Brachiaria platyphylla Nash) were over seeded at planting to provide a consistent weed population. Also at planting, an application of fluometeron was applied at 1 lb ai/A across all treatments. Weed efficacy and cotton injury were noted at 7, 14, 21 and 28 days. Cotton yields were recorded at the end of the season. Residual herbicides; pyroxasulfone, acetochlor, and metolachlor were tank mixed with gluphosinate at 0.5 lb ai/A and applied over-the-top at 1-2 leaf or 4-6 leaf growth stages. Each residual was observed at four different rates within the two growth stages. Pyroxasulfone was applied at rates of 0.053, 0.08, 0.106 and 0.213 lb ai/A. metolachlor was applied at rates of 0.475, 0.713, 0.95 and 1.9 lbs ai/A. acetochlor was applied at rates of 0.56, 0.843, 1.13, and 2.25 lbs ai/A. All plots recieved a layby application at bloom to maintain weed control until harvest.

Crop injury was present with higher rates of all residual herbicides at both 1-2 leaf and 4-6 leaf applications. Metolachlor at 1.9 lbai/A produced 25% damage at 14 days after the 1-2 leaf application, by 21 days there was no visual damage. There was 13% injury present with 1.9lb ai/A metolachlor 7 days after the 4-6 leaf applications, but by 14 days the plants recovered and there was no visible injury present. The acetochlor tank mixtures provided 18% injury at 14 days after the 1-2 leaf application and 26% at 7 days after the 4-6 leaf application. Cotton recovered 21 days in either application. Pyroxasulfone produced significant damage at high rates at both 1-2 leaf and 4-6 leaf applications. At 14 days after the 4-6 leaf treatment there was still 44% damage, but only the highest rate of 0.213lb ai/A of pyroxasulfone produced significant damage at 21 days after application. Though significant injury was observed, there was no substantial yield reduction. Also, there were no notable differences in weed efficacy.

WEED MANAGEMENT WITH ENGENIA™ HERBICIDE IN DICAMBA-GLUFOSINATE TOLERANT COTTON. J. Reed*[1], J. Frihauf[2], S. Bowe[2], L. Bozeman[2]; [1]BASF Corporation, Lubbock, TX, [2]BASF Corporation, Research Triangle Park, NC (168)

ABSTRACT

Herbicide resistant weed populations including those resistant to glyphosate continue to increase throughout cotton growing regions in the United States. Few effective herbicide options are available to growers to control these problematic weeds. Engenia™ herbicide is a new experimental formulation (EPA approval pending) based on the BAPMA (N, N-Bis-(aminopropyl) methylamine) form of dicamba. Research indicates that Engenia herbicide will reduce the secondary loss potential of dicamba beyond the previous improvement achieved with Clarity® herbicide over Banvel® herbicide. The use of Engenia herbicide in dicamba glufosinate tolerant (DGT) cotton will offer growers a new tool to effectively manage difficult to control broadleaf weeds such as those resistant to EPSPS, triazine, and ALS herbicides. BASF field trials conducted in West Texas have demonstrated that postemergence (POST) use of dicamba with glyphosate and other effective herbicides following a preemergence or preplant (PRE) residual herbicide program often provide the most consistent and effective control. Other research conducted in the mid-south and southeastern US has shown sequential POST applications of glufosinate and dicamba following application of PRE residual herbicides can provide optimal weed control in DGT cotton. Integration of weed management strategies that combine herbicide, cultural, and mechanical control techniques such as diverse herbicide programs with multiple effective mechanisms of action, crop rotation, and sanitation are critical to effectively manage herbicide resistant weeds and protect the utility of dicamba-tolerant cropping systems.

WEED MANAGEMENT SYSTEMS IN BOLLGARD II XTENDFLEXTMÂ COTTON IN THE TEXAS HIGH PLAINS. P.A. Dotray*[1], J. Keeling[2], T.S. Morris[2], M.R. Manuchehri[3], R.M. Merchant[3], J.D. Everitt[4]; [1]Texas Tech University, Texas A&M AgriLife Research and Extension Service, Lubbock, TX, [2]Texas A&M AgriLife Research, Lubbock, TX, [3]Texas Tech University, Lubbock, TX, [4]Monsanto, Shallowwater, TX (169)

ABSTRACT

Bollgard II® XtendFlex™ Cotton is anticipated to be available to growers as early as 2015 pending regulatory approval. This technology will be a three-way herbicide tolerance stack to dicamba, glyphosate, and glufosinate. This technology will improve control of Palmer amaranth (*Amaranthus palmeri* S. Wats.) and other troublesome annual and perennial weeds. The objective of this research was to examine weed management "systems" in Bollgard II® XtendFlex™ Cotton utilizing soil residual herbicides as well as dicamba, glyphosate, and glufosinate. Weed management treatments included systems with and without trifluralin (0.75 lb ai/A) preplant incorporated; acetochlor (Warrant™, 1.125 lb ai/A), acetochlor plus MON 119096 (0.5 lb ae/A), or no herbicide applied preemergence (PRE); and glufosinate (0.59 lb ai/A), glufosinate plus MON 119096, MON 76832 (an experimental low-volatility premix formulation of dicamba plus glyphosate (1.5 lb ae/A), glyphosate (Roundup PowerMax, 1.13 lb ae/A), or glyphosate plus acetochlor applied early-postemergence (EPOST), mid-postemergence (MPOST), and/or late-postemergence (LPOST). Trials were conducted at the Texas Tech Research facility near New Deal (subsurface drip irrigation) and at the Texas A&M AgriLife Research farm at Lubbock (limited furrow irrigation capabilities). Plots at New Deal were 4 rows by 30 feet and the soil type was a Pullman clay loam. Similar plot sizes were used at Lubbock, where the soil was an Acuff loam. At the New Deal location, late-season control of Texas millet and glyphosate-susceptible Palmer amaranth was at least 99% following trifluralin followed by (fb) acetochlor PRE fb MON 76832 MPOST fb glyphosate LPOST, and trifluralin fb MON 76832 MPOST fb glyphosate plus acetochlor LPOST. Texas Millet (*Urochloa texana* Buckl.) and Palmer amaranth were controlled at least 97% following trifluralin fb glufosinate plus MON 119096 MPOST and LPOST. At the Lubbock location, late-season control of Palmer amaranth and devil's-claw (*Proboscidea louisianica* P. Mill.) was at least 99% following acetochlor plus MON 119096 PRE fb MON 76832 EPOST, acetochlor PRE fb MON 76832 EPOST and LPOST, and trifluralin fb acetochlor PRE fb MON 76832 MPOST fb glyphosate LPOST. Palmer amaranth and devil's-claw were controlled at least 96% following trifluralin fb glufosinate plus MON 119096 MPOST and LPOST. Data from these trials suggest that dicamba, glyphosate, and glufosinate when used in a system that included trifluralin and/or acetochlor were effective at controlling Palmer amaranth, Texas millet, and devil's-claw.

COTTON INJURY FROM TANK CONTAMINATION LEVELS OF 2,4-D. M.E. Metting[1], P.A. Baumann[1], G.D. Morgan[1], P.A. Dotray[2], M.E. Matocha[1], J.A. McGinty[1] and M. Manuchehri[3]; [1]Texas A&M AgriLife Extension, College Station, TX, [2]Texas A&M AgriLife Research, Lubbock, TX, and [3]Texas Tech University, Lubbock, TX (170)

ABSTRACT

Herbicide resistant weeds, such as glyphosate resistant Palmer amaranth (*Amaranthus palmeri*) and common waterhemp (*Amaranthus rudis*) are plaguing the Southern U.S. with economic losses due to reduced yields and increased production costs. New herbicide resistant seed technologies are currently being developed that will allow the use of herbicides that are effective for controlling these resistant weed species. However, the use of these herbicides may present problems with spray tank contamination. Therefore, field studies were conducted during the 2013 growing season to assess the impact of 2,4-D tank contamination levels to non-2,4-D tolerant cotton. The studies were conducted on Weswood silty clay loam and Pullman Clay loam soils near College Station and Lubbock, Texas, respectively. Phytogen 499WRF and Deltapine 0912B2RF cotton varieties were planted in these studies since they are representative varieties for these two regions of the state, the Brazos Bottom and Southern High Plains cotton growing regions, respectively. Herbicide rates chosen for these studies conformed to a similar protocol being conducted in other states. The treatments consisted of 0.00178 lb ai/A (0.0018X) of 2,4-D and 0.0357 lb ai/A (0.0357X) of 2,4-D . These rates were applied at six different application timings; 4-leaf cotton, 9-leaf cotton, first bloom, first bloom + two weeks, first bloom + four weeks and first bloom + six weeks. The first bloom timing was not applied at the Lubbock location. Visual injury ratings represented the percentage of plant above-ground biomass that exhibited epinasty, leaf strapping, chlorosis and necrosis, inclusively. Lint yield was collected to determine the overall effect of these treatments on cotton production. Injury 28 days after each treatment decreased significantly between the 4-leaf (65-70% injury) and 9-leaf (10-15% injury) stages of growth at College Station, however, no differences were observed between lower levels of injury occurring at all remaining stages of growth. No differences were shown between the low and high rates within each treatment timing. At the Lubbock location, injury at the 4-leaf application was 65% and significantly higher than that observed at the 9-leaf timing (55%), however, significant reductions in injury were shown at the lower herbicide rate within these two timings. Similar to observations made at College Station, applications made at later stages of growth resulted in less than 15% crop injury. At the College Station location, no yield reduction was shown between any of the application timings made at the low herbicide rate, and as compared to the untreated plots. However, the high herbicide rate caused significant yield reduction at all applications made prior to the first bloom + two weeks timing. At Lubbock, no yield reduction was shown at the low herbicide rate, however, at the high herbicide application rate, significant reductions were shown at the 4-leaf, 9-leaf and first bloom plus 2 weeks stages of growth.

EVALUATION OF DISPLAY FOR COTTON DEFOLIATION AND MORNINGGLORY DESICCATION,
D. K. Miller[1], M. S. Mathews[1], and D. Dodds[2]; [1]LSU AgCenter Northeast Research Station, St. Joseph, LA, [2]Mississippi State University, Mississippi State, MS (171)

ABSTRACT

Field studies were conducted in 2013 at the LSU AgCenter Northeast Research Station near St. Joseph, La and on Harlow Farms in Ms. to evaluate the effectiveness of Display in defoliating cotton and providing morningglory desiccation. Separate studies were conducted in cotton (defoliation) and non-cropland (morningglory dessiccation) in La while a single study accomplished both objectives in Ms. Each study was conducted in a randomized complete block design with treatments replicated four times. Treatments were applied via compressed air sprayer at 15 GPA. In St. Joseph, treatments for the defoliation trial included Display applied alone at 0.4, 0.6, or 0.8 oz/A or at 0.4 and 0.6 oz/A in combination with Dropp SC at 1.6 oz/A; or Folex alone at 8, 12, or 16 oz/A or at 8 and 12 oz/A in combination with Dropp SC at 1.6 oz/A. All treatments included Prep at 21 oz/A + nonionic surfactant (NIS) at 0.25%. Treatments were applied at the 60% open boll (OB) stage on September 11. For the morningglory desiccation trial, treatments included Display applied alone at 0.6 or 0.8 oz/A + 1% crop oil concentrate (COC), Aim at 1 oz/A + 1% COC, ET at 2 oz/A + 1% COC, or Sharpen at 1 oz/A +1% Methylated Seed oil + ammomium sulfate at 17 lb/A, all applied 8 d after an application of Dropp at 2.4 oz/A + Prep at 21 oz/A + 0.25% NIS. Additional treatments included Display at 0.6 oz/A in combination with the Dropp + Prep treatment described above followed by (fb) Display at 1 oz/A + NIS at 0.25% and then Dropp + Prep combination applied alone. Treatments were applied on September 9 fb September 17. At Harlow Farms, treatments were similar to the morrninglory desiccation trial at St. Joseph with the exception being that the Sharpen treatment was excluded and Bollbuster was the ethephon product of choice. Treatments were applied at the 60% OB stage on October 8 fb October 18. Parameters measured at St. Joseph included cotton defoliation and desiccation 7, 14, and 23 d after treatment (DAT) and vine desiccation 7 d after the initial application and 7 and 14 d after the fb treatment. At Harlow Farms, evaluations included cotton defoliation and desiccation 10 d after the initial application and 8 and 14 d after the fb treatment along with vine desiccation.

At St. Joseph, Display applied alone at 0.4 to 0.8 oz/A resulted in no greater than 63% defoliation 7 and 14 DAT, which was significantly lower than the 74 and 85% minimums observed for Folex applied alone. Addition of Dropp SC to Display at all rates resulted in defoliation levels equivalent to those observed for Folex alone. By 23 DAT, complete defoliation was observed for all treatments. At Harlow Farms, all treatments resulted in equal cotton defoliation of at least 94%. Insignificant cotton desiccation was observed at both locations. Vine desiccation was at least 80% in St. Joseph and 90% at Harlow Farms.

Results for cotton defoliation at St. Joseph were lower than has been observed in past years and more closely resembled results obtained at Harlow Farms in 2013. In previous research, Display was applied with COC instead of NIS and defoliation has been greater and more rapid as a result. Display offers cotton producers an effective means of defoliating cotton and desiccating morningglories to aid in harvest efficiency.

MELON, COTTON, AND SOYBEAN RESPONSE TO DICAMBA DRIFT FROM A HIGH-BOY SPRAYER. S. Culpepper*[1], S. Hauf[2], J. Travers[2], M. Braxton[2], J. Sandbrink[2], K. Remund[2]; [1]University of Georgia, Tifton, GA, [2]Monsanto, St. Louis, MO (172)

ABSTRACT

Cotton technology with tolerance to dicamba, glyphosate, and glufosinate will offer growers a more effective weed management program potentially having long-term sustainability. Adoption of this technology and respective herbicide programs will be determined by the ability of growers to manage off-target movement; primarily of dicamba. An experiment was conducted at the Sunbelt Expo during 2013 to determine the sensitivity of melons, cotton, and soybean to drift from a single pass of a high-boy spraying a 60 foot swath of an experimental premix formulation of glyphosate and dicamba. The application mixture and rates were as follows: glyphosate (1.0 lb ae/A) + dicamba (0.5 lb ae/A) + dipotassium phosphate (2% v/v) + Interlock® (4 oz/A).

The high-boy traveled at 10 MPH using 11004 TeeJet® AIXR spray nozzles generating very coarse to extremely coarse droplets with the boom 24 inches above the crop canopy. Wind direction was exactly perpendicular to the crop rows (630 feet) with wind speeds ranging from 7.6 to 11.6 mph, averaging 9.5 mph. The field design included the 60 foot spray swath planted to non-dicamba cotton with an additional 100 foot of cotton planted downwind. At 103 feet from the downwind edge of the spray swath was the first row of melons. Melons rows (beds) were spaced 6 foot apart and grouped in sets of 4 beds including a cantaloupe row, watermelon row, cantaloupe row, and watermelon row with a drive bed after every fourth melon bed; this pattern was repeated across the field for a total of 384 feet of melons. Thus from the downwind edge of the spray swath, cantaloupe was transplanted as close as 103 feet and as far as 475 feet while watermelon were transplanted as close as 109 feet and as far as 481 feet. On all drive beds, two rows of soybean were seeded with distances from the downwind spray swath edge being as close as 127 feet and as far as 487 feet. Careful planning was taken to make sure that neither cotton nor soybean was taller than the melons at time of application. Cantaloupe had just begun to set fruit, watermelon were 1 wk from setting fruit, cotton was in the 2-4 leaf stage, and soybean had 1-trifoliate when drift occurred. Other methods critical to the study included Telone® II applied under a low density polyethylene mulched bed for melons, honey bee's present for melon pollination, fungicides/insecticides applications made on 5 to 7 d intervals for melons, and all crops were maintained weed free through a multitude of management approaches.

Five transects were created perpendicular to crop rows and spaced evenly across the field with transects being 25 feet for cantaloupe, 30 feet for watermelon, and 50 feet for cotton and soybean. For melons, the two transects on the outer edges of the field were covered with a high density silver on silver mulch prior to drift. Preliminary work had proven this mulch could be used as a melon cover without influencing temperatures under the mulch; thereby allowing the experiment to include downwind non-treated melon controls. Upwind controls for melons were also included as well as including upwind controls for both cotton and soybean.

The greatest distance visual epinasty of cantaloupe and watermelon were recorded were 115 and 181 feet from the downwind edge of the spray swath, respectively. Cantaloupe and watermelon vine lengths were reduced for plants growing within 122 and 174 feet of the spray swath during early season and 127 and 165 feet during late season, respectively. After harvesting cantaloupe eight times with a total experimental harvest weights exceeding 6000 lbs; fruit weights were negatively influenced but only when cantaloupe were growing within 119 feet of the spray swath. After harvesting watermelon twice with total experimental harvest weights exceeding 25,000 lbs, fruit weights were only negatively influenced when watermelon were growing within 154 feet of the spray swath.

Visual cotton epinasty ranged from 80% at 1.5 feet from the edge of the spray swath to as little as 4% at 88 feet; with 15% damage noted at 57 feet during early season and 48 feet during late season. Late-season cotton heights were reduced by dicamba drift but only when cotton was growing within 19 feet of the spray swath. Cotton was harvested by a one-row picker allowing yield to be taken on each individual row (33 rows spaced 3 foot apart). Cotton yields were reduced but only when cotton was growing within 20 feet of the spray swath.

Visual soybean epinasty ranged from 25% at 127 feet, 7% at 247 feet, and 2% at 367 feet from the edge of the spray swath; with 15% damage noted at 193 feet during early season and 132 feet during late season. Since soybean was planted on drive beds, the crop could not be harvested due to late-season equipment damage.

In conclusion, this study was designed to challenge potential label applications in regards to maximum wind speeds, maximum or slightly above maximum boom heights, and aggressive spray tips generating droplets that may be smaller than those supported by future labels. Results suggested 1) visual dicamba injury on melons when setting fruit suggests yield loss may occur; 2) watermelon are more sensitive than cantaloupe to dicamba drift; 3) cotton recovery from dicamba drift that occurs during early season was remarkable; and 4) for visual epinasty, soybean was the most sensitive crop grown in the study.

USE OF AMINOCYCLOPYRACHLOR AS A PREPLANT/ BURNDOWN WEED CONTROL OPTION FOR CORN AND COTTON. R.J. Edwards[1], D.B. Reynolds[2]; [1]Mississippi State University, Starkville, MS, [2]Mississippi State University, Mississippi State, MS (173)

ABSTRACT

Since the release of glyphosate tolerant crops in the late 90's, on farm use of residual herbicides has decreased. However, with weed resistance to glyphosate increasing, the need for residual chemistries as preplant and burndown applications is needed. Aminocyclopyrachlor (AMCP) is a synthetic auxin herbicide with known soil activity that is currently labeled for use in non-crop applications. It provides effective control of many difficult to control weed species. Little is known regarding its potential for use in rowcrops thus, three studies were conducted to test its potential for its use as a preplant burndown for both corn and cotton. In the first study, AMCP was applied at five rates (0.017, 0.035, 0.07, 0.140 and 0.280 kg ai/ha) at 4 timings (2, 1 and 0.5 months prior to planting and PRE) for corn and 5 timings (3, 2, 1 and 0.5 months prior to planting and PRE) for cotton. In the second study, AMCP was applied to corn at three rates (0.035, 0.07, 0.140 kg ai/ha for a 1/2x, 1x and 2x rate titration) and compared to 1x standalone rates of valor (flumioxazin at 0.05 kg ai/ha), zidua (pyroxasulfone at 0.119kg ai/ha), resolve (rimsulfuron at 0.017 kg ai/ha), Aatrex (atrazine at 1.168 kg ai/ha) and fierce (pyroxasulfone + flumioxazin at 0.105 kg ai/ha). AMCP at the above rates was also tank mixed with increasing rates of the above other standalone compounds at 1/2x, 1x and a 2x rates. All experiments were carried out at two sites; Starkville, MS (Leeper silty clay loam) and Brooksville, MS (Okolona silty clay). Date were collected for percent weed control, corn crop heights and crop yield and subjected to ANOVA with means separated by Fishers protected LSD (α=0.05) or LSMEANS. When compared across rates, aminocyclopyrachlor did not decrease corn yields in the timing study, except at a 0.280 kg ai/ha rate applied PRE. Corn heights were affected by timing of application with more injury occurring when AMCP was applied PRE. For cotton, soil texture was a significant factor in determining crop yield response, where a higher clay soil showed less injury then sandier soil. In the burndown study, AMCP applied alone showed good control of both henbit (69-88%) and common waterhemp (67-89%) at a 0.5 to 2x rate. When tank mixed, greater than 95% control was achieved with several tankmix combinations for henbit (0.07 kg ai/ha AMCP + 1.68 kg ai/ha atrazine, 0.140 kg ai/ha AMCP + 2.24 kg ai/ha atrazine, 0.140 kg ai/ha AMCP + 0.026 kg ai/ha rimsulfuron and 0.140 kg ai/ha AMCP + 0.108 kg ai/ha flumioxazin) and common waterhemp (0.140 kg ai/ha AMCP + 2.24 kg ai/ha atrazine and 0.07 kg ai/ha AMCP + 0.054 kg ai/ha flumioxazin). Corn yields were significantly increased from the non-treated check with several applications (0.035 kg ai/ha AMCP + 0.089 kg ai/ha pyroxasulfone, 0.140 kg ai/ha AMCP + 0.149 kg ai/ha pyroxasulfone, 0.07 kg ai/ha AMCP + 0.105 kg ai/ha pyroxasulfone + flumioxazin, 0.07 kg ai/ha AMCP + 0.054 kg ai/ha flumioxazin and 0.140 kg ai/ha AMCP + 0.108 kg ai/ha flumioxazin).

EVALUATION OF SPLIT APPLICATIONS OF PYROXASULFONE IN CORN. C.B Edwards[1], J.A. Bond[1], D.O. Stephenson, IV[2], T.W. Eubank[1], H.M. Edwards[1], and G.B. Montgomery[1]; [1]Mississippi State University, Stoneville, MS; [2]LSU AgCenter, Alexandria, LA (175)

ABSTRACT

Glyphosate-resistant (GR) Palmer amaranth (*Amaranthus palmeri*) is now present across the majority of the crop production area of the midsouthern United States. Pyroxasulfone was recently registered for use in corn and provides another mode of action to manage GR palmer amaranth and other troublesome weeds. However, research is needed to evaluate appropriate application timings and efficacy of pyroxasulfone as a stand-alone herbicide as well as in combination with the most common corn herbicide, atrazine.

Research was conducted from 2011 to 2013 at the Mississippi State University Delta Research and Extension Center in Stoneville, MS, and the Louisiana State University AgCenter Dean Lee Research and Extension Center in Alexandria, LA, to evaluate single and sequential applications of pyroxasulfone applied alone and in combination with atrazine in corn. Treatments were arranged as a two-factor factorial within a randomized complete block design with four replications. The first factor was preemergence (PRE) treatment and consisted of no PRE, pyroxasulfone at 0.15 kg ai/ha, atrazine at 1.12 kg ai/ha, and pyroxasulfone at 0.15 kg/ha plus atrazine at .12 kg/ha. The second factor was postemergence (POST) treatment and consisted of no POST, glyphosate at 0.86 kg ae/ha plus pyroxasulfone at 0.059 kg/ha, glyphosate at 0.86 kg/ha plus atrazine at 1.12 kg/ha, and glyphosate at 0.86 kg/ha plus pyroxasulfone at 0.059 kg/ha plus atrazine at 1.12 kg/ha. All POST treatments were applied to corn in the V4 growth stage. Corn density was recorded 14 days after emergence. Visual estimates of corn injury and weed control were collected 31 d after PRE application and 7, 14, and 28 d after POST application. Corn yield was determined at the end of the season. Palmer amaranth populations at Alexandria were glyphosate-susceptible (GS) while those at Stoneville were primarily glyphosate-resistant (GR). All data were subjected to ANOVA and estimates of the least square means were used for mean separation with $\alpha = 0.05$.

Corn density was not impacted by PRE applications of pyroxasulfone alone or combined with atrazine. No corn injury was observed at any evaluation. Pyroxasulfone PRE controlled ivyleaf morningglory and GR and GS Palmer amaranth similar to atrazine 31 d after application. Pyroxasulfone PRE controlled barnyardgrass 95% 31 d after application. All treatments except atrazine PRE controlled GS Palmer amaranth ≥ 93% 28 d after POST application. When no PRE was applied, glyphosate plus pyroxasulfone plus atrazine POST controlled more GR Palmer amaranth than glyphosate plus atrazine POST. Postemergence treatments were required for >90% GR Palmer amaranth control 28 d after POST application when atrazine or pyroxasulfone were applied PRE. Pyroxasulfone plus atrazine PRE controlled GR Palmer amaranth as well as the same treatment followed by glyphosate plus atrazine POST. All treatments except atrazine PRE controlled barnyardgrass ≥ 91% 28 d after POST application. Additionally, all treatments except pyroxasulfone or atrazine PRE controlled ivyleaf morningglory ≥ 92% 28 d after POST application. Corn yield was optimized following pyroxasulfone plus atrazine PRE and all treatments that received a POST application.

Pyroxasulfone PRE controlled barnyardgrass >90% until 28 d after POST application, which was after corn canopy closure. Pyroxasulfone PRE controlled GS Palmer amaranth 98% 28 d after POST application in LA, but control was only 78% at the same evaluation in MS where GR Palmer amaranth was predominant. POST-only programs of glyphosate plus pyroxasulfone or atrazine were adequate for control of barnyardgrass, ivyleaf morningglory, and GS Palmer amaranth. However, all three herbicides were required in a POST-only program to control GR Palmer amaranth similar to sequential applications. Pyroxasulfone will be useful as a component of corn weed control programs in the midsouthern U.S.A.

BICYCLOPYRONE, A NEW HERBICIDE FOR IMPROVED WEED CONTROL IN CORN. E.W. Palmer*[1], S.E. Cully[2], J.P. Foresman[1], R.D. Lins[1], and G.D. Vail[1]; [1]Syngenta, Greensboro, NC, [2]Syngenta, Marion, IL (176)

ABSTRACT

Bicyclopyrone is a new selective herbicide for weed control in field corn, seed corn, popcorn, and sweet corn. The bicyclopyrone mode of action is inhibition of HPPD (4-hydroxyphenyl-pyruvate dioxygenase) enzyme which ultimately causes the destruction of chlorophyll followed by death in sensitive plants. Bicyclopyrone is safe when applied either pre or postemergence to corn and provides pre and postemergence control of grass and broadleaf weeds.

Upon registration, SYN-A197 will be the first bicyclopyrone containing product launched with anticipated first commercial application in the 2015 growing season.

BICYCLOPYRONE FOR BURNDOWN AND POSTEMERGENCE WEEED CONTROL IN CORN. H.S. McLean[1], S. E. Cully[3], T. H. Beckett[2], R. D. Lins[2], J. P. Foresman[2] and G. D. Vail[2]; [1]Syngenta Crop Protection, LLC, Perry, GA, [2]Syngenta, Greensboro, NC, [3]Syngenta, Marion, IL (177)

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Bicyclopyrone is a new selective herbicide for weed control in field corn, seed corn, popcorn, and sweet corn. The bicyclopyrone mode of action is inhibition of HPPD (4-hydroxyphenyl-pyruvate dioxygenase) enzyme which ultimately causes the destruction of chlorophyll followed by death in sensitive plants.

Upon registration, SYN-A197 will be the first bicyclopyrone containing product launched with anticipated first commercial application in the 2015 growing season. SYN-A197 is a multiple mode-of-action herbicide premix that provides preemergence and postemergence grass and broadleaf weed control.

Field trials were conducted to evaluate SYN-A197 for no-till burndown and postemergence weed control and crop tolerance compared to commercial standards. Results show that SYN-A197 very effectively controls many difficult weeds and provides improved residual control and consistency compared to the commercial standards.

PREEMERGENCE WEED CONTROL IN SOYBEAN WITH CHLORIMURON, FLUMIOXAZIN, AND METRIBUZIN. K.A. Barnett*[1], D.J. Smith[2], K.L. Hahn[3], H.A. Flanigan[4]; [1]DuPont Crop Protection, Whiteland, IN, [2]DuPont Crop Protection, Madison, MS, [3]Dupont Crop Protection, Bloomington, IL, [4]DuPont, Greenwood, IN (178)

ABSTRACT

Growers in the Mid-South desire preplant and preemergence applications that provide several weeks of effective control of difficult-to-control weeds. In particular, glyphosate-resistant weeds are becoming increasingly difficult for growers to control. With timely rainfall or irrigation, preemergence applications with multiple modes of action can provide several weeks of residual control for glyphosate-resistant weeds such as Palmer amaranth, common and tall waterhemp, giant ragweed, and marestail (horseweed). Therefore, DuPont™ Trivence™ was developed as a new preemergence combination that includes chlorimuron, flumioxazin, and metribuzin to provide an additional option for controlling glyphosate-resistant weeds. Several studies were implemented in 2013 to determine the residual value of Trivence™ in comparison to standard preemergence herbicides such as Boundary®, DuPont™ Canopy® + DuPont™ Cinch®, DuPont™ Envive®, and Fierce® and to evaluate the crop response associated with these applications. Weed control was evaluated using a scale of 0-100% for weed species such as Palmer amaranth, common waterhemp, morningglory spp., giant ragweed, common ragweed, and marestail (horseweed). In addition, crop response was evaluated after each application using a scale of 0-100% to assess crop injury associated with these applications. Experimental design was a randomized complete block design with 3 to 4 replications, depending on the location. In the first study, all preemergence applications (including Trivence™ at 8 oz/A or 10 oz/A) provided excellent control of Palmer pigweed and Trivence™ improved control of pitted morningglory compared with standard preemergence herbicides. Crop response (up to 23% injury) was observed with preemergence treatments with Boundary® and Canopy® + Cinch® providing the least amount of crop injury. The second study evaluated full program approaches with combinations of early preplant, preemergence and post applications that included Trivence™. Less than 5% crop response was observed with preplant applications, but marginal crop response was observed with all preemergence treatments (11-17%). For Palmer amaranth, a similar level of control was observed with all preplant treatments. Trivence™ did increase control of morningglory species when compared with Boundary® or Fierce®. At 14-21 days after application, all preemergence applications provided a similar level of control of morningglory species and Palmer amaranth. In the third study, no crop response was reported with any preemergence or preplant application to soybean. Early preplant applications of Canopy® EX, Envive, Canopy® + Cinch®, or Trivence™ (all products tank-mixed with 2,4-D and glyphosate) provided >95% control of Palmer amaranth when evaluated 15 days after application. However, 28 days after application, all preplant applications provided less than 82% control of Palmer amaranth. At 14 days after the preemergence application, treatments that contained a preplant application of Canopy® EX + 2,4-D + glyphosate, no matter what preemergence was used, provided excellent control of Palmer amaranth. Additionally, treatments that contained Canopy® + Cinch® or Trivence™ improved control of giant ragweed, when evaluated at 14 days after the preemergence application. All treatments provided excellent control of pitted morningglory. In conclusion, Trivence™ did not increase crop injury when compared with standard preemergence herbicides that include flumioxazin. Trivence™ provided consistent control across broadleaf species, including difficult-to-control weeds such as Palmer amaranth, giant ragweed, and morningglory species.

COMPARISON OF FALL AND SPRING APPLIED TREATMENTS OF SAFLUFENACIL, GLYPHOSATE, DICAMBA, FLUMIOXAZIN, PYROXASULFONE, AND RIMSULFURON PLUS THINFENSULFURON-METHYL FOR GLYPHOSATE-RESISTANT HORSEWEED (*Conyza canadensis*) CONTROL. J. Tredaway Ducar*[1], C.H. Burmester[2], A. J. Price[3], and J. S. McElroy[4], [1]Sand Mountain Research and Extension Center, Auburn University, Crossville, AL; [2]Alabama Cooperative Extension System, Auburn University, Belle Mina, AL; [3]USDA-ARS, Auburn, AL; [4]Department of Crop, Soil, and Environmental Sciences, Auburn University, Auburn, AL (179)

ABSTRACT

Two field studies were initiated in fall of 2012 at the Tennessee Valley Research and Extension Center in Belle Mina, AL and in a growers field in Cherokee County, Alabama to determine 1) the efficacy of glyphosate alone and in combination with dicamba and saflufenacil to control glyphosate-resistant horseweed when applied in the fall and spring and 2) the efficacy of various residual herbicides to glyphosate-resistant horseweed when applied in the fall and spring. The data presented was from the Cherokee County, Alabama site only. The soil type is a Holston fine, sandy loam with 50% sand, 40% silt, and 10% clay. The following applies to both field studies. Plots measured 12 feet x 25 feet and were arranged in a randomized complete block with a split-plot treatment arrangement. The split-plots were application date (fall or spring) and herbicide treatment. Treatments were applied using a CO2 self-propelled sprayer equipped with 8002VS nozzle tips and calibrated to deliver 15 GPA at 40 psi. Fall treatments for both trials were applied on November 17, 2012 and spring treatments were applied on March 20, 2013. Treatments for the first trial consisted of glyphosate at 32 fluid ounces per acre, dicamba at 8 fluid ounces per acre, dicamba at 16 fluid ounces per acre, glyphosate at 32 fluid ounces per acre plus dicamba at 8 fluid ounces per acre, glyphosate at 32 fluid ounces per plus dicamba at 16 fluid ounces per acre, glyphosate at 32 fluid ounces per acre plus saflufenacil at 2 fluid ounces per acre, and an untreated check. All glyphosate treatments included ammonium sulfate (AMS) at 1% v/v and all dicamba treatments included a non-ionic surfactant at 0.25% v/v. Treatments for the second trial flumioxazin at 2 ounces per acre, pyroxasulfone at 2 ounces per acre, rimsulfuron plus thifensulfuron-methyl at 1.5 ounces per acre, saflufenacil at 2 fluid ounces per acre, and flumioxazin plus pyroxasulfone at 3 ounces per acre and an untreated check. A blanket application of gramoxone at 1 pt/acre plus AMS at 1% v/v plus saflufenacil at 1 fluid ounce per acre was applied prior to all treatments in the residual trial. Data were subjected to analysis of variance (ANOVA) and means were separated using Fisher's Protected LSD at the 0.05 significance level. There was no application date and herbicide treatment interaction for either trial. In the first trial, all fall treatments controlled glyphosate-resistant horseweed at 171 DAT (days at treatment) 93% or greater except glyphosate alone. All spring treatments provided greater than 97% control of glyphosate-resistant horseweed except glyphosate alone. In the second trial, the fall applications of flumioxazin plus pyroxasulfone and rimsulfuron plus thifensulfuron-methyl provided greater than 97% control at 171 DAT while flumioxazin alone provided 87%, saflufenacil alone provided 82%, pyroxasulfone provided 77% glyphosate-resistant horseweed control. The spring applied treatments all provided greater than 97% control except flumioxazin which provided 74% glyphosate-resistant horseweed control. Data from this trial indicate that fall applications are a viable option for managing glyphosate-resistant horseweed. Being able to control horseweed early in the fall may be due to the smaller size of the weed.

AUXINIC HERBICIDES INFLUENCE CLETHODIM EFFICACY ON GLYPHOSATE-RESISTANT ITALIAN RYEGRASS. G.B. Montgomery*, J.A. Bond, T.W. Eubank, H.M. Edwards; Mississippi State University, Stoneville, MS (180)

ABSTRACT

Glyphosate-resistant (GR) Italian ryegrass has become a tremendous problem in the midsouthern United States, especially in Mississippi. Currently, GR Italian ryegrass has been documented in 32 counties in Mississippi. The only postemergence herbicide options for GR Italian ryegrass control are Select Max (clethodim) and paraquat. Limited control options and the lengthy germination window for GR Italian ryegrass make it difficult to control. While GR Italian ryegrass is a driver weed for winter burndown applications, it does not exist in a monoculture. It co-exists with winter annual broadleaf weed species. Many winter annual broadleaf weed species are difficult to control with glyphosate alone. Burndown applications in Mississippi often consist of glyphosate plus an auxinic herbicide. Research was conducted to evaluate the efficacy of glyphosate plus Select Max when applied in mixtures with auxinic herbicides on GR Italian ryegrass and other winter annual broadleaf weed species.

Research was conducted in 2012 at the Delta Research and Extension Center in Stoneville, MS. The experiment was designed as a split-plot with four replications. Whole plots were rates of Select Max and included Select Max at 0, 0.0625, 0.094, and 0.125 lb ai/A. All treatments that contained Select Max also included glyphosate at 0.77 lb ae/A. Subplots were auxinic herbicides and included no auxinic herbicide, 2,4-D Ester at 1 lb ae/A, Clarity at 0.25 lb ae/A, and 2,4-D plus Clarity (dicamba) at 1 plus 0.25 lb/A. Crop oil concentrate at 1% (v/v) was included with all herbicide treatments. Individual plots were 10 by 40 feet. Treatments were applied on January 5 with a tractor-mounted sprayer calibrated to deliver 15 gallons per acre. Weed control was visually accessed at 15, 30, and 48 days after treatment (DAT). All data were subjected to analysis of variance (ANOVA) and means were separated using Fisher's protected LSD with $\alpha = 0.05$.

