Dedication Statement

The 64th Proceedings of the Southern Weed Science Society's meeting is dedicated to **William Lewis Barrentine**. Dr. Barrentine gave much to the Southern Weed Science Society, to the profession of Weed Science, and to humankind. His valuable contributions to American agriculture and friendship will be sorely missed by his colleagues.

William Lewis "Bill" Barrentine, 73, was born in Alligator, Mississippi on October 15, 1937 and passed away on May 11, 2010. He grew up on a cotton farm in the Mississippi River Delta of Arkansas and was a graduate of Elaine High School, Elaine, Arkansas. He received his B.S. from the University of Arkansas in 1959. In 1964 after receiving his M.S. in Agronomy from the University of Arkansas, Bill began his career as a research assistant in cotton and vegetable weed control at the Delta Research and Extension Center, Mississippi Agricultural and Forestry Experiment Station, Stoneville, Mississippi. In 1968, he was granted a sabbatical to pursue a Ph.D. in the Department of Horticulture from Purdue University. After receiving his Ph.D. in Plant Physiology in 1970, Dr. Barrentine returned to Stoneville and initiated research on weed control in soybean. Bill was recognized for his research on soil incorporated methods for herbicide application, weed interference, herbicide tolerant soybean cultivars, ultra-low volume application of herbicides in oils, herbicide rate reduction, herbicide drift, herbicide residues in crop rotation systems, and herbicide resistant weeds. After 30 years of service, Dr. Barrentine retired from the Delta Research and Extension Center and served as Station Director for the Kumiai Mississippi Research Station, Kumiai Chemical Industry from 1996 until 2000.

Dr. Barrentine was presented the American Society of Agronomy Crops and Soils Honorable Mention Award for Excellence in Agricultural Journalism in 1985. He was presented the Mississippi Weed Science Society Distinguished Service Award in 1992, Research Award in 1993, and Education Award in 1995. Bill was recipient of the Delta Council Researcher of the Year Award in 1995. In 1996, he received the Southern Weed Science Society Weed Scientist of the Year Award and was named a Weed Science Society of America Fellow. He served as an Associate Editor for Weed Technology and as a frequent reviewer for Weed Science and other agricultural journals. Over the course of his career, Dr. Barrentine was invited to write book chapters for the Weed Science Society of America and the Cotton Foundation. He authored and co-authored many peer-reviewed, experiment station, and poplar press articles on weed interference and control methods. Bill was well known and respected for research originality, quality, and integrity.

<u>Weed Management in Agronomic Crops</u>

<u>Weed Management in Turf</u>

<u>Weed Management in Ornamental Crops</u>

<u>Weed Management in Pastures and Rangeland</u>

Physiological and Biological Aspects of Weed Control

Weed Management in Horticulture Crops

Vegetation Management in Utilities, Railroads, Highway Rights-of-Way, and Industrial Sites

Weed Management in Forestry

Management of Invasive Weeds

Educational Aspects of Weed Management

Soil and Environmental Aspects of Weed Management

New Technologies

Aquatics

Weed Management in Organic Production Systems

<u>Symposium: Monitoring and Managing Invasive Aquatic Plants in Tropical Freshwater Systems</u>

Symposium: 2,4-D: Past, Present, and Future

Symposium: Management of Herbicide-Resistant Weeds

Posters

Preface

These PROCEEDINGS of the 64th Annual Meeting of the Southern Weed Science Society contain papers and abstracts of presentations in San Juan, Puerto Rico. A list is also included giving the common/trade/code names and manufacturers of herbicides mentioned in the publication. Other information in these PROCEEDINGS includes: biographical data of recipients of the SWSS Distinguished Service, Outstanding Educator, Outstanding Young Weed Scientist, and Outstanding Graduate Student Awards; the Annual Weed Survey; lists of officers and committee chairpersons; minutes of all business meetings; and lists of registrants attending the annual meeting and sustaining members.

Only papers presented at the meeting and submitted to the Editor in the prescribed format for printing are included in the PROCEEDINGS. Papers may be up to five pages in length and abstracts are limited to one page. Authors are required to submit an original abstract according to the instructions available in the Call for Papers and on the SWSS web site (www.swss.ws). The use of commercial names in the PROCEEDINGS does not constitute an endorsement, nor does the non-use of similar products constitute a criticism by the Southern Weed Science Society.

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

Theodore M. Webster
Proceedings Editor, Southern Weed Science Society

Regulations and Instructions for Papers and Abstracts

Regulations

1. Persons wishing to present a paper(s) at the conference must first electronically submit a title to the SWSS web site (http://www.swss.ws/) by the deadline announced in the "Call for Papers".

2. Only papers presented at the annual conference will be published in the Proceedings. An abstract or paper must be submitted electronically to the SWSS web site by the deadline announced at the time of title submissions.

3. Facilities at the conference will be provided for LCD-based presentations only!

4. Terminology in presentations and publications shall generally comply with standards accepted by the Weed Science Society of America. English or metric units of measurement may be used. The approved common names of herbicides as per the latest issue of Weed Science or trade names may be used. Chemical names will no longer be printed in the annual program. If no common name has been assigned, the code name or trade name may be used and the chemical name should be shown in parenthesis if available. Common names of weeds and crops as approved by the Weed Science Society of America should be used.

5. Where visual ratings of crop injury or weed control efficacy are reported, it is suggested that they be reported as a percentage of the untreated check where 0 equals no weed control or crop injury and 100 equals complete weed control or crop death.

6. A person may not serve as senior author for more than two articles in a given year.

7. Papers and abstracts must be prepared in accordance with the instructions and form provided in the "Call for Papers" and on the SWSS web site. Papers not prepared in accordance with these instructions will not be included in the Proceedings.

Instructions to Authors

Instructions for title submissions, and instructions for abstracts and papers will be available in the "Call for

Papers" and on the SWSS web site (http://www.swss.ws/) at the time of title or abstract/paper submission.

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

Typing Instructions-Format

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

2. Content:

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

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

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

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

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

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

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

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

ABSTRACT

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

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

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

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

2011 Weed Scientist of the Year
Krishna Reddy

Dr. Krishna Reddy grew up on a 14-acre grain and fruit crops farm near Bangalore, India. While working on the family farm, he received his B.S. Agriculture (1973) and M.S. Agronomy (1975) from the University of Agricultural Sciences, Bangalore. He completed his Ph.D. in Weed Science at the Ohio State University in 1987. Following postdoctoral fellowships, Krishna moved to USDA-ARS Southern Weed Science Research Unit, Stoneville, Mississippi in 1992, where he is currently a Research Plant Physiologist and Lead Scientist of the crop production systems project. Krishna's current research deals with weed biology and integrated weed management systems for soybean, corn, and cotton, and assessment of benefits and safety aspects of transgenic crops. Krishna with his collaborators elucidated causes for glyphosate injury in Roundup Ready soybean and determined glyphosate effects on secondary metabolites and glyphosate metabolite accumulation. It was shown that "yellow flashes" in soybean were from aminomethylphosphonic acid, a metabolite of glyphosate. Also, demonstrated that reduced absorption and translocation of glyphosate as the cause for resistance in glyphosate-resistant horseweed and Italian ryegrass. Krishna devised strategies to reduce redvine and trumpetcreeper infestations by integrating glyphosate and fall deep tillage. He has conducted extensive research on herbicide uptake and translocation, herbicide interaction in soils and plant residues, herbicide foliar wash off, QSAR modeling, weed biology and control, and cover crops and reduced tillage systems. Krishna has received 2010 Fellow award from Weed science Society of America and 2008 Outstanding Research Award from Weed Science society of America. Mississippi Weed Science Society has presented him with Research Award in 2002 and Education Award in 2004. Krishna is a fellow (2005) of Indian Society of Weed Science. Krishna has authored and co-authored over 160 research articles, reviews, and book chapters, and over 200 abstracts. He is an adjunct professor at Mississippi State University. Krishna has served on several graduate student committees, led research program of three postdoctoral research associates, and hosted several international visiting scientists. Krishna has been an active participant in several professional societies. Krishna has served on various committees and chaired sections in Mississippi Weed Science Society, Southern Weed Science Society, and Weed Science Society of America. Krishna is an Associate Editor (2004 - 2011) for Weed Technology.

2011 Outstanding Young Weed Scientist-Academia
B. J. Scott McElroy

B J. Scott McElroy is an Associate Professor in the Department of Agronomy and Soils at Auburn University. He received his BA in Communication with an emphasis in Chemistry from Auburn University, his MS from the Auburn University in Agronomy and Soils and his PhD from the NC State University in Crop Science with a minor in Plant Ecology. Dr. McElroy was previously employed as an Assistant Professor and Extension Specialist in Turfgrass and Weed Science at the University of Tennessee in Knoxville, Tennessee. His primary research area at Auburn is on new and improved methods for improved weed management in turfgrass systems, from golf course putting greens to turfgrass sod production to home lawns. Dr. McElroy holds a joint appointment with the Agricultural Experiment Station and the College of Agriculture. He also serves as a reviewer for the Weed Science Society of America Journal, Weed Technology, and the Agronomy and Crop Science Societies of America Journals, Agronomy Journal and Crop Science, and is a member of the American Chemical Society and American Association for the Advancement of Science. Dr. McElroy teaches two classes, Principles of Weed Science (AGRN 3120) and Applied Weed Science Technology (AGRN 5200/6200). Dr. McElroy was born and raised in Moulton, Alabama, a small town in Northwest Alabama. In his youth, Dr. McElroy was an avid basketball player, signing a basketball scholarship with Northwest Community College in Phil Campbell, Alabama for his freshman year and transferring his sophomore year to play at Calhoun Community College in Decatur, Alabama. Following his sophomore year, Dr. McElroy 'retired' from basketball and enrolled in Auburn University to pursue more academic interests. Dr. McElroy is often asked how a person can receive a degree in speech communication and end up as a professor in weed science. He admits it is not the most direct path to a career, but training in communication definitely aids him in training students for public speaking and interviewing. Dr. McElroy is married to Dr. Nichole McElroy, DVM. They have three children, Joseph (6), William (4) and Trent (3). In his spare time, Dr. McElroy is a member of the Auburn Masters Swimming Team, participates in local distance runs and triathlons, and coaches his children in soccer, baseball, and basketball.

2011 Outstanding Young Weed Scientist- Industry
Eric Palmer

Dr. Eric Palmer was born November 20, 1973 in Memphis, TN and grew up on a grain and cattle farm near Mount Pleasant, MS. He received his B.S. in Agricultural Pest Management (1995) and M.S. in Weed Science (1998) from Mississippi State University under the direction of Dr. David Shaw. He went on to complete his Ph.D in Crop Science at Oklahoma State University under the direction of Dr. Don Murray in 2001. Eric began his professional career as an R&D Scientist with Syngenta Crop Protection at the Eastern Region Technical Center near Hudson, NY in 2001. In 2004, he was transferred back to MS where he worked on the Southern Region Technical Center near Leland, MS for two years before becoming the R&D Field Development rep for Mississippi. In 2008, Eric became an R&D Group Leader for the Weed Control Group at Syngenta's Vero Beach Research Center near Vero Beach, FL were he coordinates Stage 1 herbicide testing for the U.S. and manages four full-time Scientists who conduct a diverse herbicide research program. Eric has been involved with the SWSS by serving as the Graduate Student representative while at OSU and has been a judge for the Graduate Student paper contest on several occasions. Eric has been a strong contributor in Syngenta providing science based information useful in profiling several herbicides including experimental compounds as well as several well known commercial products including; Halex GT, Flexstar GT, Sequence, Envoke and Suprend herbicide.

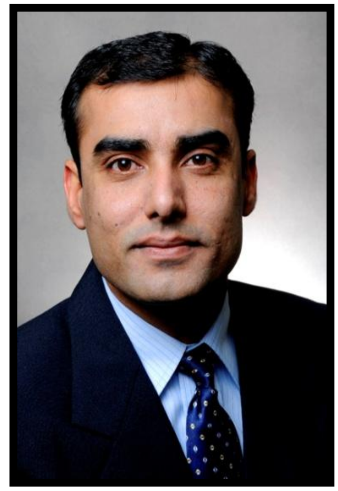
2011 Outstanding Educator Award
Eric P. Prostko

Dr. Eric P. Prostko is a Professor and Extension Weed Specialist in the University of Georgia's Department of Crop & Soil Sciences. He has been a faculty member at the University of Georgia since 1999. With a 100% extension appointment, Eric is responsible for the statewide weed science programs in field corn, peanut, soybean, sunflower, grain sorghum, and canola. He has earned degrees from Delaware Valley College (B.S.), Rutgers University (M.S.), and Texas A&M University (Ph.D.). Dr. Prostko is the author or co-author of 47 refereed journal articles, 133 scientific abstracts, and 635 extension publications. His bi-monthly popular press column entitled "From the Turn-Row", published in the Southern Farmer, is read by more than 24,000 subscribers. As a former county extension agent, Dr. Prostko is strongly committed to the county delivery system. During his career, he has provided 61 in-service training programs for county extension agents and has made educational presentations at 475 local county crop production meetings. Additionally, Eric was one of the first UGA extension specialists to formally develop an internet-based, Wimba–delivered training program for county extension agents entitled "Basic Weed Science for New and Seasoned County Agents". He has made more than 139 invited extension presentations to allied agricultural industry groups such as BASF, Syngenta, Southern States, Valent, Georgia Crop Production Alliance, Southern Peanut Farmers Federation, and the Mississippi Weed Science Society. Dr. Prostko is a member of the American Society of Agronomy (ASA), Weed Science Society of America (WSSA), American Peanut Research and Education Society (APRES), Southern Weed Science Society (SWSS), and the Georgia Association of County Agricultural Agents (GACAA). He has received numerous awards including the Michael J. Bader Award of Excellence for Junior Scientist - Extension (UGA 2004), the Outstanding Young Weed Scientist Award (SWSS 2005), the Dow AgroSciences Award for Excellence in Education (APRES 2005), Senior Specialist Award (GACAA 2010), and the D.W. Brooks Award for Excellence in Extension (Univ. of Ga. 2010). Eric has been married to the former Joann M. Carroll for 24 years and together they have three children; Nicholas (20); Shelby (16); and Isabelle (13).

2011 Outstanding Graduate Student Award (MS)
George S. "Trey" Cutts, III

George S. (Trey) Cutts, III was born in Little Rock, Arkansas in 1985. He moved to Marietta, Georgia, outside of Atlanta, when he was two years old. He grew up there along with his sister, Hayley, and graduated from Lassiter High School in 2003. Growing up in suburbia Atlanta, Trey never realized he would one day find passion for the agricultural sciences. By fate he became involved with the College of Agricultural and Environmental Sciences at the University of Georgia in the fall of 2003. Trey's background at UGA is in Turfgrass Management with a minor in Agribusiness and Management, receiving a B.S.A. in 2007. He acquired a diversity of experiences within the turfgrass industry, holding internships at Cherokee Town and Country Club in Sandy Springs, Georgia, Boyd Sod Farms in Monticello, Florida, and was employed at Athens Country Club from 2003 to 2007. Following graduation Trey was employed as an Assistant Farm Manager at Hugghins Sod Farms in Red Level, Alabama. However, he felt that there were greater challenges that could be pursued, and decided to seek an advanced degree. In January 2008, Trey was accepted by the UGA Graduate School, entering the Crop and Soil Science Department to work on an M.S. Degree with Dr. Timothy Grey in the area of Weed Science. His research project focused on broad spectrum herbicide screening for weed control in napiergrass (Pennisetum purpureum Shum.) during establishment of this new crop, as well as control methods of this potentially weedy species. This research project allowed for collaboration with many scientists working in the area of perennial grass species and evaluating them for cellulosic biofuel production. His experience also includes research with the USDAARS under the direction of Dr. Tom Potter at the Southeast Watershed Laboratory. This included lab and field studies, as well as a green house study representing field scenarios with the herbicide metolachlor. Trey completed his M.S. at UGA in May of 2010. Trey's variety of experiences has also enriched his desire to further expand on his knowledge of agronomic sciences. He is currently pursuing his Ph.D. at Texas A&M University in the area of Plant Breeding under Dr. Jane Dever. His project is focused on improving imazamox tolerance in Upland cotton through conventional breeding. Current weed science research is often influenced by the release of herbicide tolerant cultivars. This project will help increase weed control options for producers as well as improve the work of non-GMO crop herbicide tolerance. Trey feels weed science is a vital component to modern plant breeding and is necessary to understand many problems that need to be addressed within this field. Trey is currently working on his course work in College Station, but will finish his tenure at Texas A&M working on field research in Lubbock with Dr. Dever. He is scheduled to complete is Ph.D. in 2013 and hopes to begin his post-graduate career in industry research.

2011 Outstanding Graduate Student Award (PhD)
Sanjeev Bangarwa



Sanjeev Bangarwa currently serves as a Senior Field Biologist at the BASF Corporation. His primary responsibility at the BASF Corporation is to implements the Product Development Program in Visalia, California area. Sanjeev is a native of Hisar, India and received his B.S. in Agriculture and M.S. in Agronomy from Haryana Agricultural University, Hisar, India. He received his Ph.D. degree in Weed Science under the guidance of Dr. Jason Norsworthy at the University of Arkansas. Sanjeev's Ph.D. research has focused on evaluating integrated approaches to weed management in tomato and bell pepper using allelopathic Brassicaceae cover crops and synthetic isothiocyanates. The goal of his project was to find a suitable alternative to methyl bromide, a fumigant extensively used for weed control in vegetables but a significant contributor to ozone depletion. Sanjeev has disseminated his research through diverse means and authored or co-authored 11 refereed journal articles, 10 non-refereed articles, and 52 abstracts. Besides research, he has served as a guest lecturer for Weed Science classes and coordinated laboratories at the University of Arkansas. For his accomplishments, Sanjeev has awarded with Outstanding Graduate Student Award in the Department of Crop, Soil, and Environmental Sciences and in the Dale Bumpers Collage of Agricultural, Food, and Life Sciences at the University of Arkansas. Sanjeev have been actively involved in Southern Weed Science Society and other professional organizations. He has served as a student representative on the Southern Weed Contest Committee, Southern Weed Identification Committee, Southern Weed Science Graduate Student Organization, and Departmental Graduate Student Organization during 2008-2009. Sanjeev have been a member of the University of Arkansas Weed Team and won first place overall in 2009 and second place overall in 2007 and 2008. In addition, he has won several oral and poster student competitions at the University of Arkansas, Arkansas Crop Protection Association, Southern Weed Science Society, and Beltwide Cotton Conferences.

Previous Winners of the Distinguished Service Award

Year	Name	University/Company
1976	Don E. Davis	Auburn University
1976	V. Shorty Searcy	Ciba-Geigy
1977	Allen F. Wiese	Texas Agric. Expt. Station
1977	Russel F. Richards	Ciba-Geigy
1978	Robert E. Frans	University of Arkansas
1978	George H. Sistrunck	Valley Chemical Company
1979	Ellis W. Hauser	USDA, ARS Georgia
1979	John E. Gallagher	Union Carbide
1980	Gale A. Buchanan	Auburn University
1980	W. G. Westmoreland	Ciba-Geigy
1981	Paul W. Santelmann	Oklahoma State University
1981	Turney Hernandez	E.I. DuPont
1982	Morris G. Merkle	Texas A & M University
1982	Cleston G. Parris	Tennessee Farmers COOP
1983	A Doug Worsham	North Carolina State University
1983	Charles E. Moore	Elanco
1984	John B. Baker	Louisiana State University
1984	Homer LeBaron	Ciba-Geigy
1985	James F. Miller	University of Georgia
1985	Arlyn W. Evans	E.I. DuPont
1986	Chester G. McWhorter	USDA, ARS Stoneville
1986	Bryan Truelove	Auburn University
1987	W. Sheron McIntire	Uniroyal Chemical Company
1987	no nomination	
1988	Howard A.L. Greer	Oklahoma State University

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

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

Previous Winners of the Weed Scientist of the Year Award

Year	Name	University
1984	Chester L. Foy	VPI & SU
1985	Jerome B. Weber	North Carolina State University
1986	no nominations	--
1987	Robert E. Frans	University of Arkansas
1988	Donald E. Moreland	USDA, ARS, North Carolina
1989	Roy J. Smith, Jr.	USDA, ARS, North Arkansas
1990	Chester McWhorter	USDA, ARS, Mississippi
1991	Ronald E. Talbert	University of Arkansas
1992	Thomas J. Monaco	North Carolina State University
1993	A. Douglas Worsham	North Carolina State University
1994	Stephen O. Duke	USDA, ARS, Mississippi
1995	Lawrence R. Oliver	University of Arkansas
1996	William L. Barrentine	Mississippi State University
1997	Kriton K. Hatzios	VPI & SU
1998	G. Euel Coats	Mississippi State University
1998	Robert E. Hoagland	USDA, ARS, Mississippi
1999	James H. Miller	U.S. Forest Service
2000	David R. Shaw	Mississippi State University
2001	Harold D. Coble	North Carolina State University
2002	no nominations	--
2003	John W. Wilcut	North Carolina State University
2004	Gene D. Wills	Mississippi State University
2005	R. M. Hayes	University of Tennessee
2006	James L. Griffin	Louisiana State University
2007	Alan C. York	North Carolina State University

2008	Wayne Keeling	Texas A&M University
2009	W. Carroll Johnson, III	USDA, ARS, Tifton
2010	Don S. Murray	Oklahoma State University
2011	Krishna Reddy	USDA, ARS, Mississippi

Previous Winners of the Outstanding Young Weed Scientist Award

Year	Name	University / Company
1980	John R. Abernathy	Texas A & M University
1981	Harold D. Coble	North Carolina State University
1982	Lawrence R. Oliver	University of Arkansas
1983	Ford L. Baldwin	University of Arkansas
1984	Don S. Murray	Oklahoma State University
1985	William W. Witt	University of Kentucky
1986	Philip A. Banks	University of Georgia
1987	Kriton K. Hatzios	VPI & SU
1988	Joe E. Street	Mississippi State University
1989	C. Michael French	University of Georgia
1990	Ted Whitwell	Clemson University
1991	Alan C. York	North Carolina State University
1992	E. Scott Hagood, Jr.	VPI & SU
1993	James L. Griffin	Louisiana State University
1994	David R. Shaw	Mississippi State University
1995	John C. Wilcut	North Carolina State University
1996	David C. Bridges	University of Georgia
1997	L.B. McCarty	Clemson University
1998	Thomas C. Mueller	University of Tennessee
1999	Daniel B. Reynolds	Mississippi State University
2000	Fred Yelverton	North Carolina State University
2001	John D. Byrd, Jr.	Mississippi State University
2002	Peter a Dotray	Texas Tech. University
2003	Scott A. Senseman	Texas A & M University
2004	David L. Jordan	North Carolina State University

2004	James C. Holloway	Syngenta
2005	Eric Prostko	University of Georgia
2005	no nomination (industry)	
2006	Todd A. Baughman	Texas A & M University
2006	John V. Altom	Valent USA Corporation
2007	Clifford "Trey" Koger	Mississippi State University
2007	no nomination (industry)	
2008	Stanley Culpepper	University of Georgia
2008	no nomination (industry)	
2009	Jason K. Norsworthy	University of Arkansas
2009	no nomination (industry)	
2010	Bob Scott	University of Arkansas
2010	no nomination (industry)	
2011	B. J. Scott McElroy	Auburn University
2011	Eric Palmer	Syngenta Crop Protection

Previous Winners of the Outstanding Educator Award

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

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

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

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

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

Dedication of the Proceedings of the SWSS

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

Southern Weed Science Society Officers and Executive Board

100a. Officers

President	**Tom Holt**
President-Elect	**Barry Brecke**
Vice President	**Tom Mueller**
Secretary-Treasurer	**Todd Baughman**
Editor	**Ted Webster**
Immediate Past President	**Dan Reynolds**

100b. Additional Executive Board Members

Member-At-Large	**Steve Kelly**
Member-At-Large	**Donnie Miller**
Member-At-Large	**Shawn Askew**
Member-At-Large	**Larry Newsom**
Member-At-Large	**Jason Norsworthy**
Member-At-Large	**Scott Senseman**

100c. Ex-Officio Board Members

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

101a. SWSS Endowment Foundation Board Of Trustees (Elected)

President	**Frank Carey**
Vice President	
Secretary	**John Byrd**

101b. SWSS Endowment Foundation Board of Trustees (Ex Officio)

Secretary-Treasurer	**Todd Baughman**
SWSS Finance Committee Chair	**Tom Mueller (Vice President)**
SWSS Business Managere	**Phil Banks**
SWSS Constitution and Operating Procedures Committee Chair	**John Byrd**
SWSS Student Representative	**Jason Weirich**

102 Awards Committee	**Dan Reynolds (Immediate Past-President), Chairman**
Distinguished Service	**Brad Minton, Chairman**
Outstanding Young Weed Scientist	**Jason Norsworthy, Chairman**
Weed Scientist Of The Year	**Carroll Johnson, Chairman**
Outstanding Educator	**Peter Dotray, Chairman**
Outstanding Graduate Student	**Daniel Stephenson, Chairman**
Life Time Achievement	**Tom Holt (President), Chairman**

103. Computer Applications Committee	**Shawn Askew, Chairman**
104. Constitution and Operating Procedures	**John Byrd, Chairman**

105. Finance Committee

Chairperson (Vice President)	**Tom Mueller**
President-Elect	**Barry Brecke**
Secretary-Treasurer	**Todd Baughman**
Chairperson of Sustaining Membership	**John Richburg**
Ex-Officio Member, Editor	**Ted Webster**

106. Graduate Student Organization

President	**Jason Weirich**
Vice President	**Dustin Lewis**
Secretary	**Amber Eytcheson**
Weed Contest	**Brent Johnson**
Student Program	**Chase Bell**
Computer Technology	**Brock Wagner**
Endowment	**Steven Meyer**
Job Placement	**Jay Mccurdy**

107. Herbicide Resistant Weeds Committee — **Larry Steckel, Chairman**

108. Historical Committee — **Neil Rhodes, Chairman**

109. Legislative and Regulatory Committee — **Donn Shilling, Chairman**

110. Local Arrangements Committee — **Dearl Sanders, Chairman**

111. Long-Range Planning Committee

Dan Reynolds (Past President 2010-2011)
Ann Thurston (Past President 2009-2010)
David Monks (Past President 2008-2009)
Jackie Driver (Past President 2007-2008, Deceased)
David Shaw (Past President (2006-2007)

112. Meeting Site Selection Committee. Shall consist of six members and the Business Manager. the members will be appointed by the President on a rotating basis of one each year, and shall serve six-year terms. The Chairperson will rotate to the senior member within the geographical areas for the meeting to be considered.

Current Chairman, West Region	**Peter Dotray (2009-2014)**
West Region	**Jason Norsworthy (2009-2014)**
Midsouth Region	**John Byrd (2006-2011)**
Midsouth Region	**Clete Youmans (2010-2015)**
Midsouth Region	**Mike Edwards (2010-2015)**
East Region	**Timothy Grey (2007-2012)**
East Region	**Barry Brecke (2007-2012)**

113. Nominating Committee — **Dan Reynolds (Immediate Past President), Chairman**

114. Placement Committee — **Trey Koger, Chairman**

115. Program Committee — **Barry Brecke, Chairman**

116. Public Relations Committee — **Jay Ferrell, Chairman**

117. Research Committee **Tom Mueller (Vice President)**

Shall consist of the Vice President as Chairperson and the remaining members as section Chairpersons for the following sections: (1) Chemical and Physical Properties of New Herbicides, (2) Extension Publications (3) Economic Losses Due to Weeds, and (4) Weed Survey - Southern States. Section Chairpersons shall be appointed for a period of 3 years

118. Necrology And Resolutions Committee **Tom Eubank, Chairman**

119 Swss Weed Contest **Andrew Price, Chairman**

120. Student Program Committee **Jason Weirich, Chairman**

121. Sustaining Membership Committee **John Richburg, Chairman**

122. Continuing Education Units Committee **Bobby Walls, Chairman**

Minutes of the Southern Weed Science Society Board Meeting, 28 January 2010, Little Rock, AR

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

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

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

Todd Baughman provided minutes for the summer board meeting and winter board meeting. A motion was made to approve summer board meeting minutes and Monday and Tuesday January 24 and 25, 2010. Motion carried.

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

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

Shawn Askew made a computer technology report. If registration desk has room than the presentation loading area should be held there rather than in separate room. This would likely facilitate better communication between presenters and staff. Need to make sure all presentations are in Office 2003 version and provide them with information on how to name their file. Shawn needs program as soon as possible to develop hyperlinks.

John Byrd provided Constitutional and Operating Procedure Committee report. Provided update on whistle blower policy and updated file that he developed to cover SWSS. A motion was made to accept the whistle blower policy. Motion carried.

Jason Weirich provided graduate student program update. Over 60 attended the luncheon and several agreed to serve as moderators at the annual meeting. It was suggested to move job placement books to a more visible location such as where the breaks are held. Possible future graduate student symposium topics included: networking skills, grant writing and funding, interviewing skills, and personality trait skills. Many students have both books and mentioned the Herbicide Handbook as a possible option. An issue was discussed about there being only 2 Ph.D. posters and the by-laws states there has to be at least 5 papers/poster to form a section. Need to combine those with M.S. posters/papers in future instances. Concern about how the quiz bowl is run and if need for changes. Consensus was that it went fine and no need for change. Tennessee will host the Weed Contest in 2011 and BASF in 2012.

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

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

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

Meeting adjourned.

Minutes of the Southern Weed Science Society Teleconference, 26 March 2010

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

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

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

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

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

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

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

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

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

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

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

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

Meeting was adjourned.

Minutes of the Southern Weed Science Society Board Meeting: 24 June 2010, San Juan, Puerto Rico

Present: Tom Holt, Barry Brecke, Tom Mueller, Dan Reynolds, Todd Baughman, Steve Kelly, Larry Newsom, Shawn Askew, John Byrd, Jason Weirich, Phil Banks, Dearl Sanders

By Teleconference: Ted Webster, Jason Norsworthy, Scott Senseman

President Tom Holt called the meeting to order on June 24, 2010.

The first item discussed was meeting space utilization. Need to determine how much meeting room space we need and actually utilize, especially in regards to committee meetings. Need to contact committee chairs and determine if they actually meet, do they require meeting space, and how much. It was suggested in some cases committees could share a meeting room.

Todd Baughman provided minutes for the winter board meeting and spring teleconference. A motion to accept minutes was made. Motion carried.

Phil Banks provided a business manager's report. We have $66, 942.92 in checking and $243,464.50 in total assets. The total assets include $14,326 in Weed Contest funds. We have continued to sell some additions of the Weed ID Guides but this will be coming to an end shortly. We should receive additional royalties from Weeds of the South shortly. We do not currently have a budget due to the transition period and changes that will incur with that change. The telephone cost will be eliminated. As we continue to move to electronic medium postage cost should continue to decrease. The management fee will decrease. We should be able to reduce cost for audit. We could reduce cost of the program printing and mailing. We currently send a hard copy of the program to all members not just the registrants.

All the old publications housed in Champaign, IL were disposed of. All records and other items have been transferred to Phil at this time. A question was asked "Do we have an investment policy in place?" Phil plans to meet with the Finance Committee to discuss this. The board was informed that the current Myril Lynch CD's are not FDIC approved. Need to get an updated list of any member that has ever attended and when they last attended. There could be an issue if meeting was not held. How would the society handle this and what liability would we incur. While there has been discussion about possible joint meetings with other societies it was suggested that it might be best to hold off on joint meeting until we have all changes in regards to the business manager in place. A new Southern Weed Science Society website has been established. The new website will have ability to accept credit cards for meeting registration and other charges. This will also allow us to sell items directly. The issue with the old MSU URL was mentioned and what we can do to direct interested parties to the new website. Issue with being able to accept American Express and the additional charges involved with it. Need to address this since many companies currently use American Express. The listserve is currently on the MSU server. We can use the Mozilla Firefox/Thunderbird to mass e-mail. However, there are concerns about possibility of some other party being able to gain access to the e-mail addresses. There was a motion to consolidated the website and the listserve under the business manager's duties. Motion approved. A motion was made to accept the business manager's report. Motion carried.

A motion was made to make available funds up to $5000 to support publication of Weed DVD. Motion carried.

Tom Holt has asked the sustaining membership committee to assist with increasing benefits to membership in lieu of an Ad-Hoc committee.

Ted Webster Proceedings Editor reported on current discussions involving publication of proceedings. Ted and Tony White SWSS webmaster have discussed publishing Proceedings online similar to Western Society of Weed Science while keeping current SWSS format. A question was asked on availability of old proceedings if we do this. Dan Reynolds indicated he has files containing all of the Proceedings since the society went to electronic format. A motion was made to host our own proceedings and no longer employee the services of Omnipress. Motion carried.

The plans are to host a Weed Olympics in Tennessee in 2011. The Tennessee coordinators asked WSSA and SWSS for monies and this was not approved. They are asking each team for an entry fee. They are considering possibly $100 per individual. There is an issue with them asking that your team members be declared in September and not only that you have a team entered by that time. There will be individual and team placements within each region. Currently it is agreed that SWSS is in support of this event but will provide no monetary support at this time.

The Weed Science Society of America's Director of Science Policy (DSP) position

Donn Shilling is currently the chair of the WSSA Science Policy committee that coordinates and establishes an action plan and direction and reviews performance of the DSP. He was asked to present an overview and his thoughts on the DSP position.

It is critical for Weed Science to have representation in Washington. Weed Science needs to have input in discussion of policy and decisions that affect the society and its members. The best way to accomplish this is through the DSP. The DSP provides reports of his on-going work on the WSSA website. We need representation on AFRI since USDA has under gone tremendous change recently. The administration in regards to AFRI made the decision in current funding cycle that weed science was not an important funding area. This is currently being discussed for future funding opportunities. The EPA often makes phone calls to people to make recommendation and this often effects the decision making process. These contacts are often coordinated through the DSP office. This is not news since often times those discussion result in no action. Therefore, there is value in the DSP position. He indicated that WSSA has currently made some changes to reduce the cost of the DSP to regional societies. The new plan is to fund the DSP position as follows: average annual cost is approximately $121,437 (based on 3-5 years). Out to 10 years the escrow account is drawn down to approximately $2400. Contribution amounts as follows WSSA = 65% the regional societies = 35% (SWSS = $10,802). Each of the societies can ask for a reassessment at 3 years. Therefore, would have a 3 year agreement on a 10 year plan. An issue was brought up about being tied to the time commitments.

There is also need to get the DSP more involved in SWSS. Invite him to speak at the plenary session and not just the business meeting. Have the DSP and the chair of the WSSA Science Policy committee meet with the board. Bob Scott indicated that he would request the DSP quarterly report for the SWSS newsletter.

Tom Holt indicted that time would be allowed for each board member to make a short comment and then we would make a decision in regards to the DSP position.

Tom Mueller indicated he agreed that a presence in Washington DC is needed. He understood WSSA trying to solicit interaction and agreed it was wise to get a long term commitment. However, SWSS has different needs and value. He is concerned with tying hands of the board with a long term commitment. He is not in support of making a long term commitment that we need a year to year agreement. There is an issue with some in how much we are paying the position.

Jason Norsworthy agreed also that we need a presence in Washington DC. The SWSS members who are also WSSA members are contributing twice. Real concern that weed science was not included in the present AFRI plan. Jason has concern about Lee's effectiveness. He has also tried to get Lee more involved with little success in the past. As WSSA representative he has brought concerns to WSSA and has been ignored. He has concern about entering a 3 year commitment. He is also not sure of the current cost-benefit of the position.

John Byrd indicated that it needs to be made clearer to Lee that he is an employee of the Regional societies. His attending the meetings should be required.

Larry Newsome believes that positive things occurred by recognizing and discussing these issues as a board. He believes this is an important position but that process has been broken. He is concerned that SWSS members are discussing issues with EPA and not aware of whom Lee's is or what he does. He also indicated that it appeared that Lee may be a high maintenance employee. He wants to know how long we are going to commit to the position. He also indicated that WSSA does not have the ability to dictate how we function or how we support the position.

Steve Kelly indicated that the position definitely had value. He is concerned that we have asked Lee several times for bullet points of accomplishments and not received those. He feels that currently there is no benefit to me or my program. However, we must always look at entire situation and how the position can benefit the society and our industry. Is the current discussion based on the position or the person? We also need continue discussion in regards to how support fits into our budget.

Jason Weirich has concerns about pulling down the escrow account. He feels that we need to continue to support the position.

Dan Reynolds stated that the DSP is a valuable position. When we brought up concerns about the amount of SWSS contribution, this got WSSA attention and opened dialog. This was a good result. He indicated that he is supportive of the position.

Phil Banks indicated that he is supportive of the DSP position. Financially we can afford the $10,000, and that this should not be an issue unless we have an unforeseen catastrophe. It has been relayed to him that at least one sustaining member will withdraw their support if we discontinue support of the DSP position. He has recently found numerous e-mails that provided information to the society over the past five years and it appears that information was not received by SWSS membership.

Barry Brecke indicated that he supports the DSP position. He believes if sustaining members find value then that is an important point. The reduced cost of the position makes it acceptable within the current SWSS budget. He also believes the three year commitment makes it workable.