Glyphosate plus Select Max controlled more GR Italian ryegrass at 0.125 compared with 0.0625 lb/A. Control of GR Italian ryegrass was reduced when 2,4-D Ester or Clarity alone were added to mixtures of glyphosate plus Select Max at 0.0625 and 0.094 lb/A; however, GR Italian ryegrass control was not influenced by auxinic herbicides when mixed with glyphosate plus Select Max at 0.125 lb/A. All combinations of glyphosate plus Select Max plus an auxinic herbicide controlled shepherd's-purse at least 90% 48 DAT. All combinations of auxinic herbicides improved control of henbit compared with glyphosate plus Select Max at 0.094 or 0.125 lb/A. 2,4-D Ester and Clarity were required to optimize control of henbit with glyphosate plus Select Max at 0.125 lb/A. Auxinic herbicides were required with glyphosate plus Select Max to control cutleaf evening-primrose greater than 66% 48 DAT.

Glyphosate plus Select Max at 0.094 or 0.125 lb/A was required to maximize control of GR Italian ryegrass 48 DAT. Auxinic herbicides reduced control of GR Italian ryegrass control when added to glyphosate plus Select Max at 0.0625 or 0.094 lb/A. 2,4-D Ester, Clarity, or a combination of both auxinic herbicides was required to maximize control of winter annual broadleaf weed species; however, the response to auxinic herbicides varied by species. 2,4-D Ester and Clarity should be added to glyphosate and Select Max at the full use rate of 0.125 lb/A for optimum control of GR Italian ryegrass and winter annual broadleaf weed species. No herbicide combinations completely controlled GR Italian ryegrass and winter annual broadleaf weed species; therefore, sequential applications would be required for a clean seedbed at planting.

EVALUATION OF BARNYARDGRASS ANTAGONISM WITH GLUFOSINATE APPLIED EITHER BEFORE OR AFTER CLETHODIM. A.N. Eytcheson*, D.B. Reynolds; Mississippi State University, Mississippi State, MS (181)

ABSTRACT

The development of genetically modified (GM) crops with tolerance to non-selective herbicides has been rapidly adopted in the United States. The LibertyLink® system utilizes the GM crop resistance to the herbicide glufosinate. Glufosinate is a non-selective, non-residual postemergence (POST) herbicide that has the ability to control weeds that are considered to be difficult to control with glyphosate as well as glyphosate resistant weeds. However, previous research has reported grass weed control with glufosinate may be inadequate and may require additional management inputs. Clethodim, a graminicide herbicide is a POST annual and perennial grass control product that does not cause injury to dicotyledonous weeds or crops. Producers often chose to tank mix herbicides to broaden the spectrum of weed control, improve efficacy and reduce application cost by combining applications. However, combinations of graminicides with herbicides used to control broadleaves typically result in antagonism.

There have been conflicting reports of annual grass antagonism from graminicides applied before or after glufosinate. This could be due to the age of the grasses at the time of glufosinate application. Therefore, a field experiment was conducted at the Black Belt Research Station to determine if sequential applications of glufosinate either before or after clethodim will reduce or alleviate antagonism. A fallow field was selected with an average barnyardgrass population of 1,205 plants/m^2. The experimental design was a randomized complete block and plots were 2.7 by 9 m in size. Treatments included glufosinate (594 g ai/ha) applied 7, 3 or 1day(s) before (DB) clethodim (76 g ai/ha), clethodim (76 g ai/ha) tank-mixed with or without glufosinate (594 g ai/ha), and glufosinate (594 g ai/ha) applied 1, 3 or 7 day(s) after (DA) clethodim (76 g ai/ha). A crop oil concentrate (1% v/v) was included in all clethodim applications. Clethodim applications were applied on day 0 to eliminate any control differences due to barnyardgrass plant age. Visual control was evaluated 7, 14, 21, 28 and 56 days after (DA) clethodim and barnyardgrass biomass(g/m^2) was collected at 56 DA clethodim.

Initial results show increased barnyardgrass control (90 to 99%) with all treatments 7, 14, 21, and 28 DA compared to clethodim alone (80 to 85%). The tank-mix of glufosinate + clethodim had greater control of barnyardgrass 7DAT (91%) compared to clethodim alone. When glufosinate was applied either 1DB or 1DA (96 and 94%), barnyardgrass control was greater than the tank-mix. By 28 DAT, glufosinate applied 7DB, 3DB, 3DA and 7DA clethodim, barnyardgrass control ranged from 97 to 99%; whereas, the tank-mix of clethodim + glufosinate only controlled barnyardgrass 91%. Barnyardgrass biomass was significantly reduced when glufosinate was applied 7 DB and 7DA compared to the tank-mix of glufosinate + clethodim. When compared to clethodim alone, glufosinate applied 7 DB reduced barnyardgrass biomass by 97%. These data show that although barnyardgrass antagonism did not occur, glufosinate applied 7 DB and 7DA significantly reduced barnyardgrass biomass compared to the tank-mix of glufosinate + clethodim. Glufosinate applied 7 DB clethodim was the only treatment that significantly reduced barnyardgrass biomass compared to clethodim applied alone. Regrowth from the crown occurred in all treatments by 56 DAT; however, lack of significant rainfall did not occur until 1 month after the initial application which may have affected barnyardgrass control. Utilizing clethodim as a postemergence application before or after an application of glufosinate could add additional grass control in a LibertyLink® system. Additional research is needed to determine the direct comparison of sequential application of glufosinate and fluazifop-methyl, quizalofop and clethodim and the influence of barnyardgrass interference in soybean.

SOYBEAN RESPONSE TO SAFLUFENACIL CHEMISTRY IN ALABAMA. C. H. Burmester,[1] J. Tredaway Ducar[2], and B. Meyer[3]. [1]Alabama Cooperative Extension System, Auburn University, Belle Mina, AL; [2]Sand Mountain Research and Extension Center, Auburn University, Crossville, AL; [3]Agric-AFC, Decatur, AL (182)

ABSTRACT

Verdict herbicide applied at rates of 5.0 and 7.5 ounces per acre were first evaluated in on-farm strip trials in northern Alabama in 2010 and 2011. Glyphosate at 29 ounces per acre were included in all treatments. All treatments provided a rapid burn-down of large weeds including horseweed. Soybeans planted after applications developed no herbicide injury symptoms even on sandy loam soils.

In 2012 and 2013 a replicated field trial on a sandy loam soil on the Sand Mountain Research and Extension Center was conducted. The use of glyphosate plus Verdict herbicide at rates of 5.0, 7.5 and 10 ounces per acre were evaluated for burn-down, weed control and soybean crop injury. Soybeans were planted at 0, 7, 14 and 21 days following application. Excellent early season weed control was found in all treatments and no soybean herbicide injury symptoms were seen with any treatments either year, at any planting date. Soybean yields were affected by planting dates but herbicide treatments did not affect soybean yields at any planting date, in either year.

Surprisingly, reports of soybean injury to saflufencil chemistry products (Verdict and Sharpen) on different soil types in northern Alabama were reported in 2013. In early July, twenty three soybean varieties were planted in a two replication test into wheat stubble on a silt loam soil in northern Alabama. Rates of Verdict (5.0 and 7.5 oz/A) and Sharpen (1.5and 2.0oz/A) were applied one day prior to planting and at planting to evaluate any soybean variety sensitivity to these herbicides. Rainfall of two inches occurred the night following planting. Soybean injury symptoms began developing on some soybean varieties soon after emergence. Soybean injury was evaluated at 2, 3, and 5 weeks after planting. These damage ratings for the soybean varieties peaked at 3 weeks after planting and then decreased in severity at the 5 week rating. Differences between injuries to soybean varieties were dramatic with a range of no injury to severe stunting and stand loss. Overall, there was a fairly even distribution of one third of the varieties with little injury symptoms, one third with low to moderate injury symptoms, a one third with high injury symptoms.

The saflufenacil herbicide products applied at planting combined with high rainfall, created the perfect conditions for herbicide damage to occur. These results indicate a great difference in soybean variety sensitivity to the saflufenacil chemistry. One reason for our lack of injury symptom to saflufenacil chemistry in the previous testing may have been limited by variety selection. Soybean variety testing for saflufenacil sensitivity would provide useful information to growers and researchers

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RESIDUAL ACTIVITY OF SOIL-APPLIED SOYBEAN HERBICIDES. M.R. Foster, J.L. Griffin, D.O. Stephenson, IV, D.K. Miller, M.J. Bauerle, J.T. Copes, and E.P. Webster; School of Plant, Environmental, and Soil Sciences, Louisiana State University Agricultural Center, Baton Rouge, LA (183)

ABSTRACT

Research was conducted in 2013 to compare herbicides for residual weed control in non-crop areas. Herbicide treatments and rates per acre included Valor SX at 2 oz, Engenia at 12.8 oz, Prefix at 2 pt, Boundary at 1.5 pt, Tricor at 7.1 oz, Canopy DF at 6 oz, Envive at 3.5 oz, Zidua at 2.5 oz, Authority MTZ at 14 oz, and Authority Elite at 28.6 oz. Soil preparation prior to herbicide application consisted of disking and smoothing at Baton Rouge and of re-working beds with a rolling cultivator at St. Joseph. A weather station at each location monitored rainfall. Data collection was initiated 14 days after rainfall of at least 0.4 inch was received for herbicide activation. Data collection was continued at 2-week intervals out to 55 days after activation (DAA). Weed population was determined by counting the number of weeds emerging from two randomly selected 1-foot square areas in the center of each plot. Percent control was determined based on weed population compared with the nontreated. An attempt was not made to quantify injury due to weed discoloration or stunting. Following data collection at each two-week interval, the experimental area was treated with paraquat to remove all weeds. This allowed for an estimate of weed emergence across the season without the interference from other weeds. At Baton Rouge the soil type was a clay loam with pH of 5.4 and organic matter of 1.8%. At St. Joseph soil type was a silt loam with pH of 5.0 and organic matter of 1.1%.

During the 0-14 DAA period, 1.1 inches of rainfall was received at Baton Rouge and 2.7 inches was received at St. Joseph. Barnyardgrass control at Baton Rouge for 0 to 14 DAA was 86% or more for Prefix, Boundary, Zidua, and Authority Elite and was 33 to 40% for Valor, Tricor, Canopy DF, Envive, and Authority MTZ. For St. Joseph 0 to 14 DAA, barnyardgrass control of at least 97% was obtained with Prefix, Boundary, Zidua, Authority MTZ, and Authority Elite; control was 8% for Valor, 80% for Tricor, 77% for Canopy DF, and 40% for Envive. Barnyardgrass was not controlled 0 to 14 DAA with Engenia at either location. At both locations for most herbicides, barnyardgrass emergence during the 15 to 24 day period decreased compared with the previous 14 day period even though rainfall was sufficient to promote weed seed germination and emergence. Barnyardgrass control for 0 to 24 DAA for the locations was 31 and 17% for Valor, 92 to 100% for Prefix and Boundary, 44 and 53% for Tricor, 31 and 56% for Canopy DF, 38 and 45% for Envive, 80 and 99% for Zidua, 42 and 91% for Authority MTZ, and 89 and 100% for Authority Elite. Barnyardgrass was not controlled with Engenia. Residual control of barnyardgrass was observed out to 36 days with Prefix at Baton Rouge and with Authority Elite at both locations.

Hemp sesbania control at Baton Rouge for 0 to 14 DAA was highest for Valor (93%) and Authority Elite (80%) and control for the other treatments ranged from 33 to 69%. At St. Joseph where hemp sesbania emergence 0 to 14 DAA was twice that of Baton Rouge, control was 88% or more for Valor, Boundary, Tricor, Canopy DF, Authority MTZ, and Authority Elite; control with Engenia was 41%. During the 15 to 24 DAA period at St. Joseph, hemp sesbania emergence was 10 times that of Baton Rouge. Control of hemp sesbania 0 to 24 DAA at Baton Rouge was greatest for Valor (86%) and Authority Elite (72%). At St. Joseph, hemp sesbania control was greatest for Valor (91%), Tricor (100%), and Authority Elite (86%); hemp sesbania was controlled 42% with Engenia. Residual control of hemp sesbania at both locations was not observed past 24 DAA for any of the herbicide treatments. Pitted morningglory control at Baton Rouge for 0 to 24 DAA was greatest for Authority Elite (84%). Prickly sida control at Baton Rouge for 0 to 24 DAA was 94% or more for Valor, Canopy DF, and Envive. Engenia did not control pitted morningglory or prickly sida. Residual control out to 36 DAA was observed for pitted morningglory with Authority Elite and for prickly sida with Envive and Authority Elite.

ENVIVE AND CANOPY BASED PROGRAMS IN LIBERTY-LINK AND ROUNDUP READY SOYBEAN.
M.W. Marshall*, Clemson University, Blackville, SC (184)

ABSTRACT

Currently, soybean producers in South Carolina rely heavily on PPO-based postemergence herbicide programs to manage troublesome weeds like glyphosate-resistant Palmer amaranth. Exclusive reliance on these programs are a short-term solution to weed control in soybean. Diversification of soil residual herbicide program is an important management tool in managing Palmer amaranth and mitigating resistance to PPO' herbicides. Field experiments were conducted at the Clemson University Edisto Research and Education Center (EREC) located near Blackville, SC in 2012 and 2013. Glufosinate-tolerant soybean variety AGS 6011 was planted on 6/29/12 and glyphosate-tolerant soybean variety Pioneer 7502 was planted on 5/17/13 and 6/29/12. Treatments included combinations of preemergence (PRE) herbicides including Envive at 3.5 oz/A, Canopy at 4.0 oz/A, Outlook at 14 oz/A, Cinch at 1 pt/A, Zidua 1.0 and 1.5 oz/A, Fierce 2.0 oz/A; and postemergence (POST) herbicides including Liberty at 29 oz/A and glyphosate at 32 oz/A. Percent weed control and crop injury ratings were collected at 14 days after treatment (DAT) PRE and 14 DAT POST. Palmer amaranth, pitted morningglory, goosesgrass percent control and soybean injury data were analyzed using ANOVA and means separated at the P = 0.05 level. No significant (less than 10%) soybean injury was noted with either year or herbicide program. Envive and Canopy followed by Liberty (glufosinate) POST provided excellent control (100%) of Palmer amaranth and annual morningglory in the glufosinate-tolerant system. Canopy provided better annual morningglory control compared to Envive. In general, soybean yield in the glufosinate-tolerant system were higher with the Envive-based treatement compared to the Canopy-based programs. In the glyphosate-tolerant system, Envive and Canopy provided longer residual control of Palmer amaranth. The addition of Zidua to Canopy greatly improved annual grass control (100 vs 93%). The Zidua followed by Glyphosate treatment was weak on annual morningglories. In conclusion, soybean yield reductions noted in the Canopy treatments compared to the Envive treatments was most likely due to metribuzin. Liberty POST systems were more consistent in controlling Palmer amaranth compared to the glyphosate POST systems. The addition of Canopy (non-PPO containing combination) or Envive (PPO + other MOA's) would add consistency to soybean producers in their management of herbicide-resistant Palmer amaranth.

CONTROL OF GLYPHOSATE-RESISTANT PALMER AMARANTH AND OTHER WEEDS IN ROUNDUP READY II XTEND SOYBEAN. J.K. Norsworthy*[1], T.W. Eubank[2], L.E. Steckel[3], J.L. Griffin[4], J. Mills[5], R. Montgomery[6], S. Stanislav[7], E. Blinka[8]; [1]University of Arkansas, Fayetteville, AR, [2]Mississippi State University, Stoneville, MS, [3]University of Tennessee, Jackson, TN, [4]LSU AgCenter, Baton Rouge, LA, [5]Monsanto Company, Collierville, TN, [6]Monsanto Company, Union City, TN, [7]Monsanto Company, Cape Girardeau, MO, [8]Monsanto Company, Dyersburg, TN (185)

ABSTRACT

The glyphosate- + dicamba-tolerant trait provides soybean growers an additional in-crop mode of action (MOA) for controlling most glyphosate-resistant weeds, particularly Palmer amaranth, and other broadleaf weeds that have been hard to control with glyphosate alone. Anticipated launch of the new technology is 2015 in soybean, contingent upon deregulation by USDA. In preparation for use of this technology in Midsouth soybean, field trials were conducted in 2013 in AR, MS, TN, and LA to evaluate the efficacy of Roundup Ready® Xtend™ Crop System. Glyphosate-resistant Palmer amaranth was present at the AR, TN, and MS locations. At all locations, five herbicide programs were evaluated which included: 1) Valor ®(flumioxazin) at 0.064 lb ai/A PRE followed by (fb) MON 76832 (mixture of glyphosate + dicamba) at 1.5 lb ae/A applied early postemergence (EPOST) (when Palmer amaranth was 2 to 3 inches tall or other weeds reached this height in LA) fb an additional application of MON 76832 at 1.5 lb ae/A if needed, 2) same as program #1 except Warrant® (acetochlor) at 1.13 lb ai/A added to both postemergence applications, 3) Warrant® at 1.13 lb ai/A plus Clarity® (dicamba) at 0.5 lb ae/A PRE fb MON 76832 at 1.5 lb ae/A EPOST fb MON 76832 at 1.5 lb ae/A if needed, 4) same as program #3, except Clarity® replaced with Sencor® (metribuzin) at 0.25 lb ai/A, and 5) Valor® at 0.64 lb ai/A PRE fb Flexstar® (fomesafen) at 0.294 lb ai/A plus Warrant® at 1.13 lb ai/A plus Roundup Powermax® at 1.05 lb ae/A EPOST [standard program for Roundup Ready® (RR) soybean]. All applications were made at 15 gallons/acre using Turbo Teejet® Induction (TTI) nozzles. No auxin-type injury was observed from any of the herbicide applications. Injury to soybean averaged over all ratings and locations was only 4% for the standard RR program (#5), and all dicamba-containing programs (#1-4) had significantly less injury (<2%). Palmer amaranth control averaged over all ratings and locations was at least 95% for each program. At the final evaluation, Palmer amaranth control ranged from 98 to 99% for all programs. Other broadleaf weeds that were controlled at least 98% included henbit (AR) and morningglories (LA, TN, MS) with no differences noted among weed control programs. Prickly sida was present in LA, and control throughout the season ranged from 79 to 87% for programs #1, #2, #4, which was comparable to the RR standard program (87% control). Program #3 was not as effective as other programs, mainly because the PRE-applied mixture of Warrant plus Clarity provided only 40% early-season control. In regards to annual grasses when averaged over rating dates and locations, control ranged from 81 to 91%, with all dicamba-containing programs providing equal or better control than the standard RR program. In summary, weed control programs in Roundup Ready 2 Xtend soybean provided weed control that was similar to a current standard program that utilizes multiple MOAs in PRE and POST timings and with slightly better crop safety. This technology offers the potential to increase the durability of the system approach to soybean weed control.

INFLUENCE OF DEEP TILLAGE AND HAND REMOVAL ON PALMER AMARANTH POPULATIONS.

M. Inman*, D. Jordan, A. York, K. Jennings, W. Everman, D. Monks; NC State University, Raleigh, NC (186)

ABSTRACT

Experiments were established over the course of the past two years to evaluate management practices that reduce weed seed in the soil seed bank. These experiments were designed to determine the economic impact of a single deep tillage operation on Palmer amaranth populations in subsequent years. Also, the cost associated with a “zero tolerance” seed production strategy was determined following deep tillage or following a standard tillage system. Three distinct experiments were established over the course of the past two years.

Experiment 1. This experiment was initiated in spring 2013 and will be carried forward for the next 3 years. Treatments included deep tillage versus traditional tillage in conventional tillage but did not include a zero tolerance program. Palmer amaranth population in cotton during the first year was 70% lower than traditional tillage. When the cost of hand labor and moldboard plowing was considered, total weed control cost was approximately $90/acre lower when moldboard plowing due to greater expense of hand labor in absence of moldboard plowing. This experiment was conducted in a field with a high population of Palmer amaranth with a significant portion of the population expressing resistance to glyphosate. Glufosinate was not applied in this experiment and therefore these data represent a worse-case scenario for hand weeding and provides information on the greatest possible value of moldboard plowing.

Experiment 2. This experiment was initiated in spring 2012 and included deep tillage and zero tolerance programs in conventional tillage. Moldboard plowing had very little effect on weed populations during 2013. However, a reduction in Palmer amaranth population during 2013 was noted following the zero tolerance program implemented the previous year irrespective of deep tillage treatment. There was no difference in economic returns regardless of weed management program. Palmer amaranth population was relatively low and glufosinate was applied during both years to control both glyphosate-resistant and susceptible biotypes in the field. The effective control by glufosinate, which is similar to what growers have implemented in NC in many fields, most likely masked major differences in cotton yield and subsequent impacts on economic return when comparing moldboard plowing and the zero tolerance seed production program. However, a considerable number of weed escapes were noted and the zero tolerance seed production program most likely will be a positive input in future years, especially as selection pressure for resistance continues in these fields.

Experiment 3. The final experiment initiated in 2012 contained the most comprehensive set of treatments including comparison of 2 levels of deep tillage (none and a single moldboard plow operation), 2 levels of zero tolerance (none and zero tolerance seed production), and 2 levels of yearly tillage (conventional and strip tillage). The combination of deep tillage and strip tillage resulted in fewer weeds in 2013 compared with conventional tillage without moldboard plow. The zero-tolerance program also reduced weed populations in 2013. However, differences in weed populations did not always translate into differences in yield and economic returns. Major differences in yield and economic return were not observed because effective herbicides were used during both years to control resistant and susceptible biotypes.

These experiments are approximately half way through completing the amount of time needed to make assessments of weed population dynamics when deep tillage and a zero tolerance seed production program is implemented. Although not always statistically significant, moldboard plowing reduced labor required for hand weeding by approximately half. In most cases, yield and economic return were not affected by deep tillage and hand removal. Differences based on these two factors may have been masked by the effective herbicide program. Additional years are needed to determine the full impact of deep tillage on Palmer amaranth populations.

PALMER AMARANTH MANAGEMENT IN HPPD, GLUFOSINATE, AND GLYPHOSATE-TOLERANT SOYBEAN. W. Everman*[1], M. Rosemond[2], J. Allen[3]; [1]NC State University, Raleigh, NC, [2]Bayer CropScience, Hillsborough, NC, [3]Bayer CropScience, Research Triangle Park, NC (187)

ABSTRACT

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

PROGRAM APPROACHES FOR MANAGING PALMER AMARANTH AND WATERHEMP USING NEW SOYBEAN TECHNOLOGIES. J.K. Norsworthy*[1], C.J. Meyer[1], S. Stepanovic[2], L.E. Steckel[3], B. Young[4], K.W. Bradley[5], W.G. Johnson[6], M.M. Loux[7], V.M. Davis[8], T.W. Eubank[9], G.R. Kruger[10]; [1]University of Arkansas, Fayetteville, AR, [2]University of Nebraska, North Platte, NE, [3]University of Tennessee, Jackson, TN, [4]Southern Illinois Univesity, Carbondale, IL, [5]University of Missouri, Columbia, MO, [6]Purdue Unveristy, West Lafayette, IN, [7]Ohio State University, Columbus, OH, [8]University of Wisconsin-Madison, Madison, WI, [9]Mississippi State University, Stoneville, MS, [10]University of Nebraska-Lincoln, North Platte, NE (188)

ABSTRACT

Palmer amaranth and waterhemp both have a high tendency to evolve resistance to herbicides, and both weeds are causing wide-spread management difficulties for soybean producers throughout the U.S. In the near future, soybean cultivars are likely to become available having a wide array of stacked traits that will allow for various combinations of glyphosate, glufosinate, dicamba, 2,4-D, and several HPPD-inhibiting herbicides to be applied for improved weed control. Most of these traits are still not deregulated; hence, it is not feasible to test complete weed control programs involving several herbicide combinations without killing the crop. As a result, a bareground experiment was conducted seven states to assess the effectiveness of future herbicide programs that may be available in soybean once these traits are available to growers. In total, twenty-five herbicide programs were evaluated, five of which were sole use of preemergence herbicides, ten were preemergence (PRE) herbicides followed by postemergence (POST) herbicides at 3 to 4 weeks after the PRE application, and an additional ten programs consisted of the same PRE herbicides followed by POST herbicides at 6 to 7 weeks after the PRE application. Herbicides included in these studies are either currently available or are herbicides that can be utilized in new-herbicide trait technologies. Each of the programs tested are ones that are likely to be recommended by companies that will market these transgenic traits. Most of the evaluated programs contain at minimum of three effective modes of action for controlling glyphosate-resistant Palmer amaranth and waterhemp. The effectiveness of the herbicide programs were evaluated on glyphosate-resistant Palmer amaranth in Arkansas, Indiana, Nebraska, and Tennessee and glyphosate-resistant waterhemp in Illinois, Missouri, and Nebraska. Additionally, glyphosate-susceptible redroot pigweed was present in trials in Ohio and Wisconsin. For each *Amaranthus* species (pigweeds), locations were considered a random effect. A number of programs were effective in providing postemergence as well as long lasting residual control of all evaluated pigweeds. Each of the PRE-only programs provided at least 95% control of Palmer amaranth through 3 to 4 weeks after treatment. After an additional three weeks, Fierce at 3 oz/A, Dual Magnum at 1 pt/A + Sencor at 0.5 lb/A + Balance Flexx at 3 oz/A, Zemax at 2 qt/A + Sencor at 0.333 lb/A, and Prefix at 1 qt/A + Sencor at 0.333 lb/A were still providing 89 to 93% control, whereas Clarity at 32 oz/A + Warrant 2.75 qt/A had declined to only 67% control. All programs having a POST-applied herbicide at 3 to 4 weeks after a PRE-applied herbicide had 98 to 99% control of Palmer amaranth and waterhemp at 3 to 4 weeks after the POST application, except for locations where the current standard of Fierce at 3 oz/A PRE followed by Dual Magnum at 1 pt/A + Roundup PowerMax at 22 oz/A controlled glyphosate-resistant waterhemp 92% . Based on the findings from this research, the new technologies that are likely to soon be available in soybean will present growers an opportunity for highly effective management of glyphosate-resistant Palmer amaranth and waterhemp over a wide range of geographies and environments. Most of the programs evaluated were either comparable or superior to current programs being utilized in glyphosate-resistant soybean involving preemergence and postemergence residual herbicides and several modes of action. These coming technologies will further enhance mode of action diversity in soybean, lessening the risks of herbicide resistance evolving and increasing control of pigweeds and other hard-to-control weeds.

CROP RESPONSE TO DICAMBA APPLICATIONS TO SOYBEAN EVENT MON 87708. C.L. Arnevik*[1], P. Feng[1], M. DeVries[2], M. Lubbers[3], J. Cordes[1], D. Herren[4], R. Mohanty[1]; [1]Monsanto Company, St. Louis, MO, [2]Monsanto Company, Huxley, IA, [3]Monsanto Company, Wichita, KS, [4]Monsanto Company, Jerseyville, IL (189)

ABSTRACT

The soybean event MON 87708 has been engineered to provide tolerance to both glyphosate and dicamba, and is in development for commercialization as Roundup Ready® 2 Xtend soybean. The mechanism for dicamba tolerance was achieved via enzyme deactivation to the non-herbicidal 3,6-dichloro salicylic acid (DCSA). Event MON 87708 has been tested since 2007 and has consistently demonstrated excellent crop safety to Pre- and Post-emergent applications of dicamba. With expanded field testing, observations were made in 2011 by academic as well as internal researchers of a transient response to dicamba under certain environmental conditions. Subsequent greenhouse and field trials were established to further characterize this response. Results from the greenhouse and field studies as well as yield data from the 2012 and 2013 seasons will be presented.

STEWARDSHIP OF ENGENIA™ HERBICIDE. L. Newsom*[1], W. Thomas[2], L. Bozeman[2], S. Bowe[2]; [1]BASF Corporation, Tifton, GA, [2]BASF Corporation, Research Triangle Park, NC (190)

ABSTRACT

New weed control options are needed to manage herbicide resistant weeds that are limiting control tactics and cropping options in some areas. Dicamba tolerant soybean and cotton will enable the postemergence in crop use of dicamba to manage problematic weeds with an additional herbicide site-of-action. In addition, dicamba tolerant cropping systems will allow for dicamba application preemergence without a planting interval restriction. Engenia™ herbicide, currently not registered by the US EPA, is an advanced formulation based on BAPMA (N, N-Bis-(aminopropyl) methylamine) dicamba salt that minimizes secondary loss of dicamba. Combined with this formulation innovation, a comprehensive stewardship strategy will be implemented to focus on effective weed control, weed resistance management, and maximizing on-target application.

Engenia herbicide should be integrated as a component of a grower's weed control program along with other cultural, mechanical, and chemical control methods. A robust herbicide program uses sequential and/or tank mixtures of herbicides that have multiple effective sites of action on target weeds. Likewise, Engenia should complement current programs adding an additional effective site of action for broadleaf weed control. Over several years of testing, the most effective soybean weed control programs have utilized preemergence followed by postemergence applications of herbicides like Optill® PRO followed Engenia plus glyphosate.

Many parameters related to equipment setup and environmental conditions during application should be considered to maximize on-target deposition. Nozzle selection offers the opportunity to dramatically reduce the potential for spray drift. Research shows that venturi-type nozzle technology can significantly reduce drift potential. Other application parameters that should be considered include travel speed, boom height, application volume, use of a deposition aid, and proximity to sensitive crops. BASF has initiated the 'On Target Spray Academy' training program to educate applicators on best application practices. The combination of Engenia and dicamba tolerant crops plus stewardship will provide growers with an effective system to control increasingly difficult and herbicide-resistant broadleaf weeds.

PERFORMANCE OF ENGENIA™ HERBICIDE PROGRAMS IN DICAMBA-TOLERANT SOYBEANS.

B. Guice*[1], J. Frihauf[2], S. Bowe[2], L. Bozeman[2]; [1]BASF Corporation, Winnsboro, LA, [2]BASF Corporation, Research Triangle Park, NC (191)

ABSTRACT

Engenia™ herbicide is a new experimental formulation (EPA approval pending) based on the BAPMA (N, N-Bis-(aminopropyl) methylamine) form of dicamba. Research indicates that Engenia herbicide will reduce the secondary loss potential of dicamba beyond the previous improvement achieved with Clarity® herbicide over Banvel® herbicide. The use of Engenia herbicide in dicamba tolerant soybeans will offer growers a new tool to effectively manage difficult to control broadleaf weeds such as those resistant to EPSPS, triazine, ALS, and PPO herbicides. Weed management programs should be designed to take advantage of dicamba's postemergence and moderate residual activity. Combining dicamba with preemergence herbicides preplant provides burndown with critical broad spectrum early season residual control. BASF field trials have demonstrated that postemergence use of dicamba with glyphosate and other effective herbicides following a preemergence or preplant residual herbicide program often provides the most consistent and effective control. Optimum postemergence control is obtained when Engenia is applied to small weeds no larger than four inches. Residual herbicides may be needed with postemergence applications in locations where multiple weed flushes occur. Integration of weed management strategies that combine herbicide, cultural, and mechanical control techniques such as diverse herbicide programs with multiple effective mechanisms of action, crop rotation, and sanitation are critical to effectively manage herbicide resistant weeds and protect the utility of dicamba-tolerant cropping systems.

INFLUENCE OF DICAMBA RATE AND GROWTH STAGE ON SOYBEAN INJURY AND YIELD LOSS.
M.T. Bararpour*, J.K. Norsworthy, C.J. Meyer, and H.D. Bell; Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR (192)

ABSTRACT

Glyphosate susceptibility in many weed species has decreased. In the coming years, row crops with genetically modified (GM) tolerance to dicamba will be available to combat glyphosate-resistant weeds. A field study was conducted at the Agricultural Experiment Station, Keiser, Arkansas, in 2013 to evaluate the influence of dicamba (Clarity) simulated drift rates and growth stage on soybean injury and yield loss. The experiment was designed as a three (soybean growth stage) by two (dicamba rates) factorial in a randomized complete block design. Dicamba was applied at 1/16 X and 1/256X (simulated drift rates). A nontreated check was included. The 1X rate of dicamba was 0.5 lb ae/A (16 oz/A). Treatments were replicated eight times. All weeds were controlled throughout the test area.

Soybean injury (stunting and malformation of leaves and petioles) was 37 and 6% at V2 (10 weeks after treatment = WAT), 52 and 23% at V6 (7 WAT), and 6 and 5% at R2 (5 WAT) stage of soybean from high (1/16X) and low (1/256X) simulated rates of dicamba at 12 weeks after emergence (WAE), respectively. Soybean height was significantly reduced from 32 inches (check plot) to 22, 21, and 27 inches from the high rate of dicamba at V2, V6, and R2, respectively. By 16 WAE, soybean was defoliated 98 to 100% from all plots except plots that received high rate of dicamba at R2 (only 25%). The low simulated application rate of dicamba (1/256X) did not affect soybean yield regardless of growth stage. However, the high simulated rate of dicamba (1/16X) significantly reduced soybean yield at all growth stages. The high simulated rate of dicamba at the V2, V6, and R2 (harvested 2 wk later) stages reduced soybean yield 49, 31, and 22%, respectively.

ENLIST AHEAD: NOVEL MANAGEMENT AND STEWARDSHIP RESOURCES FOR THE ENLIST WEED CONTROL SYSTEM. J.D. Siebert*[1], D. Hillger[2], B. Hendrix[3], J. Laffey[4], R. Lassiter[5], D. Palmer[2], E. Throson[2], G. Finn[2], B. Maddy[2]; [1]Dow AgroSciences, Greenville, MS, [2]Dow AgroSciences, Indianapolis, IN, [3]Dow AgroSciences, Lakeville, MN, [4]Dow AgroSciences, Kansas City, MO, [5]Dow AgroSciences, Raleigh, NC (193)

ABSTRACT

Dow AgroSciences is developing the Enlist™ Weed Control System, a novel weed control technology to combat herbicide-resistant and hard-to-control weed populations that will improve upon the proven benefits of the glyphosate-tolerant cropping system. The Enlist Weed Control System will be enabled through the cultivation of Enlist crops which contain multiple herbicide tolerance traits that will allow for the post emergence application of Enlist Duo™ herbicide, a proprietary blend of glyphosate and 2,4-D choline. Just as important as the trait and herbicide solution, Enlist™ Ahead is a management resource designed to help growers succeed while promoting responsible use of the system. Built on a three-pillar foundation, Enlist Ahead will offer farmers, applicators and retailers technology advancements, management recommendations and resources, and education and training. A series of training activities, offered through a variety of delivery methods, was initiated in 2013 to educate growers and applicators on the responsible use of the Enlist™ system. Participants learned how to minimize the potential for off-target movement, principles to promote weed resistance management practices, and biotechnology trait stewardship practices. Dow AgroSciences has a commitment to responsibly commercializing the Enlist Weed Control System to sustain its longevity.

ENLIST SOYBEAN TOLERANCE AND WEED CONTROL WITH PRE FOLLOWED BY POST HERBICIDE PROGRAMS. D.M. Simpson*[1], G. Thompson[2], J. Ellis[3], M.A. Peterson[4], L.W. Walton[5]; [1]Dow AgroSciences, Indianapolis, IN, [2]Dow AgroSciences, Omaha, AR, [3]Dow AgroSciences, Smithville, MO, [4]Dow AgroSciences, West Lafayette, IN, [5]Dow AgroSciences, Tupelo, AR (194)

ABSTRACT

The Enlist™ Weed Control system is being developed in multiple crops and includes Enlist™ soybean and Enlist E3™ soybean. Enlist is a weed control system composed of new herbicide-tolerant traits and a new herbicide solution, Enlist Duo™ herbicide, which is a premix formulation containing 2,4-D choline and glyphosate. Regulatory approvals are pending for components of the Enlist system. Enlist soybean when stacked with glyphosate-tolerant traits, such as Roundup Ready 2 Yield®, and Enlist E3 soybean will provide tolerance to glyphosate, glufosinate and 2,4-D. Integrating multiple modes of action herbicides into a preemergence followed by postemergence weed control program provides consistent, highly effective broad spectrum control and helps prevent the development of herbicide-resistant weeds.

A total of 22 studies were conducted in 2013 in the U.S. to evaluate the weed control delivered by a systems approach composed of preemergence (PRE) followed by post emergence (POST) herbicide applications in Enlist E3 soybean crop. PRE treatments were cloransulam + sulfentrazone, flumioxazin + cloransulam, flumioxazin + chlorimuron ethyl or *S*-metolachlor + fomesafen herbicide products at labeled rates based on soil type. Postemergence treatments were Enlist Duo at 1640 and 2185 g ae/ha, glufosinate at 542 g ae/ha, 2,4-D choline + glufosinate at 800 + 542 and 1065 + 542 g ae/ha, and glyphosate at 1120 g ae/ha applied approximately 30 days after planting.

Premergence applications of cloransulam + sulfentrazone or flumioxazin + cloransulam followed by Enlist Duo at 1640 or 2185 g ae/ha or 2,4-D choline + glufosinate at 800 + 542 or 1065 + 542 g ae/ha provided greater than 95% control of CHEAL, IPOSS and AMAPA and glyphosate-resistant AMATA, AMBEL and AMBTR. Enlist Duo and 2,4-D + glufosinate treatments resulted in less than 3% visual soybean injury at 14 days after application.

Due to the challenges of controlling glyphosate-resistant AMAPA throughout the growing season, nine trials were conducted in 2013 in the southern US to evaluate AMAPA control delivered by a systems approach composed of PRE followed by POST + residual herbicide or two POST applications in Enlist E3 soybean. All treatments included PRE applications of cloransulam + sulfentrazone or flumioxazin + chlorimuron ethyl herbicide products. Post emergence treatments were Enlist Duo at 2185 g ae/ha, glufosinate at 542 g ae/ha, or 2,4-D choline + glufosinate at 1065 + 542 ae/ha applied 25 to 30 days after planting. S-metolachlor at 1070 g ae/ha was tank mixed with POST applications of Enlist Duo, glufosinate, or 2,4-D choline + glufosinate. S-metolachlor + fomesafen 1215 + 265 g ae/ha was tank mixed with POST applications of Enlist Duo or 2,4-D choline + glufosinate. Additionally, two POST applications of Enlist Duo™ herbicide or glufosinate applied at 25 to 30 days after planting followed 14 days later with a second application of the same treatment.

In 2013, soil applied herbicides provided greater than 97% control of AMAPA at 28 days after planting but declined to 82% control at 42 days after planting. Greater than 97% control of AMAPA at 70 days after planting was achieved with either two POST applications of Enlist Duo or glufosinate or a single POST application of s-metolachlor +/- fomesafen tank mixed with either Enlist Duo or 2,4-D choline + glufosinate.

Enlist weed control systems incorporates use of multiple modes action and application timing to provide season long weed control. Results from 2013 field trials supports intergrated weed management program consisting of residual herbicides applied at planting followed by POST applications of Enlist Duo herbicide.

Enlist E3™ soybeans are being jointly developed by Dow AgroSciences and MS Technologies.

UNIVERSITY EVALUATION OF ISOXAFLUTOLE WEED MANAGEMENT PROGRAMS IN HPPD-TOLERANT SOYBEAN SYSTEM. D. Unland*[1], M. Weber[2], J. Bloomberg[1], J. Allen[1]; [1]Bayer CropScience, Research Triangle Park, NC, [2]Bayer CropScience, Indianola, IA (195)

ABSTRACT

EFFICACY OF WEED MANAGEMENT SYSTEMS IN MGI SOYBEANS. L.E. Steckel*[1], J.C. Holloway[2], B. Young[3], S.E. Cully[4]; [1]University of Tennessee, Jackson, TN, [2]Syngenta Crop Protection, LLC, Jackson, TN, [3]Southern Illinois Univesity, Carbondale, IL, [4]Syngenta, Marion, IL (196)

ABSTRACT

Weed management in soybean has progressively become more challenging as a direct result of weeds adapting to the glyphosate-resistant soybean production system and the excessive reliance on glyphosate. Alternate herbicide chemistry such as the PPO-inhibiting herbicides for Palmer amaranth control have provided inconsistent performance as Palmer amaranth can grow 5 to 7 cm a day and PPO-inhibiting herbicides applied postemergence will not control Palmer amaranth over 5 cm tall. A new herbicide-tolerance soybean trait is under development that confers resistance to three herbicide active ingredients: Mesotrione, Glufosinate, and Isoxaflutole (MGI). This trait has been introduced to soybean cultivars which also have resistance to glyphosate which allows for the use of several herbicide mode of action groups to be used in MGI soybeans for improved management of problematic and glyphosate-resistant weed species.

Field experiments were conducted at several universities in 2012 and 2013 to evaluate the soybean response and weed control from herbicide programs enabled by the MGI system compared with commercial standard programs. Soybean injury from preemergence treatments that included various combinations of mesotrione, s-metolachlor, fomesafen, and metribuzin was 5% or less in 14 of the 16 site-years. Several preemergence herbicide treatments resulted in greater than 5% injury in 2013 in TN and MS with the most extensive injury associated with metribuzin and the standard comparison flumioxazin. Soybean injury following the postemergence applications were variable by site-year with treatments containing the premix of mesotrione, s-metolachlor, and glyphosate or fomesafen resulting in the greatest injury (up to 34%) by 11 to 16 DAT with the average soybean injury across sites being less than 10% for treatments without fomesafen. Control of both grass and broadleaf weed species was variable by site-year and weed species. However, control of Amaranthus spp. (AMATA, AMAPA, AMASS, AMARE), Ipomoea spp. (IPOSS, IPOHE), common lambsquarters, and velvetleaf by 21 to 40 days after the POST application was generally over 90% for all herbicide treatments. In most instances, the control of weed species was similar or greater than the commercial standard comparison treatments. Thus, the MGI soybean trait has the potential to improve weed management in soybean and lead toward greater herbicide mode of action diversity.

ENHANCED WEED MANAGEMENT SOLUTIONS WITH MGI HERBICIDE-TOLERANT SOYBEANS.
James C. Holloway*[1], Rakesh Jain[2], Dain E. Bruns[3], Thomas H. Beckett[4], Brian L. Wilkinson[5], Brian Erdahl[6]; [1]Syngenta, Jackson, TN, [2]Syngenta, Vero Beach, FL, [3]Syngenta, Marysville, OH, [4]Syngenta, Greensboro, NC, [5]Syngenta, Nevada, IA, [6]Syngenta, Clinton, IL (197)

ABSTRACT

Field trials were conducted in 2012 and 2013 to evaluate mesotrione-based weed control programs in MGI herbicide-tolerant soybeans stacked with glyphosate tolerance. These multiple mode-of-action herbicide tolerant soybeans enable the use of mesotrione and isoxaflutole pre- and post-emergence in addition to glyphosate and glufosinate-ammonium post-emergence.

Several mesotrione-based herbicide programs provided control of key weed species, including glyphosate resistant populations. The most successful and consistent weed control was achieved with two-pass programs that included pre-emergence residual herbicides and multiple, overlapping modes of action. These programs were designed to align with HRAC principles of weed resistance management. The use of these chemically diverse and novel programs will offer effective, safe and sustainable weed management options for soybean growers.

EVALUATION OF SAFLUFENACIL AS A HARVEST AID IN MID-SOUTH SOYBEAN (GLYCINE MAX). A. Brown*[1], B.W. Thomason[1], J.T. Irby[1], C.B. Edwards[2], T.W. Eubank[2], [1]Mississippi State University, Mississippi State, Mississippi, [2]Mississippi State University, Stoneville, MS (198)

ABSTRACT

With an increase of early maturing, indeterminate soybean (Glycine max) varieties in the Mid-South, harvest aids have seen an increased use in order to promote efficient harvest. Desiccation of late emerging weeds, progressing the physiological maturity of immature plants, and needing to combat green stem are all issues that growers face when looking to the harvest season. Without the use of harvest aids, these issues can delay or deny harvest, add foreign matter and increase moisture content to harvested seed, or cause added risk of failure to harvest equipment. Paraquat has been used as a harvest aid in soybean and shown to allow for harvest 7 days before the non-treated. Research has also shown applying paraquat at 50% seed moisture can have no adverse effect on yield. However, the paraquat label states that application should only take place at 30% seed moisture and harvest should occur no sooner than 15 days after application (DAA). Saflufenacil received labeling for harvest aid use in soybean in 2012. When applied POST, saflufenacil has reduced weed biomass by 98%. This, along with its 3 day preharvest interval, has made saflufenacil an attractive option as a harvest aid in soybean production.

An experiment conducted during 2013 at the Black Belt Branch Experiment Station near Brooksville, MS focused on the evaluation of harvest aid applications including paraquat, saflufenacil, and sodium chlorate. Armor 47-R13 soybean seed was planted on four 96 cm rows. Harvest aid applications were made when 65% of the seed pods had reached a mature color. Visual ratings for desiccation were recorded 3 and 7 DAA. At harvest, yields were recorded from the center two rows of each plot. Paraquat provided greater desiccation than saflufenacil 3 DAA with 93 and 50% desiccation levels, respectively. Sodium chlorate, paraquat tank-mixed with sodium chlorate, and paraquat tank-mixed with saflufenacil provided 88, 74, and 74% desiccation 3 DAA, respectively. No differences in desiccation were observed 7 DAA. In addition, no differences in yield were observed. All treatments provided harvest ready levels of desiccation 7 DAA, however, label requirements of paraquat do not allow soybean harvest within 15 DAA. Although saflufenacil has a 3 day preharvest interval, these data would suggest that delaying harvest until 7 days after application would promote a more efficient harvest.

EVALUATION OF HERBICIDES AS HARVEST AIDS IN SOYBEAN (*Glycine max*). B.W. Thomason*, A. Brown, and J.T. Irby; Mississippi State University, Mississippi State, MS (199)

ABSTRACT

In recent years, there has been a growing interest in the use of harvest aids in soybean (*Glycine max*) production. Herbicides such as paraquat and glyphosate have historically been used to desiccate weeds or green material at harvest. With the increased adoption of early maturing, indeterminate soybean varieties in the Mid-South, the need for harvest aids to progress physiological maturity of immature plant material and combat green stem issues is becoming increasingly important. Recent research suggests that paraquat and saflufenacil are both effective options for soybean harvest aids. However, limited data are available regarding performance of these products specific to managing green stem in soybean.

An experiment conducted during 2013 at the Delta Research and Extension Center in Stoneville, Mississippi focused on the evaluation of paraquat, saflufenacil, and sodium chlorate as harvest aids for green stem management in soybean. This experiment was designed as a factorial arrangement of treatments in a randomized complete block design. Harvest-aids were applied when 65% of the pods had reached a mature color. At the time of application, nearly 100 percent of the plot area was affected by green stem. Visual ratings were recorded 3 and 7 days after application (DAA). The treatments include paraquat + sodium chlorate + saflufenacil at .28 + 3.36 + 0.037 kg ai/ha, paraquat + sodium chlorate at 0.28 + 3.36 kg ai/ha, sodium chlorate at 3.36 kg ai/ha, paraquat + saflufenacil at 0.28 + 0.037 kg ai/ha, sodium chlorate + saflufenacil at 3.36 + .037 kg ai/ha, saflufenacil at 0.0375 kg ai/ha, and paraquat at 0.28 kg ai/ha.

All treatments proved to reduce the level of green stem when compared to the untreated. The greatest reduction of green stem ranged from 47 to 50% following either a tankmix of paraquat, sodium chlorate, and saflufenacil, tankmix of paraquat and sodium chlorate, or sodium chlorate applied alone. Saflufenacil and paraquat provided 40 and 38% reduction in green stem, respectively. All harvest aid treatments provided adequate desiccation of green leaf material, but no greater than 50% reduction in green stem. No differences in soybean yield were observed. Further research is needed to evaluate green stem management in soybean.

SOYBEAN HARVEST AID ALTERNATIVES. M.J. Bauerle, J.L. Griffin, D.O. Stephenson, IV, M.R. Foster, B.C. Woolam, and R.L. Landry; School of Plant, Environmental, and Soil Sciences, Louisiana State University Agricultural Center, Baton Rouge, LA (200)

ABSTRACT

Research was conducted in 2013 to evaluate soybean response to harvest aid treatments of Gramoxone at 1 pt/A, Sharpen at 1 and 2 oz/A, Aim at 1.5 oz/A, Gramoxone at 1 pt/A plus Sharpen at 1.5 oz, and Gramoxone at 1 pt/A plus Aim at 1.5 oz/A. In Baton Rouge, Pioneer 94Y80 was planted May 6 and harvest aid treatments were applied September 16 when soybeans were at R 6.5-R7 (full seed to beginning maturity) and 5% defoliation. In a second experiment the same treatments were applied October 2 when soybeans were at R 7.5-R8 (beginning maturity to full maturity) and 60% defoliation. In both experiments spray volume was 15 gallons/A and a nontreated was included for comparison. Visual ratings were made for percent leaf discoloration/defoliation and percent green stems and pods at 1, 3, 7, 10, and 14 days after treatment (DAT). At 14 DAT for soybeans treated with Gramoxone either alone or with Sharpen or Aim on September 16, defoliation was at least 90% with no more than 4% green stem and pods. For Sharpen at 2 oz/A 14 DAT, soybean defoliation was 58% and percent green stems and pods was 56 and 59%, respectively. Soybean defoliation with Aim and for the nontreated was no more than 49% with percent green stems and pods ranging from 75 to 80%. In the second experiment when the same harvest aid treatments were applied on October 2, soybean defoliation 14 DAT for Gramoxone alone or with Sharpen or Aim was 90 to 95%, percent green stems was 11 to 16%, and percent green pods was 5%. For Sharpen at 2 oz/A and Aim, soybean defoliation was 85 and 80% and percent green stems was 30 and 31%, respectively; percent green pods for the treatments was 8%. Soybean defoliation for the nontreated was 75% with 30% green stems and 8% green pods. The Sharpen harvest aid label states that soybeans can be harvested 3 or more days after application and that depending on environmental conditions 10 days may be needed for optimum desiccation. Under the conditions in this study, soybeans treated with Sharpen at 2 oz/A were not ready for harvest 14 DAT regardless of application timing. Aim was ineffective as a soybean desiccant. Both Sharpen and Aim could be applied with Gramoxone to enhance desiccation of morningglory, smellmelon, and other weeds.

OPTIONS FOR WEED MANAGEMENT IN RICE. E.P. Webster*[1], J.C. Fish[1], B.M. McKnight[1], R.J. Levy, Jr.[2]; [1]LSU AgCenter, Baton Rouge, LA, [2]LSU AgCenter, Crowley, LA (201)

ABSTRACT

Benzobicyclon, a Gowan experimental herbicide, is currently being sold in Japan. This herbicide has soil activity but must be activated with establishment of a permanent flood within a few hours of application; however, this herbicide seems to be more consistent if a flood is present prior to application. Benzobicyclon has excellent activity on ducksalad [*Heteranthera limosa* (Sw.) Willd.] and other aquatic weeds, and also has activity on annual sedges, grasses, and broadleaf weeds. Initial observations indicate activity on Amazon sprangletop [*Leptochloa panicoides* (J. Presl) Hitchc.].

In a study conducted at the LSU AgCenter Rice Research Station near Crowley, Louisiana several aquatic weeds were transplanted into 1 m diameter by 0.4 m tall rings under flooded conditions. The rings were placed in the center of a 2.5 m by 5 m plot approximately 5 cm into the soil profile. Benzobicyclon was applied at 247, 494, and 988 g ai/ha approximately 14 days after transplanting. The weeds transplanted were Amazon sprangletop, cattail (*Typha latifolia L). grassy arrowleaf (Sagittaria graminea Michx.), pickerelweed (Pontederia cordata L.), and red ludwigia (Ludwigia repens J.R. Forst.). The area was also naturally infested with barnyardgrass* [*Echinochloa crus-galli (L.) Beauv.], ducksalad, and Indian jointvetch (Aeschynomene indica L.).* Benzobicyclon at 247 kg/ha controlled red ludwigia, pickerelweed, and grassy arrowleaf. The higher rates were need to control cattail and Amazon sprangletop. Benzobicyclon has potential to be a herbicide that can be used on several thousand acres in Louisiana.

Nealley's sprangletop (*Leptochloa nealleyi* Vasey) is a weed that has expanded in the last 5 to 10 years in Louisiana. A glasshouse study was established on the LSU campus near Baton Rouge, Louisiana to evaluate several herbicides used in rice and other crops. Fenoxyprop at 122 g ai/ha, quizalofop at 185 g ai/ha, clethodim at 140 g ai/ha, glyphosate at 1120 g ai/ha, and glufosinate at 450 g ai/ha controlled Nealley's sprangletop 95 to 98% at 11 and 14 d after treatment. The same herbicides reduced total plant biomass to 0.9 to 2.2 g/plant compared with the nontreated with a biomass of 15.3 g/plant. Nealley's sprangletop treated with quinclorac at 420 g ai/ha and penoxulm at 40 g ai/ha had biomass values of 19.1 and 18.8 g/plant, respectively. No tillers were produced when Nealley's sprangletop was treated with fenoxyprop, quizalofop, clethodim, glyphosate, and glufosinate; however, the nontreated, quinclorac, penoxulam, bispyribac at 28 g ai/ha, imazethapyr at 105 g ai/ha, imazamox 44 g ai/ha, and thiobencarb at 4480 g ai/ha treated Nealley's had 11 to 14 tillers. This research indicates that Neally's sprangletop can be managed in a rice crop with the use of burndown herbicides like glyphosate and glufosinate and in crop with fenoxaprop.

Weed control continue to evolve in rice. On average, over the past 16 years at least one new herbicide has been labeled in rice per year. This trend appears that it will continue for the next several years.

SHARPEN (SAFLUFENACIL) FOR PRE- AND POST-EMERGENT BROADLEAF WEED CONTROL IN RICE. M. Oostlander*[1], J. Harden[2], A. Rhodes[3]; [1]BASF, Durham, NC, [2]BASF, Research Triangle Park, NC, [3]BASF, Research Triangle Park, MS (202)

ABSTRACT

POTENTIAL OF BENZOBICYCLON FOR WEED MANAGEMENT IN RICE. B.M. McKnight*, E.P. Webster, J.C. Fish, E.A. Bergeron; LSU AgCenter, Baton Rouge, LA (203)

ABSTRACT

Field studies were established to evaluate the activity of benzobicyclon on common weed species occurring in rice cropping systems in the Mid-South. Benzobicyclon is a carotenoid biosynthesis inhibiting herbicide currently marketed for use in Japan. Typical herbicide symptoms in susceptible weed species include bleached plant tissue followed by necrosis and plant death. Two field studies were conducted at the Louisiana State University AgCenter Rice Research Station near Crowley, Louisiana. The two studies were a rate-spectrum and an application timing study.

In the application timing study, 91-cm diameter by 30.5-cm deep galvanized rings were installed in individual plots for treatment containment. This study was a randomized complete block design replicated 4 times. A seeding flood was established on the field and 60 kg ha^{-1} pre-germinated rice seed was hand broadcasted into the plot area. The seeding flood was drained 24 h later to allow rice to peg. Five days after draining when rice had reached the pegging growth stage a pinpoint flood was established and remained on the field throughout the growing season. Benzobicyclon was applied at seven different application timings: preplant on dry soil, 24 h after seeding flood establishment and seeding, 24 h following the draining of the seeding flood, on pegging rice 24 h prior to pinpoint flood establishment, three- to four-leaf rice, four- to five-leaf rice, and six-leaf to one-tiller rice. Applications were made with a CO_2-pressurized backpack sprayer calibrated to spray 140 L ha^{-1} spray solution. Visual ratings were collected 10, 21, 35, and 49 days after the last application timing on 6-leaf to 1-tiller rice.

The application timings with the most consistent control of barnyardgrass (*Echinichoa crus-galli* L.) and yellow nutsedge (*Cyperus esculentus* L.) across rating dates were the pegging and 3- to 4-leaf timings. Control of barnyardgrass and yellow nutsedge from both of these application timings was greater than 90% at the time of the last rating. Ducksalad [*Heteranthera limosa* (Sw.) Willd.] control did not differ among any treatment at the time of the final rating, and control from all application timings was 84 to 99%. No rice injury was observed at any time throughout this study.

In the rate-spectrum field study, 91-cm diameter rings were installed as previously described. The study was a randomized complete block design with 4 reps. Water management for this study was as previously described. The timing selected for application of benzobicyclon was when ducksalad had reached the spoon growth stage, or leaf expansion. Benzobicyclon was applied at nine different rates: 31, 62, 123, 185, 246, 492, 738, 984, and 1230 g ai ha^{-1}. Applications were made with a CO_2-pressurized backpack sprayer calibrated to deliver 140 L ha^{-1}. Ratings were collected at four timings following application on four weed species; ducksalad, barnyardgrass, Indian jointvetch (*Aeschynomene indica* L.), and yellow nutsedge.

At 21 and 35 DAT, ducksalad control was 85 to 99% when treated with benzobicyclon at 123 g ha^{-1} or higher, suggesting this species is very susceptible to benzobicyclon. At 49 DAT, the highest barnyardgrass control was 81% when treated with benzobicyclon at 1230 g ha^{-1}. Indian jointvetch and yellow nutsedge control was highest when these weeds were treated with 1230 g ha^{-1} of benzobicyclon with 70 and 75% observed control, respectively. No difference was observed for ducksalad control with rates of 123 g ha^{-1} to 1230 g ha^{-1}, with 96 to 99% control. At 10 DAT, yellow nutsedge control was 30% when treated with 1230 g ha^{-1}; however, control increased to 75% at 49 DAT, suggesting several weeks are necessary to achieve this level of control for this species.

When a permanent flood is maintained following herbicide application, benzobicyclon exhibits activity on common rice weed species found in Mid-south rice production systems. Benzobicyclon, in combination with cultural practices, has shown effective weed control in these studies and a fit within herbicide programs recommended for Louisiana rice production.

PROVISIA™: A NEW VISION IN RED RICE CONTROL. J. Harden*[1], B.M. Luzzi[2], D. Carlson[2], H. Hong[2], D. More[2], J. Stevenson-Paulik[2], L. Mankin[2]; [1]BASF, Research Triangle Park, NC, [2]BASF Corporation, Research Triangle Park, NC (204)

ABSTRACT

The Provisia™ Rice System, a new non-GM herbicide tolerant system under development by BASF, will complement the Clearfield® rice system, providing growers with another effective weed control technology and a new tool for resistance management. The system will be a combination of Provisia herbicide with Provisia rice. Provisia herbicide is a postemergence graminicide which controls volunteer Clearfield rice (*Oryza sativa* L.), conventional rice types, red rice, weedy rice, and other common annual and perennial grasses, including barnyardgrass (*Echinochloa crus-galli* L). It is not an ALS herbicide, and thus, provides another mode of action to combat ALS-resistant grasses. In field trials, Provisia rice exhibited excellent tolerance to single and sequential herbicide applications. Optimum control of red rice and other grass species was obtained with sequential applications. Provisia herbicide can be tank-mixed with many common rice herbicides to provide broad spectrum control of broadleaf and grass weeds. Current research is focused on optimization of performance and weed control systems that mitigate the potential for the development of herbicide resistant weeds. BASF is working with multiple seed partners to bring the Provisia™ Rice System to the market in the latter part of this decade.

EFFECT OF INTERMITTENT FLOOD IRRIGATION ON RICE PRODUCTIVITY AND WEED SUPPRESSION. D.R. Gealy*[1], M. Anders[2]; [1]USDA-ARS, Stuttgart, AR, [2]University of Arkansas, Stuttgart, AR (205)

ABSTRACT

Certain indica rice lines from Asia have been shown to suppress barnyardgrass (*Echinochloa crus-galli*) effectively in conventional flood-irrigated (FLI) production systems, but their weed suppression potential in "intermittent flood-irrigated" (IFI) production systems is unknown. IFI systems (aka "alternating wetting and drying" or AWD) have been gaining popularity internationally and increasingly in the USA, due to their potential water savings. In these studies, weed-suppression potential of indica and commercial tropical japonica rice cultivars was compared under FLI and IFI production systems. Rice was drill-seeded on April 30, 2012 and 2013 into 3-m-long plots with 9 rows spaced 18 cm apart at a depth of 1.9 cm. Weed suppression by PI 312777 and Rondo (indicas), XP753 (commercial hybrid), Katy, Cheniere, and Bengal (commercial cultivars), and STG06L-35-061 (derived from PI 312777 x tropical japonica crosses) was evaluated under weedy and weed-free conditions. Plots were flush-irrigated as necessary after rice planting to maintain healthy crop plants prior to establishing the permanent flood. Immediately before application of the permanent flood, 110 kg ha^{-1} nitrogen was applied as urea to all plots. FLI plots were subsequently maintained fully flooded to a depth of ~10 cm for the remainder of the crop season, whereas IFI plots were allowed to deplete their irrigation water until the soil volumetric water content (VWC; as determined using transmission line oscillator [TLO] probes that measure the dielectric permittivity of soil) in the driest of the replicate plots had been reduced to a target level of 25 to 30% (average over 0-11 cm depth). At this VWC, the soil surface had a dry appearance, but the rice plants appeared to be healthy and not moisture-stressed. All IFI plots were then re-irrigated to a depth of 10 cm. These re-flooding procedures were repeated intermittently as needed throughout the growing season. The experimental design was a split, split plot, with irrigation method as the main plot, cultivar as sub plot, weed level as sub sub plots, and four replications. Weed-free plots were sprayed post-emergence with commercially recommended rates of quinclorac + propanil followed by fenoxaprop (2012), or quinclorac + cyhalofop (2013). Weed-infested plots were sprayed post-emergence with suboptimal rates of 2.2 and 1.1 kg ha^{-1} propanil, respectively, in 2012 and 2013, to lightly suppress weed growth. Due to warm temperatures and plentiful rainfall after the 2012 planting, pre-flood barnyardgrass densities were quite high, averaging ~182 plants m^{-2}. In 2013, pre-flood barnyardgrass densities were ~134 plants m^{-2}, but due to an extended period of unseasonably cold temperatures after planting, the rice plants emerged six days later than in 2012. Thus, early season competition from weeds was severe in both years, resulting in midseason weed control ratings ranging from 9 to 31% in 2012 and 5 to 9% in 2013. Midseason barnyardgrass biomass averaged ~15% less in IFI compared to conventional FLI plots, and was similar in the FLI plots in both years (1827 and 1969 g m^{-2} in 2012 and 2013, respectively). In weed-free plots, the conventional FLI rice yields averaged 7666 and 8451 kg ha^{-1} in 2012 and 2013, respectively, and yields averaged ~25% less in the IFI than in FLI plots in both years. Yields of Bengal were substantially lower (~44%) under IFI than FLI, whereas yields of XP753, Rondo, and PI 312777 were statistically similar in the two systems. Yield reduction in barnyardgrass-infested plots was usually >90% in both years. From these limited results, it is clear that weeds can dramatically reduce production of suppressive and non-suppressive rice cultivars in both IFI and FLI systems, particularly if high weed population densities or delayed crop emergence provide a competitive advantage to the weeds during the initial stages of crop establishment. Productivity of the weed-suppressive indicas and the hybrid were relatively less affected by the IFI conditions than were the other cultivars, particularly Bengal, suggesting that the weed-suppressive cultivars may be relatively better adapted to IFI systems. Re-flooding at higher VWC levels might be a means to prevent some of the yield loss attributed to the IFI system in this study.

RICE RESPONSE TO SIMULATED DRIFT OF PARAQUAT, FOMESAFEN, AND METRIBUZIN. J.A. Bond*, T.W. Eubank, H.M. Edwards, G.B. Montgomery, T.W. Walker; Mississippi State University, Stoneville, MS (206)

ABSTRACT

Glyphosate-resistant weeds, primarily glyphosate-resistant Palmer amaranth (*Amaranthus palmeri*), are the principal weed control issue facing growers in Mississippi. Rice is not directly affected by glyphosate resistance, but it is impacted indirectly through off-target movement of herbicides targeting glyphosate-resistant weeds in adjacent fields. Herbicide applications targeting glyphosate-resistant weeds prior to planting soybean often include paraquat and a residual herbicide. Injury symptoms from these applications are complex and the residual herbicide is often difficult to identify from visual symptoms.

A study was conducted in 2013 at the Mississippi State University Delta Research and Extension Center to evaluate the effect of simulated herbicide drift on rice growth and yield. The experimental design was a split plot with four replications. Whole plots were herbicides and included paraquat, fomesafen, and metribuzin. Sub-plots were arranged as a 4 x 2 factorial of application rate and timing. Application rates represented 3.2, 6.3, 12.5, and 25% of the use rates of paraquat (0.75 lb ai/A), fomesafen (0.25 lb ai/A), and metribuzin (0.25 lb ai/A). Application timings included a very early-postemergence (VEPOST) treatment to rice in the one-leaf stage and a late-postemergence (LPOST) treatment to rice in the four-leaf to one-tiller stage. A nontreated control for each whole plot was included for comparison. Rice injury was visually estimated at 3, 7, 14, 21, and 28 days after each application. Days to 50% heading, mature plant height, and rice yield were also determined. Days to 50% heading, mature height, and rice yields were converted to a percent of the nontreated control. All data were subjected to ANOVA and estimates of the least square means were used for mean separation.

Paraquat injured rice more following LPOST applications at 7, 14, 21, and 28 days after application regardless of application rate. Heading was delayed 4 to 14 days following paraquat, and delays were greater following LPOST applications at 6.3 and 12.5% of the use rate. Mature height was only affected when the two highest rates of paraquat were applied LPOST. Rice yield was reduced more following LPOST applications of paraquat at 12.5 and 25% of the use rate compared with VEPOST. The highest rice injury from fomesafen was 8% observed following application of 25% of the use rate at both timings. Fomesafen did not influence rice maturity. Rice yield was 94% of the nontreated control following fomesafen at 25% of the use rate, regardless of application timing. Rice yield was not impacted by other fomesafen treatments. Metribuzin LPOST generally injured rice more than VEPOST applications. However, at 14 days after application, rice injury was similar following the two highest rates for both application timings. Rice yield was 86% of the nontreated control following metribuzin at 25% of the use rate, regardless of application timing. Rice yield was not impacted by other metribuzin treatments.

Rice recovered from early-season injury following simulated drift of fomesafen and metribuzin with no reductions in rice yield following either herbicide applied at 3.2, 6.3, and 12.5% of the use rate at either timing. Rice growth, development, and yield were influenced more following simulated drift of paraquat LPOST compared with VEPOST. Growers should be extremely cautious when making herbicide applications containing paraquat near rice fields, especially when applications coincide with the early-tillering stage of rice.

ON-FARM CONTROL OF GLYPHOSATE-RESISTANT PALMER AMARANTH IN WEST TEXAS: R.M. Merchant*[1]; P.A. Dotray[1,2]; W.K.Keeling[2], M. Anderson[3], E. Fortenbury[4]. [1]Texas Tech University, Lubbock; [2]Texas A&M AgriLife Extension Service, Lubbock; [3]Texas A&M AgriLife Extension Service, Seminole; [4]Texas A&M AgriLife Extension Service, Floydada, TX (207).

ABSTRACT

Cotton (*Gossypium hirsutum*) is the most important agronomic crop in West Texas, with over 1.65 million ha planted in 2013. Glyphosate-resistant Palmer amaranth (*Amaranthus palmeri*) is a relatively new and substantial threat to cotton production in this area. In 2013, trials were conducted at 5 locations in West Texas where glyphosate-resistant Palmer amaranth are suspected; locations 1, 2, and 3 were located in Gaines County, whereas locations 4 and 5 were located in Floyd County. The purpose of these studies was to determine the effectiveness of 4 different residual herbicide programs in differing environmental conditions as well as to provide on-farm demonstration plots in these areas that would be available to County Extension Agents for use during field tours. Trials were established fields after growers had made preplant incorporated applications and immediately following cotton planting. Treatments included the growers choice of preplant incorporated herbicide (in these cases either trifluralin at 0.84 kg/ha or pendimethalin at 1.1 kg/ha) alone, preplant incorporated herbicide followed by (fb) prometryn (1.34 kg/ha) preemergence, preplant incorporated herbicide fb *s*-metolachlor (1.38 kg/ha) postemergence, and preplant incorporated herbicide fb prometryn preemergence fb *s*-metolachlor postemergence. Palmer amaranth populations were recorded 4 weeks after postemergence applications were made, fb removal of all weeds to prevent an increase in the weed seedbank in grower fields. Treatment had a significant effect on Palmer amaranth populations at locations 1, 2, and 3. At location 1, Palmer amaranth populations were 18 plants/m^2 when treated with trifluralin alone, and were reduced 83%, 44%, and 61%, by the addition of prometryn, *s*-metolachlor, and prometryn fb *s*-metolachlor, respectively. At location 2, Palmer amaranth populations were 12 plants/m^2 when treated with trifluralin alone, and were reduced 92% with the addition of prometryn fb *s*-metolachlor. At location 3 Palmer amaranth populations were 15 plants/m^2 when treated with pendimethalin alone, and were reduced 73%, 73%, and 100%, by the addition of prometryn, *s*-metolachlor, and prometryn fb *s*-metolachlor, respectively.

BICYCLOPYRONE FOR PRE-EMERGENCE WEED CONTROL IN CORN. B.D. Black*, T.H. Beckett, S.E. Cully, J. Foresman, G.D. Vail; Syngenta, Greensboro, NC (240)

ABSTRACT

Bicyclopyrone is a new selective herbicide for weed control in field corn, seed corn, popcorn and sweet corn. The bicyclopyrone mode of action is inhibition of HPPD (4-hydroxyphenyl-pyruvate dioxygenase) enzyme which ultimately causes the destruction of chlorophyll followed by death in sensitive plants.

Upon registration, SYN-A197 will be the first bicyclopyrone containing product launched with anticipated first commercial application in the 2015 growing season. SYN-A197 is a multiple mode-of-action herbicide premix that provides preemergence and postemergence grass and broadleaf weed control.

Field trials were conducted to evaluate SYN-A197 for pre-emergence weed control and crop tolerance compared to commercial standards. Results show that SYN-A197 very effectively controls many difficult weeds and provides improved residual control and consistency compared to the commercial standards.

IMPACTS OF PLANT POPULATION, ROW SPACING AND HERBICIDE PROGRAM ON SORGHUM WEED MANAGEMENT. T.E. Besancon*[1], W. Everman[2], R. Weisz[1], R. Heiniger[3]; [1]NCSU, RALEIGH, NC, [2]NC State University, Raleigh, NC, [3]North Carolina State University, Raleigh, NC (242)

ABSTRACT

Weed control remains a major challenge for economically viable sorghum production in North Carolina because sorghum is highly sensitive to weed competition during early growth stages. Moreover, herbicides able to suppress grasses are extremely limited due to sorghum sensitivity. Besides grass weeds, Palmer amaranth (*Amaranthus palmeri*) is one of the broadleaf weeds that may be the most problematic in sorghum production. Previous studies have shown improvements of weed control in sorghum with narrowed row spacing and increased planting density. Separate field studies were conducted in 2012 and 2013 at the Upper Coastal Plain Research Station (Rocky Mount, NC), at the Caswell Research Farm (Kinston, NC), at the Central Crops Research Station (Clayton, NC) and at Clarkton, NC, to determine which row spacings and which plant populations would increase crop competitiveness to allow the reduction of POST herbicide applications. The experiment was conducted in a factorial arrangement of treatments in a randomized complete block design with row spacing (19, 38, and 76 cm), plant population (40,000, 80,000, 120,000, 160,000 plants, and 300,000 plants per acre), and herbicides (non-treated, PRE application of S-metolachlor at 1412 g ai.ha^{-1} + atrazine at 1824 g ai.ha$^{\text{â€˜1}}$, and PRE application of S-metolachlor at 1076 g ai.ha^{-1} + atrazine at 1390 g ai.ha^{-1} followed by POST application of 2,4-D amine at 333 g ai.ha^{-1} or acetochlor at 840 g ai.ha^{-1}) as main factors. Sorghum was rated for the percentage of Palmer amaranth, sicklepod (*Senna obtusifolia*), large crabgrass (*Digitaria sanguinalis*) and crowfootgrass (*Dactyloctenium aegyptium*) control 4 weeks after PRE, and 1, 3 and 7 weeks after POST. Weed density and biomass were evaluated before harvest as well as yield at the harvest.

In 2012, overall, Palmer amaranth density increased with wider row spacings. Its biomass was primarily affected by plant population in 2012 and by both row spacing and plant population in 2013. Herbicide control averaged 98% for both herbicide strategies at Clarkton and Rocky Mount in 2012 and 95% at Rocky Mount in 2013. At Kinston in 2012 and 2013, sicklepod control averaged 40% for PRE herbicide alone and 70% for PRE herbicide followed by POST herbicide. Sicklepod control tended to increase with plant population for the 19 cm row spacings. In 2013 at Clayton, large crabgrass biomass was primarily affected by plant population. Results were similar for crowfootgrass with a decrease of the biomass for narrow row spacing and high plant population. Application of acetochlor as a POST herbicide didn’t improve grass control. Sorghum yields were significantly different at Clarkton and Rocky Mount in 2012 and Kinston and Rocky Mount in 2013. The highest yields were associated with the combination of narrow rows and high plant densities.

STEWARDSHIP OF DUPONT™ INZEN™ HERBICIDE TOLERANCE TRAIT FOR SORGHUM. D.W. Saunders*[1], C.R. Medlin[2], W.J. Schumacher[1]; [1]DuPont Crop Protection, Johnston, IA, [2]DuPont Crop Protection, Paradise, TX (243)

ABSTRACT

Postemergence control of grass weeds in sorghum has been a high-priority objective for weed scientists for many years. Up to now, this effort has been hampered by inadequate herbicide selectivity to the sorghum crop. Inzen™ is a new herbicide tolerance trait for sorghum that delivers crop safety to a number of ALS herbicides that have good postemergence activity on grass weeds. Inzen™ is a non-GMO trait introduced into sorghum from wild, herbicide-tolerant shattercane using natural breeding techniques. In this case, the exchange of genetic information between a cultivated crop and its wild, weedy relative resulted in the development of a valuable weed management tool for sorghum producers. However, the potential reverse movement of the trait from the crop to non-target weeds would not be desirable. Two-way movement of the Inzen™ trait between cultivated sorghum and its weedy relative shattercane (both *sorghum bicolor*) via pollen-mediated gene-flow has been well-studied and the trait has been shown to move within this species. Pollen-mediated gene flow across species lines to other sorghum relatives, such as johnsongrass (*sorghum halepense),* has also been studied and a significantly lower potential for genetic exchange has been found. Efforts are underway to better understand and minimize the potential of pollen-mediated gene flow from cultivated sorghum containing the Inzen™ trait to its weedy relatives. Learnings are being applied towards the development and implementation of Best Management Practices (BMPs) sorghum growers will be required to adopt prior to planting sorghum containing the Inzen™ trait. DuPont Crop Protection has licensed the Inzen™ trait to sorghum seed companies and several have announced the commercial introduction of hybrid sorghum lines carrying the Inzen™ trait as soon as 2015-16. Pending regulatory approval, DuPont Crop Protection will introduce new postemergence grass control solutions in sorghum that were not possible prior to the introduction of the Inzen™ trait. Successful implementation of the Inzen™ BMPs will help ensure value to sorghum producers who plant sorghum containing the trait.