Scott Senseman stated that if SWSS and WSSA want a national presence than we need the DSP position. The person in that position is a completely separate issue. Communication needs to be better with both the Society and the DSP.

Ted Webster indicated that he agreed with the comments of Barry and Scott.

Todd Baughman indicated that while there may be value in the position that he is currently not able to determine that value. He is concerned about request for information to show value that has never been produced. He is also concerned about being left out of current AFRI funding cycle. Other societies/sciences without a DSP position were included. How then if this position is effective and of value could weed science be left out. Concern that members do not know about the position, what the position does, how it could benefit them, or who is in the position. Finally he does not want to hamstring future boards with a long term albatross effecting the budget and their decision making process. He feels like that was the case during his tenure on the board.

Tom Holt visited at length with Harold Coble. Harold is very involved in Washington. Harold said the AFRI situation cannot be blamed on DSP. The current price tag of $121,000 is bargain in Washington DC. The DSP position is important position. The person in that position is a separate issue. We have to be committed to position if we want influence in the position. We wouldn't be in current discussions if we had not supported the position. Other societies are also concerned about the person. We need to have this position and need to engage the position and need to get more active. It is critical that we set high expectations and clearly need to expect those to be fulfilled, and if not fulfilled we need a new person in the position.

Donn Shilling indicated that WSSA employees Lee so that he is not a lobbyist for a scientific organization. Donn has discussed with Lee about his professionalism, follow up communication, don't assume anything etc. Currently getting reports and will continue to improve on that process. Finally he asked that the board and the membership contact him if they have any questions, needs, or issues.

It was then indicated to Donn that the regional society's presidents need to be involved in the evaluation process of the DSP position. Need to set expectations and then make sure those expectations are met.

A motion was made that due to budget constraints that we no longer support the Director of Science Policy position after the current commitment period at the current commitment level. Motion passed.

A motion was made to support the Director of Science Policy position on an annual basis at an amount of $10,802 and that this support is reevaluated annually at the SWSS summer board meeting. Motion carried.

In lieu of the DSP position issues, it was discussed that we need to clarify the role of the SWSS legislative committee.

The board met with representative of University of Puerto Rico to discuss potential outreach to potential interested parties in Puerto Rico and surrounding area. They will investigate getting CEU's for local individuals. We need to provide agenda and key speakers to them as quick as possible. They will assist in providing bilingual assistance at the registration desk. Discussed possibility of translator at various sessions. Could use tourism dollars to pay for translator.

A motion was made to not have a formal certified public accountant audit of the SWSS or to require a surety bond for the business manager. The SWSS business manager will meet with the finance committee at the annual meeting to provide internal audit.

This will save the society approximately $4,500 per year.

Motion carries.

A motion was made to allow an independent company to do "print on demand" publication of the SWSS Proceedings.

The NCWSS does this. The SWSS would get approximately $35 per copy with no cost to the Society.

Motion approved.

A motion was made to approve a stipend of at least $2500 per year for webmaster Tony White. Motioned approved.

A motion was made to provide 2 airfare tickets and a room for Bob Schmidt at the annual meeting in Puerto Rico. Motion carried.

A motion was made to present Bob with $2500 and a plaque for his services to the society. Motion approved.

It was discussed and confirmed that the following fees would be for the 2011 meeting:

$275 – Regular Member, $100 – Student Preregistration, $325 – On-Site; One-Day Student $50, One-Day Other - $100.

Need to offer banquet ticket for spouses on preregistration.

The banquet will be $84 per head. This is less than it was in Orlando and more than it was in Little Rock.

Barry presented information on program planning and symposia. Discussion about CEU's for the meeting. Bobby Walls has agreed to help with CEU's and CCA credits. We will have the Awards Banquet on Wednesday. Discussed possibility of meal versus a mixer. He also indicated that he would be soliciting information about possible membership and e-mail addresses from various members from each state. This will be done to assist in soliciting attendance. A spouse's room will be available. Discussed possibility of having a sandwich bar available at the meeting. The cost to rent 25 whiteboards would be $2,467. He needs names of possible keynote speakers. Other meals will include judges breakfast, quiz bowl, and graduate student luncheon. There are several possible tours and Sunday may be a good day for those.

The society is no longer soliciting assistance from Helms-Briscoe for potential future meeting sites. Phil Banks has developed a new proposal to present to potential hotels. In the proposal it includes the dates (January 28-31 for 2012), that sleeping and meeting rooms under the same roof, that the poster and meeting rooms are on the same floor, offer per diem room rate, ability to bring audio-visual equipment, free internet for attendees, etc.

Future locations in Texas for 2012 include DFW area, Galveston, and Houston.

It was discussed that we want to continue to look at joint meeting opportunities, but should wait until we get the business managers office and other items organized first.

Need to continue to improve committee participation, membership, and clarify duties. Committee chairpersons should review MOP for respective committee and provide recommendations to the Board for changes that need to be made to the MOP.

The call for papers will go out June 30, 2010 and the cessation for accepting titles October 1, 2010.

Meeting adjourned.

Minutes of the Southern Weed Science Society Board, 5 November 2010, Teleconference

Attending: Tom Holt, Barry Brecke, Tom Mueller, Dan Reynolds, Todd Baughman, Larry Newsom, Ted Webster, Shawn Askew, Jason Weirich, John Byrd, Phil Banks, Dearl Sanders, Tony White, Peter Dotray, Renne Keese, Bob Scott, Lisa Smith

President Tom Holt called the teleconference to order on November 5, 2010.

Phil Banks provided a 2011 meeting registration update. Currently 164 were preregistered including 53 students and 20 spouses. There were 17 registered for the SWSS golf tournament. The final date for preregistration is December 24, 2010. Because of flights we will not have the normal number of walk-in registrants. Therefore, we should know how many will be attending by the end of registrations. Currently have 869 room nights booked from Monday through Thursday of the meeting.

It was indicated that the rain forest tour needed details to post on the SWSS website for members information.

John Richburg provided an update on sustaining membership. He is receiving assistances from David Black, John Hardin, Robin Bond, and Bruce Kirksey. At the 2010 meeting had 17 sustaining members. We lost one cooperative that had been a member in the past. The other 16 sustaining members are already committed. Committee is currently contacting 10 to 15 other potential sustaining members. The plan is to have 24 sustaining members committed by the meeting. The committee is certain that we should be up at least 5 members from last year.

Ted Webster provided an update on the SWSS proceedings. They are completed. He indicated that he did not receive many of the committee reports. Do we need all the committees to report to the proceedings and which ones are critical to be included in the proceedings? It was again reiterated that we need to determine which committees are active, which ones meet, and which ones need meeting space room. There was a consensus from the board to publish the proceedings regardless of committee reports. It was also asked if we had a herbicide nomenclature committee. The answer was no. It was indicated that WSSA has a nomenclature committee. We should be able to use this information for our proceedings. It was also indicated that we have an inactive herbicide terminology committee. The recommendation was to use the list from last year. It was indicated that we need to discuss herbicide nomenclature and terminology at the January board meeting. There was further discussion about past proceedings. Dan Reynolds indicated that he has all the ones prior to Bill Vencil (at which point publication of the proceedings was transferred to Omnipress). Ted Webster indicated that he the 2008, 2009, and 2010 proceedings. Dan is in the process of digitizing the past proceedings and making them searchable.

Peter Dotray provided a update from the site selection committee. The committee investigated Dallas, Galveston, and Houston as possible sites. The committee recommended that the Galleria and the Intercontinental in Houston were both acceptable locations. They further indicated that they preferred the Intercontinental. A motion was made to accept the committee recommendation and move towards securing a contract with the Intercontinental. Motion Approved. Peter is finalizing details on a local arrangement committee at this time.

Tony White provided a SWSS website update. He indicated that work on the website is progressing well. He is also working on the SWSS listserve. He stated that if anything in regards to the website (questions, suggestions, information, changes, etc.) to please contact him.

Dan Reynolds indicated that the electronic ballot will go out next week for SWSS officer elections. Ted Webster has agreed to serve an additional term as proceedings editor. Dan is continuing to get confirmation on officer candidates.

Barry Brecke provided an update on the SWSS 2011 program. The final format has been developed. He did have a problem with the graduate student paper contest in relation to the fact that the registration did not have an area stating M.S. or Ph.D. He also had several students entered into both the paper and poster contest. This required some additional time to get final confirmation on these issues. We currently have very few registrants from Puerto Rico and South America therefore, it was decided there was no need for a translator. The website does not currently have an area for one-day registration. However, most one-day registrants will likely be walk-ins. There are currently 113 posters registered for the meeting. We have a company scheduled to provide the easels and poster boards. The plan is to have a Saturday board meeting from 3-6 pm and have the Thursday morning board meeting over by 10:30 am. Shawn Askew will have a 4 hour photo walking tour on Sunday afternoon. He will also have a formal session during the meeting. There was a concern over the photo session and the graduate student symposium overlapping. There will always be conflicts between sessions and the program is already set with no room for additional changes.

Dan Reynolds provided an update on the SWSS awards program. The final awards program should be prepared prior to Thanksgiving. We will print it locally and bring it to the meeting. The awards program needs to be formatted in Word for printing. Dan also indicated that he would take care of the award for Bob Schmidt. Tom Holt indicated that he wanted to make sure that this is not just an awards program but a recognition program.

Tom Mueller provided an update on the SWSS Quiz Bowl. He will need a poster board and easel for the Tuesday night event.

Larry Newsom and Lisa Smith provided an update on the spouses program. The plan is to visit Old San Juan on Monday, the Beach on Tuesday, and the Mall on Wednesday. They will be at the registration desk early Monday to help with other activities. A spouse's room is planned with a small gift basket and contact information.

Renne Kesse discussed the Southern Hospitality and Industry Trade Show planned for Monday and Tuesday nights. The committee currently has $25,000 donated for food and beverages.

Dearl Sanders provided a local arrangement committee report. The Rain forest tour will start at 1 pm on Sunday (or earlier). He also indicated that any equipment can be shipped to the research station in Puerto Rico if needed. Dearl will provide shipping information to those that require. He also indicated that he needed banquet numbers shortly to finalize the preparations and cost. There will be two backup computers and projectors. There is a need for a job placement liaison and job opportunities information location. A mini tour desk will be provided next to registration on Monday. There will be a tour of the university research station on Thursday morning (should be back by noon). Shawn Askew requested that the presentation upload table be placed close to registration. Bobby Walls is working on CEU's at this time for the meeting

Bob Scott indicated that he only had one article for the December newsletter. He needs all information for the December newsletter by the end of November. He would like to include several articles promoting the meeting. It was also recommended that committee membership and MOP revisions be placed in the newsletter.

Meeting adjourned.

Minutes of the Southern Weed Science Board Meeting, 22 January 2011, San Juan, Puerto Rico

Attending: Tom Holt, Barry Brecke, Tom Mueller, Dan Reynolds, Todd Baughman, Scott Senseman, Jason Norsworthy, Steve Kelly, Larry Newsom, Jason Weirich, Ted Webster, John Byrd, Phil Banks, Dearl Sanders, Tony White, Bob Scott

President Tom Holt called the meeting to order on January 22, 2011

Todd Baughman presented the summer board meeting minutes. These were reviewed at the November teleconference. Motion to accept summer board meeting minutes approved.

Todd Baughman presented minutes from the November teleconference. The only issue as discussed but not addressed was the issue with student paper and poster contest. There were discussions about the fact there were no place on the submission form to list as Ph.D. or M.S. It was stated that until recent years that the paper and poster sections were not separated by graduate status. There is a need to either not separate the sections or to make sure that there is a place on the submission form to indicate graduate status. There were also several students that listed both poster and paper on the contest and had to be contacted to determine which contest they wanted to participate in. Need to clarify to the students and advisors that they can only enter a title in one section. A motion was made to accept teleconference minutes. Approved.

Dearl Sanders provided a local arrangements update. Barry Brecke and Dearl will meet with the program committee on Monday at 11 am to review program changes, room assignments, and audio/visual equipment use and details. Everything for the meeting is currently in order. Larry Newsom stated that the spouse's program is developed with plans for transportation and contact information as needed. President Tom Holt recognized Dearl and the local arrangements committee for an outstanding job of planning and preparing for the 2011 meeting.

Barry gave an update on the program. Bobby Walls has worked on CEU and golf course superintendent credits for the meeting. Barry reiterated issues with identifying M.S. and Ph.D. papers that was discussed earlier in the meeting. He also indicated an issue with the fact that there was no place to put a symposium title in the paper submission form. He also indicated that there was an issue with submission of the abstracts if the symposia titles were submitted by the symposia chair rather than the speaker. He also received several questions on formatting for the abstract. Need to post guidelines on the website prior to submission of the abstract.

Phil Banks provided a business managers report. Everything is completed in regards to transfer of materials, files and funds, from Bob Schmidt's office. Total assets for the society are expected to be over $250,000 dollars for 2011 (2009 = $239,102.58; 2010 = $247,056.17. John Richburg has currently assisted in obtaining $14,500 in sustaining membership (one outstanding payment). The society has also had over $54,000 in funding donated for coffee breaks and the trade show functions. There are 251 members, 101 students, and 61 spouses currently preregistered for the meeting. We now have in excess of $80,000 in registration dollars. This does not count potential walk-in registration. We met the room requirements over 6 weeks in advance of the meeting and have almost doubled room requirements. He indicated that there is a plan for a meeting with the finance committee to discuss finance policy and issues. The awards program has been printed and brought to the meeting. Phil has worked with Peter Dotray on the site selection for the 2013 meeting. The negotiations with the Intercontinental Hotel in Houston have been completed and the contract signed. Cletus Youman is the chairman for the 2014 site selection committee. They are currently in the process of looking at possible locations. A motion was made to accept the Business Managers Report. Approved.

A suggestion was made to consider using the WSSA abstract submission program. There would be no cost unless it needs to be tailored to fit specific SWSS needs. A motion was made to table this discussion for Monday.

Mike Barrett is currently serving as WSSA president. He requested time to discuss WSSA issues and regionalsociety relationships with WSSA. He has plans to visit all the regional societies in his current position to convey a similar message. He wants to continue the long-standing relationship with the regional societies and work with us and provide services for SWSS. He stated WSSA provides a national ambassador and voice for weed science. He wants to encourage continued discussions with us like we had on the Director of Science Policy position. WSSA continues to work closely with EPA on policy issues in regards to regulations and especially in regards to weed resistance. WSSA met with Roger Beachey director of the National Institute for Food and Agriculture (NIFA) and has had a positive impact on funding for weed science in future Agriculture and Food Research Initiative (AFRI) competitive funding. WSSA continues to conduct activities to increase public awareness about importance of weed science and weed science issues. The Invasive Plant Science and Management journal continues to improve its performance and is on target with long term plans and goals. SWSS member issued their concerns about paper submission numbers and editorial process for Weed Science and Weed Technology. It was mentioned in many cases due to issues with the editorial process that many authors are sending their papers to other venues. SWSS has already sent a letter to the publication committee in regards to visual estimations of weed control being an acceptable method. This is still and issue, however the feeling is that there are larger issues with the journals then just this. It was also commented that the editor was rejecting papers even before the reviewers had an opportunity to review the papers. Comments made indicating that it appears to be an issue with the editors believing that it is their journal rather than the members' journal. Mike Barrett indicated his concern with the journals and appreciated our comments. Barry Brecke (in-coming President) and Darrin Dodds (in-coming representative to WSSA) will work on developing a concerns letter in regards to Weed Science and Weed Technology. It was suggested that this letter be sent to the WSSA board rather than just the publication committee.

John Byrd provided an update on the Endowment Foundation. A new member was not included in the recent election process. Needed to know how we would proceed in selecting a new member to the foundation. It was decided to hold a special election to select the new member. John also asked if there were any recommendations on how to spend the increasing interest in regards to the endowment foundation. He mentioned ideas included utilizing those funds to support the weed contest, support the director of science policy position, make contribution to the principal, as well as several others. There was some discussion about the Endowment Foundation was a separate entity from the board and should make those decisions. However, it was also indicated that there should not be an issue with the board making recommendations on how those funds could be spent, but that it was the Foundations ultimate decision. It was also mentioned that the original plan for the Endowment Foundation was to support student activities and participation in the meeting (i.e. travel cost, meeting registration). John also indicated that the Endowment Foundation was putting in place a whistle blower policy similar to the one developed for the SWSS executive board. He had a question on who those reports should be made too. It was recommended to list the chair of the trustees and the president of the society.

There was discussion about including a location similar to Puerto Rico in the normal rotation of meetings for SWSS. It was mentioned that need to be careful because if too often will lose its effectiveness and the society could be at a substantial loss due to poor attendance. However, it was suggested that the site selection committee should consider this in their plans for future meetings.

Tom Mueller made a motion to change the nomination of officer's process. **Motion:** The Past President is the chair of the nomination committee and should have the slate of candidates, pictures, and biographies, prior to the summer board meeting for approval by the executive board, and that the elections be finalized by September 1st and the candidates be notified by September 15th. Motion carried.

Tom Holt wanted to discuss the effectiveness of the committee chairs and the MOP's. Barry indicated he plans on working on MOP's this next year. There is a need to work with committee chairs to get successors where needed. There was also discussion about the paying of travel for the SWSS representative to WSSA. It was decided that the finance committee will discuss and make a recommendation on the status of paying travel for the SWSS representative to WSSA.

Bob Scott wanted to make everyone aware that Dick Oliver has made it official that he will be retiring in June 2011. It was decided that this would be discussed further at the summer board meeting.

Meeting Adjourned.

Minutes of the Southern Weed Science Board Meeting, 24 January 2011, San Juan, Puerto Rico

Attending: Tom Holt, Barry Brecke, Tom Mueller, Dan Reynolds, Todd Baughman, Scott Senseman, Jason Norsworthy, Steve Kelly, Larry Newsom, Jason Weirich, Ted Webster, John Byrd, Phil Banks, Dearl Sanders, Tony White, Bob Scott

President Tom Holt called the meeting to order on January 24, 2011

Lee Van Wychen and Donn Shilling were present to give a Director of Science Policy (DSP) update to the board. Weed Science funding included in the 2011 NIFA program. However, there is still work to be done on the final funding level. There is a proposed $24 million in funding for 4 categories in the plant protection disciplines. Originally there was $4.6 million in the original funding for weed science, but could get $5 million possibly in the new budget. The SWSS needs to encourage members to submit proposals to justify continuation of this funding. The EPA was supposed to have their draft language for the Clean Water Act completed by December. Permits are going to be required by April and there is currently no language in place. The Weed resistance white papers have had a tremendous impact and there were several SWSS members involved. Ted Webster indicated that the plans are to have these published in Weed Science. The DSP has been involved with Roundup-Ready Alfalfa regulations. Assisted in having 3 weed scientists serve as expert witnesses to the congressional committee on these issues. Lee indicated that he will make give an update to the membership at the Business Meeting. It was reiterated to him that he needs to provide a clear message on what the issues are and what the DSP is doing in regards to these issues.

Mike DeFelice was present to give an update on weed publications. He stated that we have currently sold over 5000 copies of Weeds of the South and 2200 copies of Weeds of the Midwest. Because of time involved in publishing the books the DVD had been put on hold. He is now working on the DVD and it should be ready to go into production this summer. The SWSS board has approved $5000 for production of the Weeds-DVD with the Endowment Foundation agreeing to cover $2500 of that cost (to further support weed science education). When Weeds of the South is sold out Mike would like to do a revision and second edition.

Barry Brecke needed board members to provide him with available dates for the summer board meeting.

Jason Norsworthy provided an update on WSSA activities. APHIS herbicide weed resistance management papers are being worked on by several WSSA members. 1st document complete and the second document should be completed by April (most of the writing team on the second paper made of people from the South). The University of Arkansas hosted WSSA members, the WSSA weed resistance task force, and NRCS members to provide education on weed resistance issues. There has been NRCS funding developed to support weed resistance management practices by individual producers. Future WSSA meetings will be held in Portland (2011), Hawaii (February 6-9, 2012), and a joint meeting with the Northeastern Weed Science Society in Baltimore (2013). There is a plan to hold a joint meeting with Canadian Weed Science Society to be held at a still to be determined location in Canada in 2014.

Bob Scott reiterated to the board to send information to the newsletter.

Ted Webster brought up an issue on how to handle the committee reports in regards to the proceedings. Ted will send out an e-mail with formatting instructions to each committee chair

Finance committee report provided by Tom Mueller. The finance committee's recommendation to the board is to only pay for the WSSA summer board meeting that includes travel and room (no board payment). The committee also discussed spouse's registration. The registration is currently $30, and results in a loss to the society based on cost of the banquet. The committee recommends leaving the spouses registration at the current level. Tom will visit with John Richburg to discuss appropriate levels of funding for sustaining members and make a future recommendation to the board. The committee also made the recommendation of moving away from uninsured product as they become mature to transfer those to insured projects.

In discussion of the spouses registration was mentioned that there has been a tremendous amount of industry funding to help subsidize this meeting including a call to help with the banquet cost. There was an issue raised about potential spouses that are not registered and possible attendance to the banquet. Motion to approve the financial report. Approved.

A motion was made for the SWSS society to support to payment for the SWSS representative to WSSA for WSSA and SWSS summer board meeting and for the additional days outside the WSSA meeting that includes travel and room (no board payment). No second.

Motion: SWSS society will support payment for the SWSS representative to WSAA for attendance to the WSSA summer board meeting to include travel and room (no board payment). Additionally, the SWSS society will provide payment for any additional room nights for days outside the formal WSSA meeting. **Approved.**

Andy Price provided update on weed science contest committee. Seventeen members attended committee meeting this year. There appears to be reinvigoration to participate in the contest. There are currently 130 signed up for the 2011 Weed Olympics. The contest is covered for 2011 with exception of payment for the southern awards which will be paid by the SWSS weed contest fund. There was discussion about issues of funding and need to support the weed contest fund. Information on the 2011 contest can be found at Weed Olympics2011.org. The 2010 meeting hosted by Monsanto went very well. BASF has agreed to host the meeting in 2012. Andy will present the 2010 award winners at the banquet.

Donn Shilling presented the legislative report. The formula funding for the support of the DSP position has been readjusted. He wants to continue engagement with the SWSS and with the other regional societies. Donn has been the designee for the SWSS representative to the WSSA science policy committee and is serving as chair of the committee for WSSA. The board agreed that Donn should continue to serve as the SWSS representative as well as, the chair of the committee. Todd Baughman will provide Lee Van Wychen and Donn Shilling with the board members e-mail addresses for updates from the DSP.

The board discussed committee reports to present at the business meeting.

John Byrd encouraged all board members and committee chairs to review their MOP's and make any suggestions for corrections to those MOP's.

The board will discuss the abstract submission format on Thursday.

Meeting adjourned.

Weed Science Society of America Representative Report
January 22, 2011, San Juan, Puerto Rico

Submitted by Jason Norsworthy

The following items should be of interest to the SWSS Board.

- WSSA has received a grant from APHIS on a project entitled "Herbicide-Resistant Weeds Management Report." The document has several sections, and it should soon be published in Weed Science. Additionally, a second writing team has undertaken the task of producing a second document outlining 1) best management practices for resistance management along with effectiveness of these practices, 2) current level of adoption, 3) challenges to adoption, and 4) reasons for adoption or nonadoption. This document should be completed this spring and will likewise be published in *Weed Science*. These documents should be instrumental in aiding APHIS in formulating programs to address herbicide resistance issues. Members of the second writing team include: David Shaw, Ted Webster, Mike Barrett, Bill Witt, Nilda Burgos, Jason Norsworthy, Bob Nichols, Kevin Bradley, Steve Powles, Rick Lewelyn, Sarah Ward, and George Frisvold. Plans are to have a national roll-out of the information presented in both documents.

- University of Arkansas hosted WSSA and the National Association of Conservation Districts (NACD) Herbicide Resistant Weed Task Force in August. As a result of this meeting and WSSA led efforts, NRCS has established a partial payment incentives for producers to develop herbicide-resistance management programs. BMPs for resistance management were drafted at this meeting.

- Future WSSA annual meetings SWSS

  2011 - Hilton Portland & Executive Tower, Oregon; Feb. 7-10

  2012 - Hilton Waikoloa Village, Big Island, Hawaii; Feb. 6-9

  2013 - Hilton Baltimore, Maryland; Feb. 4-7

Editor's Report

Summary of Progress: The 2010 Proceedings contained 365 pages, including 245 abstracts. 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 2010 Proceedings contained executive board minutes, business manager's report, committee reports (including: Editor's, Business Manager's, Site Selection, Legislative/Regulatory, and Herbicide Resistance), award winners, and research reports, as well as abstracts from two symposia and volunteered papers and posters. The proceedings are available via the web from the SWSS home page (www.swss.ws). Proceedings from previous years were stored on a hosted web site (Omni Press), but have since been removed. We are working on adding those archives to the SWSS web site.

Section	Number of Pages
Minutes of Executive Board, Committee Reports, etc	26
Posters	83
Weed Management – Agronomic Crops	45
Weed Management – Turfgrass & Ornamentals	22
Weed Management – Pastures, Rangelands, Forest, & Rights-of-Way	15
Weed Management – Horticultural Crops	7
Forest Vegetation Management	2
Weed Biology and Ecology	
Vegetation Management In Utilities, Railroads & Highway Rights-Of-Way, and Industrial Sites	9
Physiological and Biological Aspects of Weed Control	7
Graduate Student Symposium and Education	6
Formulations and Adjuvants	
New Technologies in Weed Science: Updates from Industry	7
Invasive Species	5
Soil and Environmental Aspects of Weed Science	6
Graduate Student Contest	28
Biofuels Symposium	3
Weed Survey (Most Common & Most Troublesome)	13
State Weed Control Publications – 2010	20
Herbicide Names (common, chemical, and trade)	7
Registrants of 2009 Annual Meeting	17

Objective(s) for Next Year: To work with the new webmaster, Tony White, to develop a system that allows for the abstracts to be completed before the summer board meeting.

Finances (in any) Requested: None.

Respectively submitted;

Theodore M. Webster, Editor

Business Manager's Report for the 2011 SWSS Meeting: San Juan Puerto Rico January 22, 2011

My duties as Business Manager officially began on July 1, 2010 but I worked with the outgoing Business Manager, Bob Schmidt, to transition records, documents, and financial institutions immediately following the 2010 Little Rock meeting. Tax forms were filed by Bob Schmidt on May 31, 2010 and all bills have been paid. The attached financial forms detail our current situation. In general, income from registrations, sustaining members, books sold, and general meeting support from various companies will cover all expected expenses for the meeting and other obligations. It is probable we will post an increase in our overall balance of funds when we file for taxes at the end of the 2010-2011 fiscal year on May 31, 2011. I will be meeting with the Finance Committee to go over the books during the meeting.

Preregistration for the Puerto Rico meeting ran smoothly. As of January 20, 2011, we had 251 regular members, 101 students, and 62 spouses/friends registered. Based on non-registered speakers and those that have made hotel registrations, I expect another 20 to 30 walk-in registrations. I also handled the registration of the SWSS Golf Tournament (22 golfers plus those Tom Holt registered) and the Rain Forest Tour (100 participants). I have worked closely with Dearl Sanders and Wilfredo Robles and their local arrangements committee as well as Barry Brecke, Program Chair. In a departure from the past, programs were only sent to those that had pre-registered for the meeting. The posting and printing of the program went smoothly and was done in a timely manner. Award plaques and the Awards Program were printed well ahead of the meeting.

I worked closely with Pete Dotray, Chair of the Site Selection Committee, and we completed negotiations with the Intercontinental Hotel in Houston to host our 2013 annual meeting. The process went smoothly and the current chair of the committee, Cletus Youmans, has started the search for a 2014 site.

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

1. The Operating Guide is very much out of date. There should be a complete revision by the Constitution and Operating Guide Chair.
2. We should consider using the WSSA title/abstract submission site in the future. NCWSS and WSWS both used it this year. It appears that putting the program together and the Proceedings process is somewhat more efficient. Tony White should be consulted on this issue.

Submitted by Phil Banks, Business Manager

SWSS CASH FLOW	4/20/10-1/19/2011
INFLOWS	
Annual Meeting Registration	76,664.20
Annual Meeting Support	56,250.00
Endowment Funds Received	370
Forest Plants Of The SE	1,902.56
Interest Inc	3,029.96
Renewal	534.6
Royalty On Pubs	73.9
Sustaining Member Dues	13,462.10
Weed DVD	500
Weeds Of Midwestern US & Candada	614.3
Weeds Of The South	4,175.91
TOTAL INFLOWS	**157,577.53**
OUTFLOWS	
Account Fee Merrill Lynch	300
AMEX	141.36
Annual Meeting Expense	7,568.75
Audit	4,000.00
Awards	3,800.00
Director Of Science Policy	2,802.02
Insurance	531
Management Fee	20,833.34
Merchant Acct.	600.88
Misc	24.43
Power Pay	195.11
Site Selection	380.3
Summer Board Meeting	1,135.50
Supplies	110.75
Travel To Annual Meeting	1,153.94
Travel To Summer Meeting	1,154.42
Website Host plus set up	4,250.00
Weed Contest	2,225.00
TOTAL OUTFLOWS	**51,206.80**
OVERALL TOTAL	**106,370.73**

Southern Weed Science Society Net Worth 2011

	1/19/2011
ASSETS	
Cash and Bank Accounts	
Money Market (0.7%)	**110,325.17**
SWSS Checking	**99,085.06**
Merrill Lynch*	**111,118.42**
Wells Fargo Savings**	**32,202.67**
TOTAL Cash and Bank Accounts	**352,731.32**
TOTAL ASSETS	**352,731.32**
LIABILITIES	
Other Liabilities	
Weed Contest Fund	**12,101.56**
TOTAL Other Liabilities	**12,101.56**
TOTAL LIABILITIES	**12,101.56**
OVERALL TOTAL ASSETS PLUS LIABILITIES	**352,731.32**
Total Assests on May 31, 2008	**242,242.37**
Total Assests on May 31, 2009	**239,102.58**
Total Assests on May 31, 2010	**247,056.17**

Merrill Lynch*	
Money Market Cash	**9,891.65**
CD Ally Bank 02004MKC6 1.15% 5/20/11	**69,999.58**
CD CAPMARK Bank 140653ZC3 4.5% 8/15/11	**30,618.96**
Estimated Accrued Interest	**608.23**
Total	**111,118.42**
Wells Fargo Savings**	
Carolina First Bank 143876ZM5 2.25% 4/29/11	**25,000.00**
Bank Deposit Sweep	**7046.17**
Estimated accrued interest	**156.50**
	32,202.67

Continuing Education Units Report

Summary of Progress: Nine states in Southern Region approved various sections of the 2011 program to received pesticide credit for those attending and completing required Sign in procedures. One hour of credit was approved for the Turf Section of 2011 meeting. 32 hours of CCA credit were pending for this year's meeting. Good participation from membership was observed as indicated by those that signed in or picked up require state forms for the various sections.

Objective(s) for Next Year: Obtain and provide CEUs for membership with various state agencies for pesticide credits, Certified Crop Advisor (CCA) program of America Society of Agronomy and Golf Course Superintendent Association of America (GCSAA).

Recommendation or Request for Board Action: Continue to provide CEUs for Pesticide credit, CCA and other groups as deemed appropriate by the program. Acknowledgement of Necrology Report in Proceedings of this the 62th meeting of SWSS.

Finances (in any) Requested: None

Respectively submitted;

Bobby Walls, Chairperson

Tim Adcock

Jeff Derr

Alan Estes

Kathie Kalmowitz

David Monks

Doug Montgomery

Patrick McCullough

Scott McElroy

Jim Taylor

SWSS Weed Contest Committee Agenda
Monday January 24, 2011

Submitted by: Andrew Price

The weed contest committee met at the annual meeting, Monday January 24, 2011, Conference Room 8, 8:00 to 10:00 am. Attendees introduced themselves and the main discussion held was about the 2011 contest to be hosted at the University of Tennessee, Knoxville. The 2011 theme is weed Olympics and students from throughout the country are invited to participate. Overall winners will be recognized and then regional winners will be recognized with plaque and monetary award as custom in the SWSS. UT representatives Dr. Jim Brosnan and Dr. Greg Armel were very receptive to input from coaches and committee members. Dr. Oliver, University of Arkansas, expressed many concerns about the feasibility of integrating region rules and successfully implementing such a large contest. Dr. Oliver passed out a letter that he had given the committee chair, Dr. Andrew Price, previous to the meeting documenting his concerns. The vast majority of committee attendees expressed positive input.

Other highlights included:

- Discussion concerning last year's Scott, MS contest
- Confirmed 2012 contest hosted by BASF in Raleigh, NC
- Finances: current balance is $ 12,101.56
    - Soliciting new funds in 2012
- Encouragement of student participation

Respectfully submitted by Andrew Price.

The following documents included in this report

- The Rules for the WSSA National Weed Olympics.
- Weeds to be included at Weed Olympics.
- A letter from Dr. Dick Oliver which outlines his concerns for the upcoming WSSA National Weed Olympics.

December 2009

1st WSSA National Weed Contest
Hosted by: University of Tennessee
Location: Knoxville, TN
Date: 25-29 July 2011

The WSSA National Weed Contest is a joint activity between the Northeastern, North Central, Southern, and Western Weed Science Societies. The purpose of this national contest is to provide an educational experience from which students from universities across the country can broaden their applied skills in Weed Science. The contest provides an opportunity for Weed Science students to meet and talk with each other, be exposed to researchers from other universities and industry, and apply what they have learned using a contest to measure their capabilities. It is also hoped that the contest will increase the visibility of Weed Science and intensify the interest level of those participating in the discipline of Weed Science.

CONTEST RULES

A. Eligibility

Any undergraduate or graduate student currently enrolled and pursuing an A.S., B.Sc., M.Sc. or Ph.D. is eligible to participate. Eligibility includes A.S. students, including 2-year schools, who will compete as undergraduate individuals and teams. Each team will consist of three or four members. If a team has four students, the top three scores will be used to calculate a team score. If a team has three students, all three scores will be used to calculate the team score. A team may be composed of: (a) graduates, (b) undergraduates, or (c) combination (graduates and undergraduates). A combination team must compete as a graduate team; however, the undergraduate students remain eligible for individual undergraduate awards. There is no restriction on the number of teams a college or university may enter in the contest. If a college or university does not have sufficient students for a team of three, students may enter as individuals.

All students graduating with an A.S. or B.Sc. degree six months before the contest (and not actively enrolled in a graduate program) will be able to participate as an undergraduate. Each society will be required to bring a minimum of 3 teams in order to compete in this contest.

B. Awards

Plaques will be awarded for the following categories:

National Level

Team – Members of the top overall graduate and undergraduate team will be awarded a plaque. Weed identification, written test and sprayer calibration, unknown herbicides, and problem solving will determine the overall contest winner in both the graduate and undergraduate divisions.

Individual – The top overall graduate and undergraduate individual scorers will be awarded a plaque. Weed identification, written test and sprayer calibration, unknown herbicides, and problem solving will determine the overall contest winner in both the graduate and undergraduate divisions.

Society Level

Team – Members of the top three overall graduate and undergraduate teams in each society will be awarded a plaque. Weed identification, written test and sprayer calibration, unknown herbicides, and problem solving will determine the overall contest winner in both the graduate and undergraduate divisions.

Individual – The top three overall graduate and undergraduate individual scorers in each society will be awarded a plaque. Weed identification, written test and sprayer calibration, unknown herbicides, and problem solving will determine the overall contest winner in both the graduate and undergraduate divisions.

Teams must declare which society they are competing with before the competition begins.

Level	Place	Plaques Awarded
National Level	1st Place Graduate Team	4
	1st Place Undergraduate Team	4
	1st Place Graduate Individual	1
	1st Place Undergraduate Individual	1
Society Level		
	1st Place NEWSS Graduate Team	4
	2nd Place NEWSS Graduate Team	4
	3rd Place NEWSS Graduate Team	4
	1st Place NEWSS Undergraduate Team	4
	2nd Place NEWSS Undergraduate Team	4
	3rd Place NEWSS Undergraduate Team	4
	1st Place NEWSS Graduate Individual	1
	2nd Place NEWSS Graduate Individual	1
	3rd Place NEWSS Graduate Individual	1
	1st Place NEWSS Undergraduate Individual	1
	2nd Place NEWSS Undergraduate Individual	1
	3rd Place NEWSS Undergraduate Individual	1
	1st Place SWSS Graduate Team	4
	2nd Place SWSS Graduate Team	4
	3rd Place SWSS Graduate Team	4
	1st Place SWSS Undergraduate Team	4

	2nd Place SWSS Undergraduate Team	4
	3rd Place SWSS Undergraduate Team	4
	1st Place SWSS Graduate Individual	1
	2nd Place SWSS Graduate Individual	1
	3rd Place SWSS Graduate Individual	1
	1st Place SWSS Undergraduate Individual	1
	2nd Place SWSS Undergraduate Individual	1
	3rd Place SWSS Undergraduate Individual	1
	1st Place NCWSS Graduate Team	4
	2nd Place NCWSS Graduate Team	4
	3rd Place NCWSS Graduate Team	4
	1st Place NCWSS Undergraduate Team	4
	2nd Place NCWSS Undergraduate Team	4
	3rd Place NCWSS Undergraduate Team	4
	1st Place NCWSS Graduate Individual	1
	2nd Place NCWSS Graduate Individual	1
	3rd Place NCWSS Graduate Individual	1
	1st Place NCWSS Undergraduate Individual	1
	2nd Place NCWSS Undergraduate Individual	1
	3rd Place NCWSS Undergraduate Individual	1
	1st Place WWSS Graduate Team	4
	2nd Place WWSS Graduate Team	4
	3rd Place WWSS Graduate Team	4
	1st Place WWSS Undergraduate Team	4

	2nd Place WWSS Undergraduate Team	4
	3rd Place WWSS Undergraduate Team	4
	1st Place WWSS Graduate Individual	1
	2nd Place WWSS Graduate Individual	1
	3rd Place WWSS Graduate Individual	1
	1st Place WWSS Undergraduate Individual	1
	2nd Place WWSS Undergraduate Individual	1
	3rd Place WWSS Undergraduate Individual	1

C. Events

The contest will consist of four major events.

1) <u>**WEED IDENTIFICATION**</u> Plants will be grown in either a field nursery or greenhouse pots and may be in any stage of growth or development, including seed samples. A complete list of potential species will be sent to each university and will be posted on the NEWSS, SWSS, NCWSS, and WWSS weed contest websites. From this list, 25 weeds will be presented in identifiable condition for the contest. Weeds may be presented in any stage of growth or development (seeds, seedlings, mature weeds or plant parts).

No more than five specimens shall consist of weed seeds only. Students will be responsible for correct identification of twenty weed species using either the correct scientific name or common name (either will be accepted) and spelling. The other five species will need to be identified by correct scientific name (genus and species) and spelling. These individuals will be clearly marked “scientific name only”.

In addition, students must choose a biological characteristic for each weed species from a list of four, only one of which is correct. These could include growth habit, reproduction, habitat, seed dispersal mechanism, native origin, leaf shape, etc.

Total points available for each weed species is 4 points: correct identification and spelling of the weed species will be worth 3 points and choice of the correct biological characteristic will be worth 1 point. One (1) point will be deducted for a slight misspelling of the common or scientific name (such as incorrect capitalization, a one-letter error, or "*arvensis*" instead of "*arvense*"). Two (2) or more points will be deducted for a more serious misspelling, an incomplete name, or the incorrect choice of closely related weeds (i.e. green foxtail instead of yellow foxtail).

In the example below, for common lambsquarters, 3 points would be awarded for the correct identification and spelling and 1 point for choosing "summer annual." Common names, scientific names, and spellings must conform to the most current "A composite list of weeds", compiled by the Standardized Plant Names subcommittee of the WSSA, published by Weed Science Society of America, revised April 2007 (www.wssa.net). A list of weeds for the identification exercise will be provided in a separate document.

2) **APPLICATION TECHNOLOGY** Each component of the application technology event will be worth 50 points.

A. Written Test on Sprayer Calibration: Questions will cover all aspects of sprayer calibration, such as volume of spray needed, amount of herbicide needed per gallon or liter, nozzle nomenclature and selection, sprayer pressure, droplet size, boom height, drift reduction techniques, etc. The test will be comprised of multiple choice, short answer, and written calculation questions. The major reference will be the TeeJet Agricultural Spray Products Catalog from Spraying Systems Company, but other sources may be used. Test information will be provided in both English and metric units. Correct answers will be accepted in both English and metric units. A 30-minute time limit will be imposed for the written test. This will be the first event of the contest. All participants will take the test during this time period.

B. Sprayer Calibration: Each student will calibrate a CO_2backpack sprayer based on a basic written problem that will be calculated during this session. If the individual answered the written test question incorrectly, the correct answer will be given so the calibration can be performed.

Sample question: You are asked to spray some research plots with Accent 75 DF at 0.031 lb ai nicosulfuron/acre plus necessary adjuvants. Each plot is 25 ft long and replicated 4 times. You will spray at 18 GPA with the provided boom (your pressure regulator can only operate in the range of 30-55 psi.). The grassy weeds are 3 inches tall and the corn is 12 inches tall. Calibrate the boom so you can proceed with this job. Using the equipment provided, determine the proper spray tips, pressure, boom height and ground speed to obtain the needed delivery volume. Assume that the distance between spray tips is 20 inches. All sprayer components will be provided. Sprayers should consist of a four-nozzle boom. Contestants should provide a stopwatch while a non-programmable calculator will be provided. Each person must choose the appropriate nozzle tips, pressure and speed for accurate calibration and application. Nozzle tips, strainers, and a Tee Jet Agricultural Spray

Name (3 points)		Circle the correct characteristic for each weed (1 point)			
	common lambsquarters	summer annual	herbaceous perennial	monocot	forms stolons

Products catalog will be provided to assist in accurate calibration.

The student must apply a designated number of gallons/acre (liters/hectare) that will be determined by the output of each spray tip and the required amount based on the intended combination of tip selection, pressure and speed. Speed will be timed over a measured course. Spray pattern and proper boom height will also be evaluated by the judges. Scoring will be based on the accuracy of the calibration and application. Each person will be allotted 15 minutes to complete the calibration. For each minute over 15 min, one (1) point will be deducted from a possible 20 points. Help will be available to assist the student in collecting output from nozzles during calibration.

When the student is satisfied that the sprayer is prepared properly, he or she should notify the judge, and time will be stopped. No further adjustments can then be made to the sprayer. The calibration will be checked with the judge watching for correct boom height (3 points), uniformity of spray pattern (3 points), and speed (4 points). Each nozzle will then be checked for accurate output. Variation in nozzle output of up to +/-10% will be accepted. As an example, if the correct nozzle output is 90 ml/min, the acceptable range will be 81 to 99 ml/min. For each ml of inaccuracy outside this range, one (1) point will be deducted up to a possible 5 points per nozzle. Obtaining the correct output from all four nozzles is worth 20 points. If the spray boom does not contain four nozzles, the 20 points possible will be distributed evenly among the number of nozzles used.

Scoring breakdown summary (50 points total):

1. Correct problem calculation (5 points)
2. Elapsed time (15 points)
3. Boom height (3 points)
4. Spray pattern quality (3 points)
5. Walking speed (4 points)
6. Nozzle output (5 points/nozzle; 20 points total)

3) **IDENTIFICATION OF UNKNOWN HERBICIDES**

Crop and weed species will be planted and treated with herbicides. Approximately 5 wks prior to the contest, PRE applications will be made, with POST treatments applied 4 wk later. A list of crops, weeds, and herbicides will be provided prior to the contest. From this list, selections will be made. Students will be required to identify by visual symptoms on crops and weeds the herbicide previously applied. Approved common names, herbicide family, and mode of action for herbicides will be utilized. This event is worth 100 points. There will be ten plots and each plot will be worth 10 points (5 points for correct common name, 3 points for correct herbicide family, and 2 points for correct mode of action). There will also be a control plot, which must be identified as a control. Herbicide plots may be duplicated.

Herbicides, Trade Names, Families, and Modes of Action Eligible For Identification Exam

1. Atrazine, Aatrex 4L, triazine, Photosystem II inhibitor site A
2. Asulam, Asulam 4F, carbamate, DHP inhibitor
3. Bentazon, Basagran, benzothiadiazole, Photosystem II inhibitor site B
4. Bromoxynil, Buctril, nitrile, Photosystem II inhibitor site B
5. Chlorimuron, Classic, sulfonylurea, ALS inhibitor
6. Clomazone, Command 3 ME, isoxazolidinone, Pigment inhibitor
7. Clopyralid, Stinger, pyridine carboxylic acid, Plant growth regulator
8. Dicamba, Clarity, benzoic acid, Plant growth regulator
9. Dithiopyr, Dimension 2EW, pyridazine, Seedling root inhibitor
10. Diuron, Karmex, substituted urea, Photosystem II inhibitor site A unique binding activity
11. Flumioxazin, Valor, phenylphthalimide, PPO inhibitor
12. Glufosinate, Ignite, amino acid analog, Nitrogen metabolism disrupter
13. Glyphosate, Roundup Weather Max, amino acid analog, Amino acid synthesis
14. Halosulfuron, Permit, sulfonylurea, ALS inhibitor
15. Isoxaflutole, Balance Pro, isoxazole, HPPD inhibitor
16. Imazethapyr, Pursuit 2 EC, imidazolinone, ALS inhibtor
17. isoxaben, Gallery, benzamide, Cell wall synthesis inhibitor
18. Lactofen, Cobra, diphenyl ether, PPO inhibitor
19. Mesotrione, Callisto, triketone, HPPD inhibitor
20. Mesosulfuron, Atlantis, sulfonylurea, ALS inhibitor

21. Metribuzin, Sencor, triazine, Photosystem II inhibitor site A
22. Nicosulfuron, Accent, sulfonylurea, ALS inhibitor
23. Paraquat, Gramoxone Inteon, bipyridylium, Cell membrane disrupter
24. Pendimethalin, Prowl 3.3 EC, dinitroanaline, Seedling root inhibitor
25. Sethoxydim, Poast Plus, cyclohexanedione, Fatty Acid syntehsis inhibitor
26. s-metolachlor, Dual II Magnum, chloroacetamide, Seedling root inhibitor
27. tembotrione, Laudis, triketone, HPPD inhibitor
28. thifensulfuron, Harmony GT, sulfonylurea, ALS inhibitor
29. trifluralin, Treflan, dinitroaniline, seedling root inhibitor
30. Trifloxysulfuron, Envoke, sulfonylurea, ALS inhibitor
31. 2,4-D, Weedone, phenoxy, Plant growth regulator
32. Quinclorac, Drive, Quinoline carboxylic acid, Plant growth regulator

Weed Science Contest Crops List

1. Alfalfa
2. Canola
3. Corn, field
4. Cotton
5. Pumpkins
6. Pine seedlings (Christmas tree)
7. Peas and/or snap beans
8. Rice (dry land)
9. Soybean
10. Sugarcane
11. Sunflower
12. Wheat
13. Grain sorghum
14. Turfgrass sod (bermudagrass, centipedegrass, or tall fescue)

4) **PROBLEM SOLVING AND RECOMMENDATION**

Students will be required to evaluate a crop production problem in a field situation and recommend an effective solution to that problem. Recommendations must comply with accepted agricultural practices. Students should consider all factors which influence crop growth and development. Although several possible answers may be correct, the best answer considering all alternative will be determined by a designated advisory panel. This event is to be presented and handled in a "role-playing" situation. The student will be asked to assume the role of an extension, sales, or research person when dealing with the farmer. Any commodity listed above for the unknown herbicide section of the contest is eligible to be the focus of the problem solving and recommendation section.

- 25 points – How the student approached the farmer
- 45 points – Assessment of situation; determine the problem.
- 15 points – Recommendation – now
- 15 points – Recommendation – next year

Each student will handle only one situation, for a total possible score of 100 points. This will allow for a possible team score of 300 points. Students will be selected by chance for each possible situation. Each team member will evaluate a different situation. Scores will be normalized and winners of this portion of the contest will be verbally recognized.

Weeds to be included for identification at the WSSA National Weed Olympics

Commelinaceae Spiderwort Family

Commelina benghalensis Benghal dayflower

Commelina communis Asiatic dayflower

Cyperaceae Sedge Family

Cyperus esculentus yellow nutsedge

Cyperus rotundus purple nutsedge

Kyllinga brevifolia green kyllinga

Poaceae (Gramineae) Grass Family

Andropogon virginicus broomsedge

Avena fatua wild oats

Bromus secalinus cheat

Bromus tectorum downy brome

Cenchus spinifex field sandbur

Digitaria ischaemum smooth crabgrass

Digitaria sanguinalis large crabgrass

Echinochloa crus-galli barnyardgrass

Eleusine indica goosegrass

Elymus repens quackgrass

Eragrostis cilianensis stinkgrass

Eriochloa villosa woolly cupgrass

Microstegium vimineum Japanese stiltgrass

Panicum dichotomiflorum fall panicum

Panicum miliaceum wild proso millet

Panicum repens torpedograss

Paspalum dilatatum dalligrass

Phragmites australis common reed

Poa annua annual bluegrass

Setaria faberi giant foxtail

Setaria pumila yellow foxtail

Setaria viridis green foxtail

Sorghum bicolor shattercane

Sorghum halepense johnsongrass

Urochloa playphylla broadleaf signalgrass

Dicots

Amaranthaceae Amaranth (Pigweed) Family

Amaranthus blitoides prostrate pigweed

Amaranthus palmeri Palmer amaranth

Amaranthus retroflexus redroot pigweed

Amaranthus rudis common waterhemp

Apiaceae (Umbelliferae) Parsley Family

Daucus carota wild carrot

Conium maculatum poison hemlock

Apocynaceae Dogbane Family

Apocynum cannabinum hemp dogbane

Asclepiadaceae Milkweed Family

24 *Asclepias syriaca* common milkweed

Asteraceae (Composite) Aster Family

Achillea millefolium common yarrow

Ambrosia artemisiifolia common ragweed

Ambrosia trifida giant ragweed

Arctium minus common burdock

Carduus nutans musk thistle

Centaurea biebersteinii spotted knapweed

Centaurea solstitialis yellow starthisle

Cichorium intybus chicory

Cirsium arvense Canada thistle

Cirsium vulgare bull thistle

Conyza canadensis horseweed

Eclipta prostrate eclipta

Galinsoga quadriradiata hairy galinsoga

Helianthus annuus common sunflower

Lactuca serriola *prickly lettuce*

Senecio vulgaris common groundsel

Solidago canadensis Canada goldenrod

Taraxacum officinale dandelion

Tragopogon dubius Western salsify

Vernonia gigantean tall ironweed

Xanthium strumarium common cocklebur

Brassicaceae (Cruciferae) Mustard Family

Alliaria petiolata garlic mustard

Barbarea vulgaris yellow rocket

Sinapis arvensis wild mustard

Capsella bursa-pastoris shepherd’s-purse

Thlaspi arvense field pennycress

Caprifoliaceae Honeysuckle Family

Lonicera japonica Japanese honeysuckle

Caryophyllaceae Pink Family

Stellaria media common chickweed

Chenopodiaceae Goosefoot Family

Chenopodium album common lambsquarters

Kochia scoparia kochia

Salsola tragus Russian thistle

Convolvulaceae Morningglory Family

Calystegia sepium hedge bindweed

Convolvulus arvensis field bindweed

Ipomoea coccinea red morningglory

Ipomoea hederacea ivyleaf morningglory

Ipomoea lacunosa pitted morningglory

Ipomoea purpurea tall morningglory

Ipomoea quamoclit cypressvine morningglory

Ipomoea wrightii palmleaf morningglory

Jacquemontia tamnifolia smallflower morningglory

Cucurbitaceae Gourd Family

Cucumis anguria burgherkin

Cucumis melo smell melon

Sicyos angulatus burcucumber

Dipsacaceae Family

Dipsacus fullonum common teasel

Dipsacus laciniatus cutleaf teasel

Equisetaceae Family

Equisetum arvense field horsetail

Euphorbiaceae Spurge Family

Acalypha ostryifolia hophornbeam copperleaf

Acalypha virginica Virginia copperleaf

Chamaesyce prostrata spotted spurge

Croton glandulosus tropic croton

Euphorbia esula leafy spurge

Euphorbia helioscopia sun spurge

Phyllanthus urinaria Chamber bitter

Fabaceae Family

Lespedeza cuneata Sericea lespedeza

Pueraria montana kudzu

Sesbania herbacea hemp sesbania

Trifolium repens white clover

Geraniaceae Family

Erodium cicutarium redstem filaree

Geranium carolinianum Carolina geranium

Geranium dissectum cutleaf geranium

Haloragaceae Watermilfoil Family

Myriophyllum spicatum Eurasian watermilfoil

Hydrocharitaceae Frog's-bit Family

Hydrilla verticillata hydrilla

Labiatae (Lamiaceae) Mint Family

Glechoma hederacea ground ivy

Lamium amplexicaule henbit

Lamium purpureum purple deadnettle

Perilla frutescens perilla mint

Salvia lyrata lyreleaf sage

Lemnaceae Duckweed Family

Lemna minor common duckweed

Liliaceae Family

Allium vineale wild garlic

Ornithogalum umbellatum Star of Bethlehem

Lythraceae Loosestrife Family

Lythrum salicaria purple loosestrife

Malvaceae Mallow Family

Anoda cristata spurred anoda

Abutilon theophrasti velvetleaf

Hibiscus trionum Venice mallow

Malva neglecta common mallow

Sida spinosa prickly sida

Molluginaceae Family

Mollugo verticillata carpetweed

Moraceae Family

Fatoua villosa mulberry weed

Phytolaccaceae Pokeweed Family

Phytolacca americana common pokeweed

Plantaginaceae Plantain Family

Plantago lanceolata buckhorn plantain

Plantago major broadleaf plantain

Polygonaceae Buckwheat Family

Brunnichia ovata redvine

Polygonum aviculare prostrate knotweed

Polygonum convolvulus wild buckwheat

Polygonum pensylvanicum Pennsylvania smartweed

Polygonum perfoliatum mile-a-minute weed

Polygonum persicaria ladysthumb

Rumex crispus curly dock

Rumex obtusifolius broadleaf dock

Portulacaceae Purslane Family

Portulaca oleracea common purslane

Rubiaceae Family

Diodia virginiana Virginia buttonweed

Galium aparine catchweed bedstraw

Scrophulariaceae Figwort Family

Verbascum thapsus common mullein

Veronica arvensis corn speedwell

Solanaceae Nightshade Family

Datura stramonium jimsonweed

Physalis longifolia var. subglabrata smooth groundcherry

Solanum carolinense horsenettle

Solanum ptycanthum eastern black nightshade

Solanum rostratum buffalobur

Typhaceae Cattail Family

Typha latifolia common cattail

Resources: Common names, scientific names, and spellings must conform to the most current "A composite list of weeds", compiled by the Standardized Plant Names subcommittee of the WSSA, published by Weed Science Society of America, revised April 2007 (www.wssa.net).

Other resources include:

Weeds of the Northeast, 1997. Uva, R.H., J.C. Neal, and J.M. DiTomaso, eds., Cornell University Press, Ithaca, NY.

Weeds of the Great Plains, 2003. Stubbendieck, J., M.J. Coffin, and L.M Landholt, eds.,Nebraska Department of Agriculture, Lincoln, NE.

Weeds of the South, 2009. Bryson, C.T. and M.S. DeFelice, eds., Southern Weed Science Society, Athens, GA.

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Dale Bumpers College of Agricultural, Food and Life Sciences
Arkansas Agricultural Experiment Station
Department of Crop, Soil, and Environmental Sciences

January 3, 2011
Andrew Price, Ph.D.
USDA-ARS-NSDL
411 S. Donahue Dr.
Auburn, AL 36832

Dear Andrew,
As an old weed contest coach for over 30 years, I have the following comments concerning the upcoming combined weed contest. The event may work very effectively if a few changes are made, but I question if we need a National Champ! The regional concept still has many advantages. I have reviewed the proposed rules and made the following comments by section.

ELIGIBILITY

What happened to the concept that a graduate student can compete for only 3 years regardless of degree program or University? This must be followed! The unlimited number of teams per University is not a viable option for continued weed contest success. A University winning all the top awards would not be a good result. Plus, students competing for more than 3 years is unacceptable! An example would be the speaking and poster contest rules for SWSS.

AWARDS

We need to give an award to the top three teams and individuals at the national level. The regional concept must be continued and recognized at the contest as it presently does.

WEED ID

The concept of only knowing five scientific names for graduate students is totally unacceptable. The most important aspect of weed science discipline is to ID and state correct scientific and common names. The SWSS and NCWSS rules must be followed; the dumbing down for graduate students is unacceptable. The common name only would be acceptable for the undergrad contest. The biological question for graduate students should be really known if the student has prepared for the contest and for a future in weed science. The number of weeds to be identified should be greater than 25; the SWSS has 50. The spelling for both common and scientific names must be correct in both contests or the answer is **wrong**. The weed contest list should also indicate if the plant or seed or both will be required (like SWSS and NCWSS examples). **The contestant's score will be figured as follows: 2 points for each correctly identified species (1 point for common name and 1 point for scientific name with ½ a point for Genus and ½ a point for species) x 50 = 100 points. If names are not spelled or capitalized correctly, they are**

wrong. I personally don't see why invasive species are on the list since everyone cannot get to study plants or seeds. Red rice should be added to list. What about winter annuals on the list?

APPLICATION TECHNOLOGY

- individual OK
- team - not a team event but OK

HERBICIDE ID

Appropriate number of herbicides but I would substitute pyrithiobac for either isoxaflutole or tembotrione. Quinclorac is also Facet. Can a student misidentify the herbicide but get credit for the correct MOA and family? The check plot statement – does that mean the host or student? The timing of herbicide is not correct and needs to follow the SWSS guidelines. (see SWSS example) **Each herbicide plot will contain a 1X rate of the unknown herbicide. It is suggested that the test be planted 4 to 5 weeks prior to the contest with post herbicides being applied 10 to 14 days prior to the contest or by 2 to 3 weeks after emergence.**

PROBLEM SOLVING

This section is the most difficult to keep uniformity, which greatly influences the individual scoring and to some extent the team scores. The SWSS format with the same two problems for each team, and judges calibrated before the contest with points given for statements within each category should be followed because it is the most fair format. (see SWSS and NCWSS example) **All contestants will experience the same set (2) of field problems. The assigned judge and farmer will independently score each participant, compare scores, and adjust if necessary. Each field problem will be worth 50 points and to obtain the participant's score, the scores for the two problems will be added for a maximum of 100 points. Judges will be available to discuss the problems and desired solutions immediately after the contest.** The points by section should be like NEWSS (20, 40, 20, 20 or 10, 20, 10, 10) for 100 or 50 points, respectively. Thus, four field problems replicated four to eight times is the most uniform way. The undergraduates would have a different four problems with less difficulty. Why should a student's discipline or area of concentration be a field problem selection criteria?

Andy, I hope these matters are discussed at the weed contest committee in San Juan!

Sincerely,

Dr. Dick Oliver

University Professor and

Elms Farming Chair for Weed Science

479-530-8741

The University of Arkansas is an equal opportunity/affirmative action institution.

2011 SWSS Legislative and Regulatory Committee Report

Committee Chair: Donn Shilling

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

Summary of Activities

SWSS Legislative and Regulatory Committee meeting minutes-1/24/2011

In attendance: Gerald Henry, Lee Van Wychen, Donn Shilling, Bob Nichols

-topics discussed
- -formula funds for WSSA DSP (see following meetings from SWSS board meetings)
- -AFRI grants for weed science
- -Clean Water Act
- -spray drift
- -APHIS I&II

-Chairman will attend WSSA Science Policy Committee meeting (see attachment 2)

SWSS Board Meeting with Chairman of the SWSS Legislative & Regulatory Committee – 1/24/2011 San Juan, PR

Topics discussed by Chairman of the Legislative and Regulatory Committee, Donn Shilling, and the Director of Science Policy, Lee Van Wychen

-formula funding for DSP

-ways to enhance the engagement of the DSP with SWSS
- -invitation to all board meetings
- -invitation to general business meeting
- -newsletter contributions
- -representative to the WSSA Science Policy Committee (SPC)

-AFRI funding

-APHIS I & II

-Clean Water Act

SWSS General Session comments by Director of Science Policy & Chairman of the SWSS Legislative and Regulatory Committee -1/24/2011

-report by Lee Van Wychen (see attachment 1)

-new formula funding to support DSP

-DSP engagement
- -board meeting
- -general business meeting
- -newsletter

Summer SWSS Board Meeting with Chairman of SWSS Legislative and Regulatory committee – 6/24/2010 San Juan, PR

The Chairman of the SWSS Legislative and Regulatory Committee, Donn Shilling was asked to comment on the WSSA Director of Science Policy to the Board. The primary issue was the formula used to fund the DSP. Each regional weed science society contributes to DSP; however, the amount contributed and the formula used was investigated and ultimately changed (see attachment 3).

Comments by Donn Shilling to the Board

Thank you. I'm here as chair of WSSA SPC and SWSS Legislative and Regulatory Committees. I believe, as many do, that representation for weed science in Washington is essential. -Today's scientists are increasingly engaged in "scientific translation." Society wants to increasingly drive policy using scientifically based information. As a science-based organization, SWSS needs to be proactive by providing transparent access, through the DSP, to science based information that drives policy. The DSP is our voice in Washington. Public & private organizations must know we want to be engaged and the best way to convey this message is to support a full-time advocate in Washington. There are many examples of how the DSP has served the interests of Weed Science and SWSS:

-AFRI
- -no section in 1st RFP for weed science
- -DSP set up a series of meetings with Beachy and others in NIFA
- -we have been assured that weed science will have a section in future granting opportunities
- -we will continue to work with Beachy & staff to elevate awareness of weed science

-DSP will let us know when weed science positions in Washington are available – worked hard to maintain ARS NPL for weed science

-EPA – Jill Schroder, Kurk Getsinger and DSP worked directly with EPA to develop, modify & implement regulations
- -DSP helped coordinate trip to Florida with EPA personnel to show them the importance of herbicides & how existing regulations are sufficient

-many other examples of DSP coordinating information flow
- -see DSP reports

-funding formula to support DSP (see attachment 3)

- -2 previous funding formulas – last one developed for previous DSP
- -3rd formula being proposed now to adjust for reduced costs

- -total DSP costs = $121,000 for 2010
- -10-year plan
  - -$121,000 + 4%increase/year – this will cover annual costs & draw down escrow account
- -new plan can be reassessed every 3 years

- -WSSA contributes 65%
- -Regionals contribute 35% (SWSS 8%)
- -Escrow account high due to Rob Hedberg (previous DSP) leaving
  - -$235,000
- -SWSS cost go down by 1/3 with new plan ($10,802 from $16,000)

Recommendations

-Donn Shilling recommended the SWSS Board support the new funding plan & continue support for the DSP

-enhanced communication in between DSP & SWSS

- -SWSS president
  - -invite DSP to present at SWSS annual plenary session
  - -meet w/SWSS board

- -SWSS newsletter editor request report from DSP

Conclusion

All organizations are made up of people, including Washington bureaucracy. Ideas and decisions are based on conversations. Sometimes huge issues are decided one way or the other based on a simple conversation – intentional or accidental. Conversations concerning weed science occur on a continuous basis in Washington. We need the DSP so that we, as professionals, are in the conversation.

See Attachments

Attachment 1

Director of Science Policy Report, Lee Van Wychen

WSSA Summer Board, July 23-25, 2010, Portland, OR

Finances

The Science Policy Committee (SPC) has a $5000 travel fund that can be used towards science policy activities in Washington DC, or sending people to attend events that advance the objectives of the Science Policy Committee. To date, we have used $1779.30 for travel expenses related to NISAW 2010 speakers and guests and for Mike Barrett's airfare to DC for the USDA NIFA Stakeholders Workshop. David Mortensen drove to DC in April to attend the USDA Plant and Pest Biology Stakeholders workshop, but did not ask for any reimbursement. Other anticipated expenses include the New Mexico EPA riparian/irrigation canal tour on Aug. 2-5, 2010 and possibly the NACD Herbicide Resistance meeting in Little Rock, AR on Aug. 9-12 and the NAWMA annual meeting in Pueblo, CO at the end of September. Travel to the regional weed science meetings, APMS, and other speaking requests are reimbursed to me through the host society or organization.

Office & Equipment- The hard drive on my desktop computer (5 yrs. old) fried in May, but I was able to save almost all of my files. ☺ I purchased a new desktop computer for $550.

Major weed science policy initiatives during 2010:

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

USDA-NIFA I met with numerous USDA staff and stakeholders about the Agricultural and Food Research Initiative (AFRI) grant program and coordinated the comments submitted jointly by the National and Regional Weed Science Societies. WSSA appealed to USDA to make three changes: **1)**. Add a Foundational program within AFRI to address weedy plant biology, ecology and management, similar to those focused on phytopathology and entomology; **2)** Reconfigure larger AFRI research programs to encompass the full breadth of the agricultural sciences. Currently, program objectives are written so narrowly as to exclude not only weed science, but many other important areas of study; and **3)** Restore funding for integrated activities under the Section 406 Legislative

Authority. Section 406 supports integrated weed management research through initiatives like the Regional IPM Centers, Risk Avoidance and Mitigation Program, Crops at Risk and Organic Transitions Program. Funding for these programs was zeroed out in the President's FY 2011 budget. I'd like to give special thanks to Dave Mortensen and Adam Davis on the WSSA Research and Competitive Grants Committee as well as Mike Barrett for substantial comments and editing. In addition, both Mortensen and Barrett traveled to Washington DC to represent the WSSA in separate USDA-NIFA stakeholder workshops. The NIFA response to the joint letter indicates that money will be directed to weed resistance issues and that more money will go to foundational programs rather than the 5 "pipeline" initiatives. The letter from Beach also indicated that NIFA will not support separate funding lines for the Section 406 programs (which has been USDA position for 8 years), thus I will continue to lobby House and Senate appropriators to restore that funding through the appropriations process (which they have done for the past 8 years). The National Coalition for Food and Agricultural Research (NC-FAR) and I will meet with Dr. Beach at the end of July to discuss their changes to the 2011 AFRI RFA's, which are currently scheduled to be announced in December.

Spray Drift- The regulation of spray drift remains problematic and the risk assessment tools that EPA employs are based on aging data and the application technology in current use has improved significantly. The WSSA, Entomological Society of America -Plant-Insect Ecosystems Section (ESA P-IE), and the American Psychopathological Society (APS) jointly submitted Federal Register comments on the EPA Spray Drift Pesticide Registration Notice in March. Our main recommendations included removing the word "could" from "could cause" (compared to "causes adverse observable effects"). "Could cause" is very subjective and could attract frivolous complaints, leading to difficult, confusing and uneven drift enforcement decisions. Obvious and off-label drift occurrences that might not have readily observable adverse effects are already enforceable as application violations (residues, species decline, etc.). Another important recommendation was to only use down-wind buffers between target and sensitive sites instead of uniform buffers around all sides regardless of wind direction. USDA determined, with the previous EPA drift PR notice in 2000, that, if buffers were not made wind-directional, the economic loss would be on the order of $1-2 billion dollars due to the large amount of irreplaceable acreage removed from production. Finally, I am working with Jill Schroeder and John Jachetta to bring in Bob Wolf this fall to give a presentation on the progress made in spray drift reduction technologies to EPA and Capitol Hill. Wolf's spray drift seminar to EPA is scheduled for Sept. 14 at 11 am.

NPDES- I have submitted comments on behalf of the National and Regional Weed Science Societies on July 19. In my opinion, there is no way that all 44 states will be ready issue NPDES Pesticide General Permits (PGP's) by April 9, 2011. The remaining states, U.S. and Indian territories have to use EPA's NPDES PGP that is currently in the comment period and will apparently be finalized by December. The National and Regional Weed Science Societies key comments include:

1) EPA Should ask 6th Circuit Court for additional time (at least 2 more years)
2) Application rate objectives are best met by directing the applicator to follow the FIFRA prescriptive label, rather than requiring research-based judgments the applicator is unqualified to make in order to "minimize" application rates.
3) EPA is incorrect that reduced rates are effective for resistance prevention (note- EPA Office of Water staff assured me that this is not their objective, but that is not how the draft PGP currently reads!). Again, the PGP stresses "MINIMIZE" and makes it sound like you will be in violation of your permit if you DO NOT USE LESS than the labeled rate.

4) Increased jurisdictional clarity would help others determine if their pesticide use(s) warrant inclusion under this general NPDES permit. It's plausible that an applicator could be sued for applying a herbicide in their field where that field has a ditch with water in it at the time of application. While Agricultural Storm water runoff and Irrigation Return Flow are exempt from Clean Water Act permitting, the application of pesticides for control of terrestrial pests associated with crop production is not covered under EPA's NPDES draft PGP. Farmers that apply pesticides in any of the four use patterns that discharge to U.S. waters may need permit coverage. Example: application of pesticides in or along the sides of irrigation canals or ditches to control vegetation.
5) Make Outstanding National Resources Water (Tier 3) eligible for PGP.
6) Pesticide R&D (such as that done at Land Grant colleges or Industry) should be automatically covered by this permit and not be required to submit an NOI and be subject to "citizen lawsuits"

Herbicide Resistance- I would like to especially thank John Jachetta, David Shaw, and Jill Schroeder for their outstanding work on this issue on behalf of the weed science societies. The WSSA created a special "Herbicide Resistance Education Committee" chaired by David Shaw to address emerging issues and develop a comprehensive education strategy. WSSA and its affiliated societies need to be the go-to organization for science-based information on herbicide resistant weeds. I cannot stress how important this for us as other groups and federal agencies look for answers. The committee is working with many stakeholders including industry and commodity groups to build on and develop new materials in a wide range of formats that will be used to educate growers about herbicide resistance management. David and Jill will in DC during the week of Sept. 13 and will provide updates on WSSA's progress on these efforts to Crop Life America and EPA.

Related to this are 2 herbicide resistance white papers that are being developed by WSSA with financial support from USDA-APHIS and EPA. The first paper, led by Bill Vencill in coordination with Carol Mallory-Smith, Bill Johnson, Nelda Burgos, Ted Webster, Bob Nichols, John Scoters, and Mike Owen deals with the development of herbicide-resistant weeds and weed shifts that are linked to the introduction of GE herbicide-tolerant corn, soybeans, wheat, rice, cotton, alfalfa and switch grass. The paper is scheduled for review in *Weed Science* by the end of August. Final paperwork for obtaining the remaining grant funds (~$16K) is due at the end of September.

The second white paper is being developed by the Herbicide Resistance Education committee led by Shaw and deals with the extent to which weed resistance management programs are being utilized in various cropping systems and an understanding of how successful they are at achieving their goals. Work on this paper is just getting started, but is expected to be completed by Sept. 2011. The writing team for this paper includes David Shaw, Mike Barrett, Kevin Bradley, Nilda Burgos, George Frivoled, Bob Nichols, Jason Norsworthy, Stephen Powles, Sarah Ward, Ted Webster, and Bill Witt.

The House Oversight subcommittee on Domestic Policy, chaired by Dennis Kucinich (D-OH) will hold a Congressional Hearing tentatively titled "Are Super weeds an Outgrowth of Ag-Biotech Policy". This could be problematic if not handled right. Basically, Kucinich is very anti-pesticide and is going after both USDA and EPA on why there is not enough regulatory oversight for pesticides. USDA asked to be allowed to testify, but were denied by the committee. As I type this, my understanding is that Mike Owen, David Mortensen, and Bryan Young will be testifying at this hearing on Wednesday, July 28 at 2 pm in 2154 Rayburn House Office Building. Messaging for this is being developed ASAP and is "red light" priority.

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

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

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

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

Attachment 2

WSSA Science Policy Committee Meeting

Monday, February 7, 2010

10:00 a.m. – 12:00 noon

Forum Room, Hilton Portland and Executive Tower Hotel

AGENDA

1. Discussion of "on-going" issues
    a. NPDES Permits
    b. USDA Research Funding
        i. NIFA AFRI
        ii. Smith-Lever, Hatch Act, Formula Funds
        iii. Section 406- CAR, RAMP, Regional IPM Centers
    c. Herbicide Resistance Education and Outreach
        i. APHIS I – Vencill group white paper
        ii. APHIS II – Shaw group white paper
        iii. Herbicide Mode of Action Labeling
        iv. "Super weed" Hearings
    d. National Invasive Species Awareness Week
    e. Healthy Habitats Coalition

2. Setting Priorities for 2011

3. 2011 Science Policy Committee Conference Call Dates
    a. May 18
    b. Aug. 17
    c. Nov. 16
    d. All calls at 4 pm EST
        i. 1-800-377-8846
        ii. Pass: 79695424#
4. Other topics/issues
    a. SPD evaluation

Attachment 3

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

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

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

Report of 2011 SWSS Meeting Site Selection Committee

January 24, San Juan, PR

The 2013 SWSS meeting will take place in the western region of SWSS. The committee suggested we look at Dallas, Galveston, and Houston. Request for proposals were sent out in late June. We did not receive a large number of proposals, but had some excellent properties to consider. The committee ranked the proposals and a small Texas committee made on-site visits. We selected the Intercontinental Houston property near the Galleria as the 2013 site. The Board agreed with the committee's recommendation. Most of our work was done electronically prior to the meeting. Present at the meeting were John Byrd, Peter Dotray, Mike Edwards, Tim Grey, Tom Mueller, Jason Norsworthy, and Clete Youmans.

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

Year of Meeting	Location	Chair of Committee	6 yr Term (start, stop)
2007	West	Dick Oliver (for 2010 location)	2005, 2010
2008	Mid	John Byrd (for 2011 location)	2006, 2011
2009	East	Barry Brecke (for 2012 location)	2007, 2012
2010	West	Peter Dotray (for 2013 location)	2008, 2013
2011	Mid	Clete Youmans (for 2014 location)	2009, 2014
2012	East	Tim Grey (for 2015 location)	2010, 2015
2013	West	Jason Norsworthy (for 2016 location)	2011, 2016
2014	Mid	Mike Edwards (for 2017 location)	2012, 2017
2015	East		2013, 2018

Respectively submitted,

Peter Dotray

SWSS Weed Identification Committee

Chair:	Michael DeFelice
Members:	Charles Bryson
	Victor Maddox
	Angela Post
	Lynn Sosnoskie

The Weed Identification Committee met at the SWSS conference in February. The following items were discussed.