WEED CONTROL OPTIONS IN ARKANSAS GRAIN SORGHUM. R.C. Doherty*, T. Barber, L. Collie, J.R. Meier; University of Arkansas, Little Rock, AR (244)

ABSTRACT

Weed Control Options in Arkansas Grain Sorghum. R. Doherty, T. Barber, L. Collie, and J. Meier; University of Arkansas, Division of Agriculture, Research and Extension

One trial was established at Rohwer, AR, on the Southeast Research and Extension Center in a Hebert silt loam soil in 2013 to evaluate crop response and efficacy of preemergence herbicide systems in grain sorghum for control of Palmer amaranth, morningglory, and broadleaf signal grass. The trial was arranged in a randomized complete block design with four replications. Parameters evaluated were visual crop injury, weed control ratings and grain sorghum yield.

Visual grain sorghum injury with Zidua at 2.5 oz/a applied PRE, Anthem at 8 oz/a applied PRE, and Anthem ATZ at 32 oz/A applied PRE 20 DAT (days after treatment) caused 24, 45, and 42% injury respectively. Zidua at 2.5 oz/a applied PRE fb AAtrex at 64 oz/A + COC at 1% v/v applied at 2-3 lf, Anthem at 8 oz/a applied PRE fb AAtrex at 64 oz/A + COC at 1% v/v applied at 2-3 lf, and Anthem ATZ at 32 oz/A applied PRE fb AAtrex at 32 oz/A + COC at 1% v/v applied at 2-3 lf caused 22, 14, and 12 cm height reduction respectively, 9 DAT.

Palmer amaranth control 20 DAT was 91% or greater with all treatments. Morningglory control was 91% or greater with all treatments. Broadleaf signal grass control was 90% or greater with all treatments except with Huskie at 15 oz/A PRE fb AAtrex at 64 oz/A + COC at 1% v/v applied at 2-3 lf which provided 84% control.

Palmer amaranth control 41 DAT was 97% or greater with all treatments. Morningglory control was 94% or greater with all treatments. Broadleaf signal grass control ranged from 25 to 88% control, with Lexar EZ PRE at 96 oz/A fb Bicep II Magnum at 51.2 oz/A + COC at 1% v/v applied at 2-3 lf and Verdict at 12 oz/A fb Bicep II Magnum at 51.2 oz/A + COC at 1% v/v applied at 2-3 lf providing 88% control.

All treatments provided greater grain sorghum yield than the untreated check. Yield ranged from 159 bu/A provided by Zidua at 2.5 oz/a applied PRE fb AAtrex at 64 oz/A + COC at 1% v/v applied at 2-3 lf to 198 bu/A provided by Dual II Magnum at 16 oz/A PRE fb Peak at 0.75 oz/A plus AAtrex at 64 oz/A + COC at 1% v/v applied at 2-3 lf.

WEED MANAGEMENT AND SORGHUM YIELD AS AFFECTED BY POST HERBICIDES. W.J. Vincent*, W.J. Everman, T. Besancon and R. Riar, North Carolina State University, Raleigh, NC (245)

ABSTRACT

Sorghum is ancient crop with growing requirements favorable to those present in North Carolina. In 2013, North Carolina producers grew it on more than 70,000 acres. This acreage is expected to increase in 2014 due to assured market, grower enthusiasm, low production cost, drought tolerance and lower risk compared to corn, especially in sandy soils. Although there is rejuvenated interest for its use as an animal feed, this is the first time it has been grown on a large scale within the state in recent years. Limited research based production and management information is available for growers to follow in the Southeast. Weed management is an important aspect of profitable crop production which has a bearing on the success of a new crop, and in determining its fit in a cropping system. To address the issues of successful weed management under the given environment and cropping system, two studies were conducted to evaluate the impact of different herbicides and weed management strategies on sorghum growth and yield. The first study evaluated the effect of two rates of Huskie tank mixed with atrazine and Banvel or 2,4-D, and AMS on weed control and yield, at two locations. The treatment combinations evaluated in this study included; Huskie 13 OZ/A + Atrazine 1 PT/A + AMS 1 LB/A, Huskie 16 OZ/A + Atrazine 1 PT/A + AMS 1 LB/A, Huskie 13 OZ/A + Atrazine 1 PT/A + 2,4-D A 4 FL OZ/A, Huskie 13 OZ/A + Atrazine 1 PT/A + Banvel 4 FL OZ/A and Atrazine 1 PT/A + Buctril 1 PT/A. At one location, there were no differences within treatments, but at the second location, the lesser rate of Huskie tank mixed with atrazine and Banvel or 2,4-D produced greater yields than the higher rate of Huskie tank mixed with atrazine and AMS. The second study tested the impact of Huskie mixed with different adjuvants on crop injury and yield. Various adjuvants were added in with a constant rate of 13 OZ/A of Huskie including; NIS 0.25 % V/V, MSO 1 % V/V, COC 1 % V/V, AMS 1 LB/A, AMS 3 LB/A, 28 % N 1 GAL/A, NIS 0.25 % V/V + AMS 1 LB/A, MSO 1 % V/V + AMS 1 LB/A and COC 1 % V/V + AMS 1 LB/A. All treatment combinations caused significant visible injury on sorghum leaves. However, injury was transient and grain yield was similar for all treatments.

EFFECTS OF PRE-PLANT BURNDOWN APPLICATIONS ON PLANT BACK TO WINTER CANOLA IN OKLAHOMA. A.R. Post*, J. Bushong; Oklahoma State University, Stillwater, OK (246)

ABSTRACT

Winter canola is an emerging crop in Oklahoma and the Southern Great Plains. Canola was introduced to the region in the late 1990's as a rotational crop for winter wheat. It is typically grown in a three year canola-wheat-wheat rotation in order to manage the build-up of grassy weeds on continuous wheat ground. In the 2013-14 winter growing season, it is estimated that nearly 300,000 acres of winter canola were planted in Oklahoma. Much of this acreage is treated with a burn-down application of glyphosate prior to planting in the fall and many growers like to use additional modes of action in their burn-down tank-mixes to broaden the spectrum of weed control. Phenoxy herbicides such as 2,4-D and dicamba are typical additions, however, labels for these products are unclear regarding canola plant-back restrictions. Many growers use a rule-of-thumb estimation for how quickly after a burn-down application with phenoxies they can plant canola. Typically they observe 30 days.

Current labels for 2,4-D and dicamba for applications in wheat do not specifically address rotational restrictions for canola. Previous work has shown canola will not tolerate dicamba applications made within 15 days of planting. Since many Oklahoma growers routinely use these tank-mixtures as burn-down prior to planting, this work aims to evaluate canola tolerance of glyphosate and glufosinate tank mixtures with 2,4-D, dicamba, and saflufenacil. Studies were initiated in September 2013 in Stillwater and Perkins, Oklahoma. They were established as a 4 by 6 factorial with four treatment timings and six herbicide tank mixtures. Treatments were glyphosate alone at 22 oz/A, glyphosate + 2,4-D at 8 oz/A, glyphosate + dicamba at 8 oz/A, glyphosate + saflufenacil at 1 oz/A, and glufosinate + 2,4-D. Treatments were applied at 15GPA at 0, 10, 20, and 30 days prior to planting. Stand counts were taken in November, December, and January following final applications to evaluate stand reduction.

Stand counts in the nontreated plots averaged 29, 23, and 19 in November, December, and January, respectively at the Stillwater location. Based on these ratings, some stand loss through this season can be attributed to winter-kill. At 0, 10, and 20 days prior the planting all treatments except glyphosate alone caused severe stand reduction compared to the nontreated. At 30 days prior to planting canola glyphosate + 2,4-D still caused a 45% stand reduction compared to the nontreated. However, stand counts for glyphosate alone, glyphosate + saflufenacil, and glyphosate + dicamba applied 30 days prior to planting were equivalent to the nontreated. Therefore, Oklahoma growers should wait the full 30 days to plant canola following a burn-down application containing dicamba. Tank-mixtures containing 2,4-D should be avoided when canola is the following crop and glyphosate + saflufenacil should be evaluated further to determine its utility as a tank-mix partner with glyphosate burn-down applications prior to canola.

CULTURAL METHODS FOR THE SUPPRESSION OF ITALIAN RYEGRASS (*LOLIUM MULTIFORUM*) IN WINTER WHEAT. Z.R. Taylor*[1], W. Everman[2]; [1]North Carolina State University, Raleigh, NC, [2]NC State University, Raleigh, NC (247)

ABSTRACT

Italian Ryegrass (Lolium multiflorum) is one of the most problematic weeds in the production of winter wheat in the southeast. As herbicide resistance issues continue to develop and expand throughout the area, our options for control post emergence continue to decline. As a result we are looking at some cultural practices that may help to suppress the problem when combined with a variety of chemical control plans. One method studied was to improve the crops ability to compete by changing row spacing. We compared wheat planted in 7.5 rows with a drill to those planted in approximately 3.75 inch rows. Differences in control between cultural practices were not seen, however this may have been due to poor weed pressure and growing conditions. A second study was conducted to determine the effect of tillage combined with herbicide treatment on Italian ryegrass management. Wheat grown in both tilled and in no-till conditions received the following treatments; non-treated check, Zidua (pyroxasulfone) at 1.25, 1.5, and 3 oz/A pre, Fierce (Flumioxazin and Pyroxasulfone) at 3 oz/A pre, Zidua at 1.25 oz/A and Sharpen (saflufenacil) at 2 fl oz/A pre, Prowl H2O (pendimethalin) at 2 pt/A at spike, Axiom (Flufenacet and Metribuzin) at 8 oz/A at spike, Axiom at 10 oz/A at spike, Zidua at 1.25 oz/A pre fb Osprey (Mesosulfuron) at 4.75 oz/A and non-ionic surfactant at 1qt/100gal post, Zidua at 1.25 oz/A pre fb Powerflex (pyroxsulam) 3.5 oz/A post, Zidua at 1.25 oz/A pre fb Axial XL (pinoxaden) at 16.4 oz/A post, Osprey at 4.75 oz/A and Zidua at 1 oz/A and non-ionic surfactant at 1 qt/100gal post, Powerflex at 3.5 oz/A and Zidua at 1 oz/A post, Axial XL at 16.4 oz/A and Zidua at 1 oz/A post. We found that control was better for all herbicides in tilled conditions compared to no-till. This study is still in progress, and we have yet to determine if this is due to inverting the seed bank or better soil contact by pre-emergence herbicides.

TIMING OF PYROXASULFONE APPLICATION FOR ITALIAN RYEGRASS (*LOLIUM MULTIFLORUM*) CONTROL IN WINTER WHEAT (*TRITICUM AESTIVUM*). T.L. Grey*[1], S. Culpepper[1], L. Newsom[2], S.H. Newell[3]; [1]University of Georgia, Tifton, GA, [2]BASF Corporation, Tifton, GA, [3]BASF, Statesboro, GA (248)

ABSTRACT

Field studies were conducted to evaluate Italian ryegrass control and soft red winter wheat tolerance. Pyroxasulfone was applied preemergence (PRE), at wheat emergence (AE), or post-emergence (POST) when wheat was in the 2 to 3 leaf (2-3 LF) Feekes' stage of growth. Research was conducted at Griffin, Plains, and Tifton GA. Susceptible and diclofop resistant Italian ryegrass control was 85% or greater with pyroxasulfone applied PRE at 60 to 120 g a.i./ha at wheat harvest. For these same rates when pyroxasulfone was applied AE, by wheat harvest Italian ryegrass control was poor ranging from 30 to 70%. When pyroxasulfone was applied POST with MSO and UAN, at wheat harvest, Italian ryegrass control was poor ranging from 28 to 50%. While pyroxasulfone has little to no postemergence activity, it still provided some late season Italian ryegrass control likely due to root absorption. Italian ryegrass control was improved when pyroxasulfone was combined with saflufenacil or pendimethalin PRE. Injury for pyroxasulfone PRE, AE, or POST up to 120 g a.i./ha was 10% or less, was transient and not observed by harvest, and did not affect wheat yield.

EARLY AND LATE POSTEMERGENCE WEED CONTROL IN SUGARCANE. D. Odero*[1], G. Montes[2], N. Havranek[1]; [1]University of Florida, Belle Glade, FL, [2]Florida Crystals, South Bay, FL (249)

ABSTRACT

Sugarcane weed control programs in Florida generally consist of combinations of early and late postemergence herbicide weed control programs. Triazine herbicides atrazine, metribuzin, and ametryn are the foundation of these programs applied in combination with mesotrione, trifloxysulfuron, asulam, halosulfuron, and 2,4-D. Field studies were conducted near Belle Glade, FL in 2013 to determine the efficacy of different herbicide programs for early and late postemergence weed control in sugarcane. Predominant weed species were yellow nutsedge, fall panicum, and broadleaf weeds. Broadleaf weeds were mainly common lambsquarters and spiny amaranth. At 8 weeks after treatment (WAT) prior to the late postemergence treatment application, the early postemergence combination of metribuzin (1.05 kg/ha) + atrazine (4.5 kg/ha) + halosulfuron (0.84 kg/ha) provided the highest level of control of yellow nutsedge (88%), fall panicum (71%), and broadleaf weeds (90%). The late postemergence combination of asulam (3.74 kg/ha) + trifloxysulfuron (0.0158 kg/ha) and mesotrione (0.105 kg/ha) + atrazine (0.56 kg/ha) + asulam (3.74 kg/ha) + trifloxysulfuron (0.0158 kg/ha) provided the highest level of fall panicum and broadleaf weeds 6 WAT. These late postemergence programs provided 79 to 81% control of fall panicum and 84 % control of broadleaf weeds. Appropriate timing of application of these herbicide combinations is critical for efficacious weed control in sugarcane.

PEANUT INJURY AND YIELD REDUCTION IN RESPONSE TO SIMULATED 2,4-D AND DICAMBA DRIFT AT TWO GROWTH STAGES. B.J. Brecke*[1], R.G. Leon[1], and J.A. Ferrell[2]; [1]University of Florida, Jay, FL, [2]University of Florida, Gainesville, FL (250)

ABSTRACT

New cotton and soybean cultivars are being developed with tolerance to 2,4-D and dicamba. The risk of unintended exposure of peanut to these herbicides from drift or application errors will increase as growers adopt these new technologies. Growers will need to determine whether the injured peanut crop has the potential to produce an economic yield or should be terminated and the area replanted when such incidents occur. Estimates of the potential yield reduction caused by exposure to 2,4-D or dicamba will need to be made. Dose response studies were conducted under field conditions in Citra and Jay, FL during 2012 and 2013 to determine peanut foliar injury and eventual yield reduction after exposure to 70, 140, 280, 560, and 1120 g ae ha-1 of 2,4-D or to 35, 70, 140, 280, and 560 g ae ha-1 of dicamba at two growth stages (21 and 42 days after planting (DAP)). Peanut age at time of exposure did not affect response to dicamba or 2,4-D. Depending on herbicide rate, dicamba caused 2 to 5 times greater peanut foliar injury and 0.5 to 2 times higher yield loss than 2,4-D. Foliar injury ranged from 0 to 35% when peanuts were treated with 2,4-D and from 20 to 78% when treated with dicamba. The maximum yield reduction from 2,4-D treatment was of 41% and from dicamba exposure was 65%. Linear regression indicated that the intercept for yield reduction was 12% for 2,4-D and 23% for dicamba. There was a 2.5% and 7.7% increase in yield loss per additional each 100 g ha-1 of 2,4-D and dicamba, respectively. Although high variability was observed, there was a positive correlation between foliar injury and peanut yield reduction ($P<0.0001$) suggesting that growers can use foliar injury data to estimate yield reduction and decide whether to continue or terminate the peanut crop.

SESAME TOLERANCE TO PRE- AND POST-EMERGENCE HERBICIDE APPLICATIONS. J.R. Meier*, T. Barber, R.C. Doherty, L. Collie; University of Arkansas, Little Rock, AR (251)

ABSTRACT

Sesame is one of the oldest crops known to humans and has become of interest to growers in Arkansas for use on land that is non-irrigated or unsuitable for other crops due to its drought resistance. Sesame develops slower upon emergence because it partitions a large amount of photosynthetic resources to increase root mass to forage more moisture. This contributes to its drought resistance, but in turn requires a longer weed-free period (50-60 d) after emergence. Two trials were conducted in 2013 near Rohwer, AR to examine sesame response and Palmer amaranth control to PRE and POST herbicide applications. Sesame was drill seeded at 8 lbs seed/acre and treatments were applied at 10 GPA in both trials. In the POST trial, Dual II Magnum at 16 oz/a was applied PRE to control Palmer amaranth. Sesame emergence and injury as well as Palmer amaranth control was evaluated and analyzed by ANOVA and means separated at the P=0.05 level. Verdict (15 oz), Fierce (3 oz), Callisto (6 oz), Balance Flexx (6 oz), Realm Q (4 oz), Capreno (32 oz), Direx + Prowl (32 + 32 oz), Dual + Prowl (32 + 32 oz), Direx + Dual (32 + 32 oz), and Authority MTZ (14 oz) applied PRE reduced sesame emergence greater than 90%, 38 DAA. Zidua at 3 oz, Dual II Magnum (32 oz), Prefix (32 oz), and Reflex (16 oz) reduced sesame emergence 50-60% 38 DAA. Sesame displayed tolerance (less than 20% reduction) to Sharpen (3 oz), Zidua at 2 and 2.5 oz, Direx (32 oz), and Cotoran (32 oz) at this time. POST applications were made to 18-24 inch sesame and 24-48 inch Palmer amaranth. MSMA (43 oz), MSMA + Direx (43 + 32 oz), MSMA + Cotoran (43 + 32 oz), Callisto (3 oz), Balance Flexx (5 oz), Laudis (3 oz), Marvel (7 oz), Ultra Blazer (16 oz), Storm (24 oz), Prefix (32 oz), Roundup WeatherMax (22 oz), and Liberty 280 (29 oz) applied POST to sesame resulted in injury above 60%, 20 DAA. Applications of Direx (32 oz), Cotoran (32 oz), Reflex (16 oz), Direx + Linex (32 + 32 oz), Zidua (2 oz), and Zidua + Direx (2 + 32 oz) resulted in injury of 30% or less and 40-60% control of Palmer amaranth at this time. From these trials, Dual, Direx, Linex, Cotoran, and Zidua have the greatest potential as weed control options for sesame production.

DROPLET SIZE AND EFFICACY OF ENGENIA TANK-MIX COMBINATIONS AS INFLUENCED BY SPRAY TIPS AND SPRAY VOLUMES. C. J. Meyer[1], J. K. Norsworthy[1], G. R. Kruger[2], B. W. Schrage[1], H. D. Bell[1], Z. T. Hill[1], D.S. Riar[1], M.T. Barapour[1], J. R. Brennan[1], L. T. Barber[1]; [1]Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR. [2]Department of Agronomy and Horticulture, University of Nebraska-Lincoln, North Platte, NE (252)

ABSTRACT

The release of auxin-type herbicide-resistant soybean is rapidly approaching; therefore, carrier volume and nozzle selection will become more important variables in maintaining efficacy of herbicide solutions while minimizing off-target movement. A field experiment was conducted in 2013 at the Northeast Research and Extension Center in Keiser, Arkansas to evaluate the efficacy of four herbicide tank-mixtures using various nozzle and spray volume combinations. To supplement the field data, droplet spectra for each nozzle and tank-mix combination were determined at the West Central Research and Extension Center in North Platte, Nebraska. This experiment was arranged as a randomized complete bock design with a factorial arrangement of three factors: nozzle size, nozzle type, and herbicide treatment. Two nozzle sizes (11003 and 11006 rated at 1.14 L min^{-1} and 2.27 L min^{-1}, respectively) were used to vary spray volume from 93.5 L ha^{-1} to 187 L ha^{-1} for TeeJet AIXR, AITTJ60, and TTI nozzles. Applications were made with a tractor-mounted research sprayer at 276 kPa and 15.1 km hr^{-1}, 21 days after planting. Herbicide treatments were labeled rates of dicamba (as the product Engenia) + glufosinate (Liberty), dicamba + glyphosate (Roundup Powermax), dicamba + glufosinate + glyphosate, and dicamba + glufosinate + glyphosate + *S*-metolachlor (Dual Magnum). Percent weed control was evaluated four weeks after application (WAA) for Palmer amaranth, velvetleaf, hemp sesbania, pitted morningglory, and barnyardgrass. Additionally, three barnyardgrass plants were harvested at four WAA to determine overall biomass reduction of the herbicide treatments compared to the untreated check. The three-way interaction between nozzle type, nozzle size, and herbicide treatment was significant for all weed control ratings and biomass, indicating the effect of one factor on weed control is dependent upon the other two factors. For most nozzles, no significant difference existed between efficacy of the two nozzle sizes of the same type with the same tank-mix. Overall weed control was highest for all herbicide treatments with AIXR nozzles, providing greater than 98% control of Palmer amaranth, velvetleaf, and hemp sesbania, and greater than 95% control of pitted morningglory and barnyardgrass. On average, AIXR nozzles reduced biomass of barnyardgrass by 97% four WAA. The weed control data correlated with the droplet spectra analysis in that as volume median diameter (Dv50) increased from AIXR nozzles to the TTI nozzles, efficacy tended to decrease. Changing nozzle size, nozzle type, or addition of another herbicide into the tank-mix can have a dramatic effect on the droplet spectrum and volume median diameter. For example, the addition of *S*-metolachlor to dicamba + glufosinate + glyphosate decreased the Dv50 for the TTI 11006 nozzle from 789 µm to 570 µm. These results indicate the importance of nozzle selection on efficacy of these herbicide treatments.

DICAMBA FORMULATION ADVANCEMENTS. A. MacInnes*, J.J. Sandbrink, J. Hemminghaus, J.N. Travers, S. Seifert-Higgins, S.E. Curvey; Monsanto Company, St. Louis, MO (253)

Monsanto Company is developing formulations containing dicamba for use in the Roundup Ready® Xtend™ Crop System. A new premix formulation containing diglycolamine (DGA) dicamba and monoethanolamine (MEA) glyphosate delivering a 2 to 1 ratio of glyphosate to dicamba has been developed. A new dicamba standalone formulation based on the DGA dicamba salt has also been developed. Both of the new formulations contain a new proprietary technology that reduces the potential of dicamba volatility compared to commercially available formulations containing the dimethylamine (DMA) salt of dicamba. The new formulations show commercially acceptable physical and chemical properties typical of Roundup® agricultural brand formulations.

Although volatility is only a small contributor to potential off-target movement, there is still a concern from growers and applicators about the volatility of dicamba weed control products. Historically, much of the concern associated with dicamba volatility is a legacy from the DMA salt of dicamba launched in the 1960s. In controlled environment testing DMA dicamba consistently shows higher levels of volatile dicamba as compared to the DGA salt of dicamba. By adding the new proprietary low volatility technology to the formulations the level of volatile dicamba can be reduced further. Minimizing off-target movement through spray drift will be a key objective for growers or applicators using dicamba in the Roundup Ready® Xtend™ Crop System. Nozzle selection, combined with appropriate spray pressures, can have dramatic effects on minimizing potential for spray drift. The Roundup Ready® Xtend™ Crop System is developed around application requirements proven to increase on-target application.

MESOTRIONE: A NOVEL MODE OF ACTION HERBICIDE FOR USE IN TREE NUT, POME FRUIT, STONE FRUIT, AND CITRUS CROPS. E.K. Rawls, J.L. Glasgow, T.H. Beckett, R.S. Bounds, K.D. Burnell, J.I. Adkins, and D.L. Hammons; Syngenta, Greensboro, NC (208)

ABSTRACT

Mesotrione is a novel herbicide for the tree nut and fruit market that provides systemic preemergence and postemergence weed control. Mesotrione is readily taken up by leaves, shoots or roots, and is translocated in both the xylem and phloem. The mode of action is through competitive inhibition of the HPPD (4-hydroxyphenyl-pyruvate dioxygenase) enzyme which ultimately causes the destruction of chlorophyll, accounting for the typical white “bleaching” symptoms of herbicidal activity. Benefits of the herbicide include: flexibility of pre and post-emergence application timing; low use rates; tank mix flexibility; excellent crop tolerance; excellent efficacy on weed biotypes resistant to other herbicide classes. The use rates range from 105 - 210 g ai/ha applied post-emergence with glyphosate or paraquat, or alone as a pre-emergence application. A maximum of three applications and 420 g ai/ha can be applied per year. Mesotrione is primarily a broadleaf herbicide with significant activity on some grass and sedge species. Key weed species controlled or partially controlled by mesotrione include: pigweeds (*Amaranthus* spp), common lambsquarters (*Chenopodium album*), nightshades (*Solanum* spp), ragweed (*Ambrosia* sp.), morningglory (*Ipomoea* sp.), spanish needles (*Bidens bipinnata*), Asiatic dayflower (*Commelina communis*), hairy fleabane (*Conyza bonariensis*), horseweed (*Conyza canadensis*), large crabgrass (*Digitaria sanguinalis*), broadleaf signalgrass (*Brachiaria platyphylla*), fall panicum (*Panicum dichotomiflorum*), and yellow nutsedge (*Cyperus esculentus*). Field trials have been conducted since 2009 in all major tree crop growing regions. Results indicate that mesotrione alone can provide effective control of many broadleaf weed species, however, overall weed spectrum and control can be improved by the addition of tank mix partners. Mesotrione gives growers another management tool for weed control and when used in combination with glyphosate or paraquat can improve burndown and provide residual control of problematic weeds.

EFFECT OF APPLICATION METHOD OF DRIP-APPLIED HERBICIDES ON CONTROL OF YELLOW NUTSEDGE IN PLASTICULTURE TOMATOES. T.A. Monday*[1], W.G. Foshee[2], G.R. Wehtje[3], E.K. Blythe[4]; [1]Auburn Univeristy, Auburn University, AL, [2]Auburn University, Auburn University, AL, [3]Auburn University, Auburn, AL, [4]Mississippi State University, Poplarville, MS (209)

ABSTRACT

Field studies were conducted in 2012 and 2013 at the E.V. Smith Research Center (EVS) in Shorter, AL to evaluate drip-application methods for applying preemergence (PRE) herbicides under polyethylene mulch on yellow nutsedge punctures and the corresponding response of a tomato crop (2013 studies only). The experiment consisted of a factorial treatment arrangement of 3 drip application methods and 3 PRE-applied herbicides [halosulfuron (54 g ai ha^{-1}), *S*-metolachlor (1.4 kg ha^{-1}), and fomesafen (280 g ha^{-1})]. Herbicides were applied either immediately following saturation of the planting beds (method A), over an extended period used to saturate the beds (method B), or prior to bed saturation (method C). Treatment combinations were compared to a commercial standard of *S*-metolachlor sprayed to the bed surface prior to mulch application. A nontreated control was included for evaluating potential herbicide injury. Nutsedge punctures were reduced in treatments receiving fomesafen applied with method B; otherwise, nutsedge punctures were similar to the commercial standard across all other treatment combinations. Additionally, marketable tomato yield was similar to the commercial standard in treatments receiving fomesafen applied with method B and method C and halosulfuron applied with method C. Marketable yield was reduced by all other treatments combinations. Results from these studies indicate fomesafen applied over an extended saturation period (method B) or prior to saturation of the planting beds (method C) and halosulfuron applied prior to saturation of the planting bed (method C) can provide similar or better (fomesafen with method B) control of yellow nutsedge and similar marketable tomato yields to that of the commercial standard (*S*-metolachlor sprayed to beds prior to mulch application). Furthermore, at the time of this research very little information existed on the response of a tomato crop to fomesafen applied via drip. These results should prompt future studies looking at the viability of using drip-applied fomesafen in tomato production systems.

CLOVE OIL FOR WEED CONTROL IN ORGANIC VIDALIA SWEET ONION: DO ADJUVANTS AND SPRAYER OUTPUT IMPROVE PERFORMANCE? DOES IT REALLY MATTER? W.C. Johnson III*; USDA-ARS, Tifton, GA (210)

ABSTRACT

Timely cultivation with a tine weeder is the primary tool for successful weed control in organic Vidalia® sweet onion. Vidalia® sweet onion is a cool-season crop and winter weather conditions frequently arise that delay cultivation. Weeds that emerge during the delay are not effectively controlled by cultivation and herbicides derived from natural products may have a role in certified organic Vidalia® sweet onion production to control the emerged weeds. In earlier trials, it was observed that the natural products herbicide clove oil (Matratec®) was more effective when sprayers were calibrated for higher output (>50 gal./A) compared to sprayers calibrated at 25 gal./A. However, herbicide costs were doubled when sprayer output was doubled. It was theorized that herbicide adjuvants might improve clove oil efficacy at lower sprayer outputs without increase in herbicide cost. Trials were conducted from 2010 through 2012 to evaluate all possible combinations herbicide adjuvants and two sprayer outputs using clove oil (10% by vol.) for cool-season weed control in organic Vidalia® sweet onion production. Adjuvants evaluated were a material composed of saponins (ThermX70®), citric acid plus garlic extract (Biolink Buffer & Penetrant®), an emulsified petroleum oil insecticide (Saf-T-Side®), a conventional petroleum oil adjuvant (Chem Nut Agri-Oil®), and no adjuvant used with clove oil. Sprayer outputs evaluated were 25 gal./A and 50 gal./A, with output set by spray tips of differing orifice size. Adjuvants provided variable improvements in weed control from clove oil and weed control improvements did not affect onion yield. Weed control was not consistently improved by higher sprayer output compared to conventional sprayer outputs and the variable weed control improvements did not affect onion yield. Based on these results, clove oil does not provide suitable levels of weed control in organic Vidalia® sweet onion production to justify the expense. Changing sprayer output or using adjuvants has minimal effect on clove oil performance.

EFFECT OF TWO-YEAR FALLOW WEED MANAGEMENT AND FUMIGATION ON NUTSEDGE (*CYPERUS SPP*.) IN BELL PEPPER (*CAPSICUM ANNUUM* L.). P.J. Dittmar[1], M.R. Miller*[1], G.E. Vallad[2]; [1]University of Florida, Gainesville, FL, [2]University of Florida, Balm, FL (211)

ABSTRACT

Nutsedge (*Cyperus spp*. L) is one of the most problematic weeds in Florida bell pepper (*Capsicum annuum* L.), which is largely attributed to the phase out of methyl bromide and the few herbicides registered. A two-year field study was established to evaluate additive effect of glyphosate and cultivation applied during the fallow season on nutsedge control in bell pepper. Locations included the Plant Science Research and Education Unit in Citra, FL and the Gulf Coast Research and Education Center in Balm, FL. Both sites initially had nutsedge populations of 100 to 200 shoots/m^2. Treatments included 8 fallow programs and 3 fumigant treatments. The 8 fallow programs included glyphosate (G) or cultivation (C) at 9 WAI: GG, CC, GC or CG at 6 and 12 WAI: GCG at 4,9 and 14 WAI: and a non-treated (NT). Glyphosate was applied at 5.51 kg ae ha^{-1} with a backpack sprayer calibrated to deliver 287 L ha^{-1}. The 3 fumigants included 1,3-dichloropropene+chloropicrin (337 kg ha^{-1}), dimethyl-disulfide (595 kg ha^{-1}), and a non-treated check. Bell pepper 'Tomcat' were transplanted in both years at both locations. Nutsedge counts were taken 0, 14, 28 and 42 days after planting (DAP) using a 1 m^2 quadrant. Data were analyzed with analysis of variance and means were separated with Duncan's multiple range test ($P \leq 0.05$). At Balm, the lowest nutsedge population was with the GCG fallow program and was similar to all other fallow programs except the nontreated at 14 DAP. At Citra, GCG fallow program had the lowest nutsedge populations and was similar to the GG, GC, and CG fallow programs. No difference was observed between years for total nutsedge populations. However, an increase in purple nutsedge between 2012 and 2013 occurred at both locations; yellow nutsedge increased over the two years only at Citra. Fumigation provided additional nutsedge control in single input fallow programs. Marketable yield was not different among fumigants however; increased marketable yield was observed with more intensive fallow programs. The increase of nutsedge control over the two years may be the result of no weed management during the bell pepper crop and plastic removal and preparing the field for the second year. However, weed management within a field season is important for reducing nutsedge and improving efficacy of the fumigant.

EFFECT OF SPRAY CARRIER SALINITY ON POSTEMERGENCE HERBICIDE WEED CONTROL AND CROP TOLERANCE. C.E. Rouse*, P.J. Dittmar; University of Florida, Gainesville, FL (212)

ABSTRACT

Increased salt levels found in irrigation water have begun to negatively impact Florida vegetable producers. A greenhouse study was conducted in the fall of 2013 at the Plant Science Research and Education Unit, Citra, FL to evaluate the effect of high salt concentrations in herbicide carriers on weed control efficacy and crop tolerance. Treatments were arranged as a factorial design (4 herbicides x 6 electrical conductivity (EC) levels x 5 species) in a randomized complete block with three replications. Herbicide treatments were no herbicide, halosulfuron at 16 g ha^{-1}, metribuzin at 228 g ha^{-1}, and sethoxydim at 128 g ha^{-1}; salinity levels measured as EC were 0, 1, 2, 3, 4, or 5 ds m^{-1}; and plant species were green bean, sweet corn, tomato, large crabgrass, and goosegrass. Applications were made over the top at 4 weeks after planting with a single nozzle backpack sprayer calibrated to 280 L ha^{-1} and visually assessed for injury (0%= no injury; 100%= injury complete plant death) weekly for 3 weeks after treatment (WAT). Plants were harvested at 6 WAT and fresh and dry weights were recorded for all samples. Data were analyzed using a general linear model and means were separated using Duncan's multiple range test. Herbicide by EC factors were not significant and means were combined. Dry weight as an effect of the herbicide was based on plant species, no antagonistic or synergistic interaction was found. Plant injury 21 DAT was not significantly different for plant species at any EC level. Fresh weight as an effect of EC was also not significant at any of the tested levels. Dry weight was similar to fresh weight, however, an increase in EC above 3 ds m^{-1} resulted in a lower overall dry weight for most species. EC at the tested levels did not have an effect on weed control or crop tolerance with the species under evaluation.

EFFECT OF FLURIDONE ON WEED CONTROL AND CROP RESPONSE IN SWEETPOTATO.
S.L. Meyers[1], K.M. Jennings[2] and D.W. Monks[2]; [1]Pontotoc-Ridge Flatwoods Branch Experiment Station, Mississippi State University, Pontotoc, MS, [2]Department of Horticultural Science, North Carolina State University, Raleigh, NC (213)

ABSTRACT

Field studies were conducted at the Pontotoc Ridge-Flatwoods Branch Experiment Station in Pontotoc, MS and the Horticultural Crops Research Station in Clinton, NC to determine weed control and sweetpotato crop response to fluridone. At both locations fluridone was applied alone pre-transplant at 0.2, 0.3, and 0.4 lb a.i./a and in tank-mixtures of 0.2 lb/a fluridone plus either 0.6 or 1.5 oz a.i./a flumioxazin and 0.1 lb/a fluridone plus 1.5 oz/a flumioxazin. At Clinton, herbicide programs containing pre- and post-transplant herbicide applications were included and consisted of 1.5 oz/a flumioxazin pre-transplant alone or followed by (fb) 0.2 lb/a fluridone or 0.7 lb ai/a *S*-metolachlor at 0, 2, or 4 WAP or a tank-mix of fluridone plus *S*-metolachlor 0 or 2 WAP. Additional programs consisted of no pre-transplant herbicide application fb 0.2 lb/a fluridone or 0.7 lb/a *S*-metolachlor at 0, 2, or 4 WAP. Hand-weeded and weed-free check plots were included for comparison. Experiment design was a randomized complete block with four replications. Plot size at Pontotoc was four rows on 40” centers and 30 ft long. All rows were treated and rated for weed control and injury. The second (Beauregard) and third (Orleans) rows were harvested. At Clinton plots were two rows on 42” centers and 20 ft long. The second row (Covington) of each plot was treated, rated, and harvested. Planting and harvest dates were July 18 and October 24, respectively at Pontotoc and July 16 and October 14, respectively at Clinton. Pre-transplant fluridone applications resulted in $\leq$6% transient interveinal chlorosis at both locations. Post-transplant applied fluridone resulted in up to 30% injury at Clinton. Redroot pigweed control at Pontotoc ranged from 95 to 100% at 2 WAP, and control decreased at 4 WAP (81 to 96%) and 8 WAP (61 to 90%). Tank mixtures containing 1.5 oz/a flumioxazin and 0.4 lb/a fluridone alone resulted in the greatest season-long redroot pigweed control (88 to 95%). At Clinton, Palmer amaranth control was $\geq$90% from fluridone applied pre-transplant, 0 WAP, or 2 WAP. *S*-metolachlor and fluridone applied alone 4 WAP resulted in only 25% control of Palmer amaranth. At Pontotoc, all fluridone treatments resulted in No. 1 and marketable yields equal to the hand-weeded check and greater than the weedy check. At Clinton, yields for No. 1 and marketable sweetpotato of all treatments were similar to both the hand-weeded and weed-free checks.