1) Our new book ‘Weeds of the Midwestern United States and Central Canada’ was published by the University of Georgia Press in July of 2010. UGA Press has been pleased with sales of the book.
2) Sales of ‘Weeds of the South’ have also remained satisfactory.

   Sales statistics from UGA Press as of 5/5/2011:

<u>Weeds of the South</u>	<u>Weeds of the Midwest</u>
Lifetime net sales are 5612	Lifetime net sales are 2407
We have 6297 in stock	We have 9499 in stock

3) We expect the new version of the ‘Encyclopedia of North American Weeds Version 4.0’ DVD to be completed by mid-summer with production and sales scheduled for August of 2011. The program is progressing well and should be ready for beta-testing by the end of June.

Attention for the SWSS Board: We will be sending the new DVD to production by the end of July and estimate the cost to the SWSS will be approximately $4,000.00. We will produce 1500 copies as we did with Version 3.0 which has sold out. The committee and SWSS board have previously agreed on a retail price of $49.95 and funds were approved for its production. We will proceed with the production of the DVD unless the board indicates otherwise.

4) We have ‘frozen’ additional weed photography for 2011 so we can focus on completing the DVD.
5) The committee agreed Version 4.0 will be the last version of the DVD to be produced. Content of this type is now widely deployed on the Internet. The committee believes the DVD should be transferred to a freely accessible web site in the future. However, it is unclear how or when that could be done. It will likely take at least several years to complete such a project. We tabled further discussion until 2012 and agreed getting the DVD completed was our priority for 2011.

SWSS Historical Committee Report
May 3, 2011

The SWSS Historical Committee is charged with collecting and delivering relevant items of historical interest to be filed in the society's archives located at the American Archives of the Factual Film, Parks Library at Iowa State University in Ames. The Chair of the committee serves as the society's archivist. Earlier this year such items as photographs, SWSS Newsletters for 2009-10 and the most recent SWSS financial statement were sent to this location.

The committee Chair recently contacted the SWSS Business Manager to get his input regarding moving in the direction of an internal, electronic archive system and discontinuing further paper archiving at a remote location. This system has certain advantages: it could reduce future expenses; it would make the items more accessible to the Board of Directors, the Business Manager, and the general membership; and it would take advantage of the fact that the Business Manager is already retaining electronic copies all items submitted by committees. Regarding materials from past years which are located at Ames, a decision would need to be made by the Board or approved by the Board in terms of which items warrant scanning to allow entry into the new, electronic system. An estimate of the cost of scanning would need to be obtained.

The committee Chair and the SWSS Business Manager will work together to draft a new Operating Procedure for the Historical Committee. This document will be submitted for Board review and approval and, if approved, it will replace the existing one in the SWSS Manual of Operating Procedures.

Respectfully submitted,

Neil Rhodes, Chair

SWSS Historical Committee

Necrologies

Three necrology reports were submitted, Dr. Brent Westerman, Dr. Bill Barrentine, and Dr. Richard Behrens.

Dr. Robert Brent Westerman, 50, died Nov.18, 2010. He was born in Hobart, OK. on Dec. 24, 1959 and was married to Linda Jo Lewis on Dec. 27, 1994.

Brent Westerman graduated from Stillwater High School in 1978 and enrolled in Oklahoma State University. He received a B.S. degree in Mechanized Agriculture/Agricultural Engineering in 1982, a M.S. degree in Agronomy in 1988, and a Ph.D. in Crop Science in 1991 with emphasis in Weed Science and Hydrogeology. During his course of study, he held the position of Sr. Research Specialist and was responsible for helping oversee Weed Science Research and was a mentor to numerous graduate students pursuing advanced degrees. In 2002, he assumed the position of Research Scientist/Coordinator of Research Operations in the Department of Plant and Soil Sciences. Later in 2005 he became Sr. Director of a new Field Research and Service Unit that was formed in the Oklahoma Agricultural Experiment Station. There he directed the operation, management, personnel and budgets of 19 outlying Experiment Stations in the state to provide service for project leaders to conduct research.

Brent was a member of numerous professional societies, received numerous awards, and served in leadership roles for the American Society of Agronomy, Research Administrators Society, Gamma Sigma Delta, Sigma Xi, Southern Association of Agricultural Scientists, Southern Weed Science Society, and Toast Masters.

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

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

THEREFORE BE IT RESOLVED that the officers and membership of the Southern Weed

Science Society do hereby take special note of the loss of our coworker, Brent Westerman, and by copy of this resolution, we express to his family our sincere sympathy and appreciation for his contributions.

Dr. William L. “Bill” Barrentine, 73, died May 11, 2010. Bill was born October 15, 1937 in Alligator, Miss. He married Betty Jean Perkins on May 31, 1957.

Bill was a 1955 graduate of Elaine High School in Elaine, Arkansas. Bill continued his education at the University of Arkansas where he earned his Bachelor’s and Master of Science degrees. He completed his PhD at Purdue University in Plant Physiology. Bill retired as a research scientist from Mississippi State University after 30 years of service. During that period he established himself as a renowned expert in soybean research and weed control. He published numerous university articles and peer-reviewed publications. He also won numerous awards in his storied career including SWSS Weed Scientist of the Year Award in 1996.

Bill was a member of numerous professional societies and served in leadership roles in the Southern Weed Science Society, and the Mississippi Weed Science Society, among others.

WHEREAS Dr. Bill Barrentine served with distinction at Mississippi State University and,

WHEREAS Dr. Bill Barrentine, one of the true pioneers in weed science, provided numerous significant contributions to weed science and the Southern Weed Science Society,

THEREFORE BE IT RESOLVED that the officers and membership of the Southern Weed

Science Society do hereby take special note of the loss of our coworker, Bill Barrentine, and by copy of this resolution, we express to his family our sincere sympathy and appreciation for his contributions.

Dr. Richard Behrens, 89, died Nov. 11, 2010. He was born on November 14, 1921 in Zenda, Wisconsin. Richard is survived by his wife Anne.

In 1941 he enlisted in the Army Air Corps. From 1942-45 he served as a bomber pilot in the 766 Squadron, 461st Group, flying 38 bombing missions out of Italy. After the war, he completed his BS, MS and PhD degrees in agronomy and plant physiology at the University of Wisconsin in Madison. Richard initiated his research studies in 1952 as a plant physiologist in the Agricultural Research Service of the U.S. Dept. of Agriculture. In 1958, he became the first full-time weed scientist at the University of Minnesota, devoting his efforts to teaching and research until he retired in 1986. He served as the president of the Weed Society of America and the Southern Weed Science Society. A research range at the University of Minnesota Research Station in Crookston, MN was named after Richard in 1989. In 2004, the University of Minnesota Landscape Arboretum dedicated a weed exhibition in its demonstration gardens in the name of the Richard Behrens' family.

WHEREAS Dr. Richard Behrens served with distinction at the University of Minnesota and,

WHEREAS Dr. Richard Behrens, one of the true pioneers in weed science, provided numerous significant contributions to weed science and the Southern Weed Science Society,

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

Report of the Constitution and By-Laws Committee

A Whistleblower policy template was modified from the original form to fit the Southern Weed Science Society membership. The policy outlines a procedure for reporting misappropriation of SWSS assets and protects against retribution toward the individual that reports the violation. The template was developed as part of the Sarbanes-Oxley Act of 2002 and must be adopted by nonprofit organizations for audit purposes. After several volleys in wording between the committee and Board of Directors, the Board voted to approve the policy.

President Holt asked all Committee Chairs to carefully review MOP of their respective committee and forward suggested changes to the Constitution and By-Laws Committee for modification.

Respectfully submitted,

John Byrd

Sustaining Members Committee Report

The committee consisting of John Richburg (Chair), Bruce Kirksey (Co-Chair), David Black, Robin Bond and John Harden met on January 24th, 2011. Items of business discussed included development of a 3 year succession plan, status of 2011 Sustaining Members and efforts needed in 2011 working towards increasing the number of Sustaining Members for the 2012 meeting. John Richburg provided a report at the business meeting indicating 16 of 17 from 2010 carried over to 2011 plus the addition of 8 new members for a total of 24 Sustaining Members for the 2011 meeting. Richburg reported that the committee will be working to retain all 24 plus add additional Sustaining members for 2012.

Submitted by,

John Richburg

NON-SELECTIVE APPLICATORS FOR THE CONTROL OF PALMER AMARANTH. Eric P. Prostko*; The University of Georgia, Tifton.

ABSTRACT

The increasing threat of herbicide-resistant Palmer amaranth (*Amaranthus palmeri*) has forced growers to re-consider all potential control options. Consequently, there has been a renewed interest in the use of non-selective applicators (NSA) including rope-wicks, carpet rollers, and sponges. These types of applicators were first developed for use in the late 1970's. In 2009 and 2010, eight field trials were conducted in Georgia to evaluate the effectiveness of several NSA for the control of large Palmer amaranth plants. Various NSA were tested including the gravity flow rope-wick, Wickmaster® Rope-Wick, GrassWorks WeedWiper™, TopCrop Super Sponge Weed Wiper, and the LMC-Cross Wick Bar. The NSA were operated at tractor speeds of 3-4 MPH and set to an application height of 20". A 50% solution of Gramoxone Inteon (paraquat) was applied in one direction to flowering Palmer amaranth plants that averaged 46" in height (range 16"- 86"). Visual weed control ratings and above-ground biomass data were collected. NSA that provided at least 85% control of Palmer amaranth included the GrassWorks WeedWiper™, TopCrop Super Sponge Weed Wiper, and the LMC-Cross Wick Bar. In the late summer of 2010, a Section 24C Special Local Need peanut label was obtained for the use of Gramoxone Inteon in NSA for the control/suppression of Palmer amaranth and Florida beggarweed (*Desmodium tortuosum*) in Florida, Georgia, and South Carolina. Although NSA may be effective in controlling larger Palmer amaranth plants, growers should be encouraged to use other management strategies (crop rotation, tillage, cover crops, narrow row spacing, residual herbicides, and timely postemergence applications) before relying on their use.

CONTROL OF EASTERN BLACK NIGHTSHADE IN CORN USING HPPD INHIBITORS ALONE OR IN COMBINATION WITH ATRAZINE. K. Vollmer*, H. Wilson, T. Hines, J. Killmon; Virginia Tech Eastern Shore Agricultural Research and Extension Center, Painter, VA.

ABSTRACT

Eastern black nightshade (*Solanum ptycanthum*) is a problem in several crops on Virginia's Eastern Shore including corn, soybeans, and tomato. Most growers on the Eastern Shore utilize no-till practices which rely heavily on herbicides for weed control. ALS-inhibiting herbicides such as chlorimuron and thifensulfuron have been heavily relied upon, and repeated applications have led to their reduced effectiveness against nightshade. In the summer of 2010 a trial was established to evaluate the effectiveness of various HPPD inhibitors alone or combinations with atrazine for nightshade management in a corn field in Eastville, VA. Plots were 6.7 ft x 20 ft and consisted of 4 replications per treatment. The following HPPD inhibiting herbicides were applied alone or in combination with atrazine (0.5 lb ai./A): topramezone (0.0164 lb. ai/A), tembotrione (0.082 lb. ai/A), tembotrione (0.082 lb ai/A)+ theincarbazone (0.02 lb ai/A), and mesotrione (0.094 lb. ai/A). MSO (1%) and UAN (1.25%) were added to all treatments. Ratings for % control were estimated 1, 2, and 3 WAT. Rate of plant death was expedited by the addition of atrazine to the HPPD inhibitors. All HPPD inhibitors controlled eastern black nightshade 45-70% at 1 WAT, whereas the HPPD inhibitors applied with atrazine provided 85-90% control. At 2 WAT, HPPD inhibitors provided 85-90% control, whereas HPPD inhibitors along with atrazine provided greater than 95% control. By 3 WAT all 4 herbicides applied alone and with atrazine provided 90-95% control. There were no significant differences in the efficacy of the herbicide products evaluated. This study showed that any one of the aforementioned herbicides can be used as an alternative to ALS compounds to control eastern black nightshade in corn; however, control was faster when atrazine was added.

DISTRIBUTION AND CONTROL OF HERBICIDE RESISTANT RYEGRASS IN ARKANSAS. James W. Dickson*, Robert C. Scott, University of Arkansas Cooperative Extension Service, Lonoke; Nilda R. Burgos, Reiofeli A. Salas, University of Arkansas, Fayetteville; and Brad M. Davis, Unversity of Arkansas Cooperative Extension Service, Lonoke.

ABSTRACT

In the spring of 2009, a comprehensive sampling of Italian ryegrass (*Lolium perenne* ssp. *multiflorum*) populations in Arkansas was conducted. Ryegrass samples were collected from a 40 ft^2 area. Field history and global positioning system (GPS) coordinates were recorded for most samples. A total of 300 samples from 21 counties in Arkansas have been obtained from various sources, including five commercially available ryegrass sources. Some of the populations were randomly sampled, while others were harvested following herbicide failures. Twenty-five of the samples received survived a glyphosate application in the spring of 2009. These 25 samples were treated with Roundup WeatherMAX at 22 oz/A and 44 oz/A applied to 3- to 4-leaf and 3- to 4-tiller ryegrass. Nine populations of Italian ryegrass from Desha County, Arkansas have been identified as resistant to glyphosate. The objectives of this research were to: (1) determine the most effective fall applied preemergence and postemergence herbicides for Italian ryegrass control, and (2) determine the most effective spring burndown herbicides for large Italian ryegrass control. Field studies were conducted near Newport, AR in the fall of 2009 and the spring of 2010 to evaluate burndown herbicides for the control of ryegrass prior to planting. Two of these studies included residual herbicides applied prior to ryegrass emergence (PRE) in the fall as well as foliar and residual herbicides applied post-ryegrass emergence (POST) in the fall and spring. One of these studies was tilled with a field cultivator prior to residual-herbicide applications. In the other study, treatments were applied to 3- to 4-leaf ryegrass that was already present (Roundup WeatherMAX at 32 oz/A was tank-mixed with all residual herbicide treatments to kill existing vegetation at the time of treatment). Foliar herbicides were evaluated in two other studies and were applied in the spring to ryegrass that was 24 inches tall. Treatments were applied with a backpack sprayer and 4 nozzle boom calibrated to deliver a 10 GPA spray volume. In the study that was not tilled, the only treatments that controlled ryegrass 70% or better 156 days after treatment (DAT) were Resolve (rimsulfuron) at 2 oz/A, Valor (flumioxazin) at 2 oz/A tank-mixed with Dual Magnum (s-metolachlor) at 16 oz/A, Command (clomazone) at 32 oz/A, and KIH 485 (pyroxasulfone) at 2.8 oz/A. In the study that was tilled prior to residual herbicide application, these same treatments controlled ryegrass by at least 85% when evaluated 156 DAT. The POST treatments, which were applied in the spring, in the tilled study that controlled ryegrass 90% or better were tank mixes of Roundup WeatherMAX at 22 oz/A with Resolve at 2 oz/A or Valor at 2 oz/A plus Dual Magnum at 16 oz/A, when evaluated 28 DAT. In the two studies in which treatments were applied to 24-inch ryegrass, Roundup WeatherMAX at 44 oz/A and Roundup WeatherMAX at 22 oz/A plus Select Max at 16 oz/A controlled ryegrass 90% when evaluated 32 DAT. Select Max alone at 8 and 16 oz/A controlled ryegrass by 50% and 70%, respectively, 32 DAT.

ITALIAN RYEGRASS (*LOLIUM MULTIFLORUM*) CONTROL AS INFLUENCED BY GROWTH STAGE WITH POWERFLEX® HERBICIDE (PYROXSULAM) IN SOUTHERN U.S. SOFT RED WINTER WHEAT. L.C. Walton*, L. B. Braxton, R.A. Haygood, R.B. Lassiter, R.E. Gast, A.T. Ellis, and J.S. Richburg; Dow AgroSciences, Indianapolis, IN.

ABSTRACT

PowerFlex® (pyroxsulam) herbicide, a member of the trizolopyrimidine sulfonamide chemical family, is a new post emergence grass and broadleaf herbicide developed by Dow AgroSciences for use in spring and winter wheat. Previous research has shown excellent activity on several grass and broadleaf species important in the global small grain markets. PowerFlex® is selective in wheat (including durum), rye and triticale but not selective in barley, oats, rice, maize or broadleaf crops. It has both foliar and soil activity; however most of its herbicidal activity is through foliar uptake. PowerFlex® is an acetolactate synthase (ALS)-inhibitor herbicide and can be applied postemergence (fall or spring) to an actively growing crop from 3 leaf to jointing stage, when grass weeds are 2 leaf to 2 tiller stage and broadleaf weeds are 2 inches tall or 2 inches in diameter. PowerFlex® is formulated as a dry granule (7.5% WG) with a use rate of 3.5 oz product/A (0.016 lbs ai/A). Dow AgroSciences conducted research during 2009-2010 season in the southern United States to determine the efficacy of pyroxsulam (PowerFlex®) on ALS susceptible Italian Ryegrass (Lolium perenne ssp. multiflorium) and also the tolerance of soft red winter wheat, with targeted application timings determined by Italian ryegrass growth stage and not time of year. This research also evaluated the impact that Italian ryegrass has upon soft red winter wheat yields in southern U.S. as it relates to duration of competition. This data summarizes results from six experiments with targeted application timings based on Italian ryegrass sizes of 2-5 leaf, < 3 tiller and < 7 tiller stages of growth. The experimental design was a randomized complete block with 3 or 4 replications. The plot size was approximately 6 ft. by 20 ft long. Treatments were applied with a CO2 backpack calibrated to deliver 10 to 20 GPA. The data from this research indicates that PowerFlex® herbicide at 3.5 oz product/acre (0.016 lbs ai/A) will provide excellent control of ALS susceptible Italian ryegrass less than the 3 tiller stage of growth and offers a significant yield protection benefit in soft red winter wheat, with increased yields observed by ~ 35% versus the weedy check. Yield data also indicates that when PowerFlex® application is delayed until Italian ryegrass reaches the 7 tiller stage of growth, wheat yields were reduced ~ 10% compared to earlier application timings, those less than the 3 tiller growth stage. Crop tolerance data from this research indicated than none of the treatments was injurious to soft red winter wheat and the data will not be discussed. ® Trademark of Dow AgroSciences LLC PowerFlex is not registered for sale or use in all states. Contact your state pesticide regulatory agency to determine if a product is registered for sale or use in your state. Always read and follow label directions.

GRASPXTRA FOR BROADSPECTRUM WEED CONTROL IN SOUTHERN RICE. **A.T. Ellis*, V.B. Langston, R.B. Lassiter, R.K. Mann, J.D. Siebert and C.E. Simpson; Dow AgroSciences, Indianapolis, IN.**

ABSTRACT

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

PROGRAM APPROACHES FOR PIGWEED CONTROL IN LIBERTY LINK® SOYBEAN SYSTEMS.
Brad M. Davis*, Robert C. Scott, and James W. Dickson; University of Arkansas Cooperative Extension Service, Lonoke.

ABSTRACT

Glyphosate-resistant pigweed has been confirmed in 21 Arkansas counties. It currently infests a vast majority of the soybean acreage in Arkansas. With limited post options for control of glyphosate-resistant AMAPA the Liberty Link technology is vital for the control of AMAPA. The objectives of these studies were to evaluate options for Arkansas producers using the Liberty Link technology and to establish program approaches for glyphosate-resistant AMAPA control in Liberty Link soybean. Field Studies were conducted in Widener, AR in 2010 on a known glyphosate-resistant AMAPA population. Studies were also conducted in Newport, AR in 2010 on a heavily infested susceptible AMAPA population. Studies included soil applied herbicides in combination with Ignite applied POST. Study design was a randomized complete block with 4 replications. Treatments were applied with a CO2 backpack sprayer calibrated to deliver 10 GPA. All program approaches containing a residual followed by Ignite POST controlled AMAPA above 84% at 37 DAE, where Ignite or residuals applied alone controlled AMAPA below 73%. By 69 DAE, only treatments containing a residual followed by Ignite POST controlled AMAPA adequately. In the timing studies, AMAPA control was greater with sequential applications of Ignite compared to single or later applications. Single applications of Ignite at 6 and 12" timing controlled AMAPA 78% or lower. However, Ignite applied at 3, 6, or 12" with a sequential application controlled AMAPA 91% or greater. AMAPA can be controlled with in the Liberty Link system. However, either the use of a residual herbicide followed by Ignite or sequential applications of Ignite are needed to control AMAPA season long. A complete post program will control AMAPA (22 oz/a Ignite fb 22 oz/a Ignite), but we promote the use of multiple modes of actions with residuals for resistance management. In addition, the use of a residual product will allow for a later sequential application of Ignite if needed for complete weed control.

WEED CONTROL IN DHT COTTON. **J.D. Siebert*, L.B. Braxton, N. Carranza, A.T. Ellis, M.L. Fisher, R.A. Haygood, R.B. Lassiter, J.S. Richburg, and L.C. Walton, Dow AgroSciences, Indianapolis, IN.**

ABSTRACT

Adoption of glyphosate tolerant crops has rapidly increased since their introduction and currently occupies greater than eighty-five percent of the row crop acreage dedicated to corn, cotton and soybean production in the United States. Concurrently, the average number of glyphosate applications and the average per acre use rate of glyphosate has also increased placing immense selection pressure on this mode of action. The Weed Science Society of America currently recognizes eleven weeds in the United States that are resistant to glyphosate; which infest an estimated 7-10 million acres of cropland. Of these weeds, none pose a greater threat to cotton production than glyphosate resistant Palmer amaranth (GLY-RES AMAPA). 2,4-D was first commercialized in 1946 and continues to be the most widely used herbicide in the world. Although synthetic auxin herbicides have been used for a long period of time, relatively few economically important weeds have developed resistance to this class of chemistry and currently no known cases of glyphosate / 2,4-D cross resistance have been identified; suggesting 2,4-D would be an excellent candidate to partner with glyphosate to create a broad spectrum weed control solution. Transgenic cotton tolerant to soil and foliar applied 2,4-D, glyphosate and glufosinate is currently under development by Dow AgroSciences (DHT: Dow AgroSciences Herbicide Tolerant Trait). Trials conducted over the last seven years have shown that the overall level of control of both glyphosate resistant and susceptible weeds with a 2,4-D + glyphosate tank mix was at least equal to and usually more consistent than either herbicide applied alone. Data from these weed control trials and current University Extension recommendations were utilized to develop "systems" approaches to provide season long weed control in cotton tolerant to 2,4-D, glyphosate and glufosinate. Systems that included a preemergence application of either pendimethalin or fomesafen after planting resulted in greater control of GLY-RES AMAPA 21 days after the first POST treatment was applied. When no PRE herbicide was applied, GLY-RES AMAPA control following a single POST application greater for treatments containing tank mixes than those with single herbicides. Weed control improved to at least 94% following the sequential POST application for 2,4-D alone, 2,4-D + glyphosate and 2,4-D + glufosinate where no PRE was applied. These same POST treatments controlled GLY-RES AMAPA at least 98% when a PRE herbicide was applied. Twenty-one days after the layby application, all treatments (with or without a PRE) provided at least 90% control of GLY-RES AMAPA except glyphosate alone. These data demonstrate that viable systems approaches in DHT cotton exist that will provide season long control of GLY-RES AMAPA with the flexibility of using a total POST program in situations where preemergence applications fail. To insure sustainability of this technology, proper stewardship using regionally appropriate weed resistance management recommendations should be utilized.

WEED CONTROL WITH SELECTED HERBICIDES WHEN SPRAY APPLICATION IS DELAYED.
P.M. Eure*, D.L. Jordan, A.C. York, R. Seagroves, and J. Hinton, North Carolina State University, Raleigh.

ABSTRACT

Unforeseen circumstances such as excessive rain, high wind speed, and equipment failure can prevent timely application of spray solutions. Although herbicides occasionally remain in spray tanks for several days, there is little information available to growers concerning the effect of delayed application of these solutions on efficacy. Therefore, experiments were conducted to determine the influence of delayed applications of herbicide solution and weed size on efficacy of atrazine, clethodim, dicamba, glufosinate, glyphosate, imazethapyr, lactofen, paraquat, and 2,4-D. In separate experiments, atrazine, dicamba, glufosinate, glyphosate, imazethapyr, lactofen, paraquat, and 2,4-D were applied at the manufacturer's suggested use rate when Palmer amaranth was 10-15 cm in height and when herbicide solutions were prepared immediately prior to application. Herbicide solutions prepared for this application were also stored in the dark at room temperature until 4 and 8 days after optimum timing based on weed size. Four and eight days after optimum timing, herbicides solutions were prepared and applied to weeds along with herbicide solutions that had been previously prepared. Palmer amaranth height was 20-25 cm and 30-35 cm when herbicides were applied 4 and 8 days after optimum timing. A similar procedure was used to determine broadleaf signalgrass control by clethodim. Spray solutions were mixed using the same municipal water source at pH 6.7. Visual estimates of percent weed control were recorded two weeks after treatment (WAT) following each timing of herbicide application and 3 WAT based on the optimum timing, regardless of when herbicides were applied, using a scale of 0 to 100% where 0 = no control and 100 = complete control. Three plants from each plot were severed at the soil surface 3 WAT to determine fresh weight. Percent reduction in fresh weight was calculated based on non-treated controls. The experimental design was a randomized complete block and treatments were replicated four times. Data for visual estimates of percent weed control 2 and 3 WAT and percent reduction in fresh weight were subjected to ANOVA and means were separated using Fisher's Protected LSD test at $p < 0.05$. Efficacy of dicamba, clethodim, glufosinate, glyphosate, imazethapyr, lactofen, paraquat, and 2,4-D was not affected when herbicides remained in solution for 4 or 8 days when Palmer amaranth control was compared with mixing solutions immediately prior to application when applied to weeds at the same size. In contrast, when atrazine was mixed four days prior to application, Palmer amaranth control was higher than when mixed the day of application. Delayed application of dicamba, clethodim, glufosinate, glyphosate, imazethapyr, lactofen, and 2,4-D by 8 days resulted in a 5-15% reduction in weed control irrespective of when spray solutions were prepared. Delaying application of paraquat 8 days did not affect weed control. Results from these experiments indicate that when application of spray solutions are delayed up to 8 days effects on efficacy will be minimal, with the major factor influencing control associated with increased weed size over that interval of time application is delayed. There are several precautions to consider when extrapolating results from these experiments to farmer or custom application operations. First, a single water source at pH 6.7 without high levels of cations and other constituents that contribute to hard water was used in all experiments. This approach was used due to constraints of time and space given the number of treatments that would be required to include water source as a treatment factor. Secondly, spray solutions were mixed in plastic bottles and were agitated several times over the duration of the experiment until any precipitants previously settled were brought back into solution. Characteristics of water on many farms will differ from the water used in our experiment, and some of these characteristics, in particular high pH, can result in rapid degradation of herbicide in spray solutions. Ability to bring settled product in spray tanks back into solution can be difficult and may not be possible with spray equipment used at the farm level.

COTTON, PEANUT, SOYBEAN, AND TOBACCO RESPONSE TO SIMULATED DRIFT RATES OF DICAMBA, GLUFOSINATE, AND 2,4-D. **V. Johnson*, L. Fisher, D.L. Jordan, K.L. Edmisten, J. Priest, S. Whitley, P.M. Eure, and A.C. York.**

ABSTRACT

Development and utilization of dicamba, glufosinate, and 2,4-D resistant crop cultivars potentially will have a significant influence on weed control in the southern United States. However, off-site movement to adjacent non-tolerant crops and other plants is a concern in many areas of eastern North Carolina and other portions of the southeastern United States, especially where sensitive crops are grown. Cotton, peanut, soybean, tobacco, and many vegetable crops not resistant to these herbicides are often grown in close proximity, and practitioners will need to consider potential adverse effects on non-resistant crops when these herbicides are used. Research was conducted to simulate drift rates of glufosinate, dicamba and 2,4-D to evaluate injury and effects on cotton, peanut, soybean and tobacco yield and quality and to test correlations of visual estimates of percent injury with crop yield. Experiments were conducted on research stations in North Carolina near Kinston, Lewiston-Woodville, and Rocky Mount during the 2009 and 2010. Cotton and peanut (Lewiston-Woodville and Rocky Mount), soybean (two separate fields (Rocky Mount), and tobacco (Kinston and Rocky Mount) during each year were treated with dicamba and the amine formulation of 2,4-D at 1/2, 1/8, 1/32, 1/128, and 1/512 the manufacturer's suggested use rate of 280 g ai/ha and 540 g ai/ha, respectively. Glufosinate was applied at rates equivalent to 1/2, 1/4, 1/8, 1/16, and 1/32 the manufacturer's suggested use rate of 604 g ai/ha. Herbicides were applied in the same experiment when cotton and soybean height was 20 to 30 cm approximately three weeks after crop emergence. Peanut 15 to 20 cm in width was treated with these herbicides. Tobacco was 60 cm tall when herbicides were applied. Herbicides were applied in early June to simulate when applications of these herbicides most likely would be applied to tolerant crops to control weeds early in the season. Crops were maintained weed free using herbicides, cultivation, and hand removal of escaped weeds. Other production and pest management practices were followed to optimize crop yield. The experimental unit for cotton, peanut, and soybean was 2 rows (91-cm spacing) by 9 m. Plot size for tobacco was one row (122-cm spacing) with a total of 25 plants in the row. Non-treated rows were included between treated rows to minimize movement of herbicide to other treatment rows. The experimental design was a randomized complete block with treatments replicated four times. A non-treated control was also included. Visual estimates of percent crop injury were recorded 7 and 14 days after treatment (DAT) using a scale of 0 to 100% where 0 = no injury and 100 = plant death. Foliar chlorosis, necrosis, and plant stunting were considered when making the visual estimates. Yield was determined for all crops during both years. Data for visual estimates of percent crop injury and crop yield were subjected to analysis of variance to determine if data could be pooled over years. In all instances experiment (year/location combination) by treatment interactions were noted ($p < 0.05$), and therefore data for each herbicide was analyzed by experiment and test for linear, quadratic, and cubic functions for injury or crop yield versus herbicide rate (g/ha). Pearson correlation coefficients and $P > F$ values were determined for injury 7 and 14 DAT versus yield. A wide range of visual injury was noted at both 7 and 14 DAT for all crops. Crop yield was reduced for most crops when herbicides were applied at the highest rate. Linear and quadratic functions were often significant for yield versus herbicide rate, and in most instances trends in response followed known patterns of herbicide susceptibility for these crops. The highest degree of susceptibility of cotton, peanut, soybean, and tobacco was to 2, 4-D, dicamba and glufosinate, dicamba, and glufosinate, respectively. In contrast, cotton, peanut, soybean, and tobacco expressed the greatest tolerance to glufosinate, 2,4-D, 2,4-D, and 2,4-D, respectively. Although correlations of injury 7 and 14 DAT with yield were significant ($p < 0.05$), coefficients ranged from -0.25 to -0.50, -0.36 to-0.62, -0.40 to -0.67, and -0.39 to -0.62 for injury 7 DAT versus yield for cotton, peanut, soybean, and tobacco, respectively. These respective crops had ranges of correlations of -0.17 to -0.43, -0.34 to -0.64, -0.41 to -0.60, and -0.44 to -0.58 for injury 14 DAT. In most instances the highest rate of each herbicide reduced crop yield. These data suggest that while visual injury for soybean and tobacco is a relatively good indicator of yield response, correlations

of injury and yield for cotton and peanut were relatively poor. The indeterminate growth habit of cotton and peanut and ability of these crops to compensate for stress most likely contributed to the variation in response and revealed limitations in using early season measurements of injury to predict yield. Results from these experiments will be used to emphasize the need for diligence in application of these herbicides in close proximity to adjacent crops that are susceptible as well as the need to clean sprayers completely before spraying sensitive crops.

CLEARFIELD* HYBRID RICE RESPONSE TO IMAZETHAPYR AS AFFECTED BY APPLICATION TIMING AND RATE. **A. L. Turner*, S. A. Senseman, Texas A&M University, College Station; G. N. McCauley, Texas AgriLife Research, Beaumont.**

ABSTRACT

Clearfield rice technology has been available for several years and has helped farmers battle red rice problems in rice since it's introduction. Recently, breeders introduced hybrid Clearfield lines hoping to maintain the desired herbicide-resistant traits while having the added benefits of a hybrid. Soon after the hybrid line released, farmers noticed herbicide injury to these new varieties while following the label recommendations. Texas AgriLife Research was able to perform preliminary trials to test the hybrids on effect of planting date, planting density, and imazethapyr application rate on visual plant injury in at Beaumont, TX and Eagle Lake, TX. A secondary experiment was designed to test the effect of imazethapyr application timing and rate on plant visual injury and yield. CLXL 745 was planted at each location. Every study had one early post and one of two different late post applications that included either a 3- to 4-leaf or a 5- to 6-leaf a treatment. Three rates were included for the early 1- to 2-leaf application that were 0, 35 and 70 g ai/ha. Four rates were included in the the late application 0, 70, 105, and 140 g ai/ha. Plots were evaluated for visual injury at two week intervals after the second application. The broad leaf weeds were controlled as needed, and a blanket application of Prowl H_2O was used to control grassy weeds. Plants showed no significant differences in height, injury, yield, or quality. There were no significant differences in visual injury, however significant differences were recorded in height. According to this data, hybrid rice seems to be tolerant to imazethapyr applications and timings.

PALMER AMARANTH CONTROL AND COTTON RESPONSE TO TANK-MIX COMBINATIONS OF GLUFOSINATE PLUS FLUOMETURON. **Kelly A. Barnett*; Lawrence E. Steckel, University of Tennessee, Jackson, TN, Thomas C. Mueller, University of Tennessee, Knoxville, TN; Alan C. York, North Carolina State University, Raleigh, NC; A. Stanley Culpepper, University of Georgia, Tifton, GA.**

ABSTRACT

Glyphosate-resistant (GR) weeds are a major issue for GA, NC and TN cotton growers. These GR weeds can be problematic to control when relying only on timely rains to activate pre applied herbicides. GR horseweed, GR giant ragweed, and GR Palmer amaranth (PA) are the three GR weeds that can currently be found in TN. GR PA has become the most difficult to control of these. A timely glufosinate (Ignite) application can control all three of these weeds, but must be applied to 8-10 cm weeds. As a result, many growers have moved to a glufosinate-based system to manage GR weeds, which includes a PRE followed by at least one over-the-top glufosinate application. Liberty Link (glufosinate-tolerant) cotton varieties are planted on just a few acres in TN due to inconsistent performance of these varieties in the state. Over 60% of the cotton acres in TN are planted to a WideStrike cotton variety which has tolerance to both glyphosate and glufosinate (Ignite). The WideStrike cotton varieties have moderate tolerance to Ignite. The injury range is typically in the 5 to 25% range but does not decrease yield. Timely glufosinate applications can control GR PA, but growers often ask what they can apply POST to control GR PA in the 10-25 cm range and how much injury they can expect from these herbicide applications. Fluometuron (Cotoran) has historically been used PRE or POST in cotton. Previous studies have indicated that fluometuron applied POST may delay maturity and decrease yields; however, other studies have not resulted in reduced yield. Other studies have demonstrated that PSII inhibitors can help control troublesome weeds when tank-mixed with glufosinate in corn. Others found that tank-mixing atrazine or cyanazine with glufosinate provided better control of giant foxtail, velvetleaf, and morningglory species in glufosinate-tolerant corn. Other studies have demonstrated that prometryn (Caparol) or diuron (Diuron) tank-mixed with glufosinate, provided better control of glyphosate-resistant horseweed than glufosinate alone. Fluometuron tank-mixed with glufosinate could potentially help control GR weeds, while helping preserve glufosinate by adding a herbicide with another mode of action. However, little is known about the efficacy of these treatments on GR weeds or the potential for crop injury and yield loss due to tank-mix combinations on WideStrike cotton. Therefore a study was constructed that examined crop response and GR PA control with these herbicide treatments. The objectives of this study were to determine if applications of glufosinate plus fluometuron effectively controlled GR PA and if these applications influenced crop response and yield. Glufosinate was applied alone at 0.59 kg ai/ha or tank-mixed with fluometuron at .14 kg ai/ha, .28 kg ai/ha, .56 kg ai/ha, and 1.12 kg ai/ha. Treatments were applied to 13cm and 26 cm PA. The experiment was arranged as a factorial design. Location was not significant; therefore data were combined across locations. Treatment was significant at $p<.05$. Therefore, differences between the application timings were analyzed by constructing single degree of freedom contrast statements. For both application timings, glufosinate alone resulted in approximately 10% visual crop injury one week after the application. Crop injury was higher for treatments that included fluometuron and ranged from 12% (0.14 kg ai/ha) to 22% (1.12 kg ai/ha) injury. One month after the second application, crop injury was less than 5% for all treatments. The best treatments for GR PA control were glufosinate plus fluometuron (all rates) applied to 13 cm GR PA or glufosinate plus fluometuron (highest rate) applied to 26 cm GR PA. One week after the second application, these treatments resulted in the highest percent control and ranged from 92 to 98%. Additionally, differences in application timing were significant with application to 13 cm GR PA resulting in 93% control and treatments to 26 cm GR PA resulting in only 85% control. One month after the second application, all treatments had good control of GR PA, with the exception of glufosinate applied to 26 cm PA. Application timing was significant with treatments applied to 13 cm PA resulting in 92% control and treatments applied to 26 cm PA resulting in only 86% control. Treatment was significant at $p<.05$ for crop yield. All treatments with glufosinate alone or fluometuron (all rates) resulted in the highest yield when compared with the non-treated control. However, treatments applied to 13 cm GR PA resulted in higher crop yields (689 kg/ha) when compared to treatments applied to 26 cm GR PA (611 kg/ha). Results indicate that glufosinate plus fluometuron can increase control of GR PA without reducing yields in WideStrike cotton. However, applications should be applied to GR PA at the 13 cm height to prevent yield loss and increase GR PA control.

WHAT IS THE VALUE OF SHARPEN IN RICE WEED CONTROL PROGRAMS?. **Jason A. Bond*, Mississippi State University Delta Research and Extension Center, Stoneville; Eric P. Webster and Justin B. Hensley, Louisiana State University AgCenter, Baton Rouge; Thomas W. Eubank, Mississippi State University Delta Research and Extension Center, Stoneville.**

ABSTRACT

Kixor, a protoporphyrinogen oxidase (PPOase) inhibiting herbicide, is manufactured by BASF. Sharpen (saflufenacil) is one of the Kixor brand herbicides and is labeled for fallow, preplant, and PRE application in a variety of small grain crops. Previous research indicated that Sharpen would be valuable for broadleaf weed control in rice. Studies were established at the MSU Delta Research and Extension Center at Stoneville and the LSU Agricultural Center Rice Research Station near Crowley to evaluate application rates and timings of Sharpen for broadleaf weed control in rice and to compare the efficacy of Sharpen when applied with different spray adjuvants. The first study evaluated Sharpen application rates and timings. Treatments were arranged as a two-factor factorial within a randomized complete block design with four replications. Factor A was herbicide treatment and included Sharpen at 0.022, 0.044, or 0.066 lb ai/A and Aim at 0.031 lb ai/A. Factor B was application timings of PRE, EPOST at two- to three-leaf rice, and LPOST at four-leaf to one-tiller rice. Visual estimates of rice injury and hemp sesbania (*Sesbania herbacea*) control were recorded at Stoneville while estimates of rice injury and hemp sesbania and alligatorweed (*Alternanthera philoxeroides*) control were recorded at Crowley. All data were subjected to ANOVA, and means were separated using Fisher's Protected LSD at $p < 0.05$. At 7 days after each application (DAP) at Stoneville, all rates of Sharpen injured rice more than Aim. Rice injury increased with Sharpen rate and greatest injury of 43% was observed 7 days following Sharpen at 0.066 lb/A EPOST. All postemergence applications of Sharpen controlled hemp sesbania at least 96% 14 DAP at Stoneville and Crowley. Sharpen PRE controlled hemp sesbania at least 80 and 91% at Stoneville and Crowley, respectively, following applications at 0.044 and 0.066 lb/A. Alligatorweed control ranged from 79 to 95% 14 DAP for all Sharpen rate and timing combinations at Crowley. A second study compared the efficacy of Sharpen applied with different adjuvant systems. Treatments were arranged as a factorial of Sharpen rates (0.022 and 0.044 lb/A) and adjuvant systems [nonionic surfactant (NIS; 0.25% v/v), crop oil concentrate (COC; 1% v/v), methylated seed oil (MSO; 1% v/v), and a blend of MSO plus organosilicone surfactant plus urea-ammonium nitrate solution (MSO+OS+UAN; 1% v/v)]. Treatments were applied when rice reached the three- to four-leaf stage. Visual estimates of rice injury and hemp sesbania control were recorded at Stoneville while estimates of rice injury, hemp sesbania, alligatorweed, Indian jointvetch (*Aeschynomene indica*), and eclipta (*Eclipta prostrata*) control were recorded at Crowley. Rice injury was low following all treatments at Crowley. At Stoneville, rice injury was greatest 14 days after treatment (DAT) when either rate of Sharpen was applied with the MSO+OS+UAN blend. For the higher rate of Sharpen, rice injury from Sharpen plus NIS was greater than that following Sharpen plus COC. At Stoneville 14 DAT, hemp sesbania control was at least 96% for all Sharpen and adjuvant combinations. No differences in treatments were detected for control of hemp sesbania, Indian jointvetch, or eclipta 14 DAT at Crowley. Hemp sesbania control was 84 to 94%, and Indian jointvetch and eclipta control was at least 91%. Alligatorweed control was inconsistent 14 DAT; however, the addition of NIS with Sharpen at both rates resulted in increased alligatorweed control. Sharpen appears safe and effective for broadleaf weed control in rice. No currently registered rice herbicides provide residual control of hemp sesbania, which is the most common broadleaf weed of rice in most areas. Although a postemergence application of a broadleaf herbicide would be required because PRE treatments did not provide complete control, residual control of hemp sesbania was observed with Sharpen. For postemergence treatments, Sharpen exhibited similar activity when applied EPOST or LPOST. Furthermore, there was no benefit to increasing the rate above 0.022 lb/A for control of hemp sesbania, Indian jointvetch, or eclipta. Although rice responded differently to Sharpen and adjuvant combinations at Stoneville, these data did not indicate a consistent weed control advantage of one adjuvant compared with another.

COMPARISON OF IGNITE APPLICATION PROGRAMS IN LIBERTYLINK COTTON. **Jason A. Bond* and Thomas W. Eubank, Mississippi State University Delta Research and Extension Center, Stoneville.**

ABSTRACT

LibertyLink cotton offers an alternative to Roundup Ready and Roundup Ready Flex for postemergence weed control in cotton. In areas where glyphosate- and/or acetolactate synthase-resistant Palmer amaranth (*Amaranthus palmeri*) is prevalent, Ignite (glufosinate) applications in LibertyLink cotton are the only option for over-the-top treatments. Research was conducted in 2010 at the Mississippi State University Delta Research and Extension Center in Stoneville to (1) evaluate Cotoran (fluometuron) as a component of a LibertyLink weed control program, (2) determine the most effective timing for the first Ignite application in LibertyLink cotton, and (3) compare Ignite rate programs in LibertyLink cotton. Treatments were arranged as a three-factor factorial in a randomized complete block design with four replications. Factor A was preemergence (PRE) treatment and included no PRE or Cotoran (0.75 lb ai/A) applied immediately after planting. Factor 2 was timings of initial Ignite application. Ignite applications were initiated 2, 3, or 4 weeks after planting (WAP). Factor 3 was Ignite rate programs and included three applications of Ignite at 0.4 or 0.53 lb ai/A with treatments spaced 7 days apart or two applications of Ignite [0.79 followed by (fb) 0.53 lb/A] with treatments spaced 7 days apart. All plots received a post-directed application of Direx (diuron; 0.75 lb ai/A) plus MSMA (2 lb ai/A) 14 to 21 days following the last Ignite application. A nontreated control was included for comparison of cotton lint yields. Visual estimates of cotton injury and Palmer amaranth and barnyardgrass (*Echinochloa crus-galli*) control were recorded at intervals following treatment application. Seedcotton was harvested from the two center rows of each plot and converted to lint yield based on 38% turnout. Data were subjected to ANOVA with means separated by Fisher¡¯s protected least significant difference test at p¡Ü0.05. The greatest cotton injury (¡Ü8%) was observed 1 week after cotton emergence. No injury was detected following Ignite treatments. For Palmer amaranth control 7 days after the last Ignite treatment, application timing was less critical when Cotoran was applied PRE or Ignite rate program was 0.53 fb 0.53 fb 0.53 lb/A. Ignite at 0.79 fb 0.53 lb/A did not improve control compared with three applications at 0.53 lb/A. Midseason Palmer amaranth control was greatest when Cotoran was applied PRE and Ignite rate program was 0.53 fb 0.53 fb 0.53 lb/A. Control of barnyardgrass was improved when Cotoran preceded Ignite at 0.4 fb 0.4 fb 0.4 lb/A or 0.79 fb 0.53 lb/A across all timings of initial Ignite application. Cotton lint yields were 14% lower when initial Ignite application was delayed from 2 to 3 WAP. Regardless of Ignite rate program, Cotoran PRE was not sufficient to overcome yield loss incurred by delaying Ignite application to 4 WAP. Annual grass control is problematic in LibertyLink cotton. A PRE application of Cotoran is beneficial in LibertyLink cotton. The first Ignite application may be delayed until 3 WAP if Cotoran is applied PRE with no loss of yield. Ignite should be applied at 0.53 fb 0.53 fb 0.53 lb/A if initial application is >2 WAP.

WEED SPECIES COMPOSITION AND COTTON YIELD IN A CONTINUOUS LONG-TERM EXPERIMENT COMPARING GLYPHOSATE AND CONVENTIAL TREATMENTS . **J.L. Porter*, N.C. Talley, A.N. Eytcheson, D.S. Murray, J.C. Banks, Oklahoma State University, Stillwater; and S.W. Murdock, Monsanto Company, St. Louis, MO.**

ABSTRACT

An experiment with Flex cotton was started in 2005 at the South Central Research Station in Chickasha, OK. The purpose of this study was to measure weed species compositions and cotton yield in a continuous long term experiment comparing glyphosate and conventional treatments using the most economically feasible practice. The experimental design was randomized complete block with four replications and sixteen herbicide treatments. Plot size was 40' X 100', with row spacings at 40". All weed counts and harvest data were collected from the four center rows of each plot. All herbicides that were used were applied at the labeled rates. The weeds that were most common in the study were johnsongrass, Palmer amaranth, and common cocklebur. Weed counts were taken after all treatments were applied. Cotton yield data was collected on all plots that were harvestable. Herbicides which were used in various combinations from 2005 through 2009 included Treflan (PPI), Caparol (PRE), Staple (PRE and POST), Roundup (POST), Dual Magnum (POST), and an untreated check in the study. Conventional herbicides applications from 2005 through 2009 did not control common cocklebur or Palmer amaranth, therefore, those plots were not harvested. Data collected from 2005 through 2009 indicated that eight of the sixteen treatments were not harvested due to high populations of common cocklebur and Palmer amaranth. In 2010 the best management practices were Treflan (PPI) followed by Roundup (POST 2 and 3) and Treflan (PPI) followed by Roundup (POST 1,2, and 3) provided effective weed control and all plots were harvested. The best management practices selected in 2010 successfully controlled the targeted weeds and allowed for a uniform cotton lint yield over the entire experiment area. Future research includes using combinations of Treflan followed by various numbers of Roundup applications.

COMPARISON OF HPPD INHIBITORS FOR WEED CONTROL PROGRAMS IN CORN. **M.T. Bararpour*, L.R. Oliver, C.G. Bell; University of Arkansas, Fayetteville, AR.**

ABSTRACT

Weed management programs are an essential component of corn production. Field studies were conducted in 2009 and 2010 at the Agricultural Experiment Stations in Keiser and Fayetteville, AR, to evaluate four HPPD (p-hydroxyphenyl pyruvate dioxygenase) herbicides and tank-mix combinations for weed control in corn. The four HPPD herbicides tested were isoxaflutole+cyprosulfamide (Balance Flexx) at 0.078 or 0.047 lb ai/A, thiencarbazone-methyl+ isoxaflutole+ cyprosulfamide (Corvus) at 0.115 lb ai/A, tembotrione+isoxadifen-ethyl (Laudis) at 0.082 lb ai/A, and tembotrione+ thiencarbazone-methyl+isoxadifen-ethyl (Capreno) at 0.081 or 0.054 lb ai/A. Each herbicide had five similar treatments: 1) Balance Flexx applied alone preemergence (PRE), 2) Balance Flexx + atrazine (Aatrex) at 2 lb ai/A PRE, 3) Balance Flexx (PRE) followed by (fb) glufosinate (Ignite 280) at 0.4 lb ai/A + Aatrex at 1 lb/A (V2-V4), 4) Balance Flexx + Aatrex at 1.5 lb/A (PRE) fb Ignite + Aatrex at 0.5 lb/A (V2-V4), and 5) Balance Flexx + Aatrex at 2 or 1.5 lb/A + Ignite (V1-V2) fb Ignite + Aatrex at 0.5 lb/A (V2-V6). Corvus treatments were applied the same as Balance Flexx. Laudis applied: 1) alone (V2-V4), 2) Laudis + Aatrex at 0.5 or 1.5 lb/A (V2-V4), 3) Laudis + Ignite at (V2-V4), 4) Laudis at 0.082 or 0.054 lb/A + glyphosate (Roundup PowerMax) at 0.75 lb ae/A (V2-V4), and 5) Laudis + Ignite + Aatrex at 0.5 or 1.5 lb/A (V2-V4). Capreno treatments were applied the same as Laudis. The plot area contained Palmer amaranth (*Amaranthus palmeri*), pitted (*Ipomoea lacunosa*) and entireleaf morningglory (*Ipomoea hederacea var. integriuscula*), prickly sida (*Sida spinosa*), broadleaf signalgrass (*Urochloa platyphylla*), and velvetleaf (*Abutilon theophrasti*). The experiment was designed as a 2 by 4 by 5 factorial and four replications. Corn was planted on May 18 and 24 at Keiser and May 28 and April 29 at Fayetteville in 2009 and 2010, respectively. Corn was harvested in October. Corn Injury was 25 to 30% when Balance Flexx and Corvus were applied postemergence (POST) at V1-V2 stage of corn, which reduced corn yield. Corn yield was increased from 163 to 188 bu/A; from 180 to 190 bu/A; and from 182 to 190 bu/A when Aatrex was added to the single application of Balance Flexx (PRE) and Laudis and Capreno (POST at V2-V4), respectively. There were no differences among Corvus (PRE), Laudis (POST), and Capreno (POST) based on corn yield. All herbicide treatments provided excellent (90 to 100%) weed control except for entireleaf morningglory from one application of Balance Flexx (58%), Corvus (79%), and Laudis (87%). In conclusion, Balance Flexx was a weaker HPPD as compared to the other three HPPD herbicides. Laudis, Corvus, and Capreno performed equally.

CLETHODIM BASED PROGRAMS FOR MANAGING GLYPHOSATE-RESISTANT ITALIAN RYEGRASS. **Robin Bond*, J. A. Bond, T. E. Eubank, and V. K. Nandula Delta, Mississippi State University, Delta Research and Extension Center, Stoneville, MS.**

ABSTRACT

Glyphosate-resistant Italian ryegrass has become increasingly problematic for growers in the Mississippi Delta since 2005. Currently, there are a limited number herbicide chemistries and application timings which provide adequate control of glyphosate-resistant Italian ryegrass. Should application opportunities be missed/delayed or additional flushes of glyphosate-resistant Italian ryegrass emerge post treatment, alternative control options are needed. Our objectives were to compare the efficacy and to identify the most effective application timings of ACCase herbicides for control of glyphosate-resistant Italian ryegrass. Research was conducted at two on-farm sites located near Elizabeth, Mississippi from 2009-2010. All treatments were applied with a tractor mounted sprayer equipped with 11002 spray nozzles calibrated to deliver 15 GPA. Data collected included a visual control rating at monthly intervals on a scale of 0 -100 with 0 being no control and 100 being complete control. Factor A was application timing and included applications made in November, January, and March. Factor B was herbicide treatment and included glyphosate (0.77 lb ae/A), clethodim (0.094 and 0.125 lb ai/A), fluazifop (0.188 and 0.25 lb ai/A) and quizalofop (0.055 and 0.0825 lb ai/A). Data was analyzed using mixed procedure with means separated by estimates of the least square means. Evaluations made 45 DAT indicated clethodim (0.125 lb ai/A) controlled glyphosate-resistant Italian ryegrass better than quizalofop (0.0825 lb ai/A) and fluazifop (0.25 lb ai/A) at January and March timings. November and January applications of clethodim were more effective than March applications. Quizalofop and fluazifop provided better control of glyphosate-resistant Italian ryegrass when applied in November. End of season evaluations made on April 12 showed clethodim at 0.125 lb ai/A was the most effective treatment at all three application timings. Control of glyphosate-resistant Italian ryegrass was better following January and March applications compared with those in November. Treatment performance varied across locations indicating that glyphosate-resistant Italian ryegrass emergence timing can differ from field to field. Clethodim is most effective ACCase herbicide for control of glyphosate-resistant Italian ryegrass. Glyphosate-resistant Italian ryegrass emergence after herbicide application compromised control from November treatments. Although applications in March provided similar control to those in January, Italian ryegrass biomass following March applications reduces the utility of spring application. Clethodim at 12 to 16 oz/A should be applied when weather permits in January for control of glyphosate-resistant Italian ryegrass.

EFFECT OF ROUNDUP-READY TECHNOLOGY ON WEED POPULATION DYNAMICS IN SOYBEAN. **M.T. Bararpour*, L.R. Oliver; University of Arkansas, Fayetteville, AR.**

ABSTRACT

To reduce the soil seedbank, seed production must be reduced. Field studies were conducted from 2007 through 2010 at Pine Tree, AR, to evaluate the effects of late-season glyphosate applications on density and seed production of a natural infestation of Palmer amaranth (*Amaranthus palmeri*), pitted morningglory (*Ipomoea lacunosa*), prickly sida (*Sida spinosa*), and barnyardgrass (*Echinochloa crus-galli*) in Roundup Ready soybean. Soybean cultivars planted (76-cm row spacing) were Armor 53K3RR (2007-2009) and Asgrow 5605RR (2010). The experiment was designed as a randomized complete block with eight treatments and four replications. Plots were 9 m wide by 9 m long with 3-m alleys between plots and 6-m alleys between replications. Treatments were: 1) Roundup WeatherMax (RWM) applied at V3 stage of soybean, 2) RWM applied at V3 followed by (fb) RWM at weed flowering (WF) stage, 3) RWM applied at V3 fb RWM at WF fb RWM at 10 day sequential (DSeq), 4) RWM applied at V3 fb RWM at WF fb RWM at 30 DSeq, 5) RWM applied at V3 fb at V6, 6) RWM applied at V3 fb V6 fb WF, 7) RWM applied at V3 fb V6 fb WF fb 10 DSeq, and 8) RWM applied at V3 fb V6 fb WF fb 30 DSeq. Roundup WeatherMax rates were 0.84 kg ae/ha (1X) at the V3 and V6 stages of soybean growth and 0.42 kg/ha (0.5X) at weed flowering (except treatment 2) and sequential applications. Plot integrity was maintained throughout the study by shallow tillage in row direction only prior to planting. Each year WF application was triggered by barnyardgrass or Palmer amaranth. RWM applied only once at the V3 stage of soybean (treatment 1) provided only 33, 42, 48 and 13% (averaged over years) control of pitted morningglory, prickly sida, Palmer amaranth, and barnyardgrass, respectively, and resulted in significantly lower soybean yield than other treatments (2, 3, 4, 6, 7, and 8). Treatments 2, 5, and 6 (with no sequential application) did not provide 100% control of all weed species present. Pitted morningglory, prickly sida, and barnyardgrass control at the end of season was 71, 92, and 82%; 79, 89, and 41%; and 86, 96, and 85% from the application of treatments 2, 5, and 6, respectively. Overall, treatment 2 (V3 fb WF) was better than treatment 5 (V3 fb V6) and comparable with treatment 6 (V3 fb V6 fb WF) in terms of reducing weed populations and the soil seedbank which indicates the application of RWM at WF was necessary and highly effective. Only those treatments (3, 4, 7, or 8) with the sequential applications provided 90 to 100% control (averaged over years) of all weed species with no detectable biomass and no weed seed production (reduced weed soil seedbank). In 2010, the weed density (plants/m^2) and seed production (g/m^2) in the plots that received treatments 1, 2, 5, and 6 were 174 and 10; 19 and 3.4; 179 and 11; 21 and 5.4, respectively. Soybean yield was reduced 55 and 27% (averaged over 4 years) from treatment 1 (V3) and 5 (V3 fb V6) as compared to treatment 3 or 4 which further indicates an increasing population dynamics and no seedbank reduction for treatments 1 and 5 (standard product recommendations). In conclusion, the application of RWM at WF is critical to reduce the soil seedbank. Treatments 3, 4, 7, or 8 were the best in terms of weed control and stopping weed seed production (reducing soil seedbank) and resulted in the highest soybean yield. Thus, to reduce weed density or to stop weed seed production (reduce soil seedbank), three to four applications of RWM (0.84 kg/ha) at V3 fb RWM (0.42 kg/ha) at WF fb RWM (0.42 kg/ha) at 10 to 30 DSeq for 3 years is required.

WEED CONTROL AND ECONOMIC EVALUATION OF SOYBEAN PROGRAMS. **Chase G. Bell*, Lawrence R. Oliver, Mohammad T. Bararpour; University of Arkansas, Fayetteville, AR.**

ABSTRACT

Soybean weed management is a perennial challenge, and evaluation of new cultivar programs is essential to allow producers to decide which programs fit their needs. The objective of this study was to determine weed control, crop tolerance, yield, and gross revenue less weed control cost (GRLWC) from four soybean cultivar programs [glyphosate-resistant (RR), glufosiante-resistant (LL), glyphosate acetlytransferase-resistant (GAT), and conventional (CON)]. Research was conducted in 2009 and 2010 at Keiser and Pine Tree, AR, in a split-split-plot design with two planting dates (early planting: late April to early May; late planting: early June) as the whole-plot factor, four cultivar programs as the subplot factor, and six herbicide programs (weedy check, delayed preplant burndown (PPB) followed by (fb) postemergence (POST), preemergence (PRE) or POST alone, short-residual PRE (SPRE) fb POST, long-residual PRE (LPRE) fb POST, and POST fb POST) as the sub-subplot factor. GRLWC was compiled by adding all weed control costs (chemical cost, application cost, and technology fee if applicable) and subtracting from the gross revenue (yield multiplied by the cash sale price from the nearest elevator on the day of harvest). Soybean injury was negligible among the cultivar programs. Higher average yields and greater GRLWC were achieved in the early planting (55 bu/A and $488/A, respectively) date compared to the late plating date (45 bu/A and $426/A, respectively). All herbicide programs produced higher GRLWC and yields than the untreated check. Herbicide programs with multiple herbicide applications were superior to programs with a single herbicide application in terms of weed control, yield, and GRLWC. The RR and LL SPRE fb POST (Valor fb Roundup PowerMax and Valor fb Ignite, respectively) were comparable in terms of the highest GRLWC and yield in any location by planting date combination. All four cultivar programs had a herbicide program that effectively controlled the weed spectrum throughout the growing season. In conclusion, considerations such as variability in price, soybean cultivar yield potential, location, and herbicide application timing should be considered when deciding which cultivar program and herbicide program to choose.

PROGRAM APPROACHES FOR CONTROL OF GLYPHOSATE-RESISTANT JOHNSONGRASS IN LIBERTY LINK SOYBEAN. **D.B. Johnson, J.K. Norsworthy, R.C. Scott, G. Griffith, J. Wilson, and C. Starkey; University of Arkansas, Fayetteville.**

ABSTRACT

Before glyphosate-resistant soybean was brought to market in 1996, johnsongrass (*Sorghum halepense*) was one of the most troublesome grass weeds to control. In the fall of 2007, a population of johnsongrass located in a field near West Memphis, AR, in Crittenden County was confirmed glyphosate-resistant. An experiment was conducted in West Memphis on the resistant site and in Fayetteville, AR, on a glyphosate-susceptible population in 2010. The objective of this study was to develop herbicide programs for management of glyphosate-resistant johnsongrass in Liberty Link soybean. The treatments in this study consisted of glufosinate (Ignite 280) at 0.40 lb ai/A applied alone in sequential applications or in tank-mixture with other postemergence herbicides. The herbicides that were evaluated in combination with glufosinate were imazamox (Raptor) at 0.05 lb ai/A, imazethapyr (Pursuit) at 0.023 lb ai/A, and clethodim (Select Max) at 0.061 and 0.121 lb ai/A. Clethodim was applied at either the V3 or V6 soybean stage and both stages, while the other herbicides were applied in combination with glufosinate at either the V3 or V6 stage. Johnsongrass was 6 to 10 inches tall at the time the V3 application was made and 12 to 18 inches at the V6 application. Visible weed control ratings were taken weekly throughout the growing season, and grain yield was determined at crop maturity. The treatment by location interaction was significant for johnsongrass control at 2 and 5 weeks after the final application (WAFT) ; therefore, data are presented by location. In West Memphis, sequential glufosinate applications controlled johnsongrass 70% 2 WAFT and control was 68% 5 WAFT. Glufosinate + clethodim fb glufosinate + imazamox or glufosinate + imazethapyr were the most consistent treatments, both providing >95% control 5 WAFT. Johnsongrass control with sequential applications of glufosinate + clethodim was 90% 2 WAFT and 88% 5 WAFT. At Fayetteville, sequential glufosinate applications controlled johnsongrass 78% 2 WAFT and control declined to 70% 5 WAFT as a result of new emergence. Similar to the trial at West Memphis, glufosinate + clethodim fb glufosinate + imazamox or glufosinate + imazethapyr were the most efficacious programs, providing >90% control 5 WAFT. Additionally, at Fayetteville, glufosinate + imazethapyr fb glufosinate + clethodim was also effective, providing 93% control 5 WAFT. Sequential applications of glufosinate + clethodim were effective early in the season; however; control declined to 81% 5 WAFT because of the lack of soybean canopy closure and late-emerging johnsongrass. Crop yield was not significantly different between locations, and all treatments yielded more than the untreated check. This research shows that sequential applications of glufosinate at the rates evaluated will not provide effective johnsongrass control; however, glufosinate applied in combination with multiple herbicide modes of action can effectively control johnsongrass and would reduce the risks of johnsongrass evolving herbicide resistance to glufosinate in glufosinate-resistant soybean.

INFLUENCE OF RYE COVER CROP ON THE CRITICAL WEED-FREE PERIOD IN COTTON.

Justin D. DeVore, Jason K. Norsworthy, D. Brent Johnson, Griff M. Griffith, Clay E. Starkey, and M. Josh Wilson; University of Arkansas, Fayetteville.

ABSTRACT

The critical period of weed control (CPWC) is an estimate of the duration of effective weed control necessary to prevent weed interference from reducing yields. In order to design a management strategy that minimizes weed interference during the critical growth period of a crop, an understanding of the CPWC is essential. A field experiment was conducted during 2009 and 2010 at the Lon Mann Cotton Research Station in Marianna, AR, in which a rye cover crop was used to determine its effect on the critical weed-free period in cotton. This experiment was organized in a split-plot design replicated four times. The main factor was the use of a rye cover crop. The subplot factor was the duration of the weed-free period and the duration of the weed-interference period. Both the weed-free period and the weed-interference period had durations of 0, 1, 2, 3, 4, 5, 7, and 9 wk, as well as season long. Initial weed control consisted of Roundup WeatherMax (glyphosate) plus Dual Magnum (S-metolachlor) followed by Roundup WeatherMax as needed. Weed biomass was collected from a 0.5-m^2 area in each treatment in the weed-interference plots and once at the end of the growing season in the weed-free period plots. Yield data were collected in all the plots, and all data were subjected to regression analysis. Throughout most of the growing season, weed biomass in the presence of a rye cover crop was less than that in the absence of a rye cover crop. In 2009, in weeks 2 through 7, there was at least a two-fold reduction in weed biomass in the presence of a rye cover crop compared to the absence of rye. In 2009, in both the presence and absence of a rye cover crop, weed removal needed to begin prior to 108 g/m^2 of weed biomass, or approximately 3 wk after planting to prevent greater than 5% yield loss. Biomass production was lower in 2010 than in 2009, so weed removal did not need to begin until 385 g/m^2 of weed biomass was present when no cover crop was used, or when 175 g/m^2 of weed biomass was present when a cover crop was used, which was 7 wk after planting.

GLUFOSINATE WEED CONTROL PROGRAMS IN SOYBEAN. **L.R. Oliver*, M.T. Bararpour, C.G. Bell; University of Arkansas, Fayetteville, AR.**

ABSTRACT

Glufosinate (Ignite 280) provides excellent postemergence (POST) control of many problem weeds but the lack of residual control is a major disadvantage. A study was conducted in 2009 and 2010 to evaluate broadleaf and grass weed control in a Liberty Link soybean herbicide program at Pine Tree, AR, on a Calloway silt loam. The objective was to determine the differences in efficacy of various preemergence (PRE) herbicides used prior to POST applications of Ignite 280. The treatments were arranged in a randomized complete block (RCB) with four replications. Halo 49 and ML 5163N were planted in 30-inch rows in 2009 and 2010, respectively. Parameters evaluated were soybean yield plus visual control ratings of Palmer amaranth (*Amaranthus palmeri*), pitted morningglory (*Ipomoea lacunosa*), prickly sida (*Sida spinosa*), hemp sesbania (*Sesbania herbacea*), broadleaf signalgrass (*Urochloa platyphylla*), and barnyardgrass (*Echinochloa crus-galli*) taken at 3, 6, 9, and 12 weeks after emergence (WAE). The PRE herbicides evaluated were: flumioxazin (Valor), Valor + metribuzin (Sencor), flumioxazin + chlorimuron (Valor XLT), sulfentrazone + cloransulam (Authority First), sulfentrazone + metribuzin (Authority MTZ), S-metolachlor + fomesafen (Prefix), and S-metolachor (Dual Magnum). Dual Magnum was also applied POST with Ignite at 22 DAE in 2010. All PRE-applied herbicides were applied at labeled rates adjusted for soil texture. All PRE applications were then followed by (fb) Ignite at 0.4 lb ai/A at 22 days after emergence (DAE) or 0.4 lb/A at 22 fb 44 DAE. In 2010, Dual Magnum data were analyzed in ANOVA with alpha equal to 0.05. Rainfall patterns between years greatly influenced the emergence of barnyardgrass. At 44 DAE in 2010, barnyardgrass density was low because only 0.1 inches of rain had fallen between 22 and 44 DAE. Barnyardgrass dominated all plots except Prefix and Dual Magnum PRE treatments. The loss of residual control 44 DAE plus timely rainfall and an open canopy allowed barnyardgrass to dominate the remaining plots. The residual PRE herbicides both years gave 80 to 100% control of the weeds present at 3 WAE, except for Dual Magnum at 1.27 lb ai/A for pitted morningglory and hemp sesbania, Valor at 0.064 lb ai/A for barnyardgrass, and Authority MTZ at 0.255 lb ai/A for barnyardgrass and broadleaf signalgrass (<80). Authority First at 0.173 lb ai/A and Valor XLT at 0.076 lb ai/A provided the most consistent control regardless of weed species a 3 WAE. Ignite alone did not provide full-season weed control either year. However, full-season barnyardgrass control was 84% in 2009, but only 50% in 2010 with the split application. A residual herbicide plus the second Ignite application improved soybean yield an average of 17%. Valor, Authority First, and Authority MTZ under a favorable rainfall pattern resulted in a 22 DAE Ignite treatment having equivalent yield to the split 22 and 44 DAE yield potential in 2009. In 2010 the timing of the Dual Magnum treatment was extremely important. Dual Magnum PRE fb a split application of Ignite 22 and 44 DAE yielded 38 bu/A while Dual Magnum PRE fb Ignite 22 DAE yielded 30 bu/A, Dual Magnum plus Ignite at 22 DAE yielded only 23 bu/A, and the Ignite split yielded 30 bu/A. The yield losses were due to weed interference and lack of initial and residual control. In summary Ignite offers excellent weed control but a residual PRE herbicide and a split application is required for full-season control.

AGRONOMIC PERFORMANCE OF COTTON VARIETIES TOLERANT TO GLUFOSINATE HERBICIDE. **L.T. Barber*, Univeristy of Arkansas Division of Agriculture, Little Rock; D.M. Dodds, Mississippi State University Extension Service; Mississippi State, C.L. Main, University of Tennessee, Jackson.**

ABSTRACT

Glufosinate (Ignite) is a non-selective herbicide used to control broadleaf and grass weed species in tolerant crops. Liberty Link crops including several cotton cultivars have been genetically transformed to contain the BAR and PAT genes which confer glufosinate tolerance. WideStrike cotton cultivars contain cry1Ac and cry1F genes that provide tolerance to certain lepidopteron pests. The WideStrike varieties also contain the PAT gene which was inserted as a selectable marker for the cry1Ac and cry1F transformations. Due to the presence of the PAT gene, WideStrike varieties also confer some tolerance to glufosinate herbicide. Research was conducted over five locations in Arkansas, Mississippi and Tennessee focusing on Widestrike cultivar tolerance to multiple applications of glufosinate herbicide. Widestrike varieties evaluated in the study include PHY 367 WRF, PHY 375 WRF, PHY 440 W, PHY 499 WRF and PHY 565 WRF. These varieties were compared to Liberty Link varieties including: FM 1735LLB2, FM 1773LLB2 and FM 1845LLB2. All varieties were subjected to two applications of glufosinate at 0.53 lb ai/A at the 1 to 3 leaf and 6 to 8 leaf cotton growth stage, and compared to untreated, weed free checks. Data recorded in this study included plant injury at 7, 14 and 28 days after each glufosinate application. Plant heights, number of main stem nodes and nodes above white flower were recorded as well. Node above cracked boll, first position fruit retention, lint yield, lint percent and fiber quality characteristics were measured at maturity. Analysis of the data indicate that the only significant herbicide by variety interactions occurred with plant injury 7 days after initial treatment, number of nodes 14 days after initial application and lint yield at harvest. Widestrike varieties displayed visual necrotic injury of 10 to 15 percent after the initial 0.53 lb ai/A application of glufosinate at the 2 leaf cotton stage. PHY 440 W displayed 3-5 percent higher injury than any of the other Widestrike varieties. Damage to Widestrike varieties was reduced to 5 to 10 percent by 14 days after the initial application. The second application of glufosinate did not injure the Widestrike varieties as much as the first. All varieties recovered visually by 28 days after the final application. Injury on all Liberty Link varieties was observed to be less than 2 percent. The number of main stem nodes was affected at 14 days after the initial glufosinate application where Widestrike varieties on average contained one less node than Liberty Link varieties. Lint yield of Liberty Link varieties was significantly lower than that of most Widestrike varieties evaluated with the exception of PHY 565 WRF which yielded equivalent to the Liberty Link varieties. PHY 375 WRF and PHY 499 WRF were the highest yielding varieties in the study reaching 1798lbs and 1895lbs lint/A respectively. However, PHY 375 WRF, PHY 367 WRF, PHY 440 WRF and PHY 499 WRF all recorded lint yields of 65 to 110 lbs lint/A less where two applications of glufosinate were made compared to the untreated check. Results from these data indicate that crop injury can be observed when Widestrike varieties are sprayed with glufosinate. Yields can also be reduced, especially in high yield environments. Environmental conditions and high levels of plant stress could increase potential injury and yield loss from glufosinate applications on any Widestrike variety.

WEED CONTROL PROGRAMS FOR CONTROLLING PALMER AMARANTH IN RR AND LL COTTON. **B. David Black*, Syngenta Crop Protection; Kenneth L. Smith, University of Arkansas, Monticello; Jason K. Norsworthy, University of Arkansas, Fayetteville.**

ABSTRACT

Researchers from University of Arkansas and Syngenta Crop Protection collaborated to develop weed control programs for control of glyphosate-resistant Palmer amaranth (*Amaranthus palmeri*) in cotton. Field trials were established at three locations in Arkansas to evaluate herbicide programs on both Roundup Ready Flex (glyphosate based) and Liberty Link (glufosinate based) cotton programs. Residual herbicides used in these trials (in selected combinations): fomesafen, S-metolachlor, fluometuron, prometryn, trifloxysulfuron, flumioxazin, rimsulfuron, thifensulfuron-methyl, pyrithiobac, and diuron. For Roundup Ready Flex trials conducted in southeast and northeast Arkansas, all of the herbicide programs provided 98 – 100% control of glyphosate-resistant Palmer amaranth. For the Roundup Ready Flex trial conducted in northwest Arkansas, the herbicide programs provided 30 - 85% control of glyphosate-resistant Palmer amaranth. For Liberty Link trials conducted in southeast and northeast Arkansas, all of the herbicide programs provided 99 – 100% Palmer amaranth control. For the Liberty Link trial conducted in northwest Arkansas, all herbicide programs provided 88 - 98% control of glyphosate-resistant Palmer amaranth. Results from these field trials show that glyphosate-resistant Palmer amaranth can be effectively controlled in cotton by utilizing residual and post herbicides that provide alternative and diverse modes of action.