WEED MANAGEMENT SYSTEMS FOR NUTSEDGE CONTROL IN SWEETPOTATO. M.W. Shankle, S.L. Meyers, T.F. Garrett; Pontotoc Ridge-Flatwoods Branch Experiment Station, North Mississippi Research and Extension Center, Mississippi State University, Pontotoc, MS (214)

ABSTRACT

Nutsedge (*Cyperus* spp.) control is an important issue in sweetpotato (*Ipomoea batatas*) production, since there are few labeled herbicides that provide adequate control of this weed. In 2013, field trials were conducted at two locations in Mississippi to study weed interference and management of nutsedge populations in sweetpotato.

Nutsedge density was evaluated in a production field in Chickasaw County. Beauregard B-14 sweetpotato slips were transplanted on June 5, 2013 f/b nutsedge emergence 1 week later. At 2 WAP, populations of yellow nutsedge were identified in densities of 0, 10, 30, 60, and 90 shoots yd^{-2} and single row, 18 x 3.33 ft plots were established with 4 replications.

Nutsedge control was evaluated in Pontotoc County in a RCB study with three replications. Plots were 10 X 30 ft with three 40-inch rows. Beauregard B-14 sweetpotato slips were transplanted and preemergence (PRE) treatments were applied on June 25, 2013. Post-transplant (POST) treatments were applied on June 26, 2013 and lay-by treatments were applied on July 18, 2013. Treatments included Dual Mag 1 pt/ac with and without Command 2.66 pt/ac POST; Dual Mag 1 pt/ac PRE f/b Command 2.66 pt/ac POST; Dual Mag 0.8 pt/ac POST f/b Dual Mag 0.5 pt/ac lay-by with and without Command 2.66 pt/ac POST; Fierce 3.75 oz/ac PRE f/b Dual Mag 0.8 pt/ac lay-by with and without Command 2.66 pt/ac POST; and a weed-free and weedy check. All lay-by treatments were applied POST after rolling cultivation. Weed control ratings were made for nutsedge, broadleaf signalgrass *(Brachiaria platyphylla)*, and redroot pigweed (*Amaranthus retroflexus*) control at 1 and 4 weeks after planting (WAP) and pre-harvest. Sweetpotatoes were harvested at 104 and 119 DAP at Pontotoc and Chickasaw locations, respectively. Sweetpotatoes were graded to determine US No.1, Canner, Cull, and Jumbo yield grades. Total marketable yield (Tmkt) was recorded as the sum of US No.1, Canners, and Jumbo grade yields.

In the nutsedge interference study, predicted US No. 1 and Tmkt yield losses were fit to a rectangular hyperbola and ranged from 5 to 95% and 4 to 78%, respectively for yellow nutsedge densities ranging from 1 to 90 shoots yd-2. In the weed control study, all herbicide treatments controlled redroot pigweed at least 96% at 4 WAP. Broadleaf signalgrass control was at least 98% for all herbicide treatments except, Fierce 3.75 oz/ac PRE f/b Dual Magnum 0.8 pt/ac lay-by at 1 WAP and was at least 97% for all treatments that included a Command tank-mix at 4 WAP. Nutsedge control was at least 76% for all treatments at 1 WAP and at least 90% for all treatments that included a lay-by. At harvest, US No. 1 yield ranged from 0 to 537 boxes/ac for the weedy check and Fierce 3.75 oz/ac PRE f/b Command 2.66 pt/ac POST f/b Dual Mag 0.8 pt/ac lay-by, respectively. US No. 1 yield was at least 490 boxes/ac for herbicide systems that included Command as a tank-mix partner POST f/b Dual Mag as a lay-by. Tmkt yield ranged from 0 to 773 boxes/ac with the weedy check and Dual Magnum 0.8 pt/ac + Command 2.66 pt/ac POST f/b Dual Magnum 0.5 pt/ac lay-by, respectively. Tmkt yield was at least 615 boxes/ac for all systems that included Dual Mag as a lay-by, except Fierce 3.75 oz/ac PRE f/b Dual Mag 0.8 pt/ac lay-by.

RESPONSE OF CUCURBITS TO RATE AND TIMING OF REFLEX (FOMESAFEN) AND SANDEA (HALOSULFURON) APPLICATION. Shilpa Singh*, Nilda R. Burgos, Sirichai Sathuwijarn, Vijay Singh and Leopoldo Estorninos, Jr.; University of Arkansas, Fayetteville, AR (215)

ABSTRACT

Cucurbits are grown in the United States for consumption as fresh and processed food. A challenge in cucurbit production is weed control due to their sensitivity to herbicides. Only a few herbicides are currently labeled in cucurbits. A field experiment was conducted at Arkansas Agricultural Research and Extension Centre, Fayetteville, AR (Captina silt loam soil) in the summer of 2013 to evaluate the tolerance of cucurbits to different rates and timings of fomesafen (0.375, 0.5, 0.75 lb ai A^{-1} PRE or POST-DIR; 0.25 lb ai A^{-1} PRE only) and halosulfuron (0.048 lb ai A^{-1} PRE or POST-DIR). These were applied, with or without S-metolachlor (1 lb ai A^{-1}), to summer squash, cucumber and cantaloupe in three replications. A broadcast treatment of ethalfluralin (4 qt A^{-1}) was applied at planting to help keep the plots weed-free. Injury was recorded 3 and 5 wk after PRE herbicide application (WA-PRE) and 1 and 2 wk after POST-DIR herbicide application (WA-POST-DIR). The injury on squash ranged from 20%- 42%. Squash injury with halosulfuron at 3 WA-PRE was higher than with fomesafen at 0.75 lb ai A^{-1}. However, halosulfuron injury declined substantially 2 weeks later. The fomesafen and S-metolachlor tankmix (0.75 lb ai A^{-1} + 1 lb ai A^{-1} ; POST-DIR) caused high injury. Cucumber and cantaloupe incurred high injury (75%) with fomesafen (0.75 lb ai A^{-1}). Injury with halosulfuron (PRE or POST-DIR did not exceed 13%. The yield of squash was reduced by POST herbicide applications. Squash treated with fomesafen (0.25 to 0.5 lb ai A^{-1}), halosulfuron and S-metolachlor+ halosulfuron PRE yielded at par with the non-treated plants. Cucumber yield was not reduced by halosulfuron POST-DIR, S-metolachlor+ halosulfuron PRE or POST-DIR, and S-metolachlor + fomesafen PRE. Cantaloupe yielded equivalent to the nontreated check with either halosulfuron PRE, S-metolachlor+ halosulfuron PRE, or S-metolachlor + fomesafen, 0.25 lb ai A^{-1} PRE. In general, cucurbits are tolerant to halosulfuron and S-metolachlor, but differ in tolerance to fomesafen. Among the three cucurbits, squash showed the most tolerance to fomesafen, but only if applied PRE. A mixture of S-metolachlor and the lowest rate of fomesafen PRE worked well with cucumber and cantaloupe. These should be pursued for label expansion.

EVALUATION OF POST EMERGENCE HERBICIDES FOR NUTSEDGE CONTROL IN TOMATO AND BELL PEPPER. N.S. Boyd*; University of Florida, Wimauma, FL (216)

ABSTRACT

Purple nutsedge is a problematic weed species in Florida vegetable production. Nutsedge emerging post-transplant competes with vegetable crops and reduces yield. Research trials were conducted at the Gulf Coast Research and Education Center in Balm, Florida, in 2012 and 2013 to evaluate post-emergence herbicides for purple nutsedge control in tomato (cv Charger and Florida 47) and bell pepper (cv Aristotle and Tomkat). Halosulfuron, imazosulfuron, rimsulfuron, chlorimuron-ethyl, flazasulfuron, nicosulfuron tank mixed with rimsulfuron, halosulfuron tank mixed with rimsulfuron and fomesafen were applied post-transplant at 52, 168, 35, 13, 53, 35+35, 52+35 g ai ha^{-1} and 400 ml ai ha^{-1}, respectively. Halosulfuron and Imazasulfuron provided the best nutsedge control or suppression with the least impact on yield. Halosulfuron significantly reduced tomato yields compared to the untreated control with the Charger variety in one of the two years. Flazasulfuron also provided consistent levels of nutsedge control without no damage to the tomato crops. Bell peppers were more susceptible to the herbicides applied. Imazasulfuron provided the greatest nutsedge control with the least impact on the crop in 2012. In 2013, Halosulfuron was the only herbicide that suppressed nutsedge and did not cause significant crop damage. We conclude that flazasulfuron is a potential herbicide for the tomato industry. Alternative herbicide products or methods need to be evaluated for post emergence nutsedge control in pepper.

TIMINGS OF SPECTICLE FLO FOR POSTEMERGENCE ANNUAL BLUEGRASS CONTROL IN BERMUDAGRASS. M.C. Cox*[1], S. Askew[1], J. Hope[2]; [1]Virginia Tech, Blacksburg, VA, [2]Bayer CropSciences, Winston-Salem, NC (217)

ABSTRACT

Indaziflam is an herbicide developed by Bayer CropScience and utilized for annual grass, broadleaf weed, and sedge control in bermudagrass turf. The liquid formulation of indaziflam, Specticle® Flo, is easier to mix and apply than the older wettable powder, likely becoming more favorable to turf managers. In previous studies, indaziflam has demonstrated pre-and postemergence activity on annual bluegrass but primarily involving high-rate, single applications. Past research has also indicated that bermudagrass injury may be increased with single, high-rate treatments of indaziflam. Since bermudagrass injury may be avoided with lower rates of indaziflam, research is warranted to evaluate sequential, low-rate applications of indaziflam for control of *Poa annua* and other problem weeds. This study evaluated low-rate, repeat applications of indaziflam at different timings for postemergence knockdown and preemergence control of *Poa annua* as compared to a dormant application of glyphosate plus oxadiazon. Field trials were initiated on October 31, 2012 in Blacksburg, VA at the Glade Road Research Facility (GRF) and Turfgrass Research Center (TRC) to determine at what rates and application timings and frequencies Specticle® Flo is most effective for annual bluegrass control in bermudagrass. Specticle® Flo was applied once, twice, and three times at 16.22 g ai haâ • »¹ two weeks apart, twice at 24.33 g ai haâ • »¹ a month apart, and once at 48.66 g ai haâ□»¹ to 'Vamont' and 'Patriot' bermudagrass infested with annual bluegrass. Glyphosate at 1,040 g ae haâ • »¹ plus oxadiazon at 3,400 g ai haâ • »¹ applied once and an untreated check were included for comparison. One application of Specticle® Flo at 48.66 g ai haâ • »¹ and glyphosate plus oxadiazon reduced annual bluegrass cover by 95 to 97%, 21 weeks after initial treatment (WAIT), but not significantly better than two applications of Specticle® Flo at 24.33 g ai haâ • »¹. Three applications of Specticle® Flo reduced annual bluegrass cover by 79%, 21 WAIT, which was not significantly different from two applications (84%). All treatments reduced annual bluegrass cover below 1%, 34 WAIT. Bermudagrass was not injured nor was spring greenup delayed by any treatment in this study. These data suggest that postemergence applications of Specticle® Flo controls annual bluegrass equivalently to a tank-mix of glyphosate plus oxadiazon. However, Specticle® Flo can be applied to bermudagrass earlier in the fall when bermudagrass is still green and provides a longer residual than oxadiazon to prevent a broader spectrum of grass and broadleaf weed germination in the fall and winter months.

CATIONS IN SPRAY WATER INFLUENCE 2,4-D EFFICACY ON DANDELION (*TARAXACUM OFFICINALE*) AND BROADLEAF PLANTAIN (*PLANTAGO MAJOR*). A.J. Patton*[1], D.V. Weisenberger[2]; [1]Purdue University, W. Lafayette, IN, [2]Purdue University, West Lafayette, IN (218)

ABSTRACT

The herbicide 2,4-D is a common ingredient in many postemergence broadleaf herbicides labeled for use in turf. It is classified as a weak acid and may bind to cations present from hard water used as herbicide carrier or from foliar fertilizers added to spray solutions. Antagonism from divalent cations on the weak acid herbicide glyphosate is well documented but less studied with other weak acid herbicides. The objectives of this research were 1) to determine if the efficacy of 2,4-D is influenced by divalent cations, namely calcium (Ca), magnesium (Mg), manganese (Mn) and zinc (Zn), in the spray solution, and 2) to determine if adding ammonium sulfate (AMS) to the spray solution can overcome antagonism.

Experiments were conducted with 2,4-D amine to evaluate the effect of cation and fertilizer solutions on the performance of the herbicide on two common turf weeds, dandelion (*Taraxacum officinale*) and broadleaf plantain (*Plantago major*). The herbicide 2,4-D (0.56 kg ae ha^{-1}) was applied with five levels of cation solution including deionized water (0 mg L^{-1}), deionized water plus calcium (594 mg L^{-1}), deionized water plus magnesium (633 mg L^{-1}), manganese fertilizer (5.0 L ha^{-1}), and zinc fertilizer (2.3 L ha^{-1}) and two levels of AMS including none or AMS at 20.37 g L^{-1}. Calcium and magnesium water solutions were made by mixing $CaCl_2$ and [$MgSO_4$ 7(H_2O)], respectively, into deionized water. Manganese and zinc fertilizer solutions were also prepared in deionized water. When mixing treatment solutions, the cation solution was added first, the AMS treatment was added second to specific treatments in the factorial design to counteract the effect of ions in the water on herbicide, and the herbicide was added third. After the herbicide was added, treatments were mixed thoroughly before spraying and applied immediately after mixing.

Two experimental runs were conducted in the greenhouse in 2013, each arranged as a randomized complete block design on the greenhouse benches with four blocks in each experimental run. Treatments were applied to broadleaf plantain when rosettes were 6 to 10 cm in diameter, and to dandelions when rosettes were 9 to 14 cm in diameter. Treatments were applied using compressed air in a track spray chamber calibrated to deliver a volume of 140 L ha^{-1} at 275 kPa. Visual estimates of percent weed control were recorded at 1, 2, 3, 4, and 5 weeks after application (WAA) on a scale of 0 (no control) to 100 (complete plant death). Digital images were taken of the weeds 5 WAA using a light box and analyzing the pictures for percent green coverage with ImageJ. At 5 WAA, plants were washed of soil and harvested into an above ground shoot tissue and below ground root tissue fraction and then dried and weighed. A non-treated control was included in these experiments as a reference point but was not included in the analysis.

Broadleaf plantain control from 2,4-D was reduced by calcium solutions in the absence of AMS in the first experimental run. Control of broadleaf plantain was 0% 5 WAA when 2,4-D was applied in a calcium solution but control was increased 29% when AMS was added. Likewise, broadleaf plantain leaf coverage, shoot and root weights decreased when AMS was added to the calcium solution. Fewer treatment effects were noticeable in the second run of the experiment but the cations, Ca, Mg, and Mn reduced broadleaf plantain control 5WAA compared to deionized water with or without AMS. Dandelion control from 2,4-D was reduced by calcium solutions in the absence of AMS in the first experimental run. Control of dandelion was 1% 5 WAA when 2,4-D was applied in a calcium solution but control was increased to 23% when AMS was added. Likewise, dandelion leaf coverage, shoot and root weights decreased when AMS was added to the calcium solution. Calcium also antagonized 2,4-D in the second run of the experiment but effects were most noticeable when comparing differences in root mass of dandelions with (0.25 g) or without (0.54 g) AMS. Magnesium was also antagonistic on dandelion control 5WAA and reduced shoot and root mass 5WAA in run 2. This antagonism from Mg was overcome through the addition of AMS to the Mg solution. In summary, similar to previous research with glyphosate and recent research with 2,4-D amine on row crop weeds, divalent cations can antagonize weak acid herbicides and reduce the control of turf weeds. Furthermore, the ability for AMS to overcome this antagonism was demonstrated in this experiment. Thus, broadleaf weed control in turf with 2,4-D amine can be reduced from hard water, especially water sources containing high concentrations of Ca and Mg such as well and municipal water.

BERMUDAGRASS AND GOOSEGASS CONTROL IN CREEPING BENTGRASS WITH TOPRAMEZONE. K.A. Venner*[1], M.C. Cox[1], S.D. Askew[2], K. Miller[3]; [1]Virginia Tech, Blacksburg, VA, [2]Virginia Polytechnic Institute and State University, Blacksburg, VA, [3]BASF, Research Triangle Park, NC (219)

ABSTRACT

Golf course superintendents work very hard to maintain high quality, weed-free fairways, tees and putting greens. Unfortunately for some, this also entails controlling bermudagrass (*Cynodon dactylon*) and goosegrass (*Eleusine indica*) in their fairways and along areas of high traffic. Although desirable on many golf courses, bermudagrass can pose a problem for superintendents maintaining predominantly cool-season turfgrasses. The difference in color, texture, and aggressive growth during summer months reduces the aesthetics of a creeping bentgrass fairway when bermudagrass is present. Similar issues are noted when goosegrass is present in the turfgrass sward or growing along areas of high traffic. Superintendents are struggling to find a suitable replacement for MSMA since it is no longer available for goosegrass control. Fortunately, there is a solution. Topramezone is a new herbicide in turfgrass marketed under the trade name Pylex™. It is a member of the triketone herbicide family and functions as an inhibitor of α-hydroxyphenylpyruvate dioxygenase (HPPD), similar to mesotrione or isoxaflutole. Research concluded that topramezone could be applied to creeping bentgrass at rates of 6.2 g ae ha^{-1} or lower with minimal turfgrass bleaching or thinning. Topramezone has also been shown to control multi-tiller goosegrass with two applications. The objective of this research was to determine the rates and application regimes required for acceptable control of bermudagrass and goosegrass in creeping bentgrass turf.

Studies were conducted at the Turfgrass Research Center in Blacksburg, VA during summer 2013. In study 1, 'Midiron' bermudagrass was sodded into a mixed stand of creeping bentgrass approximately one week prior to trial initiation in order to simulate an infested fairway. Topramezone was applied three times, at 3 week intervals beginning on June 3, July 1 and August 15, 2013 at 6.2, 12.3, 18.4 and 24.6 g ae ha^{-1}. In study 2, topramezone was applied twice at 3 week intervals beginning on June 24, 2013 at 6.1 and 12.3 g ae ha^{-1}. All herbicide treatments contained methylated seed oil. In study 1, 2 weeks after the last treatment (WALT) for the applications beginning on June 3, topramezone reduced bermudagrass cover from between 12 and 22% to between 0 and 2%. Applications of topramezone beginning on July 1 did not control bermudagrass with any treatments. Foramsulfuron and quinclorac were applied to remove perennial ryegrass and crabgrass from the plots. Topramezone applied beginning on August 15 suppressed bermudagrass growth by 3 WALT in October. This study will also be evaluated in spring to determine control following greenup. In study 2, both rates of topramezone completely controlled goosegrass after 12 weeks. These data suggest that topramezone has the potential to suppress or control bermudagrass in creeping bentgrass turf, but based on previous research, tolerance of creeping bentgrass to topramezone could limit efficacy on large infestations of bermudagrass. These data also suggest that topramezone could replace MSMA for goosegrass control in creeping bentgrass.

TRIBUTE TOTAL: AN EFFECTIVE HERBICIDE FOR POSTEMERGENCE DALLISGRASS CONTROL. B.R. Spesard*[1], J. Hope[2], S.M. Wells[3], J.H. Rowland[4], T.J. Queck[5], L. Mudge[6]; [1]Bayer CropScience, RTP, NC, [2]Bayer CropSciences, Winston-Salem, NC, [3]Bayer CropScience, High Springs, FL, [4]Bayer CropScience, Austin, TX, [5]Bayer CropScience, Clayton, NC, [6]Bayer CropScience, Clemson, SC (220)

ABSTRACT

Dallisgrass (*Paspalum dilatatum*) is a warm-season (C4) perennial grass indigenous to South America. It was first identified in Louisiana in 1840 having presumably been transported in ship ballast. Dallisgrass is currently found across the entire southern half of the U.S. In turf, dallisgrass is considered a very troublesome weed having negative effects on the appearance, texture, & playability of golf courses, athletic fields, and home lawns. Plant morphology includes short rhizomes, a clump-forming growth habit, coarse leaf texture, and an abundance of tall, unsightly seedheads. Compared to turf, dallisgrass exhibits accelerated growth, earlier spring growth, and longer fall persistence. These weedy characteristics can also result in the need for increased mowing frequency, especially since the seedheads often escape mowing, and the plant can present a tripping hazard.

There are two biotypes found within the U.S., 'common dallisgrass', *P. dilatatum*, and 'prostrate dallisgrass', *P. dilatatum* var. *pauciciliatum*, and at least five biotypes on a worldwide basis.

Selective dallisgrass control in warm-season turf has historically consisted of sequential applications of organic arsenicals (MSMA, DSMA) alone or in combination with sulfonylureas, such as Revolver(R) (foramsulfuron), or Certainty(R) (sulfosulfuron). However, MSMA is currently regulated for use on golf courses, sod farms, and highway rights-of-way and may not be used on lawns, or in the State of Florida.

Tribute(TM) TOTAL was introduced by Bayer Environmental Science, a Division of Bayer CropScience LP, in 2012. It contains the acetolactate synthase (ALS) enzyme inhibiting active ingredients thiencarbazone-methyl, foramsulfuron. and halosulfuron in approximately a 1:2:3 ratio. Tribute TOTAL allows the selective removal of certain monocot (grass, sedge, kyllinga, doveweed) and dicot weeds from bermudagrass and zoysiagrass turf types.

Multi-year trials (2011 - 2013) conducted by numerous southern universities and private cooperators have refined the sequential application timings of Tribute TOTAL to realize a high level of dallisgrass control. Presented are Bayer Environmental Science's latest trial data showing a mean 93% Control at ~1 YAT (n = 5) when Tribute TOTAL is applied according to labeled directions for use.

TRIBUTE TOTAL APPLICATION INTERVALS AND APPLICATION TIMING ON TROPICAL SIGNALGRASS (*UROCHLOA SUBQUADRIPARA*) CONTROL. S.M. Wells*[1], B.R. Spesard[2], J.H. Frank[3], J.H. Rowland[4]; [1]Bayer CropScience, High Springs, FL, [2]Bayer CropScience, Raleigh, NC, [3]Bayer Crop Science, Naples, FL, [4]Bayer CropScience, Austin, TX (221)

ABSTRACT

Tropical signalgrass also known as small flowered alexandergrass is a warm-season perennial that has become one of the most problematic weeds in golf turf and sod production in southern Florida, partly due to the prohibited use of MSMA in the state. Before the loss of MSMA, tropical signalgrass control could be achieved with two to four applications of the post-emergence herbicide. Trials were conducted in 2012-2014 at various golf course locations in south Florida to evaluate Tribute™ TOTAL efficacy on tropical signalgrass. Tribute TOTAL contains the acetolactate synthase (ALS) enzyme inhibitor active ingredients thiencarbazone-methyl, foramsulfuron, and halosulfuron in an approximate 1:2:3 ratio. The objectives of this research were to (1) evaluate the number of Tribute TOTAL spot treatments and application intervals on control of tropical signalgrass beginning late summer with rates applied at 99 g ai/ha, (2) evaluate Tribute TOTAL application timing on control of tropical signalgrass, broadcast versus spot treatments, applied late winter through early spring with rates applied at 135 and 123 g ai/ha (3) evaluate Tribute TOTAL spot treatment rate effects when application interval is held constant at 14 days with rates applied at 99 and 204 g ai/ha. Results from the number of spot treatments and application interval trial indicate that three applications at 14 day intervals beginning in October at a rate of 99 g ai/ha provided 100% control of tropical signalgrass up to 90 DAA. Results from application timing trials indicate two broadcast treatments applied in June at 135 g ai/ha provided 95% control 57 DAA. Five spot applications at 123 g ai/ha, applied in March, September and October provided 95%> control up to106 DAA. The trial to evaluate spot treatment rate effects when interval is held constant at 14 days was initiated in September. Results indicate that at 84 DAA, all treatments were providing 100% control with the exception of two spot treatments applied at 99 g ai/ha, which was providing 94% control. All 2013 fall applied trials are being evaluated through the spring of 2014. All trial treatments had the addition of MSO at 0.5% v/v + ammonium sulfate at 168 g a/ha.

ANNUAL BLUEGRASS CONTROL IN CREEPING BENTGRASS GOLF GREENS IN SHADE WITH METHIOZOLIN. K. Koh*[1], J.Q. Moss[1], X. Xiong[2], G. Bell[1]; [1]Oklahoma State University, Stillwater, OK, [2]University of Missouri, Columbia, MO (222)

ABSTRACT

BENEFITS AND LIMITATIONS OF SCREENING ZOYSIAGRASS AND ST. AUGUSTINEGRASS GERMPLASM FOR POSTEMERGENCE HERBICIDE TOLERANCE. R.G. Leon*[1], J.B. Unruh[1], and K.E. Kenworthy[2]; [1]University of Florida, Jay, FL 32565, [2]University of Florida, Gainesville, FL (223)

ABSTRACT

POST grass weed control in St. Augustinegrass and zoysiagrass is a challenge due to limited number of selective herbicides available. Because the tolerance to those herbicides is partial, in many cases turfgrass injury can reach unacceptable levels when treated with herbicide rates required to control important weed species. Similarly to their differences in morphology, or disease resistance, turfgrass species can also have differences in herbicide tolerance. Turfgrass breeding programs should consider herbicide tolerance during early stages of germplasm screening to identify genotypes that have both desirable traits (e.g. color, texture, vigor) and increased tolerance to key herbicides. Thus, new cultivars will be less likely to show injury after herbicide application, or the use higher herbicide rates will be an option to increase weed control efficacy. How to screen turfgrass germplasm for herbicide tolerance in a cost-effective manner is a challenge. We explored how feasible is to identify cultivars with increased tolerance to label rates of asulam (2,340 g ai ha^{-1}) and fluazifop-P-butyl (88 g ai ha^{-1}) in St. Augustinegrass and zoysiagrass, respectively by screening typical field experiments for cultivar assessment (e.g. 1.5 m by 1.5 m plots) used in turfgrass breeding programs. We also compared responses of zoysiagrass cultivars to fluazifop-P-butyl under field and greenhouse conditions. In St. Augustinegrass, from 20 cultivars evaluated, 6 showed increased tolerance (0-5% injury) to asulam compared with the commercial standards 'Capitva', 'Floratam', 'Palmetto' (13, 17 and 20% injury respectively). From 80 zoysiagrass (*Z. japonica*) breeding lines more than 80% of the screened lines showed less injury than 'Empire' (23% injury) and 47% of the lines showed less injury than 'JaMur' (13% injury). Screening with the highest label rate for the aforementioned herbicides affected regular performance evaluations for several cultivars, which could influence breeder selection decisions. Greenhouse experiments did not allow full expression of differences in injury symptoms and recovery dynamics across zoysiagrass cultivars as observed under field conditions. The results of the present study highlight the value of incorporating screening for herbicide tolerance as part of turfgrass breeding programs, but strategies must be designed to avoid interfering with the regular activities and evaluations of turfgrass breeders.

CELSIUS APPLICATIONS FOR SUPPRESSION OF BLANKET CRABGRASS (*DIGITARIA SEROTINA*).

S.M. Wells*[1], B.R. Spesard[2], W.C. Mixon[3]; [1]Bayer CropScience, High Springs, FL, [2]Bayer CropScience, Raleigh, NC, [3]W.C. Mixon and Associates, Apopka, FL (224)

ABSTRACT

Blanket crabgrass, (*Digitaria serotina*), is a summer annual or short-lived perennial which prefers moist sites. It is a problem in home lawns predominately in Florida due to excessive irrigation as a result of warm climatic conditions and sandy soils. There are no post herbicide options for St. Augustinegrass lawns in Florida to control blanket crabgrass. In 2013, trials were initiated to evaluate Celsius™ WG herbicide efficacy on blanket crabgrass. Celsius contains two acetolactate synthase (ALS) enzyme inhibitors active ingredients thiencarbazone-methyl 8.7%, iodosulfuron-methyl-sodium 1.9% and dicamba 57.4%. The objectives of this research were to: (1) determine how to employ spot applications of Celsius for the control of blanket crabgrass with varying spray volumes, (2) evaluate Celsius efficacy with the addition of a non-ionic surfactant compared to a methylated seed oil for the control of blanket crabgrass, (3) evaluate Celsius rates for the control of blanket crabgrass in bermudagrass and St. Augustinegrass. Results indicate that blanket crabgrass cover was reduced to 30% with two spot applications of Celsius at 180 g ai/ha with trial initiated in May. No differences were seen with Celsius at 180 g ai/ha plus a non-ionic surfactant compared to a methylated seed oil at 0.25% v/v applied three times for the control of blanket crabgrass and all treatments provided 98-100% control. Results indicate that Celsius applied three times (spot applications) at 234 and 520 g ai/ha with a trial initiated in September was providing 90-100% control, respectively of blanket crabgrass at 56/28 days after first and last applications. Previous work showed good St. Augustinegrass 'Floratam' tolerance to Celsius up to 4x high label rate (J. Michaels, 2010). However, the 2013 trial initiated in September showed greater than 30> injury 59/31 days after first and last applications with both rates. Treatments contained a non-ionic surfactant at 0.25% v/v.

SPECTICLE FERTILIZER: A NEW FORMULATION OF INDAZIFLAM FOR WEED CONTROL IN WARM-SEASON TURF. D.F. Myers[1], J. Hope[2], C. Olsen[3], A. Parker[4], T. Queck[4], J.H. Rowland*[5], S.M. Wells[6], L. Mudge[7]; [1]Bayer CropScience, Cary, NC, [2]Bayer CropSciences, Winston-Salem, NC, [3]Bayer CropScience, Temecula, CA, [4]Bayer CropScience, Clayton, NC, [5]Bayer CropScience, Austin, TX, [6]Bayer CropScience, High Springs, FL, [7]Bayer CropScience, Clemson, SC (225)

ABSTRACT

Indaziflam, a new class of herbicide chemistry, was initially introduced in 2011 as Specticle 20 WSP for preemergence weed control of annual grasses, annual sedges, and broadleaf weeds in warm-season turf. Subsequently, several new formulations of indaziflam have been introduced. These include Specticle FLO for turf, Marengo G and Marengo (FLO) for ornamental uses, Specticle G for landscape uses, and EsplanAdeTM 200 SC for industrial vegetation management. In 2014 several formulations of Specticle formulated on fertilizer including SPECTICLE 0.0213% Plus Turf Fertilizer and SPECTICLE 0.0142% Plus Turf Fertilizer have been initiated for golf and lawn care applications. Specticle formulated on fertilizer performed similarly to sprayable formulations of indaziflam with both providing extended residual preemergence weed control and excellent warm-season turfgrass tolerance. Specticle can also be used effectively in a program with postemergence products such as TributeTMTOTAL for season-long weed control. Weeds controlled by indaziflam include crabgrass, annual bluegrass, goosegrass, doveweed, and various broad-leaf weeds. Control may be improved if split applications are made within a growing-season. In addition, Specticle formulated on fertilizer enhances turfgrass quality by improving root growth and turf color.

DIFFERENTIAL RESPONSE OF BAHIAGRASS GENOTYPES TO METSULFURON. G. Henry*[1], K. Tucker[1], C. Straw[1], T. Burch[1], J. Hoyle[2]; [1]University of Georgia, Athens, GA, [2]Kansas State University, Manhattan, KS (226)

ABSTRACT

EFFECTIVENESS OF TRIBUTE™ TOTAL ON VIRGINIA BUTTONWEED, SMOOTH CRABGRASS, BULL PASPALUM AND DALLISGRASS IN COMMON BERMUDAGRASS TURF. L. Warren*, F. Yelverton, and T. Gannon; Crop Science Department, North Carolina State University, Raleigh, NC (227)

ABSTRACT

Many POST herbicide programs labeled in turfgrass stands, whether for annual or perennial weeds, suggest or recommend sequential applications to increase and extend levels of control. Research was conducted to evaluate the efficacy of sequential applications of Tribute™ Total (thiencarbazone + foramsulfuron + halosulfuron) against industry standards for control of common and troublesome weeds such as smooth crabgrass (*Digitaria ischaemum*), Virginia buttonweed *(Diodia virginiana*), bull paspalum (*Paspalum bosdianum*) and dallisgrass (*Paspalum dilatatum*).

Smooth crabgrass, Virginia buttonweed and bull paspalum trials were conducted at Thorndale Country Club in 2013. A dallisgrass trial was conducted in 2012-13 at Lake Wheeler Turf Field Lab. Smooth crabgrass treatments included 4-wk sequential applications of 136 g ai/ha Tribute™ Total + 0.5% v/v MSO + 1.68 kg/ha AMS compared to 841 g ai/ha Drive® XLR8 (quinclorac) + 1.75 L/ha MSO. 4-wk sequential applications of Tribute™ Total at the above-mentioned rate was evaluated against 231 g ai/ha Blindside® (sulfentrazone + metsulfuron) and 176 g ai/ha Celsius™ (thiencarbazone + iodosulfuron + dicamba) for Virginia buttonweed control. Induce® (NIS) was added to both treatments at 0.25% v/v. Bull paspalum treatments included 4-wk sequential applications of 136 g ai Tribute™ Total + 0.25% v/v Induce® compared to 176 g ai Celsius™ + 0.25% v/v Induce®. Dallisgrass treatment timings consisted of 5-wk sequential applications in late summer and early fall fb a third treatment at early spring greenup. Tribute™ Total was tested at 1) 374 L/ha broadcast spray volume at 136 g ai + 0.5% v/v MSO + 3.36 kg/ha AMS, 2) 1122 L/ha spot spray volume at 372 g ai/ha + 0.5% v/v MSO + 1.68 kg AMS, 3) 1122 L spot spray volume at 136 g ai + 0.5% v/v MSO. Trials were RCB designed with treatments replicated 4 times consisting of 1.52 x 2.44 m plots. Depending on the trial, treatments were applied at 304 or 374 L/ha spray volume with 235 or 304 kPa at 4.8 km/h and also at 1122 L/ha with 304 kPa at 1.6 km/h using a 4-nozzle, 25.3 cm spacing boom containing XR 8002VS nozzles. Data are presented using a 0-100 scale where visual weed control observations of 0 = no control and 100 = complete control and percent bermudagrass injury of 0 = no injury and 100 = complete death.

Tribute™ Total provided >90% smooth crabgrass control through early September (14-wk after a sequential application made in late spring) while Drive® XLR8 provided complete control. Tribute™ Total and Blindside® controlled Virginia buttonweed >90% through early October (6-wk after a sequential application made in mid-summer) while Celsius™ control dropped to 65%. Bull paspalum was controlled >95% 4-wk after sequential applications of Tribute™ Total and Celsius™ and 76 to 78% by mid October (4-mo after a sequential application made in late spring). All Tribute™ Total treatments provided 100% dallisgrass control throughout 2013 when applied in late summer and early fall of 2012 (5-wk sequential) fb a single application within 2-wk after spring greenup in 2013.

WSSA LESSON MODULES FOR HERBICIDE RESISTANCE MANAGEMENT IN TURFGRASS. R.G. Leon*[1], D. Shaw[2], J.T. Brosnan[3], J.S. McElroy[4], S.D. Askew[5]. [1]University of Florida, Jay, FL 32565, [2]Mississippi State University, Mississippi State, MS 39762,[3]University of Tennessee, Knoxville, TN 37996, [4]Auburn University, Auburn, AL 36849, [5]Virginia Tech, Blacksburg, VA (228)

ABSTRACT

The evolution of herbicide resistant (HR) weed species has seriously impacted row crop production in the United States for more than three decades, and it has reduced the number of herbicide alternatives that producers have for effective weed control. The WSSA Education Committee developed online training modules to help producers understand and manage HR weed species in row crops. Recently, cases of HR weed species have been reported in turfgrass systems. For example, populations of annual bluegrass (*Poa annua*) with resistance to simazine (Photosystem II inhibitor), glyphosate (EPSPS-inhibitor), prodiamine (mitosis-inhibitor), and several ALS-inhibitors have been confirmed in golf courses in different states. Due to the increasing number of HR cases in turfgrass systems, the WSSA Education Committee developed online training modules specifically for turfgrass professionals (e.g. golf course superintendents, sod producers, landscaping specialists). The turfgrass training modules were based on the row crop modules, but modifications were implemented to provide specific examples of HR weed species in turfgrass systems. Additionally, HR management strategies took into consideration the reduced number mechanical control options (e.g. tillage and cultivation), cultural practices (e.g. crop rotation) and mechanisms of action available for herbicide rotation in turfgrass systems in comparison with row crop systems. It is expected that these new training modules will raise awareness about the risk of HR weed species among turfgrass professionals and help them design and implement weed management strategies that delay and mitigate HR issues in turfgrass systems.