INFLUENCE OF FLUMIOXAZIN APPLICATION TIMING ON COTTON EMERGENCE AND YIELD . **J. Ferrell*, University of Florida, Gainesville; B. Brecke, University of Florida, Milton; and W. Faircloth, USDA-ARS, Dawson, GA. .**

ABSTRACT

Flumioxazin is being increasingly utilized as a preplant burndown herbicide in cotton production. The pattern of flumioxazin use is 0.03 to 0.06 lb/A and must be applied 14 or 21 days prior to cotton planting, respectively. However, it is unknown whether cotton injury and subsequent yield reduction will be observed if flumioxazin is applied closer to planting. Therefore, experiments were established in Citra, FL, Jay, FL, and Dawson, GA in 2009 and 2010. Flumioxazin was applied at 0.03 and 0.06 lb/A in 2009 and 0.03, 0.06, and 0.09 lb/A in 2010. Applications were made 30, 20, 15, 10, 5 and 0 days before planting (DBP). Cotton emergence per 10' of row was counted at 2 and 3 weeks after planting (WAP), cotton height was measured at 4 and 6 WAP, and cotton yield was determined at end of season. For the Jay, FL location, no reductions in cotton stand, height, or yield was observed in either year. At the Citra, FL location, no reductions were observed in 2009. In 2010, cotton stand was reduced when flumioxazin was applied at 0.06 and 0.09 lb/A at 0 DBP. Cotton height was unaffected by these applications, but cotton yield was reduced when 0.09 lb/A was applied at 5 and 0 DBP. Flumioxazin applications in Dawson, GA were much more injurious than the other locations. Applications of 0.03 lb/A reduced cotton stand by 21, 35, and 58% when applied at 10, 5 and 0 DBP, respectively. Similarly, 0.06 lb/A reduced cotton stand by 58, 62, and 70% when applied at 10, 5 and 0 DBP, respectively. Cotton height was not affected by any application and cotton yield was somewhat erratic at this location. The differences in cotton emergence between the Florida and Georgia locations were likely due to rainfall. The Florida location received between 0 and 2 inches of rainfall within 0 to 5 days after planting, but between 0 and 0.8 inches within 5 to 10 days after planting, or during cotton emergence. Conversely, the Georgia location received 2.4 inches within 0 to 5 days and an additional 1.7 inches during 5 to 10 days after planting. It is likely that the increased rainfall at the Georgia location during cotton emergence resulted in greater cotton injury.

WHEAT RESPONSE TO PYROXSULAM WHEN TOPDRESSING NITROGEN AT DIFFERENT TIMINGS.

James R. Martin*, Charles R. Tutt, and Dorothy L. Call; University of Kentucky, Princeton.

ABSTRACT

Pyroxsulam is a relatively new Acetolactate Synthase Inhibitor (ALS) herbicide labeled for controlling certain weedy grasses and broadleaf weeds in wheat. It is similar to mesosulfuron in that it is an ALS inhibitor herbicide that requires a safener to limit the risk of wheat injury. Previous research has shown that formulations of mesosulfuron, with the safener, injured wheat when applied in the spring near the time of topdressing nitrogen fertilizer. Research was conducted during the spring of 2009 and 2010 to determine if wheat response to pyroxsulam is similar to that observed in earlier research with mesosulfuron. The commercial formulation of pyroxsulam, with the safener, was applied in a spray volume of 187 l/ha using 8003 flat fan tips in mid March at 18.3 g ai/A plus a nonionic surfactant at 0.5% v/v plus dry ammonium sulfate at 1.7 kg/ha. Each plot received a single application of liquid nitrogen (28%) fertilizer using TeeJet stream tips at 374 l/ha (134.5 kg of nitrogen/ha). The timing for topdressing nitrogen occurred over a period of 5 weeks at weekly intervals designated as -14, -7, 0, +7, and +14 days relative to timing of the pyroxsulam. Each nitrogen timing had a duplicate set of plots with one group receiving herbicide at day 0 and the other set of plots without herbicide. Discoloration was rated as a percent chlorosis during the first 6 weeks after pyroxsulam was applied. Stunting was based on differences in height of wheat plants treated with pyroxsulam relative to the non-treated check for each nitrogen timing. Height measurements were taken during the first 6 weeks after the herbicide was applied and at maturity. The injury symptoms associated with pyroxsulam were chlorosis and stunting of wheat plants and were consistent with those observed with mesosulfuron. Chlorosis ranged from 0 to 43% in the 2009 ratings and from 0 to 9% in the 2010 study. There were no meaningful trends in the amount of time for chlorosis to dissipate in the 2009 study; however, there were no chlorotic wheat plants beyond 3 weeks after pyroxsulam treatment in the 2010 study. The greatest level of stunting in the 2009 study occurred when pyroxsulam and nitrogen were applied the same day and persisted through maturity of wheat. Stunting due to pyroxsulam was also observed through maturity when nitrogen was topdressed 7 days prior to the herbicide. Stunting in the 2010 study tended to be greatest when nitrogen was topdressed 7 days after pyroxsulam, but dissipated by maturity. According to the statistical analysis, none of the treatments limited wheat yield. However there was a strong trend in lower yields when pyroxsulam was applied the same day as topdressing nitrogen relative to the yields for the other timings of topdressing nitrogen. In summary the response of wheat to pyroxsulam is similar to that of mesosulfuron when applying near the time of topdressing nitrogen fertilizer. The pyroxsulam product label cautions against making applications within 7 days of topdressing ammonium nitrogen fertilizer. The likelihood of pyroxsulam causing a significant reduction in wheat yield is minimal when following the herbicide label in regards to application timing relative to topdressing nitrogen fertilizer.

EFFECT OF SAFLUFENACIL ON THE ABSORPTION AND TRANSLOCATION OF 14C-GLYPHOSATE IN HORSEWEED (*CONYZA CANADENSIS*). **T. W. Eubank*, V. K. Nandula, D. R. Shaw, Mississippi State University, Stoneville; and K. N. Reddy, USDA-ARS, Stoneville, MS.**

ABSTRACT

Saflufenacil has shown potential as an alternative means for controlling glyphosate-resistant (GR) horseweed. Saflufenacil inhibits protoporphyrinogen oxidase activity with a peroxidative mode-of-action which results in rapid necrosis and wilting of leaf tissues. This may lead to the disruption of cell membranes, which in turn, may inhibit the uptake and translocation of other herbicides when applied in combination, such as glyphosate. The objectives of this study were to investigate interactions between saflufenacil and glyphosate mixtures on the control of horseweed, and to determine patterns of uptake and translocation of glyphosate applied alone and in combination with saflufenacil in horseweed. Greenhouse studies were conducted in 2009 to evaluate the addition of glyphosate to saflufenacil on the control of GR and glyphosate-susceptible (GS) horseweed. Horseweed plants were transplanted to 10 cm pots and grown in a greenhouse with natural light supplemented with sodium vapor lamps set to a 14 h photoperiod and day/night temperatures of 25/15 C (± 3 C). Herbicide treatments were initiated when plants uniformly reached 10- to 15-cm in diameter which corresponded to approximately 35 to 40 leaves per plant. Treatments were glyphosate at 0, 0.42, 0.84, and 1.68 kg ae ha^{-1}; saflufenacil at 0, 0.0125, 0.025 and 0.05 kg ai ha^{-1}. A nontreated control was also included for comparison. All treatments, including the nontreated, included an adjuvant system of 2% (w/v) AMS and 1% (v/v) COC. Visual control ratings for horseweed control were determined using a 0 to 100 scale (0, no control; 100, complete control) and were collected at 7, 14, and 21 days after treatment (DAT) as percent weed control. The method described by Colby et al. (1965) was used to calculate the expected response for herbicide combinations. Saflufenacil at all rates controlled both GS and GR populations at least 93% and 100% at 14 and 21 DAT, respectively and control of horseweed with the combination of saflufenacil + glyphosate was additive. Studies were conducted in 2009 to determine saflufenacil effects on absorption and translocation of glyphosate in the GR and GS populations. Trial treatments were initiated when horseweed plants uniformly reached 10- to 15-cm in diameter, which corresponded to approximately 35 to 40 leaves per plant. Prior to overspray the youngest, fully expanded leaf was covered with an 8 x 8 cm piece of aluminum foil to prevent contamination. A factorial arrangement of treatments was utilized with one factor being glyphosate at 0.4 kg ha^{-1} and the second factor being saflufenacil at 0 and 0.0125 kg ha^{-1}; and COC at 0 and 1% (v/v). Plants were oversprayed with their corresponding treatment to fully evaluate the deleterious effects saflufenacil had on whole plants. Within 30 min after application ten µL of the respective 14C-glyphosate solution, containing 5KBq was distributed in the form of 10 droplets on the adaxial surface of the previously foil-covered leaf. Treated plants were harvested at 24, 48 and 72 hours after treatment (HAT). Overall, GS horseweed absorbed 12 and 13% more 14C-glyphosate than GR horseweed at 24 and 48 hours after treatment (HAT), respectively. The addition of saflufenacil did reduce glyphosate absorption in GR horseweed by 7 and 13% at 24 and 72 HAT, respectively compared to GS horseweed. Generally, the addition of saflufenacil reduced 14C-glyphosate translocation in horseweed at least 6% in both populations; however, due to the exceptional efficacy of saflufenacil on horseweed these reductions did not reduce control.

ADDITION OF PHOTOSYSTEM II INHIBITORS TO PARAQUAT IMPROVES CONTROL OF ITALIAN RYEGRASS (*LOLIUM PERENNE* SSP *MULTIFLORUM*) . **T. W. Eubank*, J. A. Bond, V. K. Nandula, and R. C. Bond, Mississippi State University, Stoneville.**

ABSTRACT

Glyphosate-resistant (GR) Italian ryegrass (*Lolium perenne* ssp. *multiflorum*) continues to spread across Mississippi and has now been reported in Arkansas, Louisiana, and North Carolina. Italian ryegrass can cause significant problems for producers at planting and for subsequent crops. Spring-applied postemergence control options are very limited, especially once Italian ryegrass reaches anthesis. Paraquat has been utilized to control Italian ryegrass; however, due to capacious vegetative growth, herbicide coverage is often poor, and treated plants typically initiate regrowth shortly after treatment. The addition of Photosystem II (PSII) inhibitors, such as metribuzin, to paraquat has been shown to improve control of weeds. The objective of these studies was to determine if the addition of a PSII inhibiting herbicide to paraquat improved control of GR Italian ryegrass. Separate studies were conducted in 2010, near Stoneville, MS, on a naturally occurring population of GR Italian ryegrass. Italian ryegrass was treated on March 3, 2010 when plants were approximately 20 to 30 cm in height. Treatments were applied in 140 L ha^{-1} using an XR11002 flat fan nozzle at 234 kPa. All treatments included 1% v/v crop oil concentrate. Visual control ratings were taken at 7, 14 and 28 days after treatment (DAT). Both studies were repeated in space. The first study was a factorial arrangement of paraquat (0, 0.84 and 1.12 kg ai ha^{-1}) and metribuzin (0, 0.1, 0.2 and 0.4 kg ai ha^{-1}) rates. Results indicate that paraquat alone at 0.84 and 1.12 kg ha^{-1} controlled Italian ryegrass only 58 and 64%, respectively 28 DAT. The addition of metribuzin, regardless of rate, to paraquat improved control of Italian ryegrass over paraquat alone. The highest rate of paraquat plus the mid and high rates of metribuzin provided the greatest control of Italian ryegrass at 80 and 81%, respectively. Based on these findings, a second study was initiated to determine if other PSII inhibitors and/or combinations improved control of Italian ryegrass. In the second study, a factorial arrangement of treatments was utilized with paraquat rate (0, 0.84, 1.12 kg ha^{-1}) being the first factor and the second factor being a PSII herbicide (none, metribuzin at 0.36 kg ha-1, atrazine at 1.12 kg ai ha^{-1}, diuron at 0.9 kg ai ha^{-1}, metribuzin at 0.36 kg ha^{-1} plus chlorimuron at 0.06 kg ha^{-1}, and metribuzin at 0.36 kg ha^{-1} plus sulfentrazone at 0.24 kg ai ha^{-1}). Results indicated that paraquat alone at 0.84 and 1.12 kg ha^{-1} controlled Italian ryegrass only 60 and 65%, respectively 28 DAT. None of the PSII treatments, applied alone, controlled Italian ryegrass >0% 28 DAT except sulfentrazone plus metribuzin at 29%. All PSII herbicides improved control of Italian ryegrass over paraquat alone. Greatest Italian ryegrass control (84%) was observed with the addition of diuron to 1.12 kg ha^{-1} paraquat. These studies suggest the addition of a PSII inhibitor to paraquat can improve the control of larger Italian ryegrass plants as compared to paraquat alone.

IDENTIFICATION OF SSR MARKERS ASSOCIATED WITH SEED DORMANCY IN STRAWHULL AND BLACKHULL RED RICE. **T.M. Tseng*, N.R. Burgos, P. Chen, E.A.L. Alcober, V.K. Shivrain, University of Arkansas, Fayetteville.**

ABSTRACT

Dormancy is a trait that allows weedy red rice (*Oryza sativa* L.) to persist in rice production systems. Weedy and wild relatives of rice exhibit different levels of dormancy. This high variation in dormancy allows red rice to escape weed management tactics and increases the potential for flowering synchronization, and therefore gene flow, between weedy and cultivated rice. Arkansas red rice populations range from highly dormant (80-100% non-germinating seeds) to non-dormant (0-10% non-germinating seeds). Understanding the genetic controls of dormancy could help find means to circumvent this weedy trait for better red rice management. The objective of this study is to determine the genetic diversity and differentiation of representative dormant (D) and non-dormant (ND) red rice populations from Arkansas. Thirteen simple sequence repeat (SSR) markers, distributed across 4 chromosomes, were used to estimate the genetic diversity and divergence of D and ND red rice populations. These markers are reported to be closely linked to seed dormancy. Four populations were included in this study, dormant blackhull (DBH), dormant strawhull (DSH), non-dormant blackhull (NDBH), and non-dormant strawhull (NDSH). Each population consisted of 2 accessions collected from different fields, and two plants per accession were included. The SSR primers amplified up to 6 DNA fragments, 88-652 bp long. A total of 90 alleles with a mean value of 6.9 alleles per locus were detected. The overall genetic diversity was 0.61, indicating a high level of genetic variation among the accessions in these dormancy-related alleles. High genetic diversity was found within the D and ND population groups, with a value of 0.53 and 0.60, respectively, owing to the different biotypes within each group. Unweighted pair-group method (UPGMA) cluster analysis of the 16 accessions, based on Nei's genetic distance, showed two major clusters and five subclusters. Cluster I consisted of mostly blackhull (BH) accessions, except for one strawhull (SH) accession, whereas cluster II was comprised of all SH accessions. These two major clusters did not clearly separate into D and ND accessions, indicating that that not all markers were tightly linked to dormancy. However, the markers were able to differentiate among siblings of the same accession. About 75% of the D accessions had siblings separated into different subclusters, while siblings of all the ND accessions were grouped in the same cluster. This implies that D accessions are more genetically diverse than ND ones. These data reveal the evolutionary divergence of red rice populations with respect to dormancy. Markers associated with the dormant accessions maybe unique, and would be good candidates for follow-up studies on the control of dormancy gene expression in red rice.

INVERSION TILLAGE, HIGH RESIDUE COVERS, AND DIFFERENT HERBICIDE REGIMES FOR PALMER AMARANTH MANAGEMENT IN LIBERTY LINK COTTON. **Jatinder S. Aulakh*, Auburn University, Auburn, AL Andrew J. Price, USDA-ARS, Auburn, AL Stephen F. Enloe, Auburn University, Auburn, AL Michael G. Patterson, Auburn University, Auburn, AL .**

ABSTRACT

Glyphosate-resistant Palmer amaranth is adversely affecting cotton production in the Southeast US. A field experiment was established in fall 2008 at the E.V. Smith Research Center, Field Crops Unit near Shorter, AL, to investigate the role of inversion tillage, high residue cover crops, and different herbicide regimes for Palmer amaranth management in LibertyLink¢â cotton. The experimental design contained a split-split-split plot treatment restriction in a randomized complete block design with three replicates. The main plots consisted of tillage (inversion vs no inversion), the subplots were cover crops (winter fallow, crimson clover and cereal rye), and the sub-subplots were herbicide programs (No herbicide, preemergence herbicide (PRE) alone, postemergence (POST) alone and PRE + POST). The herbicide programs included; pendimethalin (0.92 kg a.i/ha) plus fomesafen (0.28 kg a.i/ha) as PRE; single application of glufosinate (0.42 kg a.i/ha) as POST and a combination of these as PRE+POST program. Dixie variety of crimson clover (25 lbs/acre) and elbond variety of winter rye (70 lbs/acre) were planted on November 20th and December A glufosinate- resistant cotton variety FM-1845 was planted on June 3rd and May 29th during 2009 and 2010, respectively. Data were collected on cover biomass, pigweed count and biomass and cotton yield. Palmer amaranth control ratings were taken at weekly interval after herbicide application. Data were analyzed using the GLIMMIX procedure and the LSMEANS PDIFF option to distinguish between treatment means. Inversion tillage without herbicide resulted in ¡Ã 80% Palmer amaranth control compared to no inversion and resulted in one and half time higher cotton yield. Results reveal that cover crop biomass differed between years; cover biomass was less during 2010 due to extremely cool weather. Surprisingly, clover produced the maximum biomass during both the years compared to rye and winter fallow. Cotton yield was also higher with cotton following clover cover. Among herbicide programs, significant interactions of inversion by herbicide and cover by herbicide programs were revealed. While PRE and PRE + POST treatments gave more than 95% control of Palmer amaranth, single POST application of glufosinate under no inversion did not control (20%) this weed compared to inversion tillage (95%). Among cover crops, again the PRE and PRE + POST herbicide programs gave similar control in all the cover crops; clover was more effective in Palmer amaranth suppression than rye and winter fallow when no herbicide was used. Averaging over the tillage system, the highest cotton yield was recorded with PRE + POST herbicide program followed by PRE and POST alone. Our research indicates that though soil inversion helps reduce Palmer amaranth density but a LibertyLink cotton variety , no inversion tillage, PRE + POST herbicide program will likely achieve ¡Ã 95 % control of Palmer amaranth while protecting conservation tillage.

EFFICACY AND TOLERANCE OF DRY-SEEDED RICE TO METHIOZOLIN. J.K. Norsworthy, D.B. Johnson, G.M. Griffith, C. Starkey, M.J. Wilson, and J. Devore.

ABSTRACT

Barnyardgrass has evolved resistance to four of the most commonly used modes of action in Arkansas rice. As a result, there is an urgent need for new herbicides having a unique mode of action, different from that of currently labeled products. An experiment was conducted in the greenhouse in the spring of 2010 and a separate experiment was conducted in the field to determine the potential for using methiozolin for weed control in rice. In the greenhouse, methiozolin applied PRE at 200 and 100 g ai/ha provided 92 and 98% control of propanil-resistant barnyardgrass at 2 weeks after treatment, without causing injury to rice. POST-applied methiozolin to one-leaf barnyardgrass was less effective, regardless of rate, causing only temporary termination of barnyardgrass growth and no injury to rice. In the field, rice and a single row of soybean planted perpendicular to the rice rows exhibited tolerance to PRE- and POST-applied methiozolin at 200, 500, and 1000 g/ha. PRE-applied methiozolin at 1000 g/ha controlled barnyardgrass 90% at 3 weeks after rice planting (WAP) whereas lower rates were ineffective. By 6 WAP, methiozolin at 1000 g/ha was no longer effective on barnyardgrass. POST-applied methiozolin at all rates was ineffective in controlling barnyardgrass, and both PRE- and POST-applied methiozolin failed to control broadleaf signalgrass and hemp sesbania.

REBELEX FOR BROADSPECTRUM WEED CONTROL IN SOUTHERN RICE. **V. B. Langston, A. T. Ellis, R. B. Lassiter, R. K. Mann, J. D. Siebert and L. L. Walton; Dow AgroSciences LLC, Indianapolis, IN.**

ABSTRACT

RebelEX™ is a pre-mixture of cyhalofop-butyl (Clincher®) + penoxsulam (Grasp®) and was launched in 2010 for use in Southern US rice for the postemergence control of broadleaf, aquatic, and grass weeds. Labeled rates for RebelEX are 16 to 20 fluid ounces of product per acre. In 2008 – 2010, RebelEX trials were conducted in the southern US rice belt using small plot research methods. Studies were conducted in both water- and direct-seeded rice programs. Results from these studies provided information on the crop safety, efficacy of weed control, and target application rates of RebelEX when applied POSTFLOOD (after the permanent flood was established). Control of barnyardgrass (Echinochloa crus-galli, ECHCG) with RebelEX was: 77% at 285 g ai/ha (16 fl oz/a), 83% at 320 g, and 84% at 356 g (20 fl oz/a). ECHCG control was slightly lower (71 to 83%) with Grasp and Clincher alone treatments at equivalent active ingredient rates. RebelEX at 284, 320, and 356 g/ha controlled sprangletop (Leptochloa sp., LEFSS) 69 to 79%, respectively. Control of LEFSS with Clincher® alone was 70 to 75%. Broadleaf weeds included alligatorweed (Alternanthera philoxeroides, ALRPH), hemp sesbania (Sesbania exaltata, SEBEX), northern jointvetch (Aeschynomene virginica, AESVI), and Texasweed (Caperonia palustris, CNPPA). When RebelEX was tank mixed with Newpath* or Beyond*, grass control with RebelEX alone was equivalent to RebelEX + Newpath or Beyond. Broadleaf weed control with RebelEX was equivalent to RebelEX + Newpath or Beyond, in some instances, significantly better than that observed with Newpath or Beyond when applied alone. Crop safety was excellent with all treatments. Overall, the efficacy of RebelEX was similar to or slightly better than the stand alone treatments of Clincher or Grasp®. ®™ Trademark of Dow AgroSciences LLC Always read and follow label directions. * Trademark of BASF

EFFECT OF PLANTING PATTERN ON SEQUENTIAL APPLICATION TIMINGS OF GLUFOSINATE IN GLUFOSINATE-RESISTANT SOYBEAN. **Daniel O. Stephenson, IV, Randall L. Landry, Sterling B. Blanche; Louisiana State University Agricultural Center, Alexandria.**

ABSTRACT

Research was conducted at the LSU AgCenter Dean Lee Research and Extension Center in Alexandria, LA in 2010. The objective was to determine if reducing the row spacing of glufosinate-resistant soybean would allow for delaying the sequential application of glufosinate. The experiment was a 4 x 5 factorial arranged in a randomized complete block design with four replications. Factor 1 consisted of 19-, 38-, single-row 97-, and twin-row 97-cm planting patterns. Factor 2 included glufosinate application timings; 0 days after emergence (DAE) (nontreated control), 10 DAE, 10 followed by (fb) 20 DAE, 10 fb 30 DAE, and 10 fb 40 DAE. All treatments, except the nontreated control, received a glufosinate application 10 DAE. Glufosinate was applied at 0.5 kg/ha in all applications. Weeds rated included barnyardgrass (*Echinochloa crus-galli*), browntop millet (*Urochloa ramosa*), goosegrass (*Eleusine indica*), Palmer amaranth (*Amaranthus palmeri*), entireleaf morningglory (*Ipomoea hederacea* var. *integriuscula*), hophornbeam copperleaf (*Acalypha ostryifolia*), and sicklepod (*Senna obtusifolia*). Weed control 42 d after sequential application timing, as well as soybean yield, are presented. Planting pattern had little influence on the control of barnyardgrass, browntop millet, and goosegrass. Data indicated glufosinate should be applied 10 DAE fb 20-30 DAE to achieve at least 85% control of all grass weeds. Without the sequential application of glufosinate, Palmer amaranth control with glufosinate was greatest when applied to single- and twin- 97-cm rows, which may be a function of coverage. As the sequential application timing was delayed, Palmer amaranth control decreased, with the 10 fb 20 DAE application timings providing greater than 90% control. Control of entireleaf morningglory, hophornbeam copperleaf, and sicklepod were similar, with all sequential application timings of glufosinate providing 95% control or greater. Soybean yield increased with decreasing row spacings with the 19- and 38-cm rows yielding at least 3.0 Mg/ha and both wide-row planting patterns yielding approximately 2.5 Mg/ha.

EVALUATION OF A HIGH-RESIDUE CULTIVATOR FOR PALMER AMARANTH CONTROL IN CONSERVATION-TILLAGE SYSTEMS. **Andrew J. Price*, Michael G. Patterson, C. Dale Monks, and Jessica A. Kelton; USDA-ARS Auburn, AL and Auburn University, Auburn, AL.**

ABSTRACT

Resistant Palmer amaranth control in conservation systems continues to challenge producers. Recommendations currently include sequential soil applied herbicides in an attempt to prevent Palmer amaranth emergence. However, in the event activation is inadequate, alternative postemergence control options are needed. An experiment was conducted evaluating a high-residue sweep cultivator in both conventional and conservation tillage systems in corn, cotton, and soybean. Preemergence herbicide treatments applied broadcast in corn or both broadcast and banded in cotton and soybean included: S-metolachlor at 1.12 kg/ ai/ha plus atrazine at 1.68 kg ai/ha in corn, flumioxazin applied at 0.07 kg/ai ha in soybean, and pendimethalin at 1.12 kg ai/ha plus fomesafen at 0.28 kg ai/ha in cotton. Glyphosate applied at 1.12 kg/ai ha was applied in all systems EPOST. Cultivation treatments included either rolling cultivator or sweep cultivators applied late POST. In corn, results indicate >90% Palmer amaranth when the sweep cultivator was utilized in combination with PRE herbicides, sicklepod was not controlled with either cultivator following PRE applications. In cotton, results indicate >90% Palmer amaranth, tall morningglory, or sicklepod between row control when the sweep cultivator was utilized in combination with PRE herbicides banded or broadcast. Palmer amaranth control utilizing cultivation in soybean was similar to control in cotton. Neither cultivation treatment alone provided adequate weed control in any crop. The sweep disturbed relatively little residue when utilized in a high-residue setting. Future research will compare weed control utilizing high-residue sweeps in various weed control systems augmenting control when soil applied herbicides utilized in controlling resistant Palmer amaranth fail due to lack of activation.

TEMBOTRIONE MIXES WITH COMMERCIAL ADJUVANT PACKAGES. **Gary Schwarzlose*, Dave Lamore, Matt Mahoney, John Cantwell and Jim Bloomberg; Bayer CropScience, Research Triangle Park, NC.**

ABSTRACT

Tembotrione is a highly active HPPD herbicide labeled for broad spectrum weed control on corn. Label recommendations require the addition of a methylated oil adjuvant and a nitrogen source in solution with 92 g ai/ha of tembotrione for acceptable weed control. Deposition aids are often added to help reduce the drift potential to sensitive crops. Distribution channel partners have requested approval of various oil based surfactants, deposition aids and nitrogen substitutes in tank mix with tembotrione. Based on the distribution recommendations, studies were established in 2009 and 2010 with University specialists and Bayer CropScience scientists to determine the effects of these products on the weed control provided by tembotrione.

EMERGENCE DATE AND CROP CANOPY EFFECTS ON SEED PRODUCTION OF BARNYARDGRASS (*ECHINOCLOA CRUS-GALLI*). **J.R. Meier, K.L. Smith, J.K. Norsworthy, J.A. Bullington, and R.C. Doherty; University of Arkansas, Fayetteville.**

ABSTRACT

Field experiments were conducted in 2010 to examine the effects of emergence date and canopy closure on seed production of barnyardgrass in soybean. Experiments were planted on May 19, 2010 in a Hebert silt loam soil with Progeny 5115 soybeans. In the first experiment, soybeans were drill-seeded at 75,000, 125,000, and 175,000 seed/acre and barnyardgrass was seeded weekly for six weeks following crop establishment. In the second experiment, single-row soybeans were planted on 38 inch beds at 140,000 seed/acre. Barnyardgrass was seeded 0, 9.5, and 19 inches from the center of the beds weekly for eight weeks following crop establishment. One barnyardgrass plant from each planting date was selected and five heads were each covered with a germination bag to collect seed. At soybean maturity, the total number of heads/plant was counted and the germination bags were collected. In the first experiment, barnyardgrass that was seeded one week after planting (WAP) produced more seed than plants from other seeding dates regardless of soybean seeding rate. Little or no barnyardgrass seed was produced past 1 WAP in all seeding rates. In the second experiment, barnyardgrass seeded 0 and 9.5 inches from the soybean row 1 WAP produced more seed than plants at other planting intervals. However, when barnyardgrass was seeded 19 inches from the soybean row, more seed were produced from plants seeded 0 WAP. Little or no barnyardgrass seed was produced past 1 WAP when seeded 0 or 9.5 inches from the soybean row, but barnyardgrass seeded 19 inches from the soybean row produced seed up to 3 WAP. In both experiments, barnyardgrass seed production decreased as time progressed and soybean canopy cover increased.

INFLUENCE OF APPLICATION TIMING ON PALMER AMARANTH CONTROL WITH HPPD-INHIBITING HERBICIDES IN COMBINATION WITH GLUFOSINATE AND WITH GLYPHOSATE.

C. Starkey*, J. K. Norsworthy, D. B. Johnson, P. Devkota. University of Arkansas, Fayetteville, AR..

ABSTRACT

An increase in occurrence of glyphosate-resistant Palmer amaranth (*Amaranthus palmeri*) and herbicide-resistant barnyardgrass (*Echinochloa crus-galli*) in the Midsouth has led to an increased need for alternative control methods. Combining effective modes of action during a cropping year is one resistance management strategy. Future release of transgenic crops will allow the use of HPPD-inhibitors over-the-top of both soybean and cotton. During the summer of 2010, a mixture of susceptible and glyphosate-resistant Palmer amaranth seed was planted on beds in 1-m-long rows. The experimental design was a 6 by 11 factorial with one untreated check and four replications. Following emergence, application rates of Balance Flexx (isoxaflutole at 6 fl oz/A), Laudis (tembotrione at 3 fl oz/A), and Roundup WeatherMax (glyphosate at 22 fl oz/A) along with two application rates of Ignite (glufosinate at 22 and 29 fl oz/A). Combinations of Balance Flexx and Laudis were applied alone and in combination with Roundup WeatherMax and with the two rates of Ignite. Herbicides were applied at 3, 9, 16, 24, 27, and 31 days after emergence to represent a wide array of weed sizes ranging from 2.5 cm to 100 cm. Visible-control ratings were taken approximately 7, 14, and 21 days after treatment. All herbicide treatments, except for Roundup WeatherMax alone and Roundup WeatherMax tank-mixed with Laudis, provided >90% control at one week after treatment when applied to 2.5- to 7.5- cm Palmer amaranth. As the weed size at application increased, all herbicides were less effective in controlling Palmer amaranth. Treating 15- to 25- cm Palmer amaranth with Laudis + either rate of Ignite controlled Palmer amaranth (>90%). Use of HPPD-inhibiting herbicides over-the-top of transgenic crops is a viable control option to offer an alternative mode of action for control of Palmer amaranth with weed size at application being strongly influential on control. HPPD-inhibiting herbicides with glyphosate or glufosinate will consistently and effectively control glyphosate-resistant Palmer amaranth as long as weeds are <7.5 cm at time of application.

GLYPHOSATE-RESISTANT ITALIAN RYEGRASS IN MISSISSIPPI: CURRENT STATUS FIVE YEARS AFTER CONFIRMATION. **Robin Bond* and Vijay Nandula, Mississippi State University, Delta Research and Extension Center, Stoneville, Mississippi.**

ABSTRACT

Italian ryegrass has become increasingly problematic for growers in the Mississippi Delta since 2005. Two Italian ryegrass populations from Mississippi, Tribbet (T) and Fratesi (F), were suspected to be tolerant to glyphosate. Both suspected resistant populations were screened for glyphosate resistance. A susceptible (S) population from Elizabeth, Mississippi (E) was included for comparison. Plants were treated with isoproylamine salt of glyphosate at 0, 0.11, 0.21, 0.42, 0.84, 1.68, 3.36, and 6.72 kg ae/ha. GR50 values for T, F, and E populations were 0.66, 0.66, and 0.22 kg/ha, respectively, indicating that the T and F populations were threefold more tolerant to glyphosate compared to the E population. Laboratory experiments were also conducted to characterize the mechanism of glyphosate tolerance in the two glyphosate resistant populations. The Tribbet population absorbed less of the applied 14C-glyphosate (43%) compared to the susceptible (E) population (59% of applied) at 48 h after treatment (HAT). The Fratesi population absorbed 56% of the applied 14C-glyphosate 48 HAT which was similar to both the T and E populations, but tended to be more comparable to the E population. The amount of 14C-glyphosate that remained in the treated leaf was significantly higher than the T (67% of absorbed) and F (65% of absorbed) populations compared to the E population (45% of absorbed) at 48 HAT. There were no differences in epicuticular wax mass among the three populations. Shikimate acid accumulated rapidly at higher levels in glyphosate-treated leaf segments of the S populations compared to the T population up to 100 µM glyphosate. However, above 500 µM glyphosate, the levels of shikimate were similar in both the T and E populations. No degradation of glyphosate to tolerance to glyphosate in the T population is partly due to reduced absorption and translocation of glyphosate and in the F population it is partly due to reduced translocation of glyphosate. Information regarding the influence of environmental factors of germination and emergence of glyphosate-resistant (GR) Tribbet Italian ryegrass population was needed to understand of the biology and ecology and to aid in management of this resistant weed species. Experiments were also conducted to determine the effects of temperature, light, pH, salt, and osmotic stress and planting depth on germination of T and glyphosate-susceptible Elizabeth Italian ryegrass populations. Overall, germination of both populations of Italian ryegrass was highest at 13° C and decreased when temperature increased to 20 or 27° C under both light and dark conditions. Light stimulated germination (57%) compared to darkness (41%) at 13° C, but light had no effect on germination at 20 and 27° C. The GR Italian ryegrass population had higher germination (69-87%) compared to the E Italian ryegrass population (37-57%) at pH range of 4-7. Seedling emergence was less than 7% from seed planted at 0.5 cm depth and no seedlings emerged from seed planted below 2.5 cm for both populations. Both populations germinated under a broad range of environmental conditions used in the study, however, the T populations was higher than the E population. A survey of GR Italian ryegrass was also conducted to document the distribution GR populations in Mississippi. Seed samples suspected to be resistant to glyphosate were collected from 17 counties in the Mississippi Delta region. Greenhouse studies were conducted to screen for resistance to glyphosate at 0.84 kg ae/ha. Among 100 Italian ryegrass populations, one-third was considered to be resistant to glyphosate with at least one resistant population in 12 counties. Additional greenhouse experiments were conducted to screen for resistance to preemergence and postemergence herbicides Preemergence herbicides screened included S-metolachlor, clomazone, trifluralin, and chlorimuron-ethyl plus tribenuron-methyl. Postemergence herbicides included diclofop, mesosulfuron, and pyroxsulam. There were one or more Italian ryegrass populations resistant to chlorimuron ethyl plus tribenuron methyl, diclofop, mesosulfuron, and pyroxsulam.

EFFECTS OF BROMOXYNIL PLUS PYRASULFATOLE WHEN APPLIED IN GRAIN SORGHUM.

R.E. Brandon*, B.W. Bean, and J.W. Robinson; Texas AgriLife Research, Amarillo.

ABSTRACT

Huskie, a combination of bromoxynil octanoate; 13.4%, and pyrasulfatole heptanoate; 12.9%, is labeled for post emergence control of broadleaf weeds in wheat, barley, oats, rye, and triticale. A two year study was initiated in 2009 to determine Palmer amaranth efficacy and grain sorghum (sorghum bicolor L.) phytotoxicity to Huskie. The objectives of the study were: 1) to determine the minimum rate of Huskie needed to control 76 mm. Palmer amaranth, 2) examine the effectiveness of Huskie to control Palmer amaranth at different growth stages (76, 230, 380 and 455 mm.) and 3) evaluate crop injury when applied at 4 leaf, 8 leaf and boot growth stages. Three trials were conducted to address these objectives. In the first study, Huskie rates of 0.13, 0.19, 0.24 and 0.30 kg ai/ha with or without (0.54 or 1.12 kg ai/ha) atrazine and dicamba (0.22 kg ai/ha) were applied to 76 mm Palmer amaranth. All applications were applied with ammonium sulfate. In the second trial, three rates of Huskie (0.19, 0.24, and 0.30 kg ai/ha) with the addition of atrazine (0.54 kg ai/ha) was examined when applied to Palmer amaranth at four growth stages (76, 230, 880 and 455 mm) . In the third trial crop injury was examined by making Huskie applications to weed-free plots. Treatments evaluated for crop injury were Huskie at 0.19, 0.24, and 0.30 kg ai/ha with and without 0.22 kg ai/ha dicamba. All treatments had 0.54 kg ai/ha atrazine. Plots were planted on six 762 mm raised beds 7620 mm long. A five row CO2 sprayer was calibrated at 94 liters per hectare with XR Teejet flatfan 11002 tips spaced762 mm apart. Weed control ratings were made 3, 7, 14, 28, and 52 days after each application. Yield was obtained at full crop physiological maturity. Data was analyzed using ANOVA at the 0.05 confidence level and means separated by LSD using Agriculture Research Manager Ver. 8 software. In 2010 when Huskie alone was applied to 76 mm Palmer amaranth, control was 93% or better, throughout the growing season. When applied with 0.54 Kg ai/ha atrazine, control was 100% 42 days after application. With all rates of Huskie, control was 90-93% when applied with 0.22 Kg ai/ha dicamba. Control increased to 95% or better 42 days after application. Results were similar in 2009 except the low rate of Huskie (0.13 kg ai/ha) alone resulted in only an 80% control throughout the growing season. When comparing Huskie efficacy applied to different weed growth stages, season long control was achieved for all weeds less than 230 mm in height. When Huskie was applied to 380 mm or 455 mm weeds, control was only 80-85% In both years of the study only minor leaf burn (<10%) was observed 3 days after application on 4 leaf sorghum. Sorghum had recovered when evaluated 14 days after application with no effect on grain yield. No significant crop injury was observed with any treatments applied at the 8 leaf stage. When applied at the boot stage, those treatments with 0.30 kg ai/ha Huskie plus 0.22 kg ai/ha dicamba reduced yield by as much as 30%. In 2009, Huskie with dicamba at all rates decreased yield when applied at boot stage. In conclusion, Huskie provided excellent control of small and large Palmer amaranth with only minor leaf burn injury to grain sorghum.