LONG-TERM EVALUATION OF SEASONAL METHIOZOLIN PROGRAMS FOR POA ANNUA CONTROL ON GOLF PUTTING GREENS. S.D. Askew*[1], S. Koo[2]; [1]Virginia Polytechnic Institute and State University, Blacksburg, VA, [2]Moghu Research Center, Daejeon, South Korea (229)

ABSTRACT

The first application of methiozolin on US soil was made by Shawn Askew at Spotswood Country Club, Harrisonburg, VA on March 16, 2009 but this treatment was applied two weeks after Harold Walker at Auburn University initiated a pot study in the greenhouse. Thus, both Walker and Askew are listed as the "first scientist" to spray methiozolin in the US by Moghu Research Center, Daejeon, Korea. Several US researchers have published results from experiments that evaluated methiozolin over the past few years. Most published research on methiozolin has demonstrated the herbicides ability to selectively control annual bluegrass on creeping bentgrass putting greens over a single season. Although the herbicide is designed to work slowly to avoid disruption to putting surfaces, few research studies have reported herbicide impacts for more than one year or evaluated repeated treatment programs where treatments were applied over more than one year. The current work, includes the first US field trial on golf putting greens and a subsequent study that was initiated the following year in 2010. Both of these studies included two years of treatments and a third year of evaluation. In some cases, studies were repeated in a following year, and thus, this body of work spans the entire five year period since the first US treatment. The objective of the first trial was to determine creeping bentgrass putting green response and annual bluegrass control from cumyluron, methiozolin, bensulide, and bensulide + oxadiazon when applied once in spring and fall for two years. The objective of the second study was to evaluate how the number of split applications of a given annual methiozolin rate will influence creeping bentgrass and annual bluegrass response compared to bensulide. Each study was repeated on three different golf putting greens and work was conducted at the Virginia Tech Golf Course, Blacksburg, VA; Gypsy Hill Golf Course, Staunton, VA; Draper Valley Country Club, Draper, VA; and Spotswood Country Club, Harrisonburg, VA. All studies were randomized complete block designs with three replications. Data consisted of visually-estimated and grid count cover of annual bluegrass and creeping bentgrass, visually-estimated control and injury, and normalized difference vegetative index using a Crop Circle spectrum analyzer. In the first experiment, annual bluegrass cover declined from 45% to 15% and 35% when methiozolin was applied at 750 and 500 g ai/ha, respectively four times (spring and fall for each of two years). Area under the annual bluegrass cover progress curve was significantly lower at both rates of methiozolin compared to two rates of cumyluron and the industry standards and untreated check. In the subsequent study, a stepwise decrease in annual bluegrass cover was observed when the 4000 g ai/ha annual use rate was split into 2, 4, or 6 applications per year (further split between spring and fall). Results from these studies and others have led to current recommendations of low use rates (500 g ai/ha) applied frequently (2 week intervals) as the most effective annual bluegrass control programs on putting greens.

NITROGEN FERTILIZER APPLICATION TIMING INFLUENCES MESOTRIONE EFFICACY ON LARGE CRABGRASS. L.L. Beck*[1], A.J. Patton[2], D.V. Weisenberger[1], G.K. Breeden[3], J.J. Vargas[3], J.T. Brosnan[3], D.V. Farnsworth[3]; [1]Purdue University, West Lafayette, IN, [2]Purdue University, W. Lafayette, IN, [3]University of Tennessee, Knoxville, TN (230)

ABSTRACT

Mesotrione, a 4-hydroxyphenylpyruvate dioxygenase (HPPD) inhibiting herbicide is labeled for preemergence and postemergence control of numerous grassy and broadleaf weeds. It has enhanced efficacy on smooth and large crabgrass [*Digitaria ischaemum* and *D. sanguinalis* (Schreb.) Schreb. ex Muhl.] when applied in conjunction with soil applied nitrogen (N). Field and greenhouse studies were conducted in Indiana (IN) and Tennessee (TN) to determine the efficacy of N application timings, the influence of N rate and concentration on mesotrione activity, and the influence of N source on the control of smooth and large crabgrass with mesotrione.

Field experiments were conducted on Kentucky bluegrass (IN) naturally infested with large crabgrass or tall fescue (TN) naturally infested smooth crabgrass to determine how N application timings influenced mesotrione application efficacy. Treatments included applications of urea N at 49 kg N/ha applied at 14, 7, 3, and 1 day before mesotrione application (175 g/ha) (DBM), immediately before mesotrione application (0 DAM), and 1, 3, 7, and 14 days after mesotrione application (DAM). In Indiana, large crabgrass plants that received N at 0, 1 DAM and 1 DBM had the highest percentage of bleached leaves (≥ 32%) compared to 3 to 14 DBM and 3 DAM (≤ 23%) when evaluated 7 days after treatment (DAT). When evaluated 21 DAT, large crabgrass plants that received N 3 DBM or later had the highest percentage of bleached leaves (>51%) compared to N applications made 7 and 14 DBM (≤ 43%). All timings reduced crabgrass coverage (≤ 23% in IN and ≤ 33% in TN) with the exception of 14 DBM (38 %) in IN and 14 DBM and 14 DAM (47 and 47%) in TN 28 DAT.

Greenhouse studies were conducted in July and August of 2013 in IN and TN to determine how N application rates influenced mesotrione activity in large crabgrass. Treatments consisted of urea N applied at 0, 3, 6, 12, 24, 49, or 98 kg N/ha three days prior to mesotrione application (175 g/ha). In IN, large crabgrass plants that received 12 kg N/ha or higher 3DBM had the greatest amount of bleached and necrotic leaves (≥ 55%) compared to plants that received 6 kg N/ha or less (≤ 48%) 7 DAT. Additionally, large crabgrass plants treated with the same N rates were harvested 3 days after N application to determine if the N concentration within the plant tissue influenced mesotrione activity after application. Nitrogen concentration (%) increased in crabgrass leaf and stem tissues as the N application rates increased up to ≥ 12 kg N/ha in IN and ≥ 24 kg N/ha in TN. Beyond these N application rates, N concentration in leaf tissues did not increase. The amount of bleached and necrotic leaves also increased as application rates increased up to 12 kg/ha in both IN and TN. These results indicate that mesotrione activity is higher in plants that have higher N concentrations in leaf and stem tissues.

Greenhouse studies were also conducted in July and August of 2013 in IN and TN to determine if N source influenced mesotrione activity in large crabgrass. Four N source treatments consisted of urea (46N-0P-0K), ammonium sulfate (21N-0P-0K), potassium nitrate (13N-0P-44K), or ammonium nitrate (33N-0P-0K) at 49 kg N/ha. No significant differences were detected at either location indicating that N source has no influence on mesotrione activity in large crabgrass.

Despite the observations of improved mesotrione activity in conjunction with N applications, these were only moderate improvements in control or increased bleaching. Still, practitioners can time their N and mesotrione applications together to help enhance crabgrass control. However, as a caution we have also observed that applying mesotrione in conjunction with nitrogen may also have the potential to increase injury to sensitive turfgrass species such as fine fescues (*Festuca* spp.) and perennial ryegrass (*Lolium perenne*).

GOOSEGRASS (ELEUSINE INDICA) AND LARGE CRABGRASS (*DIGITARIA SANGUINALIS*) CONTROL WITH COMBINATIONS OF TOPRAMEZONE AND CLOQUINTOCET-MEXYL. M.T. Elmore*[1], J.T. Brosnan[2], G.R. Armel[3], C.L. Brommer[4], G.K. Breeden[2], J.J. Vargas[2]; [1]The University of Tennessee, Knoxville, TN, [2]University of Tennessee, Knoxville, TN, [3]BASF Corporation, Research Triangle Park, NC, [4]BASF, Research Triangle Park, NC (231)

ABSTRACT

Creeping bentgrass (CBG) (*Agrostis stolonifera*) is the most widely used cool-season turfgrass species on golf course fairways and tees in the United States, but it is tolerant to few postemergence herbicides. Topramezone is a hydroxyphenylpyruvate dioxygenase-inhibiting herbicide recently registered for use in turfgrass; however, it is not labeled for use on CBG. Previous experiments demonstrated that the safener cloquintocet-mexyl (cloquintocet) applied at 28 g ha^{-1} increased CBG tolerance to topramezone at 37 g ha^{-1}. Data describing CBG tolerance and weed control with topramezone and cloquintocet-mexyl are warranted.

Greenhouse experiments were conducted in 2012 and 2013 at the University of Tennessee to evaluate the effects of topramezone applied with various rates of cloquintocet on CBG tolerance and control of large crabgrass (*Digitaria sanguinalis*) and goosegrass (*Eleusine indica*). Topramezone was applied at 0, 2, 4, 8, 16, 32, 64 and 128 g ha^{-1} alone and in combination with cloquintocet (28 g ha^{-1}) or the cytochrome P450 inhibitor malathion (1000 g ha^{-1}). All treatments were applied with NIS at 0.25% v/v. Treatments were applied with a water carrier at 221 L ha^{-1} using a spray chamber to mature CBG grown in 6-cm cone-tainers filled with a peat moss, perlite, and vermiculite growing medium. Plants were maintained in a greenhouse under ambient light and fertilized every 10 days with 10 kg N ha^{-1} using a complete (20-20-20) fertilizer.

Treatments were in arranged in a completely randomized design with four replications and repeated in time. Injury was evaluated visually on a 0 (no injury) to 100% (complete kill) scale and with digital image analysis 7, 14 and 21 days after treatment (DAT). Goosegrass and large crabgrass aboveground dry biomass were also quantified 21 DAT. Non-linear regression was used to calculate GR_{50} and I_{50} values.

Non-linear regression analysis determined GR_{50} and I_{50} values for large crabgrass and goosegrass were not affected by cloquintocet or malathion at 14 DAT. These responses indicate that cloquintocet does not antagonize topramezone efficacy for large crabgrass and goosegrass control. Visual evaluations of large crabgrass and goosegrass injury were similar to aboveground biomass responses.

Cloquintocet inclusion increased the CBG I_{50} value from 60 g ha^{-1} to 113 g ha^{-1} in the first experimental run and from 32 to 55 g ha^{-1} in the second run at 14 DAT. Malathion decreased the CBG I_{50} value (from 60 to 42 g ha^{-1}) in the first experimental run only.

Our findings suggest that CBG tolerance to combinations of topramezone and cloquintocet may be related to metabolism. Future experiments will investigate mechanisms by which cloquintocet and other herbicide metabolism inhibitors affect CBG tolerance to topramezone. Additional research will also evaluate CBG tolerance and weed control efficacy with topramezone-cloquintocet combinations in the field.

POSTEMERGENCE DALLISGRASS (*PASPALUM DILITATUM*) CONTROL OPTIONS. A.W. Gore, L.B. McCarty, A.G. Estes, and R.B. Cross; Clemson University, Clemson, SC (234)

ABSTRACT

The purpose of this study was to evaluate the use of Tribute Total (halosalfuron, foramsulfuron, thiencarbazone) with varying application methods, timings, and rates of ammonium sulfate for control of dallisgrass (*Paspalum dilitatum*), a problematic grassy weed in turf areas.

Two separate studies evaluated the efficacy of Tribute Total for postemergence control. Study 1consisted of Tribute Total 3.2 oz/ac applied via broadcast + methylated seed oil (MSO) 0.5 % v/v + ammonium sulfate (AMS) 3lb/ac, Tribute Total 0.073 oz/gal applied as a spot treatment + MSO + AMS, Tribute Total 3.2 oz/ac broadcast + MSO, Tribute Total 0.073 oz/gal spot + MSO + AMS fb Revolver (foramsulfuron) 2 oz/gal 263 DAIT, Tribute Total 0.073 oz/gal spot + MSO + AMS fb Revolver + Sencor (metribuzin) 0.0353 oz/gal 263 DAIT, and Tribute Total 0.073 oz/gal spot + MSO + AMS fb Revolver + Celsius (thiencarbazone, iodosulfuron, dicamba) 0.113 oz/gal DAIT. Treatments were applied September 24, November 1, and June 14, 2013.

Study 2 was used to determine effect of timing on the efficacy. Treatments consisted of Tribute Total 0.073 oz/gal + MSO 0.5% v/v + AMS 3 lb/ac applied twice, Tribute Total + MSO +AMS 1.5 lb/ac applied twice, Tribute Total 0.08 oz/gal + MSO applied three times, Tribute Total 0.073 oz/gal + MSO + AMS 1.5 lb/ac applied three times, Tribute Total + MSO + AMS applied twice, Tribute Total + MSO + AMS 3 lb/ac applied twice, Tribute Total + nonionic surfactant (NIS) 0.25 v/v + AMS 1.5 lb/ac applied three times, Tribute Total + NIS applied twice, and Tribute Total + NIS applied twice. Treatments were applied September 9, October 4, October 18, and/or a final application in the spring of 2014 at the emergence of dallisgrass.

Study 1 was conducted the Clemson University Research Farm with study 2 being conducted at the Walker Golf Course located in Clemson, South Carolina. Plots were active bermudagrass (*Cynodon dactylon*) heavily infested with dallisgrass with all treatments being replicated four times. Applications were made using a CO_2 powered sprayer calibrated at 40 GPA. Visual ratings were based on a 0-100% scale, 0% indicating no control and 100% indicating total control.

Greatest efficacy for Tribute Total was achieved with two fall applications applied as a spot treatment as well as a spring application. While ammonium sulfate was not necessary for the control, the addition of it did seem to increase the efficacy. All Tribute Total applications did provide >85% control.

Additional herbicides need to be evaluated for control of dallisgrass.

FLUMIOXAZIN TANK-MIXTURES WITH SIX HERBICIDES FOR ANNUAL BLUEGRASS CONTROL IN BERMUDAGRASS. T. Reed, P. McCullough, C. Waltz*; University of Georgia, Griffin, GA (235)

ABSTRACT

Flumioxazin is a protoporphyrinogen oxidase (Protox) inhibitor with potential for POST annual bluegrass (*Poa annua* L.) control and preemergence (PRE) smooth crabgrass (*Digitaria ischaeum* (Schreb.) Schreb. ex Muhl.) control in bermudagrass (*Cynodon dactylon* (L.) Pers.). However, efficacy is often reduced for annual bluegrass control during winter months, and tank-mixtures with other herbicides may improve control. The objective of this research was to evaluate tank-mixtures of flumioxazin with six other herbicide modes of action for POST annual bluegrass, and residual smooth crabgrass control. Flumioxazin at 0 or 0.42 kg ai ha^{-1} was evaluated in combination with flazasulfuron at 0.05 kg ai ha^{-1}, glufosinate at 1.26 kg ai ha^{-1}, glyphosate at 0.41 kg ae ha^{-1}, mesotrione at 0.28 kg ai ha^{-1}, pronamide at 1.68 kg ai ha^{-1}, or simazine at 1.12 kg ai ha^{-1}. All tank-mixtures improved POST annual bluegrass control from flumioxazin alone at 8 WAT, and controlled annual bluegrass 70% and 80% in 2012 and 2013, respectively. In 2012, flumioxazin tank-mixtures with flazasulfuron, glufosinate, glyphosate, and pronamide reduced time to control annual bluegrass 50% by 2 weeks from flumioxazin alone. However, no tank-mixture significantly reduced the time to achieve 50% control in 2013. Treatments that included flumioxazin provided excellent (90 to 100%) control of smooth crabgrass at 4, 5, and 6 months after treatment (MAT) in both years. Overall, tank-mixing flumioxazin with other herbicide chemistries may improve POST annual bluegrass control compared to exclusive treatments, and also provide excellent PRE smooth crabgrass control.

ANNUAL BLUEGRASS CONTROL IN SEASHORE PASPALUM WITH AMICARBAZONE. J. Yu*, P. McCullough; University of Georgia, Griffin, GA (236)

ABSTRACT

Annual bluegrass is a problematic weed that reduces turfgrass quality and there are limited POST herbicides safe for use in seashore paspalum (*Paspalum vaginatum* Sw.). Field research was conducted to evaluate ‘Sea Isle 1’ seashore paspalum tolerance to amicarbazone for annual bluegrass control. Treatments included amicarbazone at 98 g ai ha^{-1} followed by (fb) 3 weeks after treatment (WAT), 196, or 392 g ai ha^{-1}, and pronamide at 1680 g ai ha^{-1} applied at two growth stages of seashore paspalum, complete dormancy and 50% green-up. Seashore pasplaum injury was minimal and never exceeded 3% throughout the experiment from either amicarbazone or pronamide applications at dormancy or 50% green-up. Herbicide by application timing interactions were not detected for annual bluegrass control. By 3 WAT, annual bluegrass control from herbicides at dormancy and 50% green-up was 13 and 48%, respectively. Annual bluegrass control was similar across amicarbazone and pronamide rates, ranging from 18 to 45% by 3 WAT. By 6 WAT, annual bluegrass control from dormant and 50% green-up applications were similar, averaging 51 and 57% annual bluegrass control, respectively. Amicarbazone at 392 g ai ha^{-1} and pronamide at 1680 g ai ha^{-1} provided similar annual bluegrass control, averaging 78% by 6 WAT. However, lower rates of amicarbazone evaluated provided <50% control. Overall, results of this field experiment suggest that amicarbazone is safe on seashore paspalum during spring transition but high rates (≥392 g ai ha^{-1}) may be needed during winter and early spring for effective annual bluegrass control.

TIFGRAND BERMUDAGRASS SEEDHEAD CONTROL WITH HERBICIDES AND GROWTH REGULATORS. S. Sidhu*, P. McCullough; University of Georgia, Griffin, GA (237)

ABSTRACT

TifGrand™ bermudagrass has desirable color, texture, and shade tolerances for fine turf, but prolific seedhead production may reduce quality. Acetolactate synthase (ALS) inhibiting herbicides have potential to regulate bermudagrass growth, and may provide alternatives to growth regulators for seedhead control. Field experiments were conducted to evaluate efficacy of six ALS inhibitors for TifGrand bermudagrass seedhead control over 9 wks. Sequential applications of flucarbazone-sodium at 60 g a.i. ha^{-1} 3 wk^{-1} and nicosulfuron at 53 or 105 g a.i. ha^{-1} 3 wk^{-1} provided good (80 to 89%) to excellent (90%) control of bermudagrass seedheads on the majority of evaluation dates in both years, and were comparable to ethephon plus trinexapac-ethyl at 3820 + 44 g a.i. ha^{-1} 3 wk^{-1}. Ethephon plus trinexapac-ethyl, flucarbazone-sodium, and both nicosulfuron rates caused unacceptable (>20%) injury on 5, 2, and 0 out of 17 evaluations, respectively. Sequential applications of other herbicides including, flazasulfuron at 26 or 52 g a.i. ha^{-1}, foramsulfuron at 44 g a.i. ha^{-1}, metsulfuron-methyl at 21 g a.i. ha^{-1}, and trifloxysulfuron-sodium at 29 g a.i. ha^{-1}, provided poor (<70%) seedhead control on most evaluations, but caused <10% injury. Overall, flucarbazone-sodium and nicosulfuron appear to have potential for controlling TifGrand bermudagrass seedheads as an alternative to PGRs currently used in turfgrass.

PREEMERGENCE GOOSEGRASS CONTROL WITH FLUMIOXAZIN IN BERMUDAGRASS. M. Aderhold*, P. McCullough; University of Georgia, Griffin, GA (238)

ABSTRACT

Flumioxazin is Protox inhibitor recently registered for pre- and postemeregnce control of weeds in bermudagrass. However, there is limited research on residual control of goosegrass from winter applications. Field experiments were conducted in 2012 and 2013 in Griffin, GA to evaluate efficacy of flumioxazin for PRE goosegrass control in bermudagrass. Treatments were applied with CO_2 pressured sprayers at 234 L/ha in both years. In 2012, single applications of flumioxazin in March at 0.21 or 0.42 kg ai/ha were provided >95% control of goosegrass in July. By September, flumioxazin at 0.42 kg/ha completely controlled goosegrass, similar to oxadiazon at 3.36 kg ai/ha, and was more effective than the low flumioxazin rate that provided 90% control. In 2013, single applications of flumioxazin at 0.42 kg/ha in February or March provided fair control (70 to 79%) of goosegrass by July, but control was poor (<70%) by September. Sequential applications (February followed by March timing) of flumioxazin provided excellent (90 to 100%) goosegrass control in July and >75% control by September. Single applications of oxadiazon at 3.36 kg/ha were more effective for goosegrass control by September than single applications of flumioxazin. However, goosegrass control from sequential flumioxazin applications was similar to oxadiazon applied sequentially by September.

DIFFERENTIAL ABSORPTION, TRANSLOCATION, AND METABOLISM OF ATRAZINE AND AMICARBAZONE IN SEASHORE PASPALUM. R. Singh*, P. McCullough; University of Georgia, Griffin, GA (239)

ABSTRACT

Triazine herbicides are widely used in Georgia for weed control in warm-season turfgrass. However, these chemistries cause excessive phytotoxicity to seashore paspalum. Amicarbazone is a triazolinone with a similar mechanism of action to triazines but is less injurious to seashore paspalum at rates required for weed control. The objective of this work was to investigate physiological mechanisms attributed to seashore paspalum tolerance to amicarbazone and atrazine. Laboratory experiments were conducted at the University of Georgia in Griffin, GA. Single plants of ‘Sea Isle 1’ seashore paspalum were collected from mature stands in the field, planted in the greenhouse, and allowed to develop 5 to 7 tillers before treatments. Seashore paspalum had more foliar absorption of ^{14}C-amicarbazone than ^{14}C-atrazine from 1 to 7 days after treatment (DAT). Seashore paspalum distributed the majority of root-absorbed ^{14}C to shoots after 72 hours, but differences were not detected between herbicides. The majority of foliar absorbed ^{14}C was retained in the treated leaf with minimal distribution to nontreated shoots and roots at 1, 3, and 7 DAT. Seashore paspalum had more rapid metabolism of amicarbazone than atrazine when applied to roots or shoots, suggesting differential tolerance levels are attributed to metabolism.

CRABGRASS AND KYLLINGA CONTROL IN BERMUDAGRASS WITH TRIBUTE TOTAL. H. Jordan*, P. McCullough; University of Georgia, Griffin, GA (267)

ABSTRACT

Tribute Total is a new combination product from Bayer containing thiencarbazone-methyl, foramsulfuron, and halosulfuron-methyl. Tribute Total has shown potential to control annual bluegrass, yellow nutsedge, and other problem weeds in bermudagrass, but research is limited on efficacy for controlling kyllinga and crabgrass species. Field experiments were conducted in Griffin, GA to evaluate efficacy of Tribute Total for postemergence control of fragrant kyllinga (*Kyllinga odorata*) and smooth crabgrass (*Digitaria ischaemum*) in a 'TifSport' bermudagrass fairway. Treatments included single and sequential applications of Tribute Total at 136 g ai/ha, Certainty (sulfosulfuron) at 39 g ai/ha, or Dismiss (sulfentrazone) at 0.42 kg ai/ha. Initial treatments were made on June 14 and sequential treatments of Tribute Total were applied after six weeks. All treatments except sulfentrazone contained a non-ionic surfactant at 0.25% v/v. Applications were made with CO_2 pressured sprayers calibrated at 374 L/ha. Experimental design was a randomized complete block with four replications. At 4 weeks after initial treatment (WAIT), Tribute Total provided good (80 to 89%) control of fragrant kyllinga and was comparable to sulfentrazone and sulfosulfuron. Tribute Total also provided good control of smooth crabgrass at 4 WAIT but sulfentrazone and sulfosulfuron provided poor control (<70%). At 10 WAIT, sequential applications of Tribute Total provided 96% control of fragrant kyllinga and 83% control of smooth crabgrass. However, single applications of Tribute Total, sulfentrazone, and sulfosulfuron provided poor control of both weeds. Bermudagrass injury was no detected on any observation date. Overall, Tribute Total has potential to effectively control fragrant kyllinga and smooth crabgrass but sequential applications may be required in areas with heavy weed pressure in summer.

A NOVEL GENE MUTATION CONFERRING DIFFERENTIAL ACCASE INHIBITING HERBICIDE RESPONSE INÂ ELEUSINE INDICA. J.D. McCurdy*1, J.S. McElroy2, M.A. Cutulle3, S. Chen2, F. Dane2; 1Mississippi State University, Auburn, AL, 2Auburn University, Auburn, AL, 3Syngenta Crop Protection, Vero Beach, FL (268)

ABSTRACT

Acetyl-coenzyme A carboxylase (ACCase) inhibiting herbicide resistance has previously been identified in *Eleusine indica*. Herbicides such as aryloxyphenoxypropionates (AOPPs) and cyclohexanediones are graminicides that competitively inhibit ACCase and disrupt fatty acid biosynthesis. However, several point mutations of the ACCase enzyme have been reported to confer resistance. *Eleusine indica* biotypes suspected of resistance to ACCase inhibiting herbicides were screened. Rate-response trials confirmed the presence of diclofop resistance within a single *E. indica* biotype as well as increased clethodim and fluazifop tolerance relative to other biotypes. The molecular basis for differential response was investigated using PCR and next generation sequencing techniques. The diclofop resistant population contained a Thr-1805-Ser amino acid substitution within the carboxyl-transferase region, which has not previously been associated with ACCase inhibiting herbicide resistance. Three dimensional modelling revealed that a substitution of Ser_{1805} for Thr_{1805} impacted electrostatic interactions within the ACCase Carboxyl Transferase domain. These interactions may impact the conformation of amide groups in the binding pocket that are involved in hydrogen bonding with inhibitors. This site mutation may confer altered sensitivity to ACCase inhibiting herbicides, specifically diclofop, but must be confirmed amongst other resistant biotypes.

LONG-TERM DALLISGRASS CONTROL WITH TRIBUTE TOTAL. G.K. Breeden*, J.T. Brosnan; University of Tennessee, Knoxville, TN (269)

ABSTRACT

Dallisgrass (*Paspalum dilitatum*) is a difficult-to-control perennial grassy weed of turfgrass. Previous research has illustrated that dallisgrass susceptibility to POST herbicide applications varies throughout a growing season; as a result, growing degree day (GDD) and cooling degree day (CDD) accumulation in spring and fall can be used to maximize the efficacy of POST applications. Tribute Total is a new herbicide mixture [thiencarbazone (TCM) + foramsulfuron + halosulfuron] being evaluated for dallisgrass control. Field research was conducted from 2011 to 2013 in Knoxville, TN evaluating the efficacy of Tribute Total applications at various GDD and CDD timings in spring and fall. Data from these experiments could be used to provide turfgrass managers with optimal programs for dallisgrass control using Tribute Total.

Two separate studies were conducted from 22 September 2011 through 1 October 2013 on mature stands of common bermudagrass (*Cynodon dactylon*) infested with dallisgrass at the East Tennessee Research and Education Center in Knoxville, TN. Plots (1.5 by 3 m) in both studies were maintained as a golf course rough and arranged in a randomized complete block with four replications. No supplemental irrigation was applied during the trial and supplemental nutrients were applied minimally (< 49 kg N ha^{-1}) over the two years. Herbicide treatments in all trials were applied with a CO_2 powered boom sprayer calibrated to deliver 281 L ha^{-1} utilizing four, flat-fan, 8002 nozzles at 124 kPa, configured to provide a 1.5-m spray swath. Weed control and turf injury were visually evaluated in all trials utilizing a 0 (i.e., no weed control or turf injury) to 100 % (i.e., complete weed control or turf injury) scale at 8, 36, 43, 56, and 88 weeks after initial treatment (WAIT).

Study 1 treatments included sequential applications of Tribute Total (136 g ha^{-1}) on a 4 week interval in fall 2011 (TTF2011), TTF2011 followed by (fb) a mixture of Celsius (TCM + iodosulfuron + dicamba)-plus-Revolver (foramsulfuron) at 215 + 132 g ha^{-1} in spring of 2012, and TTF2011 fb single and sequential applications of Tribute Total in the fall of 2012 on a 4 week interval. All Tribute Total treatments included a methylated seed oil (MSO) surfactant at 0.5% v/v and ammonium sulfate at 2% w/w. Two applications of monosodium methanearsonate (MSMA) were applied at 2240 g ha^{-1} as a comparative standard in the fall of 2011. CDDs were monitored beginning on 15 July each year using a base temperature of 22 C. Fall treatments were initiated after 5 CDD accumulated in 2012 and 2013. GDDs were monitored beginning 1 January 2012 using a base temperature of 10 C. Spring applications were made at 283 GDD.

Study 2 treatments included sequential applications of Tribute Total (136 g ha^{-1}) on a 4 week interval in fall 2012 (TTF2012), and TTF2012 fb single applications of Tribute Total (136 g ha^{-1}) at various timings in spring 2013. CDDs were monitored beginning on 15 July 2012 using a base temperature of 22 C. Fall applications were made after 5 CDD accumulated in 2013. GDDs were monitored beginning 1 January 2013 using a base temperature of 10 C. Spring applications of Tribute Total were applied on 17 April, 1 May, or 16 May after 146, 209, and 306 GDD had accumulated, respectively. All Tribute Total treatments included a MSO surfactant (0.5% v/v) and ammonium sulfate (2% w/w).

At no time during these studies was common bermudagrass injury observed. In both studies dallisgrass control (≥ 90%) with sequential fall applications of Tribute Total and MSMA were equivalent at 8 WAIT. Dallisgrass control had reduced to ≤ 65% from these fall-only applications by 36 WAIT. In both studies, sequential applications in fall required additional treatments the next year due to dallisgrass re-growth. Our findings indicate that optimal programs with Tribute Total incorporate sequential fall applications of Tribute Total after 5 CDD have accumulated followed by either a single spring application or sequential fall applications the following year at a similar CDD timing.

DITHIOPYR: NEW DEVELOPMENTS FOR POST EMERGENT CRABGRASS CONTROL IN THE WESTERN AND SOUTHERN U.S. A.L. Alexander *[1], J.M. Breuninger[2], D.D. Loughner[3], V.F. Peterson [4], M.D. Lees[5], J.T. Brosnan[6], G.K. Breeden[6], B. Brecke[7], R. Leon[8], S. McElroy[9], M. Flessnor[9]; [1]Dow AgroSciences, Lawrenceville, GA, [2]Dow AgroSciences, Indianapolis, IN, [3]Dow AgroSciences, Lawrenceville, NJ, [4]Dow AgroSciences, Mulino, [5]Dow AgroSciences, Granite Bay, CA, [6]University of Tennessee, Knoxville, TN, [7]University of Florida, Milton, FL, [8]University of Florida, Jay, FL, [9]Auburn University, Auburn, AL (270)

ABSTRACT

Dithiopyr (Dimension® 2EW) is a member of the pyridinecarboxylic acid family of herbicides and controls annual grasses, especially crabgrass (*Digitalis spp.*), and numerous broadleaf weeds in established lawns, commercial sod farms, non-cropland and industrial sites, ornamental turf, and container, field-grown, and landscape ornamentals. The current label allows for use on crabgrass at early post emergence: *Early postemergence applications of this product will control crabgrass only if applied prior to the fifth leaf (first tiller) stage of growth. The addition of a nonionic surfactant at 0.5% by volume (2 qt per 100 gallons of spray) may improve early postemergence control*. Research was conducted from 2010 through 2012 in CA, FL, AL, and TN to establish the potential for post emergent control of crabgrass past the fifth leaf stage and the need for a surfactant with those applications. Research from 4 sites in CA in 2010 and 2011 showed excellent control of crabgrass (93%) at 6 to 10 weeks after post emergent applications on 1 to 3 tiller crabgrass in bermudagrass turf. Broadcast applications were made with a CO_2 backpack sprayer at 80 or 86 GPA on 5 X 10 ft plots in a randomized complete block design with 4 replications per treatment. All sites were bermudagrass (*Cynodon dactylon*) or a bermudagrass and fescue (*Fescue spp*.) mix (CA). Treatments were dithiopyr at 0.5 lb ai/A with and without 0.25% v/v non-ionic surfactant, MSMA at 2 lb ai/A with 0.25% v/v non-ionic surfactant, and quinclorac (as Drive XLR8) with 1.5 pt product/A crop oil concentrate. Applications were made on crabgrass (*Digitalis adscendens* in AL, and *D. ischaemum* in CA, TN and FL) when it was at pre tiller, 1 to 2 tiller or 3 to 5 tiller. Evaluations of percent visual cover and control of crabgrass were made at 3 to 5, 6 to 10 and 11 to 14 weeks after each application timing. Results from sites are combined and analyzed using an ANOVA and Tukey™s mean separation (P=0.05). At 11 to 14 weeks after application, control of crabgrass was excellent with dithiopyr with or without a non-ionic surfactant at pretiller (97% for both treatments) and 1 to 2 tiller (85 or 87%). Quinclorac and MSMA gave 50% control or less at these 2 timings. At the 3 to 5 tiller stage dithiopyr with surfactant (58%) was better than without the surfactant (37%), quinclorac (31%) or MSMA (30%). Surfactant only made a difference in crabgrass control at the 3 to 5 tiller stage where better control was observed (58%) with surfactant than without the surfactant (37%). Dithiopyr labeled for selective use in all major turfgrass species gave superiorcontrol of crabgrass post emergence than quinclorac or MSMA which have limited tolerance in major turfgrass species of importance. Surfactant was not necessary with dithiopyr at pretiller or 1 to 2 tiller stages but increased control at the 3-5 tiller stage. New label wording is being considered for the Dimension® 2EW label to expand the window of application of dithiopyr for post emergent control of crabgrass in bermudagrass and other vigorous grasses.

PRE WEED CONTROL IN BERMUDAGRASS TURF OR HOW DID YOUR PRODUCT PERFORM IN 2013? L.B. McCarty* and A. Estes, Clemson University, Clemson, SC (271)

ABSTRACT

Preemergence (PRE) control of crabgrass (*Digitaria* spp.) and goosegrass (*Eleusine indica*) is a primary goal on many commercial turfgrass sites. Normally these are satisfactorily controlled with 1 or possibly 2 applications of PRE herbicides. However, in 2013, many areas received abnormal rainfall amounts. For example, in Clemson, SC, a total of 92-inches were received compared to the yearly norm of 48-inches. Given the volatilization potential of several major PRE herbicides and the introduction of a new herbicide, flumioxazin (SureGuard 51WDG) along with a new formulation of indaziflam (Specticle Flo 0.622 SC), 2013 was an 'acid-test' in terms of evaluating products and was the objective of this research.

Plot sizes for each treatment were 2.0 by 3.0 m, with 3 replications. Treatments were applied using a CO_2 pressurized backpack sprayer calibrated at 20 GPA to 'Tifway' and common bermudagrass mixed golf course fairways naturally infested with goosegrass and crabgrass. All herbicides had an initial application on March 21, 2013 (1X) with repeat applications for indicated treatments (2X) on May 20, 2013. Visual ratings are shown for July 31 (132 DAT) and August 23, 2013 (155 DAT) including percent weed control and percent visual bermudagrass injury ratings.

Goosegrass: In a standard product trial for PRE goosegrass control at 155 DAIT, 80 to 85% control followed Specticle Flo at 6 and 9 oz/acre and ~60% control at 4.5 oz/acre. Forty to 60% control was achieved with dithiopyr (Dimension 0.1G) at 0.5 lb ai/a, prodiamine (Barricade 0.22G) at 0.75 lb ai/a and Specticle Flo at 3 and 4.5 oz/a. Less than 40% PRE goosegrass control followed flumioxazin 51WDG at 10 oz/a. In a trial comparing generic vs. brand names, by 155 DAT, 75 to 80% control followed Oxadiazon 3.2L and Ronstar 3.2 L both at 121 oz/a (1X), and SureGuard 51WG at 10 oz/a (1X). Less than 40% control followed Dithiopyr 2L or Dimension 2EW at 16 oz/a (2X) or at 32 oz/a (1X), or Prodiamine and Barricade 4L at 32 oz/a (1X). When comparing G vs. L indaziflam formulations, by 155 DAT, 80 to 85% control followed a G formulation at all rates (0.0142 to 0.0426 lb ai/a) as well as the liquid Specticle Flo formulation at either 0.0292 or 0.437 lb ai/a. Specticle Flo rates <0.0219 lb ai/a provided ≤60% control at this time. In an additional standard trial, by 155DAT, 80 to 95% control followed Specticle Flo at 9 oz/a and SureGuard at 10 oz/a. Less than 30% control followed sulfentrazone (Dismiss 4L) at 0.125 or 0.25 lb ai/a or sulfentrazone + prodiamine (Echelon 4SC) at 1.125 lb ai/a.

Crabgrass: In a standard trial, by 159 DAT, ~80% PRE crabgrass control followed Specticle Flo at 4.5 or 9 oz/a while <70% control followed Dimension (0.1G at 0.5 lb ai/a), Barricade (0.22g at 0.75 lb ai/a), SureGuard (51WG at 10 oz/a) or Specticle Flo at 3 or 6 oz/a. In a generic vs brand name trial, by 145 DAIT, ≥90% control was achieved with Dithiopyr 2L at 16 (2X) or 32 (1X) oz/a, Dimension 2EW at 32 oz/a (1X), Oxadiazon and Ronstar 3.2L at 121 oz/a (1X), and Prodiamine and Barricade 4L at 32 oz/a (1X). Eighty to 85% control was provided at this time with Dimension 2EW at 16 oz/a (2X) and SureGuard 51WD at 10 oz/a (1X). In a G vs L indaziflam trial, the granular formulation at 0.0214 to 0.0426 lb ai/a provided ~80% PRE crabgrass control at 159 DAT while the liquid formulation only at 0.0219 or 0.0437 had similar control.

Overall, generic formulations of oxadiazon, dithiopyr, and prodiamine performed similar for PRE goosegrass and crabgrass control to brand names. Oxadiazon and SureGuard provided 'best' PRE goosegrass control, though, consistency varied between trials. At lower rates (e.g., ~0.0146 lb ai/a), granular formulations of indaziflam provided better PRE goosegrass control vs the liquid. Differences were not seen at higher rates. No noticeable turf damage occurred from any treatment at any time.

Future research will involve repeating this study and screening additional products alone and in various combinations with single and repeat applications.

EFFECT OF DIURON CONTAMINATED IRRIGATION WATER ON WARM-SEASON TURFGRASSES.
J.W. Boyd, University of Arkansas, Little Rock, AR (272)

ABSTRACT

In 2010, 2.5 inch diameter plugs of St. Augustinegrass and TifEagle, Tifway and TifDwarf bermudagrass were planted in 4 inch pots with an 80/20 sand/peat mix as a growing medium. Diuron treatment began the day after planting. Treatments consisted of diuron fortified water at five concentrations, 0.25, 1.0, 2.0, 4.0 and 8.0 ppm. Each treatment was replicated four times. Diuron solutions were made immediately before use. Each pot received 60 mls of water daily. The plugs were grown in a greenhouse in September and October with 13 hour day length using supplemental lighting. Unless otherwise noted, diuron treatments were applied for 17 consecutive days and were harvested at 28 and again at 49 DAIT, (days after initial treatment). In 2010, St. Augustinegrass dry weight was reduced 78% by diuron at 1.0 ppm and 90% by 2.0 ppm. Visual injury to St. Augustinegrass at 1.0 and 2.0 ppm diuron was 30 and 40% at 28 DAIT and 73 and 93% at 49 DAIT. A diuron concentration of 0.25 ppm caused a significant reduction in turfgrass quality and growth of Tifway, TifDwarf and TifEagle bermudagrass. Diuron at 0.25 ppm reduced dry matter production for Tifway, TifDwarf and TifEagle bermudagrass 30, 77 and 83%, respectively. At 49 DAIT, visual injury ratings from diuron at 0.25 ppm for Tifway, TifDwarf and TifEagle bermudagrass were 45, 48 and 78%, respectively. Growth reduction of TifEagle at rates of 1.0 and 2.0 ppm was not statistically different than 0.25 ppm. At 1.0 ppm, Tifway and TifDwarf growth reduction was significantly greater than that produced by 0.25 ppm but did not differ from 2.0 ppm. The pots receiving the 4.0 and 8.0 ppm rates were allowed to establish for 10 days and then were treated 10 consecutive days. Harvest was at 19 and 40 DAIT. A diuron rate of 4.0 ppm reduced dry weight of Tifway, TifDwarf and TifEagle bermudagrass by 60, 63, and 37%, respectively. Visual injury from 4.0 ppm diuron at 40 DAIT for Tifway, TifDwarf and TifEagle bermudagrass was 88, 90, and 95%. The 8.0 ppm rate reduced dry weight, for Tifway, TifDwarf and TifEagle bermudagrass by 82, 75, and 74%, respectively. Visual injury from 8.0 ppm at 40 DAIT for Tifway, TifDwarf and TifEagle bermudagrass was 98, 100, and 100%, respectively. In a 2012 greenhouse study, plugs of centipedegrass, ‘Meyer’ zoysiagrass, ‘Tifdwarf’ bermudagrass, ‘Tifway’ bermudagrass and St. Augustinegrass, and were allowed to establish for three weeks before treatment began. Pots were irrigated daily with water containing 2.0 ppm diuron for 21 consecutive days. The turfgrasses were harvested 22 days after herbicide treatment began. Percent dry weight reduction was 32, 60, 71, 81, and 81%, respectively. Visual injury ratings taken before harvest were 20, 70, 60, 74, and 95%, respectively.

EFFICACY OF SEVERAL HERBICIDES FOR DEERTONGUE GRASS (*DICHANTHELIUM CLANDESTINUM*) CONTROL. S.D. Askew*[1], M.C. Cox[2], A.R. Post[3]; [1]Virginia Polytechnic Institute and State University, Blacksburg, VA, [2]Virginia Tech, Blacksburg, VA, [3]Oklahoma State University, Stillwater, OK (273)

ABSTRACT

Deer-tongue grass is a native perennial cool-season grass that can be a troublesome weed in certain turfgrass areas. Deer-tongue grass produces a mat of rhizomes that can be over 8 cm deep. Leaves are broad (up to 2 cm wide) and don't blend with turf-type grasses. In golf nonmow areas and secondary roughs, deer-tongue grass can form impenetrable patches that eliminate the potential to find or advance an errant shot. Although deer-tongue grass is not a common weed of turfgrass areas, infested areas can be considerably troublesome to manage. A literature search in early 2013 did not produce any information on deer-tongue grass control. Since several golf superintendents in Virginia continue to struggle with this weed, a research experiment was initiated in spring of 2013 to evaluate several herbicides for deer-tongue grass control. Two greenhouse experiments were separated spatially and conducted in tandem between March and July of 2013. Deer-tongue grass rhizome mats were collected from secondary rough areas at Primland Resort near Meadows of Dan, Virginia and immediately divided and potted in the greenhouse using native silt loam soil. Plants were allowed to break dormancy and acclimate for 6 weeks. Plants were 8 to 12 inches tall at herbicide treatment. Only glyphosate at 4 rates between 0.5 and 1.0 lb ai/A, fluazifop at 0.085 lb ai/A, topramezone at 0.03 lb ai/A twice at 3 week intervals, imazapic at 0.09 lb ai/A, and a premix product of iodosulfuron, thiencarbazone, and dicamba at 0.21 lb ai/A reduced shoot regrowth more than 50%. The following herbicides did not control deer-tongue grass more than 50% or reduce biomass appreciably: sethoxydim, primisulfuron, amicarbazone, fenoxaprop, diclofop, metamifop, fluazifop + fenoxaprop, mesotrione, nicosulfuron + rimsulfuron, metsulfuron + rimsulfuron, metsulfuron, bispyribac sodium, chlorsulfuron, and quinclorac. Data from these studies suggest that qlyphosate, imazapic, fluazifop, topramezone, and iodosulfuron + thiencarbazone + dicamba warrant further investigation in field trials.

USE OF PGRS AND HERBICIDES FOR SEEDHEAD SUPPRESSION AND QUALITY IMPROVEMENT IN BERMUDAGRASS (*CYNODON DACTYLON* X *C. TRANSVAALENSIS*) 'TIFGRAND'. P.C. Aldahir*, J.S. McElroy; Auburn University, Auburn, AL (274)

ABSTRACT

TifGrand bermudagrass (*Cynodon dactylon* x *C. transvaalensis*), a relatively new cultivar, has been reported to be shade tolerant, a rare characteristic in warm-season turfgrasses, especially in bermudagrass. Despite the tolerance to shade, TifGrand seedhead production is excessive under full or partial sunlight during the summer, limiting its use. The goal of this trial was to evaluate a range of PGRs and herbicides that may control or suppress TifGrand seedheads under full sunlight, improving TifGrand overall quality.

Research was conducted at the Auburn University Turfgrass Research Unit in Auburn, AL from July to August 2013. Treatments included trinexapac-ethyl (Primo Maxx, Syngenta Crop Protection, Greensboro, NC) at 96 g ai ha^{-1}, imazapic (Plateau, BASF Corp., Research Triangle Park, NC) at 8.8 and 17.5 g ai ha^{-1}, fenoxaprop (Fusilade II, Syngenta Crop Protection) at 17.5 and 35 g ai ha^{-1}, imazamox (Clearcast, SePRO Corp., Carmel, IN) at 35 g ai ha^{-1}, glyphosate (Roundup Pro, Monsanto Company., St. Louis, MO) at 105 g ai ha^{-1}, flucarbazone (Everest, Arysta Lifescience, Cary, NC) at 29.4 g ai ha^{-1}, flucarbazone + trinexapac-ethyl at 29.4 + 96 g ai ha^{-1}, and a nontreated control. Treatments were applied to 1 x 1 m plots sequentially 4 times on a 21-day interval (first application on 17 Jun 2013). Applications were made with a hand-held sprayer with four TeeJet 8002VS nozzles spaced at 25 cm and calibrated to deliver 280 L ha^{-1}. Treatments were arranged in a randomized complete block with 4 replications. Data were collected weekly and included turfgrass quality on a 1 to 9 scale, where 1 represented brown, thin, seedhead-infested, low quality turf; and 9 represented dark green, dense, seedhead-free, high quality turf. Data also included turfgrass injury on a percent basis, and seedhead counts within a 0.15 by 0.15 m frame with 3 subsamples per plot. The recorded counts were further converted to number of seedheads per square meter. Statistical analysis were performed in SAS and means separated using ANOVA with adjusted 95% confidence intervals with $\alpha = 0.05$.

In general, most injury occurred 14 DAIA. At 14 DAIA, imazapic at 17.5 g ai ha^{-1} and fenoxaprop at 17.5 g ai ha^{-1} resulted in the least quality scores, 4.5 and 4, respectively. Also at 14 DAIA, no other treatment resulted in a quality score equal or great than 8. Most seedhead production occurred 35 DAIA. Despite significantly reduction in seedhead production relative to the nontreated, imazapic at 17 g ai ha^{-1} (93% reduction), and fenoxaprop at 17.5 g ai ha^{-1} (94% reduction) and 35 g ai ha^{-1} (71% reduction) also resulted in most injury at 14 DAIA (48, 53, and 23%, respectively). In turn, imazapic at 8.8 g ai ha^{-1} resulted in 86% reduction in number of seedheads compared to the nontreated with acceptable injury (19%) 14 DAIA. At 70 DAIA, only the nontreated, imzapic at 8.8 g ai ha^{-1} and imazamox at 35 g ai ha^{-1} resulted in quality scores of 8 or above.

In sum, none of the treatments were able to completely suppress seedhead production by TifGrand. Imazapic at 8.8 g ai ha^{-1} provided the most seedhead suppression (86%) while maintaining turfgrass quality (8). Future research should focus on investigation of the causes for excessive mid-summer seedhead production on TifGrand, as well as on investigation of imazapic and imazamox application rates, mixtures, and timing.

LIFELONG EFFECTIVENESS: BALANCING YOUR LIFE AND CAREER. S. Mundy*; University of Tennessee, Knoxville, TN (232)

ABSTRACT

PANEL DISCUSSION. S.A. Senseman*[1], J.T. Brosnan[1], E.P. Prostko[2], J.S. McElroy[3], P.A. Banks[4]; [1]University of Tennessee, Knoxville, TN, [2]The University of Georgia, Tifton, GA, [3]Auburn University, Auburn, AL, [4]Marathon-Agric. & Environ. Consulting, Inc., Las Cruces, NM (233)

ABSTRACT

BUSH-TYPE BLACKBERRY CONTROL COMPARISONS AT 1 YAT UTILIZING HERBICIDE MIXTURES VERSUS MECHANICAL MOWING. W.N. Kline*[1], E. G. Lowe[2], P.L. Burch[3]; [1]William N Kline, LLC, Ball Ground, GA,[2]University of Georgia, Arnoldsville, [3]Dow AgroSciences, Christiansburg, VA (255)

ABSTRACT

Dow AgroSciences efforts to “figure out” how to manage blackberry (primarily in pastures) have been on-going for many years ~ 15+ years. Research goals have focused on finding herbicides and herbicide mixtures that provide acceptable long term blackberry control (> 1 Year). The key objective is to kill the blackberry and have grass in the pasture the following year (or multiple years) with little blackberry regrowth. Historically, Remedy® Ultra, PastureGard® HL, Surmount®, and Grazon® P+D + Remedy® Ultra mixtures provide season-long control and control into the second growing season. Blackberry control from these offerings has been good but blackberry regrowth usually occurs after about 2 growing seasons following treatments. Many producers will often just mow pastures annually but control is only temporary at best.

Aminopyralid herbicides and mixtures with aminopyralid have recently shown promise for longer term blackberry control (Kline et al SWSS 2012). Based on other research and commercial use, aminopyralid + metsulfuron (Chaparral® Herbicide) has shown consistent long term blackberry control. Also, all of the Dow AgroSciences research has demonstrated that blackberry control is best with fall herbicide applications.

The objective of this field research was to compare Chaparral® and Chaparral® mixtures with several other herbicides and compare to mechanical mowing for pasture renovation. The experiment was initiated on 11 Oct 2012 in an abandoned pasture near Crawford, GA. Sprayed plots are 24 ft X 50 ft; untreated buffers between plots = 16 ft; so each plot - treated + buffer = 40 ft X 50 ft. Design is a randomized complete block design with 3 replications per treatment. Total sprayed volume = 30 GPA applied with ATV boom sprayer and TT11004 Turbo Teejet nozzles. Treatments were: Chaparral 3.3 Oz/A; Chaparral 2 Oz + PastureGard HL 1 Pt/A; ForeFront HL 2 Pt + Remedy Ultra 2 Pt/A; Forefront HL 2 Pt + PastureGard HL 1 Pt/A; PastureGard HL 2 Pt/A; ACP 1.11 Oz + Metsulfuron 0.17 Oz (Ai/Ac); ACP 2.22 Oz + Metsulfuron 0.34 Oz (Ai/Ac); Metsulfuron 0.34 Oz (Ai/A); and Mechanical Mowing. All treatments included a non-ionic surfactant (0.25% v/v). Mechanical mowing was done at the same time as spray treatments with a “bush hog” mower attached to farm tractor.

All plots were visually rated for % blackberry control on 13 Aug 2013 (306DAT) and again on 11 Oct 2013 (365DAT). Blackberry control ratings taken on 13 Aug 2013 demonstrated excellent control (>/= 85%) with all treatments except for PastureGard HL alone (~60%) and the mechanical mowing treatment (~5%), which were not commercially acceptable. Blackberry control ratings taken on 11 Oct 2013 demonstrated slightly less “end-of-season control” than expected for some of the treatments. Key treatments that appear to be "breaking" at end-of-season rating (</= 80% control) included ForeFront HL + PastureGard HL and both (ACP) Aminocyclopyraclor + metsulfuron treatments.

An indication of pasture renovation success is assessed by observing fescue recovery. Fescue grass cover ratings were taken on 13 Aug 2013. Chaparral alone and ForeFront + Remedy provided the best and most consistent stands of fescue cover (>/= 96%). Metsulfuron alone treatment resulted in 52% fescue cover. Chaparral + PastureGard HL and ForeFront HL + PastureGard HL delivered ~ 80% fescue cover. Both (ACP) Aminocyclopyraclor + metsulfuron treatments delivered ~ 65% fescue cover. In general, treatments containing metsulfuron reduced fescue cover except for the Chaparral alone treatment. Mechanical mowing provided very little fescue cover response ~ 22% fescue cover.

All plots were re-treated with the same treatments again on 11 Oct 2013 - fescue injury was evaluated at 27 DAT from these repeat treatments. Fescue injury was consistently higher from treatments containing metsulfuron and ranged from 23% to 37% fescue injury. Treatments without metsulfuron had injury ratings that ranged from 3% to 7%. Based on previous research and operational experience; we can expect the fescue injury from these low rates of metsulfuron to disappear during the early part of the next growing season.

Treatments that released fescue and provided opportunity for vigorous fescue growth response, left little opportunity for other weeds or grasses. Where gaps in fescue occurred (i.e. fescue response was less aggressive or suppressed), broadleaf weeds and warm season grasses invaded these areas.

RESPONSE OF SMUTGRASS (*SPOROBOLUS* SPP.) TO MANAGEMENT PRACTICES IN FLORIDA.

B.A. Sellers*[1], J.A. Ferrell[2]; [1]University of Florida, Ona, FL, [2]University of Florida, Gainesville, FL (256)

ABSTRACT

Two smutgrass species, small smutgrass (*Sporobolus indicus*) and giant smutgrass (*Sporobolus indicus* var. *pyramidalis*), are invasive clump forming perennial grasses native to southeast Asia. Small smutgrass first became problematic in south Florida during the 1950s, while giant smutgrass was not recognized as a problem until the early 1990s. Bahiagrass (*Paspalum notatum*) is the most widely utilized warm-season forage for beef cattle production in Florida, and smutgrass invasions are often observed in bahiagrass pastures. Both cultural and chemical management techniques have been researched over the past 50 to 70 years Mowing was found to be a temporary solution and was thought to increase seed spread. Grazing studies were also conducted, however, cattle either lost weight during the study or ranchers felt rotational grazing was too labor intensive to incorporate into their forage management programs. Chemical control with hexazinone is the only current option available to ranch managers for smutgrass control. However, hexazinone is expensive and smutgrass infestations often return to initial densities within three years after a single application. The recommended rate for hexazinone for smutgrass control in bahiagrass pastures is 1.12 kg/ha, but application of 0.56 to 0.84 kg/ha have resulted in control as high as 85%. Because ranch managers are in need of an economical long-term smutgrass management plan, experiments were initiated to determine the best strategy for long-term smutgrass control. Three experiments were conducted beginning in 2008. The first experiment examined the effect of burning (whole plot) on smutgrass control with sub-plot treatments of hexazinone at 1.12 kg/ha, complete renovation, or fall roller chopping with four replications; 0.56 kg/ha hexazinone was applied to all sub-plot treatments the following year. The second experiment investigated the effect of 2 x 2 factorial arrangement of treatments consisting of hexazinone at 0 or 0.56 kg/ha and nitrogen at 0 and 56 kg/ha in a randomized complete block design after hexazinone was applied to the entire experimental area at 1.12 kg/ha the previous year. The third experiment utilized a 4 x 4 factorial treatment arrangement with hexazinone applied at 0, 0.56, 0.84 or 1.12 kg/ha in year one followed by 0, 0.28, 0.56, and 0.84 kg/ha in year two. Smutgrass control in all experiments was evaluated by counting plants in 1 m^2 quadrats prior to application and at yearly intervals for three years after the second treatment. In the first experiment, smutgrass counts were nearly 6 times greater in renovated plots than in plots treated with hexazinone or fall-roller chopped one year after the initiation of the experiment. However, applying 0.56 kg/ha hexazinone the second year resulted in similar smutgrass densities two and three years after the initiation of the experiment. By 2012, smutgrass density was 70% greater in renovated plots and plots that were fall roller-chopped than plots treated sequentially with hexazinone. In the second experiment, neither nitrogen nor a second hexazinone application influenced smutgrass density three years after treatment; however, a trend for increased smutgrass density in plots without hexazinone is apparent. In the third experiment, 0.56 followed by 0.56 kg/ha hexazinone resulted in only 1 plant per plot, which was similar to 0.84 and 1.12 kg/ha followed by 0.56 kg/ha two years after the sequential treatment and 1.12 kg/ha applied only in the first year. By three years after the sequential treatment, however, the density of smutgrass in plots treated once with 1.12 kg/ha was at least 3-times greater than in plots treated sequentially with 0.56 followed by 0.84 kg/ha, 0.84 followed by 0.56 kg/ha, and 0.84 followed by 0.84 kg/ha. These data indicate that burning has no influence on smutgrass control and that soil disturbance does not improve long-term smutgrass control compared to sequential herbicide treatments. Nitrogen fertility has no impact on long-term smutgrass control, but it may improve the bahiagrass sward. If a rancher is to employ a sequential program with annual hexazinone treatments, it is likely more economical if reduced rates are utilized.

WAX MYRTLE CONTROL WITH AMINOCYCLOPYRACHLOR. M.T. Edwards; DuPont, Pierre Part, LA (257)

ABSTRACT

DuPont Crop Protection is evaluating aminocyclopyrachlor for brush control in the southern United States. Aminocyclopyrachlor is characterized by low use rates, a favorable mammalian toxicological profile, and a favorable environmental profile. Aminocyclopyrachlor demonstrates both foliar and residual activity on a broad spectrum of brush species, including many invasive species. The focus of this presentation will be on control of Wax Myrtle (Myrica cerifera) from 2009 – 2013 in Louisiana.

Data is presented at 1 and 2 years after application from 10 trials in Louisiana with 3 replicates. Applications were made via Individual Plant Treatments (IPT) at 60 PSI and 50 GPA, basal treatments applied in an oil carrier, spot applications applied undiluted, and broadcast applications via backpack or tractor mounted sprayer at 18-30 GPA and 30-40 PSI.

EPA registration is pending for the aminocyclopyrachlor pasture brands DuPont™ Rejuvra™ and DuPont™ Invora™. EPA registration is anticipated in 2014 and 2015.

A Program Approach may be needed, based on field trial results to date. IPT treatments appear to provide moderate control, but regrowth can occur. Broadcast treatments appear to provide moderate control, but regrowth occurs. The addition of ½ - 1 pint of triclopyr appears to improve control. Higher rates of DuPont™ Rejuvra™ and Invora™ appear to provide better control – 9 oz and 48 fl oz. Mowing before or after application appears to increase control. Spot gun applications with aminocyclopyrachlor or DuPont™ Velpar® L appear to provide excellent control. Applications in basal oil appear to provide excellent control.

Trial results to date show that there are several potential Best Management practices that will need further testing. This includes the mowing or rolling of the area the year prior to application. Initial broadcast applications of DuPont™ Rejuvra™ at 5.5 oz + 1 pint triclopyr appeared to control other brush and herbaceous species, but regrowth of Wax Myrtle and McCartney Rose occurred. These scenarios are being tested one to two years after trial applications, when regrowth is about 2 feet: broadcast applications of DuPont™ Invora™ at 24 – 36 fl oz.; IPT application with Invora™ at 64 fl oz /100 gallons of spray solution; spot gun applications with aminocyclopyrachlor or DuPont™ Velpar® L; and the application of aminocyclopyrachlor in basal oil.

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.

Products containing aminocyclopyrachlor for use on range and pasture are not registered for sale or use in the United States. No offer for sale, sale or use of these products is permitted prior to the issuance of the required EPA and state registrations.

DuPont™ Invora™ and DuPont™ Rejuvra™ herbicides are not registered for sale and use in the United States, and no sale, offer for sale or use of this product may be made unless and until all necessary federal and state registrations have been obtained.

WEED MANAGEMENT CHALLENGES IN TENNESSEE PASTURES AND HAY FIELDS: MANY QUESTIONS, SOME ANSWERS. G. N. Rhodes, Jr. and T.D. Israel; University of Tennessee, Knoxville, TN (258)

ABSTRACT

The majority (85 percent) of Tennessee pastures and hay fields are composed of tall fescue which is predominantly 'KY 31'. Roughly 10 percent are orchardgrass or a mixture of orchardgrass and timothy. Bermudagrass is important to producers who market small bales in the high value horse hay market, but it still composes only about 5 percent of our grass forage base. A number of producers are expressing increased interest in bermudagrass, but the cost of establishment and price of nitrogen keep acreage low. Most of our research and educational programs historically have focused on management of annual and herbaceous perennial broadleaf weeds in tall fescue.

Buttercups (*Ranunculus spp*.) continue to be troublesome each year, and most species are winter annuals that are relatively easy to control with a timely (pre-bloom) application of 2,4-D. Over the years we have made most recommendations for applications in March. However, we have shifted our emphasis in recent years to encouraging fall (late-October to mid-December) applications. In general, it is less windy, not as wet, and fewer sensitive crops, gardens, and active greenhouses are present. While most timely applications in the fall or late winter have been successful, we are experiencing an increasing number of reported failures with 2,4-D where everything apparently was done correctly. This has prompted a number of producers to inquire regarding the possibility of 2,4-D resistance in buttercups. Investigations so far have revealed that we are most likely experiencing a species shift from hairy buttercup (*R. sardous Crantz*) to bulbous buttercup (*R. bulbosus L.*) in the suspect fields.

The introduction of aminopyralid into the pasture market greatly improved the ability of our cattle producers to manage two troublesome perennials, horsenettle (*Solanum carolinense L.*) and tall ironweed (*Vernonia gigantea (Walt.) Trel.*). Our research has shown that applications of aminopyralid at the horsenettle bloom stage provides better lasting control than those made earlier or later in the season. Our best recommendation for tall ironweed is to clip during the spring and summer to weaken the root system, then follow with aminopyralid applied to regrowth. Investigations over the past six years have shown that aminocyclopyrachlor, when registered, will be an excellent option for both of these weeds.

Our most troublesome summer annual broadleaf weed is spiny amaranth (*Amaranthus spinosus L.*). This prolific seed producer is easily controlled with 2,4-D and other auxinic herbicides. However, no herbicide has given appreciable residual control. This, coupled with the fact that it is most prevalent in areas where adequate grass is lacking, often results in multiple flushes of seedlings through the summer. Our recommendation in most cases is for one to two applications of 2,4-D supplemented with clipping. Another summer annual, nodding spurge (*Chamaesyce nutans (Larg.) Small*), has increased in prevalence in the central and eastern portions of our state. The weed emerges following the first hay cutting, and it is not controlled by any auxinic herbicides we have tested to date. Research in our state and others has shown that it can be easily controlled with metsulfuron.

A serious challenge to the sustainability of high quality bermudagrass in small bales for the horse market is the spread of knotroot foxtail (Setaria parviflora (Poir.) Kerguélen) in the western portion of our state. This perennial grass reproduces by seed and rhizomes, and it is very difficult to control. Seedhead bristles in hay have been reported to cause serious problems with mouth ulcers in horses. We have had limited success (suppression only) with sequential applications of Pastora + glyphosate followed by Pastora. However, bermudagrass injury has been severe. Our future research will examine the possible interaction of herbicide timing with nitrogen rate and timing.

MANAGEMENT OF *OPUNTIA SPP.* IN FLORIDA PASTURES. M.W. Durham*[1], J.A. Ferrell[1], B.A. Sellers[2]; [1]University of Florida, Gainesville, FL, [2]University of Florida, Ona, FL (259)

ABSTRACT

Prickly pear (*Opuntia spp.*) is a difficult to control pasture and rangeland weed species found throughout Florida. Cultural control methods are ineffective because prickly pear is a perennial that resprouts from roots and the base of the plant, if mowed and it can easily root from vegetative propagules. Cladodes can live for a least 12 months once detached which gives them plenty of time for establishment. Herbicide application timing has traditionally been done in the late summer, early fall to coincide with carbohydrate replenishment in hopes of achieving better translocation throughout the plant. In western states, picloram is the herbicide of choice for controlling prickly pear. In Florida, however, picloram is not available for use, so an alternative herbicide is needed for adequate control. The purpose of this study was to determine herbicide timing and rate on prickly pear control. The herbicides tested were CleanWave (fluroxypyr + aminopyralid) and GrazonNext (aminopyralid + 2,4-D). In this study CleanWave was applied at 52 fl oz/a as a spring or fall application and as a split application with plots receiving 26 fl oz/a in spring and fall. GrazonNext was applied at 2 pt/a alone and in combination with CleanWave at 52 fl oz/a in spring. Ratings were taken at 6 and 12 months after treatment (MAT). At 6 MAT, the CleanWave + GrazonNext combo provided the greatest control at 63%. All other treatments were <33%. At 12 MAT, the combo treatment still provided the greatest control at 93%. The spring, split and fall applications provided 83%, 80% and 63% control, respectively, while the GrazonNext application only provided 40% control. The combination treatment provided the best control for all rating dates. The spring and split applications also provided adequate control while the fall application did not provide the amount of control needed to be effective.

AMINOCYCLOPYRACHLOR FOR WEED CONTROL IN PASTURE AND RANGELANDS. F. Yelverton*, L. Warren, T. Gannon; NC State University, Raleigh, NC (260)

ABSTRACT

Aminocyclopyrachlor (AMCP) controls many winter and summer broadleaf weeds commonly found in pasture and rangelands throughout the southeastern US. Several weeds that are not controlled include mouseear chickweed (*Cerastium vulgatum*), parsley-piert (*Alchemilla arvensis*) and yellow woodsorrel (*Oxalis stricta*). Erratic corn speedwell (*Veronica arvensis*) and wild radish (*Raphanus raphainistrum*) control has been observed with AMCP. Research was conducted to evaluate AMCP combinations consisting of metsulfuron, chlorsulfuron, 2,4-D or triclopyr on several of these weeds and to determine tolerance on 'Coastal' bermudagrass and tall fescue stands.

AMCP + metsulfuron or chlorsulfuron provided complete control of mouseear chickweed, corn speedwell and oldfield toadflax (*Linaria canadensis*). However, AMCP + 2,4-D did not control any of these weed species. AMCP + 2,4-D, metsulfuron, chlorsulfuron or triclopyr completely controlled arrowleaf sida (*Sida rhombifolia*) 4 WAT but new germination was evident in all treated plots by 8 WAT.

AMCP applied alone or with metsulfuron, 2,4-D or triclopyr did not affect 'Coastal' bermudagrass yield when applied immediately after spring greenup. When applied to 6 to 8 inch new spring growth, AMCP applied alone or with metsulfuron caused 30% stand and yield reduction (1 MAT). AMCP with 2,4-D or triclopyr caused 20% stand reduction 1 MAT but did not affect yield. All treatment combinations reduced stand <10% 1 MAT when applied 10 days after 1^{st} cutting.

AMCP + chlorsulfuron or metsulfuron caused tall fescue injury (necrosis) 15 or 37%, respectively, 4 WAT with recovery by 8 WAT. Tall fescue yield was not affected. AMCP + 2,4-D, thifensulfuron or tribenuron did not injury tall fescue or affect yield.

CHINESE TALLOWTREE CONTROL IN PASTURES AND BOTTOMLAND HARDWOODS. S.F. Enloe*; Auburn University, Auburn, AL (261)

ABSTRACT

Chinese tallowtree is an invasive tree that is predominantly found across the southeastern United States from Florida to Texas. Its negative impacts can be seen in numerous natural and managed ecosystems including bottomland hardwood forests, seasonally wet pastures, pine plantations, and along lakes, streams, and rivers. Despite its troublesome presence for many decades, there are relatively few effective control strategies available. Studies were conducted in Alabama and Louisiana to evaluate several herbicides for cut stump, basal bark, and foliar individual plant treatment methods. For each IPT study, individual trees served as experimental units and each treatment was randomly assigned to twenty trees. Cut stump and basal bark treatments were applied in December 2011. Foliar treatments were applied in June 2012 to Chinese tallowtree stump sprouts that had been cut in December 2011 and had grown to approximately five feet in height. Herbicide treatments included triclopyr amine and ester formulations, imazamox, aminopyralid, aminocyclopyrachlor, and fluroxypyr and rates varied between the foliar, cut stump, and basal bark studies. Data were collected near the end of the growing season in 2012 and 2013 just before tallowtree leaf senescence and included number of stump or root collar sprouts and all sprouts originating from lateral roots within a one meter radius of each tree. For the cut stump and basal bark studies, herbicide treatments tended to prevent regrowth from the stump or root collar region much better than from lateral roots. Aminocyclopyrachlor was generally the most consistent herbicide across studies while the other herbicide treatments varied in effectiveness between studies. For example, aminopyralid and fluroxypyr were effective in the cut stump study but provided less control in the foliar treatment study. Triclopyr amine and ester formulations, which are commercial standards, did not consistently control tallowtree across these IPT studies. These studies provide some promising treatments to increase the number of effective tools that can be used to manage Chinese tallowtree. Additional research is needed to address the prolific nature of lateral root sprouting following any of these treatment methods.

HAIRY BUTTERCUP CONTROL AND WHITE CLOVER TOLERANCE TO MULTIPLE FORMULATIONS OF 2,4-D. S.F. Enloe*; Auburn University, Auburn, AL (262)

ABSTRACT

Hairy buttercup is a winter annual weed that is widespread throughout Southeastern US pastures. Its potential toxicity and aggressive spring growth have made it a common concern among producers. There are few published studies that have examined its ecology or control. Furthermore, a lack of herbicide selectivity is frequently an issue when broadleaf weed control is needed in mixed grass-legume pastures. We evaluated multiple formulations of 2,4-D and imazethapyr, hexazinone, and aminopyralid + 2,4-D at December and February application timings for hairy buttercup control and white clover tolerance. Dimethylamine, diethanolamine, and ester formulations of 2,4-D controlled hairy buttercup at 0.4 kg/ha. One hundred and twenty days after a December treatment, white clover cover was similar between all 2,4-D treated plots and the unsprayed control plots. Imazethapyr was also effective in controlling hairy buttercup but hexazinone was not effective for hairy buttercup control and also resulted in a considerable reduction in white clover. Aminopyralid + 2,4-D provided excellent hairy buttercup control but completely eliminated white clover cover. In general effective herbicide treatments worked at both application timings. These studies indicate that hairy buttercup can be controlled in mixed white clover/grass pastures with multiple herbicide options without damaging white clover populations.

SWSS ENRICHMENT SCHOLARSHIP PRESENTATION - SUSHILA CHAUDHARI. S. Chaudhari*; North Carolina Sate University, Raleigh, NC (263)

ABSTRACT

In 2013 I received Southern Weed Science Society Endowment Enrichment Scholarship. The goal of this scholarship is to provide an opportunity to students to participate in a week long educational experience with industry or academia. In September 2013, I visited Syngenta Vero Beach Research Center (VBRC), Vero Beach, Florida. The VBRC is located on 240 acres and has 12 greenhouses, irrigated plots, citrus groves, native woodlands and wetlands. Due to the sub-tropical climate of this location, field research can be conducted year round. During my visit, I worked with Cheryl Dunne (Group Leader, Weed Control), Rakesh Jain (Sr. R & D scientist), Erik Rawls (R & D Scientist) and Vinod Shivrain (R & D scientist). The weed control group was very welcoming and supportive; they answered all my queries regarding the industry work environment. I rated greenhouse trials, applied herbicides with a spray chamber, established studies in the field and greenhouse, learned about screening for herbicide resistant in weeds, and was exposed to ARM software. Additionally, I also interacted with the plant disease and insect control groups of Syngenta. This was a great opportunity for me to learn about the agrochemical industry work environment and I enjoyed my trip to VBRC. This experience will help me achieve my future career goals. I highly recommend graduate and undergraduate students to apply for this rewarding scholarship and take advantage of this great opportunity.

SWSS ENRICHMENT SCHOLARSHIP PRESENTATION - MATT ELMORE. M.T. Elmore*; University of Tennessee, Knoxville, TN (264)

ABSTRACT

SWSS ENRICHMENT SCHOLARSHIP PRESENTATION - PETER EURE. P.M. Eure*; The University of Georgia, Tifton, GA (265)

ABSTRACT

BALANCING LIFE AND CAREER. S. Mundy*; University of Tennessee, Knoxville, TN (266)

ABSTRACT

GLYPHOSATE-RESISTANT AND -SUSCEPTIBLE PALMER AMARANTH: HYPERSPECTRAL REFLECTANCE PROPERTIES OF PLANTS AND POTENTIAL FOR CLASSIFICATION. K.N. Reddy*, Y. Huang, M.A. Lee, V.K. Nandula, R.S. Fletcher, S.J. Thomson, F. Zhao; USDA-ARS, Stoneville, MS (275)

ABSTRACT

Palmer amaranth (*Amaranthus palmeri* S. Wats.) is a common agronomic weed in the southern U.S., and several populations have developed resistance to glyphosate. Not all Palmer amaranth field populations are resistant to glyphosate. Glyphosate-resistant (GR) and glyphosate-susceptible (GS) Palmer amaranth plants look alike, and it is impossible to distinguish visually GR plants from GS plants. Currently, GR and GS plants are identified by assessing physiological and biochemical changes in plants following glyphosate treatment. Whole plants, single leaves, or leaf discs are subjected to glyphosate treatment to identify GR from GS plants. These methods are undoubtedly reliable in distinguishing GR from GS plants, but are tedious and labor-intensive. Hyperspectral imaging has been used in identification of plant stress caused by biotic and abiotic factors, but the authors are not aware of any studies where this technology was used to address its utility in differentiating GR and GS plants. The objectives of this study were to (1) characterize the hyperspectral reflectance properties of GR and GS Palmer amaranth plants and (2) assess classification accuracy of an unknown set of plants (test set) using the analysis of data from a known set of plants (training set).

Three GR and three GS Palmer amaranth populations from Mississippi and Georgia were raised from seed and clone in greenhouse as well as in the field. Hyperspectral images of greenhouse plants (10- to 15-cm tall) and field plants (75- to 120-cm tall) were obtained using a Resonon Pika II hyperspectral camera (394 – 900 nm, 240 bands). Data were preprocessed by normalizing the spectra to remove artifacts caused by plant height variation. Data analysis used Forward Selection to select the bands, Fisher’s Linear Discriminant Analysis to reduce dimensionality, and maximum likelihood to classify plants.