TOLERANCE OF WIDESTRIKE™ COTTON VARIETIES TO TOPICAL APPLICATIONS OF GLUFOSINATE. **D.M. Dodds, Mississippi State University, Mississippi State; L.T. Barber, University of Arkansas Division of Agriculture, Little Rock; G.D. Collins, University of Georgia, Tifton; C.L. Main, University of Tennessee, Jackson; J. Whitaker, University of Georgia, Statesboro; and N.W. Buehring, Mississippi State University, Verona.**

ABSTRACT

Cotton tolerant to glyphosate is planted on greater than 95% of the acreage in the Mid-South. However, as glyphosate-resistant weed species have emerged and spread throughout the Mid-South and Southeastern United States, growers are continually looking for ways to control these species. In particular, glyphosate-resistant Palmer amaranth has proven to be very problematic due to its competitiveness, rapid growth, prolific seed production, and ability to withstand difficult environmental conditions. One option for control of this, and other weed species, is glufosinate. Glufosinate tolerant cotton varieties are available; however, they are only planted on a small percentage of the acreage in the Mid-South and Southeast. Increasingly, growers in many areas are utilizing cotton varieties containing Widestrike™ technology as these varieties utilize the pat gene as a selectable marker for Widestrike™. The pat gene also confers some level of tolerance to glufosinate herbicide. Previous research indicates that glufosinate may cause visual injury to Widestrike™ cotton; however, yields were unaffected. This research was undertaken to determine the level of tolerance present in Widestrike™ cotton in comparison to Liberty Link® cotton. Studies were conducted at two locations in Starkville, MS; Jackson, TN, Chic, TN; Marianna, AR; and Plains, GA. Fibermax 'FM 1773LLB2' and Phytogen 'PHY 375 WRF' were planted at seeding rates determined by local standards. Plots consisted of two rows either 9 or 12 m in length. Glufosinate applications were made at 0.59, 1.19, 1.78, and 2.38 kg ai ha^{-1} either once or twice using a tractor-mounted compressed air sprayer or a CO_2 powered backpack sprayer. Applications were made to one- to three-leaf cotton and/or six- to eight-leaf cotton. Visual injury, growth and development, yield, and fiber quality data were collected. No application rate by number of application interactions were present; therefore, data were pooled over number of applications. Visual injury seven days after the one- to three-leaf application increased significantly as application rate increased. Application of 0.59 kg ai ha^{-1} resulted in ~15% visual injury whereas application of 2.38 kg ai ha^{-1} resulted in ~47% visual injury to 'PHY 375 WRF'. Less than 10% injury was observed at all application rates on 'FM 1773 LLB2'. Plant height was unaffected by glufosinate application for either variety; however, application rates beyond 1.19 kg ai ha^{-1} caused significant reductions in the number of plant nodes 14 days after the one- to three-leaf application. Cotton injury on 'PHY 375 WRF' seven days after the six- to eight-leaf application also increased as application rate increased. Approximately 6% injury was observed following the 0.59 kg ai ha^{-1} application compared to 30% visual injury following the 2.38 kg ai ha^{-1} application. Less than 3% injury was observed on 'FM 1773 LLB2' at all application rates. Plant height of 'FM 1773 LLB2' 14 days after the six- to eight-leaf application was unaffected by application rate. Plant height of 'PHY 375 WRF' was reduced at application rates beyond 1.19 kg ai ha^{-1}. Total plant nodes of either variety were unaffected by application rate of glufosinate. End of season plant height and nodes were also unaffected by glufosinate application rate. Application of glufosinate at rates beyond 1.19 kg ai ha^{-1} did increase nodes above cracked boll of 'PHY 375 WRF' indicating a delay in maturity. Application rate had no effect on maturity of 'FM 1773 LLB2'. Lint yield of 'FM 1773 LLB2' was unaffected by glufosinate application rate. Application rates beyond 1.19 kg ai ha^{-1} resulted in reduced lint yield of 'PHY 375 WRF'.

PUERTO RICO'S CONTRIBUTIONS TO THE DEVELOPMENT OF HERBICIDE-RESISTANT CROPS. **Andy Kendig*, Phil Rahn, Oscar Sparks, Tom Peters and Rey Rodriguez, Monsanto, St. Louis, MO.**

ABSTRACT

Producing seed for field evaluations is a major process for any crop breeder or seed company that is trying to commercialize new seeds and traits. In today's agricultural economy, speed and efficiency is critical for success. The quantity of seed needed demands that the few seeds produced from a cross, progeny row, or new transformation be multiplied in a highly controlled manner, in the shortest time possible, and be delivered in time for the spring planting season. In order to achieve this, a winter seed increase nursery, or counter-season nursery is used to advance generations, increase seed amounts, or finish any plant selection activities during the non-growing season before the intended field trials. The island of Puerto Rico is commonly used by major seed companies and crop breeders to accelerate the development of new crop varieties and traits for major agronomic crops. A brief survey identified 12 individual farms on the island representing many major seed and crop protection companies. Other warm-climate-counter-season areas include Hawaii, and several South-American countries. Puerto Rico's Southern area is especially good due to generally clear and warm weather. Temperatures vary little through the year. Ponce, Puerto Rico, on the South coast has an average high/low of 86/66 degrees Fahrenheit (F) in February and 91/73 F in August. Rainfall is influenced strongly by topography, and by the June through October tropical storm season. Some areas qualify as rain forests, while certain wild areas on the Southern side of the island become very dry with vegetation turning brown in the dry months. The island is influenced by consistent easterly trade winds. A common Puerto Rico crop cycle involves planting in November and harvesting in March. This 3 to 4 month growing period allows many crops to have three cycles per year to increase seed. Planting and harvest may be done at other times within Puerto Rico; however, scheduling usually avoids planting or harvest within the tropical storm season of June through October. In many cases, supplemental light is supplied to help with photoperiod-sensitive crops. While the climate provides for rapid crop growth, the actual seed transfer between the US and Puerto Rico typically adds four weeks (two weeks per transfer) to timelines. This process includes phytosanitary inspections and certification, fumigation, and import/export permits. The Puerto Rican climate also stimulates significant insect pressure. Corn, cotton and soybean nurseries typically receive multiple insecticide applications per week. Weed control is relatively straight forward. There are several unique weed species (although many are recognizable as taxonomic relatives to common US weeds). The availability of pesticides is slightly limited as compared to that of the continental US. Dry weather can limit the efficacy of soil-applied and post emergence herbicides, and mechanical weed control is practiced widely. The warm climate and summer storm season can also cause seed quality problems that have to be factored in to the production and harvesting processes. Nurseries can provide seed increases of 100- to 200-fold for corn and cotton and 50- to 100-fold increases for soybean. While nursery production is a core activity, the island provides an excellent environment for insect-control testing and herbicide-crop-response testing. However, due to the need for registrations in other countries, more research takes place in countries where data must be generated before commercialization.

MID-WINTER AGRICULTURAL RESEARCH IN PUERTO RICO. D. Sanders*, Louisiana State University AgCenter; Bob R. Jones, Idlewild Research Station; Clinton, LA.

ABSTRACT

Cooperative or individual agricultural research endeavors in Puerto Rico have been overlooked by most on the mainland as a way to “fast track” many agricultural ventures. Off-season testing has been a staple of pesticide researchers and plant breeders for nearly five decades. This has been almost exclusively the transfer of information between parallel programs in North America and South America (as far as the US is concerned). A great deal of this transfer of information could and can be accomplished simpler, quicker and cheaper utilizing the off-season resources available in Puerto Rico. In 1995, while working with the rice winter nursery in Lajas, a request was made to do a rapid winter time turn around on a potential rice herbicide. This request turned into a variety of projects successfully completed in the off-season in Puerto Rico. Fifteen years later we have conducted efficacy, injury and/or residue trials on rice, soybeans, corn, cotton, tobacco, sugarcane, strawberries, edible beans, grain sorghum, pumpkins, papaya and a few others. Most of this work has been conducted in the Lajas Valley in conjunction with the University of Puerto Rico Lajas Experiment Station. The pluses of conducting this work in Puerto Rico are: 1. Minimal paperwork: No visas, Overnight delivery UPS and FedEx, No seed quarantine except on a very few species, On sight USDA inspection upon request, No currency exchange. 2. Time: 45 flights into San Juan per day from mainland. Two hours from Miami, three and a half hours from Atlanta, two hours by car from one end of the island to the other, Overnight trips are easy still allowing 6-8 hours for project work. 3. Expense: $300 plane flights instead of $1200 flights, No customs fees, No need to maintain a research farm for cooperative projects. 4. Site diversity: UPR operates six branch stations (Lajas, Juana Diaz, Isabela, Adjuntas and Corozal) from tropical wet to arid. 5. Crop diversity: Can grow both temperate and tropical crops. 6. Pest diversity: Seventy-five percent of the weeds common to Lajas are common to Louisiana, Insect pressure is always constant (no dormant season), Disease pressure is constant (in wet areas, no dormant season) There are some minuses, cool season crops (wheat, barley, potatoes, etc area struggle to make to yield), there is no dormant season, so multiple insecticide and fungicide treatments are mandatory. Finally a great place to work in the winter.

IN-CROP WEED CONTROL AND CROP SAFETY IN COTTON AND SOYBEANS WITH WARRANT HERBICIDE. **L.M. Etheredge*, D.H. Williamson, L. Lloyd, J.B. Willis, S.W Murdock, P.G. Ratliff; Monsanto Company, St. Louis, MO.**

ABSTRACT

In 2010, several different locations across the Southeast, Mid-South, and Southwest were set up to evaluate MON 63410™(newly encapsulated acetochlor formulation) for crop safety and weed control in cotton and soybeans. The objectives of this research were to verify crop safety from one application timing (2-4 leaf crop stage) and to learn more about the residual capabilities on grasses and small seeded broadleaves, especially amaranthus species across several locations and environments. Another objective was to determine the best fit for this product in an overall weed control program that manages for resistance. In 2010, all trials were performed with MON 63410™, which is now known as Warrant™herbicide. Five different herbicide systems that are consistent with Herbicide Resistance Action Committee (HRAC) recommendations for using more residuals with multiple modes of action were evaluated. Results from these trials showed that weed control systems containing Warrant™herbicide, applied at the 2-4 leaf crop stage, were highly effective for controlling grasses and small seeded broadleaves, including amaranth species (90-100%). The use of residual herbicides, especially early in the system, reduced overall weed pressure throughout the season allowing timely and effective POST applications while minimizing early season weed competition. Minimal to no visual crop injury was reported from the 2-4 leaf applications. In locations where minimal injury was observed, cotton rebounded quickly resulting in no significant yield reductions. With the introduction of Warrant™herbicide, the row-crop industry will now have another viable, economical option for an over-the-top, in-crop application that will provide residual control of grasses and small seeded broadleaves, while adding another mode of action into the weed control program.

HERBICIDE PROGRAMS FOR MANAGING HERBICIDE-RESISTANT BARNYARDGRASS IN ARKANSAS RICE. **M.J. Wilson*, J.K. Norsworthy, D.B. Johnson, R.C. Scott, and C.E. Starkey; University of Arkansas, Fayetteville.**

ABSTRACT

Barnyardgrass is the most problematic weed in Arkansas rice production, causing yield reduction, lodging, and poor grain quality. It infests most of the Arkansas rice acreage and has biotypes resistant to Stam (propanil), Facet (quinclorac), Command (clomazone), and the acetolactate synthase (ALS)-inhibitors. Growers tend to use the same herbicide programs repeatedly year after year, which puts selection pressure on the population and results in resistant barnyardgrass biotypes. Although resistance management programs are now in effect to deter evolution of new resistant biotypes, effective herbicide programs are needed for control of existing resistant biotypes. Field studies were conducted at Lonoke and Pine Tree, AR, to develop herbicide programs for effective control of propanil-, quinclorac-, clomazone-, and ALS-resistant biotypes. Susceptible and resistant biotypes to propanil, quinclorac, clomazone, and ALS-inhibiting herbicides were planted perpendicular to the rice rows, and herbicides were applied at different times to determine best combinations for control of the resistant biotypes. Herbicide treatments included combinations of clomazone and quinclorac applied preemergence (PRE) followed by preflood (PREFLD) applications of propanil + thiobencarb + bispyribac or penoxsulam; delayed preemergence (DPRE) applications of pendimethalin + clomazone, quinclorac, or thiobencarb fb early postemergence (EPOST) applications of propanil + thiobencarb alone, in combination with clomazone, or clomazone + propanil with PREFLD applications of quinclorac + fenoxaprop and bispyribac or fenoxaprop + bispyribac alone. Over the course of the growing season, all herbicide programs effectively controlled the susceptible and resistant biotypes. Three or more herbicide applications per year are common in productions fields containing resistant barnyardgrass; however, this research shows that as few as two applications can provide season-long control of resistant barnyardgrass biotypes if herbicides are properly timed and appropriate tank mixtures are used.

BENCHMARK STUDY: FOUR YEARS LATER - GROWER PERCEPTIONS ON GLYPHOSATE RESISTANCE. **Wade A. Givens and David R. Shaw, Mississippi State University, Mississippi State; Stephen C. Weller, Purdue University, West Lafayette; Bryan G. Young, Southern Illinois University, Carbondale; Robert G. Wilson, University of Nebraska, Scotts Bluff; Micheal D.K. Owen, Iowa State University, Ames; David L. Jordan, North Carolina State University, Raleigh.**

ABSTRACT

A survey was conducted by phone to 1,195 growers in six states (Illinois, Indiana, Iowa, Mississippi, Nebraska, and North Carolina) during the winter of 2005-2006. The survey measured producers' cropping history, perception of glyphosate-resistant weeds, past and present weed pressure, tillage practices, and herbicide use as affected by the adoption of glyphosate-resistant (GR) crops. This survey was administered again during the winter of 2009-2010, and expanded to include 22 states total, including the 6 states from the previous survey. Date presented in this paper is from a group of 350 growers who participated in both surveys. This paper summarizes the change in grower perceptions of glyphosate-resistant weeds and glyphosate resistance management. Grower responses to the the question asking if they were aware to a weed's potential to develop resistance to glyphosate herbicide indicate that 74% of the growers were aware of this potential as compared to 26% from the earlier survey. The state with the largest increase in growers who were aware of the potential for resistance develpment was North Carolina with a 64% increase in growers who were aware of a weed's potential to develop resistance to glyphosate herbicide. Growers who reponded that they were aware of a weed's potential to develop resistance were then asked to rank how serious a problem resistant weeds were on a scale from 1-10 with 1=not serious to 10=very serious. Results show that growers in Illinois, Mississippi, North Carolina, and Nebraska ranked weed resistance as a more serious problem in the latest survey than in the previous survey. The largest change in results came from North Carolina growers who rated the problem of weed resistance an average of 8.3 versus of average rating of 3.4 from the earlier survey. Growers were next asked if they were aware of documented cases of glyphosate weed resistance in their state, over 80% of growers answered "yes", compared to less than 20% from the previous survey. Growers were also asked to list seven sources used for obtaining information about weed resistance to glyphosate herbicide. Results from the latest survey were similar to those from the previous survey with 29% listed farm publications, 16% listed dealers/resellers, 14% listed university/extension as the top three sources for obtaining information about weed resistance to glyphosate. Although this data is based on a small subset of growers, it is clear that grower perceptions on weed resistance to glyphosate are increasing. Results from the latest survey indicate that 74% of the subset of growers was aware of a weed's potential to develop resistance to glyphosate. This represents a 48% increase in awareness among these growers in over 4 years. Similar increases were reported concerning grower awareness to state specific cases of weed resistance and personal experience with glyphosate resistant weeds. Growers continued to listed farm publications, dealers/retailers, and university/extension as their 3 primary sources of information concerning weed resistance issues.

CONTROL OF HPPD-RESISTANT WATERHEMP IN CORN AND SOYBEAN. **Eric W. Palmer*, Nicholas D. Polge, Vinod K. Shivrain, Dave A. Thomas, Gordon D. Vail, and Charles L. Foresman, Syngenta Crop Protection, Greensboro, NC.**

ABSTRACT

In 2010, a waterhemp population [Amaranthus tuberculatus (Moq.) Sauer] from a continuous seed corn production field in McLean county, Illinois was confirmed resistant to three postemergence HPPD-inhibiting herbicides. Postemergence resistance was confirmed in both greenhouse and field trials. Other postemergence herbicides including glyphosate, glufosinate, fomesafen, and dicamba effectively controlled this IL waterhemp population. Additionally, mesotrione containing herbicides including Lumax® and Lexar® applied preemergence provided excellent control in field experiments. Relying solely on HPPD-inhibiting herbicides to control waterhemp for over seven growing seasons contributed to the development of this resistant waterhemp population. Corn production systems should include proactive measures and incorporate key resistance management strategies like using residual herbicides preemergence, using a two-pass (preemergence followed by postemergence) program, and using multiple modes-of-action to help manage waterhemp.

CONFIRMATION AND GREENHOUSE CHARACTERIZATION OF AN HPPD-INHIBITOR RESISTANT WATERHEMP ACCESSION FROM ILLINOIS. **Nicholas D. Polge*, Vinod K. Shivran, David A. Thomas, Charles L. Foresman, Albrecht Michel; Syngenta Crop Protection, Greensboro, NC.**

ABSTRACT

In 2009, a suspected HPPD-inhibitor resistant waterhemp *[Amaranthus tuberculatus* (Moq.) Sauer] population was reported from a field in McLean County, Illinois that had been used for continuous seed corn production for seven years. Seed was collected from plants that survived postemergence applications of tembotrione and mesotrione during the 2009 season and was used in greenhouse trials to evaluate the efficacy of postemergence applications of HPPD-inhibitor and other postemergence herbicides relative to a standard sensitive waterhemp accession (Azlin 1999). Herbicides were applied to 7.5 - 9 cm plants, and visual weed control was rated at 23 DAA. Full label rates of Callisto® (mesotrione), Impact® (topramezone) and Laudis® (tembotrione) provided 99-100% control of the Azlin accession, compared to 72, 87 and 75% control, respectively, of the McLean County accession. Also, 4x rates of all HPPD-inhibitors evaluated did not provide acceptable control of the McLean County accession. Analysis of dose response curves of Callisto® activity over 1/16 to 4x use rate provided ED75 values of 6.6 and 97g ai/ha for Azlin and McLean County accessions, respectively, and an estimated resistance ratio of 15x. Both waterhemp accessions were fully controlled by recommended use rates of glyphosate, glufosinate, fomesafen and dicamba, but activity of nicosulfuron was significantly reduced on the McLean County accession indicating resistance to ALS-inhibitor herbicides. In a separate study, waterhemp seedlings were collected in 2010 from field locations each of the following distances: 1.6, 3.2, 8, and 16 km, in each of the following directions: to the northeast, northwest and south of the original McLean County site. Such collected seedlings were screened in the greenhouse for response to mesotrione. Callisto® at 105g ai/ha provided 90% or greater control of 4-7.5 cm height seedlings from all locations with the exception of the 1.6 km south location where individual plants showed reduced susceptibility to mesotrione similar to plants collected from the original McLean County site.

DEVELOPMENT OF AN EARLY SURFACTANT SCREENING PROCESS USING SHIKIMIC ACID ANALYSIS. **C.A. Massey*, D.R. Shaw, J.A. Huff, J.W. Weirich; Mississippi State University, Mississippi State, MS.**

ABSTRACT

Since generic glyphosate products have become available, the market has become very competitive and many different surfactant systems accompany these products to the marketplace. Traditional surfactant selection processes are extremely costly and time consuming. Studies were conducted to develop a simple, high-throughput screening procedure to compare relative surfactant effectiveness. Field efficacy screens were conducted to compare 18 surfactant/glyphosate combinations and three pre-formulated glyphosate products. Applications were put over the top of glyphosate-tolerant soybean [*Glycine max* (L.) Merr.] at 0.88 kg ae ha at the V6-V8 stage. Visual control was evaluated 7, 14 and 21 days after treatment (DAT). Pre-formulated products (Roundup Weathermax, Touchdown) controlled barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.] better than surfactant/glyphosate combination HAI1022-2, 7 DAT. All treatments reached a minimum of 93% control of barnyardgrass 21 DAT. The second experiment was conducted to determine the optimum glyphosate rate and sampling procedure for shikimic acid analysis on soybean. Non-glyphosate tolerant soybean were planted and maintained in the greenhouse. A series of rates ranging from 0.11-0.88 kg ae ha were used to magnify the degree of sensitivity to glyphosate. 3, 6, 9 or 12 leaf discs were collected from the third trifoliate of each plant 24, 48 or 72 hours after treatment (HAT). Shikimic acid concentration was determined using a spectrophotometer. Glyphosate rate 0.66 kg ae ha and nine leaf discs harvested 72 hours after treatment HAT produced the maximum separation between treatments. Greenhouse correlation experiments were conducted to determine if shikimic acid analysis can effectively be utilized as an early screening technique for surfactant effectiveness. Non-glyphosate tolerant soybean was grown and maintained exactly as rate titration/sampling procedure experiment. Treatments consisted of the same surfactant/glyphosate combinations and pre-formulated products as field efficacy screen. Applications were made at 0.66 kg ae ha and collection method of 9 discs 72 HAT was utilized as indicated by titration/sampling procedure experiment. Visual control data from efficacy screen and shikimate concentrations from greenhouse correlation were then analyzed; a model was developed to determine percent control of each treatment in relation to shikimic acid concentration.

RESIDUAL CONTROL OF *AMARANTHUS* AND OTHER KEY WEEDS IN CORN AND SOYBEAN WITH PYROXASULFONE. **J. Harden*, W. Thomas, R.C. Bond, S. Bowe, R. Liebl; BASF Corporation, Research Triangle Park, NC; Y. Yamaji, H. Honda; Kumiai America, White Plains, NY; T. Ambe, Kumiai Chemical Industry, Tokyo, Japan.**

ABSTRACT

Pyroxasulfone is a selective herbicide under development for residual control of grass and small seeded broadleaf weeds in conventional and herbicide-tolerant corn and soybean production. Field research trials have been conducted across the US to evaluate weed control and crop safety from various application timings including fall, early preplant, preplant, preemergence and postemergence. Rate ranges of pyroxasulfone have been tested for various soil types and application timings; with tested rate ranges being 94 to 157, 125 to 188, and 157 to 220 g ai/ha on coarse, medium, and fine textured soils, respectively. Combined with flexible application timings and length of residual weed control, studies indicate that pyroxasulfone will provide an effective solution for many problematic weeds including *Setaria spp*. and glyphosate-resistant *Amaranthus spp*. Similar to other K_3 herbicides, pyroxasulfone may not provide complete control of some weeds such as common lambsquarter (*Chenopodium album*) and giant ragweed (*Ambrosia trifida*). Thus, our research indicates that a tank-mix partner or sequential herbicide system may be required to provide adequate control. Negligible corn and soybean injury has been observed from pyroxasulfone, regardless of application timing. These field trials show that pyroxasulfone provides a flexible management tool that consistently controls numerous grasses and small-seeded broadleaf weeds. Registration is anticipated in 2011.

MANAGEMENT OF ITALIAN RYEGRASS WITH PYROXASULFONE IN WINTER WHEAT. **C.R. Bond*, S. Tan, S. Bowe, R. Liebl; BASF Corporation, Research Triangle Park, NC; Y. Yamaji, H. Honda; Kumiai America, White Plains, NY; T. Ambe, Kumiai Chemical Industry, Tokyo, Japan.**

ABSTRACT

Pyroxasulfone is a new selective herbicide under development for residual control of grass and broadleaf weeds in wheat production. Field research trials have been conducted across the USA from 2005 to 2009 to evaluate Italian ryegrass control and wheat safety from different application timings including preplant, preemergence, and postemergence. Rates range of pyroxasulfone from 25 to 250 g ai/ha have been tested for different application timings. Studies indicate that pyroxasulfone provides excellent control of Italian ryegrass and some other winter annual weeds with flexible application timing and long-lasting efficacy. No or little crop response was observed from most of the weed-free trials. These field trials show that pyroxasulfone can be an effective management tool for Italian ryegrass and other grass and broadleaf weeds in winter wheat.

SOYBEAN RESPONSE TO DICAMBA SIMULATED DRIFT AT VEGETATIVE AND REPRODUCTIVE GROWTH STAGES. **Matthew J. Bauerle*, James L. Griffin, Daniel O. Stephenson, Donnie K. Miller, and Joey M. Boudreaux; LSU AgCenter, Baton Rouge, LA.**

ABSTRACT

Field studies were conducted over three years and at three locations in Louisiana to evaluate soybean growth and yield response to postemergence application of dicamba. Clarity (dicamba) was applied to soybean at V3-V4 at 8, 4, 2, 1, 0.5, 0.25, and 0.125 oz/A (50 to 0.78% of the labeled use rate). In a separate study, soybean at R1 was treated with Clarity at 2, 1, 0.5, 0.25, 0.125, 0.063, and 0.031 oz/A (12.5 to 0.20% of the labeled use rate). In both studies a nontreated control was included for comparison and a randomized complete block experimental design with four replications was used. Treatments in both studies were applied in 15 gallons per acre spray volume. Parameters measured were visual crop injury 7 to 10 and 14 to 21 d after treatment (DAT); mid-season plant height and crop canopy width; mature plant height; and soybean yield. For each of the parameters measured, data were averaged across experiments. For the V3-V4 application, soybean injury 7 to 10 DAT was 90% at 8 oz/A Clarity and injury decreased in a stepwise progression as rate decreased; injury was 18% at 0.125 oz/A. At 14 to 21 DAT, soybean injury for the V3-V4 application was 97% at 8 oz/A and 36% at 0.125 oz/A. For the R1 application, injury 7 to 10 DAT was 65% at 2 oz/A Clarity and injury decreased in a stepwise progression as rate decreased; injury was 16% at 0.031 oz/A. At 14 to 21 DAT, soybean injury for the R1 application was 67% at 2 oz/A and 19% at 0.031 oz/A. Injury ranged from cupping and crinkling of uppermost leaves to plants turned down with growing points near the soil surface. At higher rates stem swelling and cracking were observed. For the V3-V4 application, mid-season soybean height compared with the nontreated was reduced 85% at 8 oz/A Clarity and 14% at 0.125 oz/A. Mid-season height following the R1 application was reduced 56% at 2 oz/A and 21% at 0.031 oz/A. For the V3-V4 application mid-season soybean canopy width compared with the nontreated was reduced 83% at 8 oz/A Clarity and 9% at 0.125 oz/A. Mid-season canopy width following the R1 application was reduced 42% at 2 oz/A and 13% at 0.031 oz/A. For the V3-V4 application mature soybean height compared with the nontreated was reduced 71% at 8 oz/A Clarity and 6% at 0.125 oz/A. Mature height following the R1 application was reduced 57% at 2 oz/A and 26% at 0.031 oz/A. Soybean yield compared with the nontreated for the V3-V4 application was reduced 92% at 8 oz/A Clarity and 8% at 0.25 oz/A. When Clarity was applied at 0.125 oz/A, soybean yield was equivalent to the nontreated (46.6 Bu/A). For the R1 application, soybean yield was reduced 79% at 2 oz/A and 17% at 0.031 oz/A. When Clarity was applied at 0.25 oz/A (1.56% of the use rate and which can be expected with herbicide drift), soybean yield was reduced 8% with Clarity applied at V3-V4 and 43% when applied at R1. Based on previous research conducted with glyphosate, percentage yield reduction in corn, rice, and wheat at 1.56% of the use rate was about the same as that observed in the present study for the 1.56% rate of Clarity applied to soybean at V3-V4. However, when Clarity was applied at R1 at 1.56% of the use rate, percentage yield reduction in soybean was as much as three times higher compared with that observed previously for grass crops treated with glyphosate at the same percentage rate.

A FIVE-YEAR PERSPECTIVE ON THE BENCHMARK STUDY FOR GROWER ATTITUDES REGARDING GLYPHOSATE RESISTANCE. **J. M. Prince*, D. R. Shaw, W. A. Givens, Mississippi State University, Mississippi State; S. C. Weller, Purdue University, West Lafayette, IN; B. G. Young, Southern Illinois University, Carbondale; R. G. Wilson, University of Nebraska, Scottsbluff; M. D. K. Owen, Iowa State University, Ames; and D. Jordan, North Carolina State University, Raleigh..**

ABSTRACT

A 2010 grower survey was administered to almost 1300 growers in 22 states, with an additional 350 growers who had participated in a 2005 Benchmark Survey. Growers were asked to report any changes to their weed management programs in the previous three years. They were also asked if they had made specific changes in weed management to address issues of glyphosate resistance, and if so, why these changes had been made. The majority of growers had not made changes to weed management plans in the previous three years; however, 75% reported using weed management practices targeted at GR weeds. Growers were asked to rate their efforts at controlling GR weeds. Growers were also asked to rate the effectiveness of various practices for controlling/preventing glyphosate-resistant (GR) weeds whether they were personally using them or not. Using the herbicide label rate, scouting fields, and rotating crops were among the practices considered most effective at helping managing GR weeds. Sixty-seven percent of growers stated they had been effective at controlling GR weeds. When compared with the answers of participants of the 2005 Benchmark Survey, a significant increase was noted in the percentage of those growers employing specific actions to manage GR weeds. The relative effectiveness of methods remained the same, but the effectiveness rating of tillage and the use of post-applied and residual herbicides increased. However, the perception and adoption of these practices is still not at the level research and industry would determine to be sufficient.

PERFORMANCE OF HERBICIDE TOLERANT SORGHUM SYSTEMS IN TEXAS. **P.A. Baumann*, B.W. Bean, D.D. Fromme, T.A. Baughman, and J.W. Keeling, Texas AgriLife Extension and Research, College Station, Amarillo, Corpus Christi, Vernon and Lubbock; P.A. Dotray Texas AgriLife Extension and Research, Texas Tech University, Lubbock; E.P. Castner and R. Rupp, Dupont, Weatherford, TX, and Edmund, OK.**

ABSTRACT

During the 2010 growing season, several weed management systems were employed in grain sorghum crops resistant to the ALS inhibitor herbicides and the "FOP" herbicide quizalofop (Assure II). These studies were conducted at seven sites, each located within grain sorghum production areas of Texas. This abstract and presentation contains only highlights of these studies that are supported by the results. Readers are encouraged to contact the authors for more detailed information regarding individual studies. All studies were conducted employing traditional field plot techniques that included 4 replications of each treatment arranged in an RCB design. Applications were made with CO2 pressurized backpack or tractor mounted sprayers. Plot sizes were four rows by 25 to 30 ft. The ALS herbicides examined were nicosulfuron (Accent), rimsulfuron and/or metsulfuron (Ally), applied alone or in PRE or POST combinations with atrazine, dicamba (Clarity), metolachlor + atrazine (Cinch ATZ), pyrasulfotole + bromoxynil octanoate + bromoxynil heptanoate (Huskie) and saflufenacil (Sharpen). In seperate studies, quizalofop (Assure II) was examined alone or in PRE or POST combinations with 2,4-D, carfentrazone (Aim) and all of the above herbicides listed for the ALS studies, except rimsulfuron and metsulfuron. Accent provided highly effective control of johnsongrass (Sorghum halepense) at rates of 0.66 oz./A alone or in combination with other herbicides at the Thrall location. At Muleshoe, Accent applied alone at 1.0 oz/A or in combination with metsulfuron or rimsulfuron, provided significantly better control than the 0.66 oz./A rate of Accent. Johnsongrass control at Bushland was excellent (>90%) from all treatments of Accent applied alone or in combinations. Palmer amaranth control (Amaranthus palmeri) control at Lubbock from all applications of Accent + rimsulfuron or metsulfuron exceeded 90%. For devils claw (Proboscidea louisianica) control, combinations of Accent with either Clarity or atrazine were required to provide equivalent control. In the ACCase herbicide tolerant sorghum studies, Johnsongrass control from Assure II at rates equal to 8 oz./A or greater, alone or in combinations, exceeded 90% at Thrall. At the Lubbock site, these treatments provided equal control (>90%) of johnsongrass and barnyardgrass (Echinochloa crus-galli), with no antagonism evident from the combination treatements. Assure II efficacy on Texas panicum (Panicum texanum) at Corpus Christi was significantly enhanced (>10%) by a POST combination with atrazine or when following a PRE application of Cinch ATZ. Control from these treatments exceeded 90% 29 DAT. At the Lubbock location, only Assure II (10 oz./A) plus Ally (0.1 oz/A) and 2,4-D (8.4 oz./A) provided excellent control of Palmer amaranth, devils claw, and silverleaf nightshade (Solanum eleagnifolium). At the Lockett location, excellent southern crabgrass (Digitaria ciliaris) control was achieved from Assure II rates of 8 oz./A alone or in combination with Aim (1.0 oz./A). Significant antagonism was noted when Assure II was combined in a POST application with atrazine. The grassy weed control provided in these studies is a significant improvement over current programs employed in non herbicide tolerant sorghum. In addition, most combinations were not antagonistic to grass control and provided excellent control of labeled broadleaf species.

EFFECTS OF AMS SUBSTITUTES ON NEWPATH. **J. Caleb Fish*, Eric P. Webster, Justin B. Hensley, Nathanael D. Fickett, Louisiana State University Agricultural Center, Baton Rouge.**

ABSTRACT

Clearfield rice was developed at the Louisiana State University Agricultural Center Rice Research Station near Crowley, Louisiana. It is a non-genetically modified rice that allows the use of herbicides in the imidazolinone family to control red rice and other difficult to control weeds without an adverse impact on the crop. Newpath, imazethapyr, is used in conjunction with Clearfield rice to control red rice and other weeds. AMS is a water conditioner that is used to lower the pH of water by binding to hard water ions of Na, Ca, Mg, and Fe. Choice and Quest are liquid based sprayable AMS substitute adjuvants. This study was established to evaluate the potential impact of these AMS substitutes on the activity of Newpath. CL 131 was drill seeded on April 6, 2010. Treatments included Newpath at 4 oz/A applied at early postemergence (EPOST) followed by (fb) Newpath at 4 oz/A late POST (LPOST). At each timing Choice at 8 oz/A or Quest at 4.8 oz/A was added to both timings of Newpath. Each herbicide treatment was mixed and allowed to stay in solution for 0, 3, 6, 12, and 24 hours after mixing. Solution pH values were taken at mixing, prior to application and immediately after application. A standard treatment of Newpath EPOST fb Newpath LPOST without AMS at 4 oz/A and a nontreated were added for comparison. A COC at 1% v/v was added to each application. Water from the same source was used throughout mixing. Control of red rice (*Oryza sativa* L.), eclipta (*Eclipta prostrata* L.), yellow nutsedge (*Cyperus esculentus* L.), broadleaf signalgrass [*Urochloa platyphylla* (Munro ex C. Wright) R.D. Webster], and barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.] was visually evaluated at 7, 18, and 35 days after treatment (DAT) on a scale of 0 to 100%, where 0 equals no control and 100 equals complete plant death. At 7 DAT, red rice control was 80 to 88% for all treatments except for the standard treatment. At 18 and 35 DAT, red rice control was above 90% for all treatments. This indicates that the addition of AMS to Newpath did not improve red rice control over the standard treatment. Barnyardgrass, broadleaf signalgrass, and yellow nutsedge control for all ratings was above 90%, except for the 6 and 12 hour premix of the standard treatment for broadleaf signalgrass which was 89 and 84 respectively. At 7 DAT, eclipta control was 80 to 84%, except for the at 6 and 12 hours premix for the standard treatment which was 73 and 79% respectively. The addition of an AMS substitute to Newpath did not increase or decrease the control of red rice, barnyardgrass, broadleaf signalgrass, and yellow nutsedge over the standard treatment. However control of eclipta decreased when the standard treatment was allowed to sit for 6 hours prior to application compared with all other treatments. Producers should add these adjuvants only after their individual water source has been evaluated.

ALS HERBICIDES ON CLEARFIELD RICE. Eric P. Webster*, Justin B. Hensley, J. Caleb Fish, and Nathanael D. Fickett, Louisiana State University, Baton Rouge.