GS and GR plants have their own unique reflectance spectral signatures. GS plants reflected a slightly greater portion of light in the visible part of the spectrum, while GR plants reflected a greater portion of light in the infrared part of the spectrum. Reflectance patterns were similar in both greenhouse and field grown plants. In the greenhouse, the classification accuracy (using leave-one-out) in the heterogeneous (raised from seed) populations was 94.2% with 52 plants and in homogeneous (raised by cloning) populations was 100.0% with 133 plants. In the pooled populations, the classification accuracy was 93.5% with 185 plants. Similar to the greenhouse populations, the overall classification accuracy was 96.8% with 126 plants grown under field conditions using leave-one-out validation. When using 94 plants for training and 32 plants for testing, the permutation mean of the confusion matrix obtained with 14 bands using the field data showed an overall accuracy of about 96.4% (SD ±4.69) and was comparable to results of greenhouse plants. The normalized reflectance spectrum of the GR and GS plants indicated the best separability in spectral regions of 400-500 nm, 650-690 nm, 730-740 nm, and 800-900 nm. These results demonstrate that hyperspectral imaging has the potential to distinguish GR from GS Palmer amaranth plants (without a glyphosate treatment) with practical weed management applications.

MORPHOLOGY AND PHENOLOGY CHARACTERISTICS OF *ECHINOCHLOA* ACCESSIONS FROM ARKANSAS. H. Tahir, N.R. Burgos and J.L. Gentry; Department of Crop Soil and Environmental Sciences, University of Arkansas, Fayetteville, AR (276)

ABSTRACT

Echinochloa spp is the most common grass weed in rice and soybean fields in the southern United States. This genus has high intra- and interspecific variability, with many ecotypes observed within a species. Field experiments were conducted in 2012-2013 to examine the morphological and phenological variations in 96 *Echinochloa* accessions collected from rice and soybean fields in Arkansas. Seeds were collected quasi-randomly, along state and county roads with late-season infestation in 2010-2011. Accessions were grown as single plants in a common garden at the Arkansas Agricultural Research and Extension Center, Fayetteville in Captina silt loam (fine-silty, siliceous, mesic Typic Fragiudults) with a pH of 6.1. The accessions were arranged in a randomized complete block design (RCBD) with four replicates. Twenty (20) vegetative and reproductive traits pertaining to panicle, culm, leaf, and spikelet were measured. Emergence date, flowering time, and days to maturity were also evaluated. Junglerice (*E. colona*) was identified as the most common in the fields sampled, comprising about 82% of the accessions collected. Barnyardgrass (E.*crus-galli*) comprised 9% of the accessions and rough barnyardgrass (*E. muricata*), was 7%. The height of junglerice ranged from 69-113 cm; barnyardgrass, 92-125 cm; and rough barnyardgrass, 105-135 cm. Rough barnyardgrass is the largest species, with has the longest (23-40 cm) and widest (1.38-2.19 cm) leaf, followed by barnyardgrass. Junglerice is the earliest to flower, within 40-58 days after planting (DAP) followed by barnyardgrass (44-62 DAP) and rough barnyardgrass (46-62 DAP). The growth habit of junglerice could be either prostrate, decumbent, open and upright whereas barnyardgrass and rough barnyardgrass are decumbent to open. The accessions also have different tolerance patterns to herbicides. Because response to herbicides and other management practices could vary between species, proper identification will be helpful in achieving sustainable *Echinochloa* management.

DOWN WITH PCR!: DISCOVERING TARGET-SITE RESISTANCE MECHANISMS USING NEXT-GENERATION SEQUENCING. J.S. McElroy*; Auburn University, Auburn, AL (277)

ABSTRACT

Identifying nucleic acid mutations and subsequent amino acid substitutions in herbicide target enzymes is a key component in herbicide resistance management. Target-site amino acid substitutions can be correlated to various cross-resistance scenarios within herbicide families or modes of action. Nucleic acid substitutions can be used as molecular markers to chart the expansion of resistance events in time and space. Further, rather than rescreening new suspected resistance populations to an herbicide and related modes of action, plants can be screened for the nucleic acid marker correlated to resistance.

The polymerase chain reaction (PCR) is the primary tool used to identify nucleic acid changes leading to subsequent changes in target proteins. But for non-model organisms such as weed species, PCR is a challenging, time-consuming process. For instance, few weed species have been sequenced thus designing PCR primers must be based on closely related species often leading to a trial and error process to find a functional primer pair. Further, polyploid species can confound downstream sequencing of PCR product leading to noisy un-interpretable sequence chromatograms.

Next generation sequence (NGS), also referred to as massively parallel sequencing, is a new tool that can be utilized to avoid the many pitfalls of traditional PCR to sequencing approaches. NGS using the Illumina platform sequences millions of nucleic acid sections, or reads, simultaneously leading to billions of sequenced bases in one sequencing run. Sequencing reads of 100 to 200 base pair lengths can then be assembled using computational methods to form contiguous sequences, or contigs. Contigs can then be annotated and compared to sequences of related species for potential novel target site resistance mechanisms. Contig assembly requires quality checking of sequencing reads, trimming and reduction of low quality reads, and assembly. In my seminar I present a workflow utilizing FastQC (http://www.bioinformatics.babraham.ac.uk/projects/fastqc/) for quality checking of reads, FastX Toolkit (http://hannonlab.cshl.edu/fastx_toolkit/) for trimming and reduction of low quality reads, and Trinity (http://trinityrnaseq.sourceforge.net/) for transcriptome contig assembly. The CLC Genomic Workbench (http://www.clcbio.com/products/clc-genomics-workbench/) was utilized for searching and annotating of the assembled transcriptome assembly. Using the workflow outlined, target-site mutation discovery can be achieved in 2-3 weeks compared to months of trial and error PCR research.

PALMER AMARANTH GROWTH AND SEED PRODUCTION IN COTTON. T.M. Webster*[1], T.L. Grey[2]; [1]USDA-ARS, Tifton, GA, [2]University of Georgia, Tifton, GA (278)

ABSTRACT

Herbicide resistant Palmer amaranth is one of the most economically important weeds of cotton in the Southeast US. With the continual marginalization of potential herbicide tools, research has expanded to include alternative means of affecting future Palmer amaranth populations by altering safe sites and reducing inputs to the seedbank population. The influence of delayed Palmer amaranth emergence on seed production potential has not been investigated in the Southeast US. Studies were conducted near Chula, GA in 2011 and 2012 to evaluate the influence of time of Palmer amaranth establishment on growth and seed production. The experiment was a factorial, with five levels of Palmer amaranth transplanting and two levels of crop type. Palmer amaranth was seeded in peat pots in the greenhouse two weeks prior to cotton planting; as cotton emerged, 10 Palmer amaranth plants (2-leaf stage) were transplanted into specific plots in the center two rows in a half-diamond pattern with 2 m between plants and plot edges. This procedure was repeated for a total of five transplanting times (0, 3, 6, 9, and 12 weeks after cotton emergence). Cotton was planted 11 May 2011 and 14 May 2012 in 91 cm rows in plots 4 rows wide and 13 m long. Adjacent to each cotton plot is a similarly sized weed-free fallow plot in which Palmer amaranth was transplanted. Palmer amaranth plants were measured for canopy width (widest point of the plant) and plant height at the conclusion of the season; plant biomass and number of seeds produced were also measured. Palmer amaranth plants were segregated by sex and data were analyzed using mixed models with years and replications as random effects and time of transplanting and crop type as fixed effects. Palmer amaranth (seeds per plant, plant biomass, plant width) and cotton (yield) responses were regressed on time of Palmer amaranth transplant using a log-logistic model that contains a parameter for maximum response (d) and one for the amount of time to elicit a median response (T_{50}). There were log-logistic relationships between Palmer amaranth seed production and time of Palmer amaranth establishment ($R^2 = 0.75$ to 0.77, $p < 0.0001$). In the absence of crop competition, Palmer amaranth produced 446,000 seeds per plant. This potential seed production was reduced 50% when Palmer amaranth plants were established nearly six weeks ($T_{50} = 5.8$ wks) later. In contrast, Palmer amaranth growing in competition with cotton and established at cotton planting, produced 312,000 seeds, less than ($t_{0.05} = 3.25$) that produced in the absence of competition. In addition, the presence of cotton competition shifted median seed production ($T_{50} = 1.8$ weeks) to occur nearly four weeks earlier in the growing season ($t_{0.05} = 4.0$). The relationship between Palmer amaranth plant biomass and establishment time was described by log-logistic regression ($R^2 = 0.58$ to 0.65). When established at the beginning of the season, biomass of Palmer amaranth plants was greater ($t_{0.05} = 3.7$ and 2.4 for male and female plants, respectively) in fallow plots ($d = 0.55$ kg and 1.1 kg for male and female plants, respectively) compared to those competing with cotton ($d = 0.33$ kg for males and 0.8 kg for females). Female Palmer amaranth plants had more than double the plant biomass of male plants ($t_{0.05} = 5.5$ for fallow and $t_{0.05} = 4.3$ for cotton). The time of delayed establishment to reduce male Palmer amaranth plant biomass 50% occurred 5.6 weeks later ($t_{0.05} = 2.9$) in the growing season in fallow ($T_{50} = 7.3$ weeks) relative to cotton ($T_{50} = 1.7$ weeks). Similarly, with female plants the T_{50} for plant biomass that occurred five weeks later in the growing season ($t_{0.05} = 2.5$) in fallow ($T_{50} = 6.6$ wks) compared to cotton ($T_{50} = 1.6$ wks). There were no differences between T_{50} values for male and female plant biomass in fallow ($t_{0.05} = 0.88$) and cotton ($t_{0.05} = 0.03$), indicating that growth for both sexes were equally impacted by the presence and absence of cotton. In conclusion, the presence of cotton reduces maximum Palmer amaranth seed production 30% and causes median seed production nearly 6 weeks earlier in the growing season in plants establishing after cotton emergence. Palmer amaranth plants that establish two weeks after actively growing cotton had reduced growth and seed production.

DOCUMENTATION OF PALMER AMARANTH AND POTENTIAL HERBICIDE RESISTANCE IN ARGENTINA. S. Berger*[1], J.A. Ferrell[1], S. Morichetti[2]; [1]University of Florida, Gainesville, FL, [2]Aceitera General Deheza, Rio Cuarto, Argentina (279)

ABSTRACT

Palmer amaranth (*Amaranthus palmeri*) has become one of the most troublesome weeds in the southeast, despite being a native desert plant. Limited specimens exist in worldwide herbarium records and little information is available on the species' spread outside of the United States. In 2013, Palmer amaranth was identified botanically in Argentina. Due to great phenotypic plasticity observed in Palmer amaranth plants, genetic documentation of these populations was necessary. Seed from five populations (3 expected Palmer amaranth, 1 suspected *A. hybridus* ssp. *hybridus*, and 1 suspected hybrid of the two species) was collected and grown in a greenhouse in Gainesville, Florida. DNA was extracted from tissue samples and ITS analysis was performed. Data from NCBI Taxonomy was used to confirm that samples from Argentina thought to be Palmer amaranth were that species. The suspected hybrid was confirmed to be *A. hybridus* ssp. *hybridus,* as well as the remaining population. Due to the nature of herbicide resistance developing in US Palmer amaranth populations, the Argentinian populations were also screened for glyphosate and ALS resistance. Plants from each of the five populations were treated with 0, 0.5, 1, 2, 4, 5, and 10x rates of glyphosate (1x= 840 g ae ha^{-1}), nicosulfuron (1x=35 g ha^{-1}), imazapic (1x=70 g ha^{-1}), and diclosulam (1x=26 g ha^{-1}). GR_{50} values were calculated for each population and herbicide combination. No glyphosate resistance was found in the tested populations. Two Palmer amaranth populations were found to be resistant to typical use rates of the 3 ALS-inhibiting herbicides. The third Palmer amaranth population was resistant to imazapic only. The two *A. hybridus* ssp. *hybridus* populations were resistant to both imazapic and diclosulam. These results indicate that Palmer amaranth is indeed in Argentina and that the tested populations, as well as populations of *A. hybridus* ssp. *hybridus*, have developed herbicide resistance to ALS-inhibiting herbicides.

HERBICIDE UPTAKE AND TRANSLOCATION AS INFLUENCED BY APPLICATION TIME OF DAY.

P.M. Eure[1], A.S. Culpepper[1], T.L. Grey[1], W.K. Vencill[2], S.M. Hauf[3], J.S. Richburg[4], and K.S. Rucker[5]; [1]University of Georgia, Tifton, GA, [2]University of Georgia, Athens, GA, [3]Monsanto Company, St. Louis, MO, [4]Dow AgroSciences, Headland, AL, [5]Bayer CropScience, Tifton, GA (280)

ABSTRACT

Glufosinate has been extensively used to manage glyphosate-resistant (GR) Palmer amaranth in recent years. Crops tolerant to dicamba or 2,4-D are being developed and will offer additional weed management options to growers. Drift with each of these herbicides is of concern and producers may want to apply these products when winds are lower during the evening or early morning hours. However, previous field research has documented reduced Palmer amaranth control following application of 2,4-D, dicamba, or glufosinate at night or at sunrise as compared to application 2 or more hours after sunrise. Although environmental conditions can influence herbicide efficacy, physiological processes may be a contributing factor to these field results. Therefore, research was conducted to determine the influence application time of day has on 2,4-D, dicamba, and glufosinate absorption and translocation in Palmer amaranth. Absorption and translocation of these three herbicides were studied independently during 2013, with each experiment conducted twice.

The experimental design was a factorial consisting of three herbicide application timings (sunrise: ~7:00 am; afternoon: 7 hours after sunrise; midnight: 7 hours before sunrise) by six harvest timings (0.5, 2, 4, 8, 12 and 24 hours after treatment [HAT]) for glufosinate and five harvest timings (0.5, 6, 12, 24, and 48 HAT) for 2,4-D and dicamba. Sunrise and midnight applications were completed under low intensity green light. Topical applications of glufosinate (16 oz/A), 2,4-D choline (8 oz/A), or dicamba (4 oz/A) were made to greenhouse grown Palmer amaranth 12- to 14-cm in height; rates selected from preliminary greenhouse work showing a response similar to that noted with the 1X rate in the field. Prior to application, the most acropetally upper leaf was covered with a plastic sheath. Following topical sprays, the plant was allowed to dry and the plastic sheath was removed. Using a Burkard microapplicator, ten 1-µl droplets containing a total of 2.6, 4.7, or 3.3 kBq of ^{14}C-glufosinate, 2,4-D, or dicamba, respectively were applied to the adaxial surface of the covered leaf. The treated leaf was then excised at each harvest timing and rinsed twice using a 1:1 mixture of H_20:OH. To determine translocation of ^{14}C herbicide, plants were divided by treated leaf, above treated leaf, below treated leaf, and roots, dried for 48 h, weighed, and combusted with a biological sample oxidizer. Radioactivity of each sample was quantified using a liquid scintillation spectrometry. All data were subject to ANOVA using PROC MIXED in SAS. When appropriate, Tukey's pairwise comparison ($p \leq 0.1$) was used to determine absorption or translocation differences between sunrise or midnight application and afternoon application. When pooled over harvest timings, glufosinate absorption following application at sunrise or midnight was 17 to 20% greater than application during the afternoon. At 0.5 HAT, application of glufosinate at midnight or sunrise resulted in 9 to 12% more ^{14}C-glufosinate in the treated leaf, 230 to 260% less above the treated leaf, and 260 to 470% less in the roots as compared to application in the afternoon. When pooled over harvest timings, 29% less ^{14}C-glufosinate was translocated below the treated leaf following application at midnight or sunrise as compared to application during the afternoon. Results suggest the time of day effect noted with glufosinate in the field may be partly due to reduced translocation when applied at night or at sunrise. Absorption of 2,4-D was not influenced by application time of day. When pooled over harvest timings, application of 2,4-D at sunrise resulted 11% less ^{14}C-2,4-D in the treated leaf, 12% greater translocation above the treated leaf, 20% greater translocation below the treated leaf, and 37% greater translocation to the roots than application in the afternoon. Although 2,4-D translocation was influenced with the sunrise application, no differences were noted when comparing afternoon and night applications. Therefore, results suggest translocation and absorption may not be a significant factor contributing to the time of day effect noted with 2,4-D applications in the field. Application time of day did not influence dicamba absorption. Dicamba applied at sunrise resulted in 30% more ^{14}C-dicamba remaining in the treated leaf 48 HAT when compared to application in the afternoon. When pooled over harvest timings, application of dicamba at sunrise resulted in 20% more ^{14}C-dicamba translocation above the treated leaf than application during the afternoon. Translocation of ^{14}C-dicamba below the treated leaf or to the roots was not influenced by application time of day. Although translocation was influenced with the sunrise application, no differences were noted when comparing afternoon and night applications. Therefore, results suggest translocation and absorption may not be a significant factor contributing to the time of day effect noted with dicamba applications in the field.

APLOTAXENE IS POTENTIAL ALLELOCHEMICAL OF INVASIVE *CARDUUS* SPECIES. **S.O. Duke*; USDA, ARS**, Oxford, MS (281)

ABSTRACT

The invasive thistle *Carduus nutans* has been reported to be allelopathic, yet no allelochemicals have been identified from the species. In a search for allelochemicals from *C. nutans* and the closely related invasive species *C. acanthoides*, bioassay-guided fractionation of roots and leaves of each species were conducted. Only dichloromethane extracts of the roots of both species contained a phytotoxin (aplotaxene, (Z,Z,Z)-heptadeca-1,8,11,14-tetraene) with sufficient total activity (activity in soil times tissue concentration) to potentially act as an allelochemical. Aplotaxene made up 0.44% of the weight of greenhouse-grown *C. acanthoides* roots (*ca*. 20 mM in the plant) and was not found in leaves of either species. It inhibited growth of lettuce 50% (I_{50}) in soil at a concentration of ca. 0.5 mg g^{-1} of dry soil (*ca*. 6.5 mM in soil moisture). These values gave a total activity in soil value (molar concentration in the plant divided by the molarity required for 50% growth inhibition in soil = 3.08) similar to those of some established allelochemicals. The aplotaxene I_{50} for duckweed (*Lemna paucicostata*) in nutrient solution was less than 0.333 mM, and the compound caused cellular leakage of cucumber cotyledon discs in darkness and light at similar concentrations. Soil in which *C. acanthoides* had grown contained aplotaxene at a lower concentration than necessary for biological activity in our short-term soil bioassays, but these levels might have activity over longer periods of time and/or might be an underestimate of concentrations in undisturbed and/or rhizosphere soil.

POPULATION STRUCTURE OF JOHNSONGRASS ON ARKANSAS AND LOUISIANA. N.R. Burgos*[1], M.A. Nadeem[2], T. Tseng[3], R. Salas[4], D.O. Stephenson, IV[5], J.L. Griffin[6], V. Singh[1], A. Lawton-Rauh[7]; [1]University of Arkansas, Fayetteville, AR, [2]University of ARkansas, Fayetteville, Fayetteville, AR, [3]Purdue University, West Lafayette, IN, [4]University of Arkansas-Fayetteville, Fayetteville, AR, [5]LSU AgCenter, Alexandria, LA, [6]LSU AgCenter, Baton Rouge, LA, [7]Clemson University, Clemson, SC (282)

ABSTRACT

Johnsongrass (*Sorghum halepense* L.) is an invasive species that is among the top 10 worst weeds worldwide. It is a major weed problem in many crops including corn, cotton, and soybean and spreads by rhizomes and seeds. It has evolved resistance to herbicide groups 1 (ACCase inhibitors), 2 (ALS inhibitors), 3 (microtubule inhibitors), and 9 (EPSPS inhibitor). Experiments were conducted using 19 accessions from Louisiana and Arkansas to 1) survey the response of these accessions to glyphosate and other herbicides and 2) determine the connectivity of these populations. Dose response assays to glyphosate were conducted for the LA accessions. Screening for resistance to glyphosate was conducted at 0.5x and 1x rates for the AR accessions. Likewise, tests with glufosinate, imazethapyr, primisulfuron, clethodim, sethoxydim, and fluazifop were conducted at 0.5x and 1x rates for all accessions. Selected accessions from AR and LA were DNA-fingerprinted using 19 simple sequence repeat (SSR) markers. Grain sorghum was used as an outgroup for molecular marker analysis. Herbicide response data were analyzed using PROC GLM and nonlinear regression in SAS and JMP softwares. Molecular marker data were analyzed using PopGene and Structure softwares. The GR_{50} values of LA accessions in the seedling bioassays ranged from 480 – 600 g ae/ha glyphosate; that of the most sensitive accession (LA-8) was 60 g ae/ha. Rhizomes of LA accessions obtained from glyphosate-treated fields had a GR_{50} of 570 – 1120 g ae/ha; that of LA-8 was 320 g ae/ha. The AR accessions were not resistant to glyphosate. All accessions were sensitive to ACCase inhibitors, but LA 4-7 showed tolerance to ALS inhibitors. Johnsongrass from both states formed three populations, which could be related to plant response to glyphosate: 1) highly sensitive; 2) slightly tolerant; and 3) resistant. Grain sorghum formed a separate population from johnsongrass, but minor introgression of crop genes could be detected in the weed populations. Genetic introgression was also observed between some AR and LA accessions, indicating gene flow. The contribution of herbicide selection and geographic location to population grouping is still to be determined.

WEED SURVEY – SOUTHERN STATES
2014

Vegetable, Fruit and Nut Crops Subsection

(Cucurbits, Fruiting Vegetables, Cole Crops and Greens, Other Vegetables, Peaches, Apples, Fruits and Nuts, Citrus Crops)

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

Ranking	States	
	Alabama	Georgia, North Carolina, and South Carolina
Ten Most Common Weeds		
1	Crabgrass spp.	Large crabgrass
2	Pigweed spp.	Common lambsquarters
3	Cutleaf eveningprimrose	Smooth pigweed
4	Bermudagrass spp.	White clover
5	Prickly sida	Buckhorn plantain
6	Ragweed spp.	Morningglory (*Ipomoea*) spp.
7	Common lambsquarters	Carolina geranium
8	Yellow nutsedge	Dandelion
9	Purple nutsedge	Common chickweed
10	Morningglory (*Ipomoea*) spp.	Fall panicum
Ten Most Troublesome Weeds		
1	Blackberry spp.	Mugwort
2	Southern dewberry	Yellow nutsedge
3	Yellow nutsedge	Poison ivy
4	Purple nutsedge	Virginia creeper
5	Prickly sida	Bermudagrass
6	Ragweed spp.	Bramble spp.
7	Common lambsquarters	Morningglory (*Ipomoea*) spp.
8	Cutleaf eveningprimrose	Horsenettle
9	Bermudagrass spp.	White clover
10	Bahiagrass	Dallisgrass

Table 2. The Southern States 10 Most Common and Troublesome Weeds in Citrus. (**No states reporting)**

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Cole Crops and Greens.

	States		
Ranking	Florida	Georgia	Mississippi
Ten Most Common Weeds			
1	Henbit	Henbit	Henbit
2	Common lambsquarters	Wild radish	Common chickweed
3	Common ragweed	Chickweed spp.	Wild garlic
4	Wild radish	Cutleaf eveningprimrose	Annual bluegrass
5	Cutleaf evening-primrose	*Amaranthus* spp.	Little barley
6	Purslane spp.	Pink purslane	Mouseear chickweed
7	*Amaranthus* spp.	Annual grasses	Curly dock
8	Swinecress	Swinecress	Annual ryegrass
9	Purple nutsedge	Nutsedge spp.	Hairy buttercup
10	Carolina geranium	Morningglory (*Ipomoea*) spp.	Carolina geranium
Ten Most Troublesome Weeds			
1	Wild radish	Wild radish	Wild garlic
2	Cutleaf evening-primrose	*Amaranthus* spp.	Rattail fescue
3	Purple nutsedge	Yellow nutsedge	Henbit
4	Swinecress	Purple nutsedge	Curly dock
5	Carolina geranium	Cutleaf eveningprimrose	Hairy buttercup
6	Purslane spp.	Henbit	Carolina geranium
7	Henbit	Morningglory (*Ipomoea*) spp.	Field madder
8	Virginia pepperweed	Pink purslane	Mouseear chickweed
9	Chickweed spp.	Swinecress	Annual bluegrass
10	Common ragweed	Chickweed spp.	Wild radish

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

	States		
Ranking	Alabama	Arkansas	Georgia
Ten Most Common Weeds			
1	Crabgrass spp.	Eclipta	Crabgrass spp.
2	Goosegrass	Morningglory (*Ipomoea*) spp.	*Amaranthus* spp.
3	*Amaranthus* spp.	Indian heliotrope	Texas millet
4	Morningglory (*Ipomoea*) spp.	Broadleaf signalgrass	Yellow nutsedge
5	Sicklepod	Barnyardgrass	Purple nutsedge
6		Prostrate spurge	Pink purslane
7		Palmer amaranth	Florida pusley
8		Amazon sprangletop	Wild radish
9		Crabgrass spp.	Morningglory (*Ipomoea*) spp.
10		Yellow nutsedge	Goosegrass
Ten Most Troublesome Weeds			
1	Sicklepod	Palmer amaranth	Purple nutsedge
2	Morningglory (*Ipomoea*) spp.	Morningglory (*Ipomoea*) spp.	Yellow nutsedge
3	*Amaranthus* spp.	Yellow nutsedge	*Amaranthus* spp.
4		Broadleaf signalgrass	Morningglory (*Ipomoea*) spp.
5		Barnyardgrass	Pink purslane
6		Prostrate spurge	Wild radish
7		Eclipta	Goosegrass
8		Amazon sprangletop	Florida pusley
9		Crabgrass spp.	Texas millet
10		Indian heliotrope	Crabgrass spp.

Table 4. The Southern States 10 Most Common and Troublesome Weeds in Cucurbit Crops (continued).

Ranking	States — Florida	Mississippi
Ten Most Common Weeds		
1	Purple nutsedge	Purple nutsedge
2	Yellow nutsedge	Annual sedge
3	Common purslane	Southern crabgrass
4	Goosegrass	Goosegrass
5	Florida pusley	Rice flatsedge
6	Spanish needles	Prickly sida
7	American black nightshade	False nutsedge
8	*Amaranthus* spp.	*Amaranthus* spp.
9	Carolina geranium	Smooth groundcherry
10	Crabgrass spp.	Carpetweed
Ten Most Troublesome Weeds		
1	Purple nutsedge	Prickly sida
2	Yellow nutsedge	Smooth groundcherry
3	Common purslane	Carpetweed
4	Goosegrass	Horsenettle
5	Florida pusley	Pathrush
6	American black nightshade	Annual sedge
7	Carolina geranium	Goosegrass
8	Dogfennel	Southern crabgrass
9	Black medic	Black nightshade
10	Crabgrass spp.	Common ragweed

Table 4. The Southern States 10 Most Common and Troublesome Weeds in Cucurbit Crops (continued).

	States	
Ranking	North Carolina[a]	North Carolina[b]
Ten Most Common Weeds		
1	Palmer amaranth	Palmer amaranth
2	Carpetweed	Carpetweed
3	Large crabgrass	Large crabgrass
4	Smooth pigweed	Smooth pigweed
5	Yellow nutsedge	Yellow nutsedge
6	Common purslane	Common purslane
7	Pink purslane	Pink purslane
8	Ivyleaf morningglory	Ivyleaf morningglory
9	Eclipta	Eclipta
10	Pitted morningglory	Prickly sida
Ten Most Troublesome Weeds		
1	Palmer amaranth	Palmer amaranth
2	Yellow nutsedge	Yellow nutsedge
3	Florida pusley	Florida pusley
4	Smooth pigweed	Smooth pigweed
5	Ivyleaf morningglory	Ivyleaf morningglory
6	Eclipta	Goosegrass
7	Goosegrass	Common purslane
8	Prickly sida	Pink purslane
9	Wild radish	Eclipta
10	Common cocklebur	Prickly sida

[a] This survey refers to watermelon and squash for North Carolina.

[b] This survey refers to cucumber and cantaloupe for North Carolina.

Table 5. The Southern States 10 Most Common and Troublesome Weeds in Fruit and Nut Crops.

	States		
Ranking	Alabama[c]	Georgia, North Carolina, and South Carolina[d]	Florida[e]
Ten Most Common Weeds			
1	Bahiagrass	Large crabgrass	Black medic
2	Bermudagrass spp.	Horsenettle	Carolina geranium
3	Crabgrass spp.	Palmer amaranth	Goatweed
4	*Amaranthus* spp.	Common lambsquarters	Goosegrass
5	Morningglory (*Ipomoea*) spp.	White clover	Common purslane
6	Florida pusley	Goosegrass	Hairy galinsoga
7	*Cyperus* spp.	Common chickweed	Crabgrass spp.
8	Plantain spp.	Dandelion	Purple nutsedge
9	Ragweed spp.	Morningglory (*Ipomoea*) spp.	Yellow nutsedge
10	Curly dock	Spotted spurge	Wild mustard
Ten Most Troublesome Weeds			
1	Blackberry spp.	Bermudagrass	Black medic
2	Southern dewberry	Horsenettle	Carolina geranium
3	*Cyperus* spp.	White clover	Goosegrass
4	Arrowleaf sida	Virginia creeper	Purple nutsedge
5	Trumpetcreeper	Johnsongrass	Yellow nutsedge
6	Vetch spp.	Smallflower morningglory	Wild mustard
7	Spotted spurge	Morningglory (*Ipomoea*) spp.	Common purslane
8	Morningglory (*Ipomoea*) spp.	Purslane spp.	Goatweed
9	Bahiagrass	Yellow nutsedge	Hairy galinsoga
10	Bermudagrass spp.	Henbit	Crabgrass spp.

[c] This survey refers primarily to pecan for Alabama.
[d] This survey refers to grape for Georgia, North Carolina, and South Carolina.
[e] This survey refers to strawberries in Florida.

Table 5. The Southern States 10 Most Common and Troublesome Weeds in Fruit and Nut Crops (continued).

	States	
Ranking	North Carolina[f]	North Carolina[g]
Ten Most Common Weeds		
1	Needleleaf rosettegrass	Henbit/purple dead nettle
2	Large crabgrass	Chickweed spp.
3	Annual sedge	Vetch spp.
4	Common toadflax	Curly dock
5	Maryland meadowbeauty	Carolina geranium
6	Greenbriar spp.	Cutleaf evening-primrose
7	Broomsedge	Wild radish/mustard
8	Carolina redroot	Yellow nutsedge
9	Red maple	Morningglory (*Ipomoea*) spp.
10	Carolina jasmine	
Ten Most Troublesome Weeds		
1	Greenbriar spp.	Vetch spp.
2	Carolina redroot	Henbit/purple dead nettle
3	Yellow nutsedge	Chickweed spp.
4	Bramble spp.	Curly dock
5	Large crabgrass	Cutleaf evening-primrose
6	Needleleaf rosettegrass	Carolina geranium
7	Maryland meadowbeauty	Yellow nutsedge
8	Carolina jasmine	Clover spp.
9	Red maple	Wild radish/mustard
10	Holly spp.	Morningglory (*Ipomoea*) spp.

[f] This survey refers to blueberry for North Carolina.

[g] This survey refers to strawberry in North Carolina.

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

	States		
Ranking	Alabama	Georgia	Florida
Ten Most Common Weeds			
1	Crabgrass spp.	Crabgrass spp.	Purple nutsedge
2	Sicklepod	*Amaranthus* spp.	Yellow nutsedge
3	Morningglory (*Ipomoea*) spp.	Pink purslane	Goosegrass
4	Yellow nutsedge	Yellow nutsedge	American black nightshade
5	Purple nutsedge	Purple nutsedge	Common purslane
6	*Amaranthus* spp.	Goosegrass	Florida pusley
7	Florida pusley	Texas millet	Devil’s beggarticks
8	Florida beggarweed	Morningglory (*Ipomoea*) spp.	Crabgrass spp.
9	Bristly starbur	Florida pusley	*Amaranthus* spp.
10	Arrowleaf sida	Wild radish	Carolina geranium
Ten Most Troublesome Weeds			
1	Yellow nutsedge	Purple nutsedge	Purple nutsedge
2	Purple nutsedge	Yellow nutsedge	Yellow nutsedge
3	Morningglory (*Ipomoea*) spp.	Morningglory (*Ipomoea*) spp.	American black nightshade
4	Horsenettle	Pink purslane	Common purslane
5	Tropic croton	*Amaranthus* spp.	Goosegrass
6	Spotted spurge	Goosegrass	Florida pusley
7	Smartweed spp.	Crabgrass spp.	Crabgrass spp.
8	Bristly starbur	Wild radish	Ragweed parthenium
9	Florida beggarweed	Florida pusley	*Amaranthus* spp.
10	Arrowleaf sida	Texas millet	Spanish needles

Table 6. The Southern States 10 Most Common and Troublesome Weeds in Fruiting Vegetables (continued).

	States		
Ranking	Mississippi[h]	North Carolina[h]	North Carolina[i]
Ten Most Common Weeds			
1	Annual sedge	Yellow nutsedge	Yellow nutsedge
2	Southern crabgrass	Morningglory (*Ipomoea*) spp.	Morningglory (*Ipomoea*) spp.
3	*Amaranthus* spp.	*Amaranthus* spp.	*Amaranthus* spp.
4	Yellow nutsedge	Carpetweed	Carpetweed
5	Prickly sida	Common purslane	Common purslane
6	Carpetweed	Large crabgrass	Large crabgrass
7	Purple nutsedge	Goosegrass	Goosegrass
8	Ivyleaf morningglory	Common lambsquarters	Common lambsquarters
9	Horsenettle	Eastern black nightshade	Pink purslane
10	Smooth groundcherry	Pink purslane	Hairy galinsoga
Ten Most Troublesome Weeds			
1	Smooth groundcherry	Palmer amaranth	Yellow nutsedge
2	Horsenettle	Common lambsquarters	Common purslane
3	Prickly sida	Smooth pigweed	Pink purslane
4	Goosegrass	Common purslane	Palmer amaranth
5	Barnyardgrass	Pink purslane	Common lambsquarters
6	Broadleaf signalgrass	Ivyleaf morningglory	Smooth pigweed
7	Carpetweed	Yellow nutsedge	Ivyleaf morningglory
8	Prostrate spurge	Eclipta	Wild radish
9	Annual sedge	Wild radish	Eclipta
10	False nutsedge	Prickly sida	Prickly sida

[h] This survey refers to tomato for Mississippi and North Carolina.

[i] This survey refers to pepper for North Carolina.

Table 7. The Southern States 10 Most Common and Troublesome Weeds in Other Vegetable Crops.

	States		
Ranking	Georgia	Mississippi[J]	North Carolina[K]
Ten Most Common Weeds			
1	Crabgrass spp.	*Amaranthus* spp.	Palmer amaranth
2	*Amaranthus* spp.	Southern crabgrass	Carpetweed
3	Texas millet	Common ragweed	Yellow nutsedge
4	Pink purslane	Smooth groundcherry	Large crabgrass
5	Wild radish	Prickly sida	Goosegrass
6	Yellow nutsege	Barnyardgrass	Smooth pigweed
7	Purple nutsedge	Nodding spurge	Common lambsquarters
8	Goosegrass	Sicklepod	Common purslane
9	Morningglory (*Ipomoea*) spp.	Pitted morningglory	Florida pusley
10	Florida pusley	Annual sedge	Ivyleaf morningglory
Ten Most Troublesome Weeds			
1	Yellow nutsedge	Sicklepod	Palmer amaranth
2	Purple nutsedge	Prickly sida	Yellow nutsedge
3	*Amaranthus* spp.	Smooth groundcherry	Common purslane
4	Pink purslane	Nodding spurge	Pink purslane
5	Wild radish	Barnyardgrass	Florida pusley
6	Morningglory (*Ipomoea*) spp.	Dayflower spp.	Ivyleaf morningglory
7	Goosegrass	Common ragweed	Smooth pigweed
8	Crabgrass spp.	Ivyleaf morningglory	Common lambsquarters
9	Florida pusley	Southern crabgrass	Pennsylvania smartweed
10	Texas millet	Goosegrass	Wild radish

[J] This survey refers to Southern peas/butter beans in Mississippi.

[K] This survey refers to sweet potato in North Carolina.

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

	States	
Ranking	Alabama	Georgia, North Carolina, and South Carolina
Ten Most Common Weeds		
1	Crabgrass spp.	Cutleaf eveningprimrose
2	*Amaranthus* spp.	Large crabgrass
3	Morningglory (*Ipomoea*) spp.	Palmer amaranth
4	Horseweed	Common chickweed
5	Prickly sida	Henbit
6	*Cyperus* spp.	Common lambsquarters
7	Plantain spp.	Goosegrass
8	Florida pusley	Bermudagrass spp.
9	Arrowleaf sida	Morningglory (*Ipomoea*) spp.
10	Curly dock	Carolina geranium
Ten Most Troublesome Weeds		
1	Blackberry spp.	Purple nutsedge
2	Bermudagrass spp.	Yellow nutsedge
3	Yellow nutsedge	Bahiagrass
4	Purple nutsedge	Horseweed
5	Ragweed spp.	Bermudagrass spp.
6	Curly dock	Johnsongrass
7	Morningglory (*Ipomoea*) spp.	Morningglory (*Ipomoea*) spp.
8	Florida pusley	Palmer amaranth
9	Arrowleaf sida	Virginia creeper
10	Bahiagrass	Cutleaf evening-primrose

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