ABSTRACT

Studies were established at the Louisiana State University Agricultural Center Rice Research Station near Crowley to evaluate several herbicides which inhibit the acetolactate synthase (ALS) enzyme on imidazolinone resistant Clearfield rice. In the first study, Clearfield 'CL 151' was used as the target crop and in the second study Clearfield hybrid 'CLXL 745' was the target crop for applications of the different ALS herbicides. The herbicides used belonged to the imidazolinone, sulfonylurea, pyrimidinylthiobenzoic acid, and sulfonanilide herbicide families. The herbicide program consisted of imazethapyr at 105 g ai/ha plus clomazone at 340 g ai/ha applied at rice emergence. A second postemergence (POST) application was applied 14 days later. The second application consisted of one of the other ALS herbicides evaluated. The imidazolinone herbicides evaluated were 140 g ai/ha imazapic, 210 g ai/ha imazapyr, and 275 g ai/ha imazaquin. The sulfonylurea herbicides evaluated were 17 g ai/ha chlorimuron, 35 g ai/ha chlorsulfuron, 84 g ai/ha metsulfuron, 68 g ai/ha nicosulfuron, 80 g ai/ha primisulfuron, 35 g ai/ha rimsulfuron, 131 g ai/ha sulfosulfuron, 23 g ai/ha thifensulfuron, 53 g ai/ha tribenuron, and 16 g ai/ha trifloxysulfuron. The pyrimidinylthiobenzoic acid was 106 g ai/ha pyrithiobac, and the sulfonanilide herbicides evaluated were 35 g ai/ha cloransulam and 14 g ai/ha flumetsulam. The comparison treatment consisted of 2 POST applications of imazethapyr at 105 g/ha. A crop oil concentrate was added to all POST applications at 1% v/v. Crop response was visually estimated at 10 and 48 days after the second POST application (DAP) on a scale from 0 to 100%, where 0 = no control and 100 = complete plant death. Rice height was recorded at 15 DAP and immediately prior to harvest. Height measurements were taken from four plants per plot from the ground to the tip of the extended leaf or extended panicle. The center 0.75 by 6 m area of each plot was harvested on August 23, 2010 using a mechanical plot harvester. Rough rice yield was adjusted to 12% moisture. In the study planted with CL 151, crop injury increased when treated with chlorimuron, chlorsulfuron, metsulfuron, primisulfuron, rimsulfuron, sulfosulfuron, and trifloxysulfuron compared with the standard imazethapyr program at 10 DAP. CL 151 treated with rimsulfuron resulted in 65% rice injury. At 48 DAP, the same herbicides continued to have high injury ratings with little to no recovery observed. Rice treated with metsulfuron and rimsulfuron resulted in injury above 80%, and this was primarily due to height and stand reduction. Rice treated with trifloxysulfuron resulted in an increased rice yield and when treated with metsulfuron or rimsulfuron yield decreased compared with the standard program. In the study planted with CLXL 745, crop injury increased when treated with chlorimuron, nicosulfuron, primisulfuron, rimsulfuron, sulfosulfuron, and trifloxysulfuron compared with the standard imazethapyr program at 10 DAP. CLXL 745 treated with rimsulfuron resulted in 58% rice injury. At 48 DAP, rice treated with metsulfuron, primisulfuron, and rimsulfuron resulted in injury above 80%, and this was primarily due to height and stand reduction. Rice treated with metsulfuron, primisulfuron, or rimsulfuron had a decreased yield compared with the standard program. These results indicate that herbicides in the sulfonylurea family tend to be more injurious to CL 151 and CLXL 745 than imidazolinones, pyrimidinylthiobenzoic acid, and sulfonanilide herbicides. Several herbicides other than imidazolinones with ALS activity may have potential use in a Clearfield system.

HERBICIDE-MIXTURES THAT SYNERGIZE IMAZETHAPYR. **Nathanael D. Fickett*, Eric P. Webster, Tyler P. Carlson, Justin B. Hensley, J. Caleb Fish, Louisiana State University Agriculture Center, Baton Rouge.**

ABSTRACT

In 2009, a study was conducted on a Crowley silt loam soil at the LSU AgCenter Rice Research Station near Crowley, Louisiana to evaluate the weed control of Newpath (imazethapyr) with various propanil formulations. Clearfield rice was planted and treated with Newpath early postemergence (EPOST) followed by late postemergence (LPOST) at 4 oz/A. Propanil was added at 3 lb ai/A to either the EPOST or LPOST treatments. Among the various propanil formulations, control of red rice (*Oryza sativa* L.), rice yield, and net returns increased from 22 to 38%, 1300 to 2650 lb/A, and 29 to 71%, respectively, when propanil was added EPOST, and from 9 to 29%, 650 to 1600 lb/A, and 11 to 42%, respectively, when propanil was added LPOST. In 2010, RiceBeaux (propanil plus thiobencarb) was evaluated for the potential synergistic effects on Newpath. The study was conducted at the same location as previously described. Treatments consisted of an EPOST application of Newpath at 1, 2, or 4 oz/A, with and without the addition of RiceBeaux at 2.5 qt/A followed by (fb) Newpath at 6 oz/A LPOST. RiceBeaux at 2.5 qt/A fb Newpath LPOST, and a nontreated were added for comparison. The control of red rice, broadleaf signalgrass [*Brachiaria platyphylla* (Munro ex Wright) R.D. Webster], barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.], yellow nutsedge (*Cyperus esculentus* L.), and Indian jointvetch (*Aeschynomene indica* L.) were visually evaluated at 0 to 100%, where 0% equals no control, and 100% equals complete plant death. Ratings were taken at 14 and 35 days after (DA) EPOST and LPOST applications, respectively. Data were evaluated using Tukey's HSD test. The addition of RiceBeaux to Newpath increased the control of red rice, broadleaf signalgrass, and barnyardgrass compared with Newpath fb Newpath when Newpath was applied at 2 and 4 oz/A at 14 DAEPOST, and 1 and 2 oz/A at 35 DALPOST. The addition of RiceBeaux to Newpath increased the control of yellow nutsedge compared with Newpath fb Newpath when Newpath was applied at 1 and 2 oz/A at 14 DAEPOST. RiceBeaux controlled Indian jointvetch with or without Newpath in the mixture. Furthermore, the addition of RiceBeaux to Newpath had no increase in control of all weeds evaluated when the Newpath rate was increased to 4 oz/A. This study indicates that synergism exists between Newpath and RiceBeaux, in the control of yellow nutsedge, and the grasses evaluated in this study. However, no synergism was observed for Indian jointvetch due to the control obtained by RiceBeaux alone.

PYROXASULFONE FOR USE IN SOUTHERN STATES SOYBEAN PRODUCTION. **M.E.Kurtz*, K-I Chemical U.S.A., Leland, MS; Y.Yamaji, H. Honda, K-I Chemical U.S.A., White Plains, NY; O.Watanabe, Kumiai Chemical Industry, Co., LTD., Tokyo, Japan.**

ABSTRACT

A new herbicide, pyroxasulfone is under development in the United States. After several years of field research in soybean production, pyroxasulfone has proven to be a reliable herbicide that provides both grass and broadleaf weed control with a variety of application timings. It can be applied in the Fall through early postemergence with excellent soybean tolerance. Several trials were conducted at Kumiai America's Mississippi Research Station on silt loam soils where the use rate of pyroxasulfone is 166 g ai/ha and silty clay loam soils where the use rate is 209 g/ha. With a Fall application of pyroxasulfone, broadleaf signalgrass (BRAPP) was controlled as much as 85% at 197 DAT compared to 57% with s-metolachlor at the same rating. Velvetleaf (ABUTH) was controlled 77% with pyroxasulfone at this same rating while s-metolachlor provided only 10%. In another Fall trial, pyroxasulfone gave 96% Italian ryegrass (LOLMU) control while pendimethalin only provided 68% control. In a postemergence study, Pyroxasulfone was tank mixed with glyphosate early post and followed by glyphosate + flumiclorac at late post and compared to glyphosate early post followed by glyphosate + flumiclorac late post . The treatment containing pyroxasulfone provided 95% BRAPP control 80 days after the late post compared to only 80% BRAPP control by the glyphosate alone treatment, and the soybeans in the pyroxasulfone treatment yielded 45 bu/A compared to only 39 bu/A in the treatment that did not contain pyroxasulfone. Pyroxasulfone is a versatile new herbicide with both grass and broadleaf activity with excellent soybean tolerance. This new herbicide will offer Southern State soybean producers a broad window of application timings and a mode of action (VLCFAE) that weeds do not readily develop resistance to.

PYROXASULFONE: NEW HERBICIDE FOR RESIDUAL WEED CONTROL IN CORN, SOYBEAN AND WHEAT. **Yoshihiro Yamaji*, Hisashi Honda, Kumiai America, White Plains, NY; Masanori Kobayashi and Osamu Watanabe, Kumiai Chemical Industry, Tokyo, Japan.**

ABSTRACT

A new herbicide, pyroxasulfone (KIH-485) is being developed in the United States of America by Kumiai Chemical Industry, Tokyo, Japan. Pyroxasulfone can be used in corn, soybeans and wheat. It provides excellent, consistent, weed control with outstanding residual activity. The season-long control provides benefits to growers including: 1) avoidance of herbicide resistant weed development, 2) expanded herbicide program management capabilities and 3) reduced late season weed escapes. Field trials, including a plant back study using barnyardgrass, indicate pyroxasulfone will provide residual control up to eight weeks after application. Pyroxasulfone suppression of Texas panicum continued up to six weeks. In medium texture soils, Palmer amaranth, a troublesome species in Southern States, was controlled by pyroxasulfone for up to six to eight weeks at the lower end of the KIH-485 label recommend use range, and for an additional one to two weeks when rates at the higher end of the range were utilized. Pyroxasulfone is undergoing joint regulatory agency review in the U.S., Australia and Canada.

RYE-LEGUME WINTER COVER CROP MIXTURES AND PALMER AMARANTH (*AMARANTHUS PALMERI*). **Theodore M. Webster*, Brian T. Scully, USDA-ARS, Tifton, GA; and A. Stanley Culpepper, University of Georgia, Tifton.**

ABSTRACT

The development of glyphosate-resistant Palmer amaranth is a significant challenge for cotton production in Georgia and much of the Southern US. Winter cover crops, rye and rye mixtures with legumes, were evaluated for weed suppression and their influence on cotton production. Two studies were initiated on in the autumn of 2008 and 2009 near Ideal, GA and near Chula, GA in areas with naturalized Palmer amaranth. The first study evaluated main plot treatments of cover crops: rye, blue lupin, crimson clover, Austrian winter pea, and cahaba vetch. Each of the legumes was evaluated alone and in mixture with rye. The second study evaluate rye+lupin, rye+clover, and fallow with four rates of supplemental nitrogen applied to cotton. Cover crop biomass was greatest with rye and lupin. Averaged over all legumes, biomass more than doubled when rye was planted in mixture compared to the legume alone. Palmer amaranth populations were seven-times greater in the cotton row where soil was disturbed compared to the undisturbed row middles. Rye+Legumes had greater weed suppression than monocultures. Rye and pea suppressed Palmer amaranth >80% in mid-June and suppression was related to cover biomass. Yield in plots treated with an effective herbicide program had similar cotton yields among cover crops. Where herbicides were not used, cotton could not be harvested, regardless of cover crop. Effective cover crop use hinges on Palmer amaranth control in the cotton row, which is still elusive.

YIELD REDUCTIONS ASSOCIATED WITH SPATIAL MOVEMENT OF GLYHPOSATE-RESISTANT PALMER AMARANTH. **G. M. Griffith*, J. K. Norsworthy, D. B. Johnson, University of Arkansas, Fayetteville; and T. Griffin, University of Arkansas, Little Rock.**

ABSTRACT

There are now six confirmed glyphosate-resistant (GR) weed species in Arkansas. Of particular concern to many producers and researchers is how far and how fast these populations will spread. Prior to the evolution of GR weeds such as Palmer amaranth, these natural populations were easily controlled with glyphosate; however, the 2009 Southern Weed Science Society survey of most common and troublesome weeds has Palmer amaranth in the top five most troublesome weeds in cotton for all 10 states that participated. Multiple factors no doubt contribute to in-field expansion of Palmer amaranth. However, the objective of this research was to determine the collective impact of dispersing agents on the rate of expansion of Palmer amaranth, and any resulting yield reductions in a Roundup Ready Flex® cotton system where the crop is managed in a manner similar to that by producers. Because GR Palmer amaranth data were collected from a field-scale landscape, it was hypothesized that inherent spatial variation exists. Glyphosate-resistant Palmer amaranth from Lincoln County, AR, was sown at 20,000 seeds into a single circular 1-m^2 area in four 0.6- to 1.2-ha fields (1.5 to 3 acres) at the Main Experiment Station of the University of Arkansas at Fayetteville in February 2008. The center and edge of these initial 1-m^2 patches were georeferenced (±4 cm). This initial introduction was intended to represent seed production from a single GR-plant that survived to maturity in 2007. These fields do not contain a natural infestation of Palmer amaranth based on observations taken in 2006 and 2007. Each year, glyphosate was applied as needed (four applications) to control all other species in the field. In 2008 and 2009, the final density of Palmer amaranth was taken using a 1.0-m^2 grid, collecting densities in a Cartesian coordinate system using a continuous scale of 0, 1, 2, 3, 4, 5, and 6 (>5) Palmer amaranth m^{-1} of row. Spatial seed cotton yield data were collected using a yield monitor and GPS. Palmer amaranth density data were subjected to exploratory spatial data analysis (ESDA) using GeoDa 0.9.5-i (Arizona State University software). Row-standardized spatial weights matrices were created based on either queen (8 directions) or rook (4 directions) contiguity. These spatial weight matrices were used in Moran's I test for global spatial autocorrelation, as well as LISA (local indicator of spatial association) to determine if significant local clustering occurred. Regression analysis was performed on cotton yield reductions and Palmer amaranth density using a quadratic equation. In 2008, over 28 cm of rain fell in the month of March, and it is believed this rainfall resulted in longitudinal seed movement as far as 114 m downslope. This resulted in a GR female Palmer amaranth setting seed and creating a separate GR Palmer amaranth patch in 2009. Longitudinal movement was greater in 2009, likely a result of cotton harvest, stalk shredding, tillage, and increased seed production from 2008 survivors. Moran's I for Palmer amaranth density indicate significant spatial autocorrelation in all four fields, regardless of spatial contiguity used. LISA analysis indicates significant clustering in all fields in 2008 and 2009. In 2008, Palmer amaranth patches increased in size from the initial 1-m^2 (2007) to a total infested area in each field of 26 to 36 m^2. In 2009, GR Palmer amaranth had expanded to the borders of all four fields, infesting 955 to 1,248 m^2 in fields G6 (12% of total area) and G5 (24% of total area), respectively. In 2010, Palmer amaranth infested from 95 to 100% of all fields, causing crop failure. Results from these data support resistance management options such as reducing the number of resistant seed that return to the seedbank each year. Regression analysis indicates that for 1 Palmer amaranth m^{-2}, 27 kg lint was lost. Economic analysis (assuming \$2.20 kg $lint^{-1}$) shows a net loss of \$149.26 ha^{-1} for 1 Palmer amaranth m^{-2}. One of the best early-season glyphosate-resistant Palmer amaranth herbicide programs in Arkansas [fomesafen 14 to 21 d preplant followed by (fb) fluometuron preemergence fb glyphosate + S-metolachlor at 1- to 3-lf cotton] cost \$139.43 ha^{-1} including a \$18.53 ha^{-1} aerial applicator's fee, which is less than the \$149.26 ha^{-1} loss for 1 Palmer amaranth m^{-2}.

RICE WEED CONTROL PROGRAMS CONTAINING IMAZOSULFURON. S. S. Rana*, J. K. Norsworthy, D. B. Johnson, J. Wilson, University of Arkansas, Fayetteville; and R. C. Scott, University of Arkansas, Little Rock.

ABSTRACT

Imazosulfuron (V-10142) is a new acetolactate synthase-inhibiting herbicide that is being developed by Valent for use in drill- and water-seeded rice in the U.S., with an anticipated launch date in spring of 2011. Although imazosulfuron provides preemergence (PRE) and postemergence (POST) control of several important weeds of Arkansas rice, it fails to control grasses making it unsuitable for use as a stand-alone herbicide. Research was conducted in 2009 and 2010 at Keiser (clay soil) and Stuttgart (silt loam soil), AR, to evaluate the effectiveness of imazosulfuron-containing herbicide programs relative to a standard herbicide program for drill-seeded rice culture. Herbicide programs included imazosulfuron applied at 0.2 lb ai/A PRE and 0.15 lb/A EPOST in tank mixture with clomazone, and followed by various mixtures of quinclorac, propanil, and imazosulfuron. The standard program for comparison was clomazone plus quinclorac PRE fb propanil plus halosulfuron PREFLD. At Stuttgart (2009 and 2010), late in the season, all imazosulfuron-containing herbicide programs controlled hemp sesbania ≥99%, barnyardgrass ≥91%, and broadleaf signalgrass ≥92%, grass control by was comparable to the standard treatment. At Stuttgart in 2010 at 15 WAP, all imazosulfuron programs controlled yellow nutsedge ≥99%; whereas in 2009, all imazosulfuron programs did not provide effective yellow nutsedge control. At Keiser (2009 and 2010) 9 to 12 WAP, all POST-applications of imazosulfuron controlled hemp sesbania ≥95%. In addition, imazosulfuron programs provided excellent yellow nutsedge control both years. At Keiser in 2009 at 8 WAP, the standard treatment provided Palmer amaranth control superior to programs with imazosulfuron applied EPOST followed by PREFLD (70% vs ≤ 45% control). Imazosulfuron-containing herbicide programs provided barnyardgrass and pitted morningglory control equal to or better than the standard treatment. Imazosulfuron appears to have the potential to be used as an additional herbicide that can be incorporated in the current PRE and POST weed management programs in rice.

WEEDS AND WEED MANAGEMENT IN RURAL COMMUNITIES OF GUYANA, SOUTH AMERICA. **Alyssa H Cho*, University of Florida, Gainesville; Robert C. Kemerait, University of Georgia, Tifton; Gregory E. MacDonald, Courtney A. Stokes, University of Florida, Gainesville.**

ABSTRACT

Guyana is located in South America, bordered by Venezuela, Brazil, and Suriname. A significant number of Amerindians (indigenous population) still reside in the interior of the country. A USAID Peanut CRSP was granted in 2001 to improve the standard of living while protecting the environment in the rural interior (Rupununi) of Guyana. This was accomplished by improving peanut yields and overall production. One of the primary objectives of the Peanut CRSP grant was to provide tools to the farmers for weed identification and management to improve peanut yields. A major objective of the program was educating the farmers about the importance of managing weeds, and demonstrating effective methods of weed management. Studies were conducted at three different locations (Aranaputa, Moco Moco, and Shulinab) to evaluate several aspects of peanut production. For weed management, three herbicide treatments were applied and included Strongarm (disclosulam), Cadre (imazapic), and Valor (flumioxazin), applied preemergence at the standard rate. In addition to herbicide application, four different seed spacings were evaluated for weed suppression and yields at two locations (Moco Moco and Shulinab). The seed spacings were: 3 seed/foot, 2 seed/foot, 1 seed/foot, and 0.5 seed/foot. At all three locations, Cadre and Valor resulted in the best weed control with no impact on peanut yield. At both locations, more seeds/foot led to greater canopy coverage and greater weed control. The highest peanut yields were observed with 2 seeds/foot at both locations. Although the results varied slightly between locations, it appeared that 2 seeds per foot provided the best combination of canopy closure and yield. While herbicide inputs have the ability to greatly improve yields in this region, adoption of chemical weed control has been limited due to cost and availability. In contrast, the adoption of tighter seed spacing has been widely adopted and has resulted in reduced weeding and improved yields.

DIFFERENTIAL RESPONSE OF VIRGINIA JOHNSONGRASS ACCESSIONS TO GLYPHOSATE.

Adam Smith*, E. Scott Hagood, and Shawn D. Askew Virginia Tech, Blacksburg.

ABSTRACT

Johnsongrass is a perennial weed with prolific growth and reproductive abilities. It is considered one of the most common weeds in corn production and is difficult to control; uncontrolled infestations can lead to complete crop failure. Researchers have confirmed glyphosate resistance in johnsongrass in Argentina and Arkansas, USA. The loss of glyphosate for johnsongrass control could have severe consequences. A suspect population was reported in Virginia. It failed to be controlled by 0.88 kg a.e. ha-1 of glyphosate. A field experiment was initiated in the suspect population, subjecting johnsongrass to five rates of glyphosate and four rates of nicosulfuron. The experiment was a randomized complete block design (RCBD) with four repetitions. Visual control was estimated. Seed was collected from surviving plants and germinated for greenhouse experiments. Individual greenhouse seedlings were treated with the same glyphosate and nicosulfuron rates used in the field experiment. Vigor, height, and final fresh weights were collected at 14, 21, and 28 DAT. In the field experiment, glyphosate failed to provide adequate johnsongrass control. At 0.88 kg a.e. ha-1 glyphosate, control was 65%. At 3.52 kg a.e. ha-1 glyphosate, control was 90%, whereas glyphosate applied at 0.22 kg a.e. ha-1 gave 7% control. In the greenhouse, glyphosate at 0.22 kg a.e. ha-1 and 0.44 kg a.e ha-1 failed to control johnsongrass seedlings, when compared to a wild type. Plant vigor and height was decreased in surviving seedlings. Decreased vigor and height suggest that treated seedlings had reduced plant fitness. This was also observed in the field experiment, where treated plots had shorter plants. Reductions in plant fitness, coupled with differential responses to glyphosate, suggest that johnsongrass plants in Virginia may exhibit differential sensitivity to glyphosate. Additional greenhouse and field experiments will be conducted to confirm this phenomenon. Upon confirmation of a differential response, laboratory experiments will be conducted to determine the basis of this response.

EVALUATION OF WEED CONTROL SYSTEMS IN DICAMBA-TOLERANT SOYBEANS (DTS).
Simone Seifert-Higgins*, Monsanto Company, St. Louis, MO.

NO ABSTRACT

ASSESSMENT OF WEED CONTROL IN DOUBLE-CROP AND RELAY-INTERCROPPING SYSTEMS OF PEANUT WITH PEANUT. **J.W. Moss*, R.S. Tubbs, T.L. Grey, N.B. Smith, University of Georgia, Tifton; J.W. Johnson, University of Georgia, Griffin.**

ABSTRACT

Multiple cropping systems for peanut (*Arachis hypogaea*) have potential in the southeastern U.S. where there is a prolonged growing season. Full season wheat (*Triticum aestivum*) production typically pushes peanut planting later than optimum, but a relay-intercrop system may allow peanut to be planted on-time while still gaining a grain crop of wheat. However, typical at-plant herbicide programs cannot be used where wheat is still actively growing, so a post-emergence herbicide program must be relied upon in such systems. The objectives of this project were to determine the most effective cropping systems to maximize wheat and peanut yield potential and the system effect on weed control. Studies were conducted in Tifton, GA in 2009 and in Plains, GA in 2010. Visual weed ratings were used to determine the effectiveness of control for crowfootgrass (*Dactyloctenium aegyptium*) and smallflower morningglory (*Jacquemontia tamnifolia*) in 2009, but not in 2010 due to low weed pressure. A split-plot design was used with 8 cropping systems as main effects: wide tramline relay-intercrop (WRI), narrow tramline relay intercrop (NRI), double crop conventional-till (DCCT), double-crop strip-till (DCST), strip-till peanut with wheat cover (STWC), conventional-till peanut with wheat cover (CTWC), peanut only (optimum planting) (PO), and peanut only (planted late) (PL). The subplot effect was three peanut cultivars: Georgia Green, Georgia-06G, and Tifguard. Both WRI (54%) and NRI (65%) had significantly lower control of crowfootgrass compared to the other systems (95-99%). Control of smallflower morninglory was lowest in the NRI (70%) treatment. Wheat yields in 2009 were lower for WRI (1280 kg/ha) versus NRI (2560 kg/ha), with both yielding lower than the DCCT (4245 kg/ha) and DCST (4040 kg/ha) treatments. Wheat yields were again lower in 2010 for the WRI (3100 kg/ha) and NRI (2930 kg/ha) treatments compared to the DCST (4110 kg/ha) and DCCT (4180 kg/ha) treatments. In 2009, peanut yields in NRI (3500 kg/ha) and DCCT (3550 kg/ha) treatments were significantly lower than PO (5960 kg/ha) and STWC (5100 kg/ha) treatments, though they were not significantly different from all other treatments (3715-4550 kg/ha). Peanut yields in 2010 were significantly lower in WRI (3590 kg/ha) plots versus PL (4920 kg/ha), but were not different from all other treatments (3650-4710 kg/ha). There were differences among cultivars in both years, with Georgia-06G (4470 and 4465 kg/ha, respectively) and Tifguard (4650 and 4170 kg/ha) providing better yields than Georgia Green (3920 and 3855 kg/ha). These data indicate potential weed control challenges within the WRI and NRI systems although there was reduced weed pressure in 2010. Wheat yields were consistently higher in the DCCT and DCST treatments compared to the WRI and NRI treatments. Peanut yields within the WRI and NRI treatments were consistently among the lowest. Tifguard and Georgia-06G yielded higher than Georgia Green. At this time, relay-intercropping of peanut with wheat does not provide any advantage over double cropped peanut after wheat. Additional research is needed to improve management of relay-intercrop systems to fully realize the benefits that such systems can provide.

FERTILITY-BASED HERBICIDE RECOVERY FROM CLOMAZONE HERBICIDE IN HYBRID RICE (*ORYZA SATIVA*). **B.M. McKnight*, S.A. Senseman, Texas AgriLife Research & Texas A&M University, College Station; G.N. McCauley, Texas AgriLife Research, Eagle Lake, TX.**

ABSTRACT

Abstract: Field and laboratory studies were conducted to evaluate fertility-based clomazone injury remediation in hybrid rice. Hybrid rice was drill seeded in two field locations near Eagle Lake and Ganado, TX at 39 kg/ha. In the first objective of the field study, clomazone was applied PRE at 6 different rates (0.11, 0.22, 0.34, 0.45, 0.56, and 0.67 kg a.i./ha) to produce a standard curve of clomazone herbicide injury. Visual injury ratings and plant heights were recorded at four timings between clomazone application and physiological maturity. Tissue samples were also collected at each rating event for chlorophyll content analysis in the laboratory. In the second objective of the field study, clomazone was applied uniformly to field plots at 0.45 kg a.i./ha. Another application of clomazone at 0.45 kg a.i./ha was needed EPOST to further induce injury symptoms. After initial visual injury ratings were recorded at the 4 to 6 leaf growth stage, tissue samples were collected and fertility treatments were applied. Treatments consisted of two recommended forms of nitrogen fertilizer (ammonium sulfate and urea) and two foliar-applied micronutrient fertilizers (iron sulfate and magnesium sulfate) at different combinations of rates and application timings. Visual injury ratings and plant heights were recorded at four timings between herbicide application and physiological maturity. Tissue samples were collected at each visual assessment for chlorophyll content analysis. At the conclusion of the study, yield data was taken from all plots. Initial visual injury ratings for the standard curve plots near Eagle Lake were statistically different with the highest injury ratings in plots that received higher rates of clomazone. Later visual injury ratings and plant height measurements were not different. Yield data showed that only control plots receiving no clomazone application were statistically different. Visual injury ratings and yield showed no difference in the herbicide injury remediation plots. Plant height was different in plots receiving only foliar-applied micronutrient fertilizers when compared to plots receiving nitrogen fertilizers. Visual injury ratings for the standard curve plots near Ganado were different with the highest injury ratings in plots that received higher rates of clomazone. There were no differences in plant height or yield throughout the study. Visual injury ratings were not different in the herbicide injury remediation plots at Ganado. Plant height measurements were different and plots receiving the highest rates of nitrogen produced taller plants. Yield data showed differences with the highest yield occurring in plots that received the highest rates of nitrogen. Initial laboratory results from chlorophyll extraction and quantification show chlorophyll content decreases as the rate of clomazone increases in the standard curve study.

EVALUATION OF GLYTOL + LIBERTYLINK COTTON (*GOSSYPIUM HIRSUTUM*) TOLERANCE TO VARIOUS GLYPHOSATE OR GLUFOSINATE BASED HERBICIDE SYSTEMS. **J.T. Irby*, D.M. Dodds, D.B. Reynolds, R.C. Storey, C.L. Smith; Mississippi State University, Mississippi State; C.C. Main; University of Tennessee, Jackson.**

NO ABSTRACT.

HERBICIDE CONTROL OPTIONS FOR VOLUNTEER GLYPHOSATE-TOLERANT CORN (*ZEA MAYS*) AND SOYBEAN (*GLYCINE MAX*) IN A GLYPHOSATE-TOLERANT COTTON (*GOSSYPIUM HIRSUTUM*) SYSTEM. **R.C. Storey*, D.B. Reynolds, J.T. Irby, and C.L. Smith; Mississippi State University, Mississippi State.**

NO ABSTRACT.

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ITALIAN RYEGRASS (*LOLIUM MULTIFLORUM*) CONTROL IN WINTER WHEAT (*TRITICUM AESTIVUM*) WITH PYROXASULFONE IN GEORGIA. **R.D. Wallace, G.S. Cutts, III, and T.L. Grey*; University of Georgia, Tifton.**

ABSTRACT

Field studies were conducted to evaluate Italian ryegrass control, and soft red winter wheat cultivars tolerance to pyroxasulfone and other herbicides, when applied preemergence (PRE), or when in the 2 to 3 leaf (2-3 LF) at Feekes' stage 1 of growth. Tests were conducted at Griffin, Plains, and Tifton GA. Susceptible and diclofop resistant Italian ryegrass control was 86% or greater with pyroxasulfone at 60 g a.i./ha applied PRE or at 2-3LF. While it is believed that pyroxasulfone has little to no postemergence activity, it still provided excellent late season Italian ryegrass control likely due to root absorption. Italian ryegrass control was inconsistent with pendimethalin CS PRE and pinoxaden at 2-3 LF. Different wheat cultivars exhibited a dose response to pyroxasulfone with greatest injury of 50% at 160 g a.i./ha (2x rate) at 35 to 50 days after treatment. Injury for pyroxasulfone at 80 g a.i./ha or less was transient and did not affect wheat yield.

EFFECTIVE USE OF RESIDUAL HERBICIDES IN PALMER AMARANTH MANAGEMENT. **J.A. Bullington*, K.L. Smith, R.C. Scott, R.C. Doherty, J.R. Meier; University of Arkansas-Division of Agriculture.**

ABSTRACT

Palmer amaranth has been a major agronomic problem since the 1970's. Many studies have shown its competitive characteristics and how it is capable of severely reducing yields. Palmer amaranth is known to produce as many as 500,000 seeds which can lead to problems annually. Since 1989, resistance has been a growing issue with Palmer amaranth, more recently; resistance to glyphosate has proven to be a major obstacle for producers. The objective of this research was to evaluate the length of Palmer amaranth residual control of different soil applied herbicides. This trial consisted of 25 treatments arranged in a randomized complete block design with four replications on a Sharkey & Desha silt loam soil. All treatments in this study were applied preemergence (PRE) or preplant incorporated (PPI) on bedded rows with overhead irrigation. All treatments were activated with an irrigation event three days after application. Twenty-one days after application all treatments provided above 94% control. Thirty days after application, Cadet (0.0071 & 0.0036 lb ai/A), Basis (0.0024 lb ai/A), Prowl (1 lb ai/A), and Treflan (1 lb ai. A) provided less than 85% control of Palmer amaranth. Thirty-seven days after application, the pervious treatments with the addition of Sharpen (0.023 lb ai/A), Traverse (0.061 lb ai/A), and Synchrony XP (0.0369 lb ai/A) provided less than 85% control. Forty-five days after application, all pervious treatments with the addition of Valor SX (0.064 lb ai/A) and Sharpen (0.0334 lb ai/A) provided less than 85% control. Fifty-five days after application, all pervious treatments with the addition of Sharpen (0.0445 lb ai/A) and Envive (0.0888 lb ai/A) provided less than 85% control. Sixty-five days after application, all pervious treatments with the addition of Dual Magnum + Sharpen (0.95 + 0.0223 lb ai/A), Flexstar GT (1.24 lb ai/A), and Authority MTZ (0.28 lb ai/A) provided less than 87.5 % control. At the sixty-five day evaluation interval, greater than 94% control of Palmer amaranth was achieved using Reflex (0.25 & 0.375 lb ai/A), Prefix (1.32 lb ai/A), Dual Magnum + Sharpen (0.95 + 0.0445 lb ai/A), Fierce (0.166 & 0.178 lb ai/A), Diligent (0.1426 lb ai/A), and Boundary (1.63 lb ai/A). We concluded from this trial, there are several treatments that can provide season-long weed control when applied preemergence. There are also many treatments, that when included with a postemergence treatment, could provide a Palmer amaranth control system to ensure that no late emerging weeds were allowed make seed. When used correctly soil residual herbicides play an important role in herbicide resistance management.

EVALUATION OF CULTURAL CONTROL METHODS FOR CRABGRASS MANAGEMENT IN ST. AUGUSTINEGRASS. **B.D. Glenn*, B.J. Brecke, J.B. Unruh, University of Florida, West Florida Research and Education Center, Jay; J.A Ferrell, G.E. Macdonald, and K.E. Kenworthy, University of Florida, Gainesville, FL.**

NO ABSTRACT.

RESPONSE OF TRIAZINE-RESISTANT ANNUAL BLUEGRASS BIOTYPES TO AMICARBAZONE AND ATRAZINE. **D.H. Perry*, J.S. McElroy; Auburn University, Auburn.**

ABSTRACT

Herbicide-resistant annual bluegrass (*Poa annua*) has been reported across multiple states and countries to approximately five modes of action (MOA), including photosystem II (PSII) inhibition. For years, triazine herbicides have been successfully utilized for postemergence control of annual bluegrass in dormant bermudagrass. However, it is posited that their repeated use in these situations has led to the evolution of triazine-resistant annual bluegrass populations. Target-site triazine resistance can be attributed to amino acid substitutions in the *psbA* gene which codes for the D1 protein. Amicarbazone is a PSII-inhibiting herbicide being investigated for postemergence annual bluegrass control in certain turfgrass systems and triazine-resistant annual bluegrass could potentially affect amicarbazone success. The objective of this study was to evaluate the physiological response of triazine-resistant and -susceptible annual bluegrass populations to amicarbazone. Two greenhouse studies were conducted in fall 2009 and spring 2010 at the Plant Science Research Center at Auburn University in Auburn, AL. Seed of two susceptible and two resistant annual bluegrass biotypes were seeded in 10 cm^2 plastic pots and thinned to five plants per pot prior to herbicide treatment. The soil medium was 90:10 (v:v) Wickham sandy loam : Fafard potting mix (pH – 6.0). Pots were watered daily until both species were established at which time pots were watered as necessary to prevent wilting. Herbicide treatments included amicarbazone (0.26 kg/ha), atrazine (1.7 kg/ha), or simazine (1.7 kg/ha) and a nontreated. Herbicides were applied with a nonionic surfactant at 0.25% v/v in an enclosed spray chamber at 280 L/ha with an 8002E nozzle. Treatments were a factorial combination of herbicide treatment and annual bluegrass biotype. Annual bluegrass control was rated on a percent scale (0-100%) where 0 equaled no control and 100 equaled complete control. Photosynthetic yield (Φ_{PSII}) was measured 0, 1, 2, 4, 8, 16, 24, 48, 72, and 168 hours after application (HAA) using a pulse-modulated chlorophyll fluorometer. Plants were placed in artificial lighting 30 minutes prior to and during each measurement but remained in greenhouse growing conditions otherwise. Φ_{PSII} measurements were taken by holding the light probe at approximately 45˚ directly above the desired annual bluegrass leaf. The saturation pulse width and modulation intensity were set to 0.8 s and 6, respectively. Two measurements were taken from two plants for a total of four measurements per pot. Measurements were calculated as a percent of the nontreated. Data were subjected to ANOVA using PROC MIXED in SAS. Amicarbazone did not reduce Φ_{PSII} of the two resistant biotypes for any measurement timing. Amicarbazone treatment of the two susceptible biotypes reduced Φ_{PSII} rapidly in both studies. Amicarbazone reduced Φ_{PSII} of both susceptible biotypes significantly greater than atrazine and simazine 1-16 HAA and 1-48 HAA for study 1 and study 2, respectively. These results indicate a highly efficient PSII inhibitory nature of amicarbazone. Complete control of both susceptible biotypes was observed 2 weeks after application (WAA) with amicarbazone. Neither triazine-resistant biotype was injured following application of amicarbazone and the triazines. The absence of injury and Φ_{PSII} reduction in triazine-resistant annual bluegrass biotypes following amicarbazone treatment indicates that resistance to amicarbazone likely exists among triazine-resistant annual bluegrass biotypes.

LEGUMINOUS WEED RESPONSE TO COMMON TURF HERBICIDES. **James D. McCurdy*, J. Scott McElroy, and Michael L. Flessner; Auburn University, Auburn, AL.**

ABSTRACT

Two studies were conducted at the Auburn University Turfgrass Research Unit, Auburn, AL to evaluate herbicide control of various legume species. Study one evaluated cool-season legume response to common turf herbicides. Legumes, including white clover (*Trifolium repens*), small hop clover (*T. dubium*), rabbitfoot clover (*T. arvense*), crimson clover (*T. incarnatum*), ball clover (*T. nigrescens*), and spotted burclover (*Medicago arabica*) were transplanted into dormant bermudagrass (*Cynodon dactylon*) turf February 10, 2010. The study was conducted as a randomized complete block design with six species as randomized sub-units within each main plot. Main plot treatments included a non-treated control and eleven herbicide treatments: 2,4-D amine (15.8 g ae 100 m^{-2}), 2,4-DB amine (15.8 g ae 100 m^{-2}), dicamba (11.2 g ae 100 m^{-2}), MCPA (5.2 g ai 100 m^{-2}), triclopyr (5.6 g ai 100 m^{-2}), clopyralid (4.2 g ai 100 m^{-2}), bentazon (11.2 g ai 100 m^{-2}), metsulfuron methyl (0.21 g ai 100 m^{-2}), trifloxysulfuron (0.28 g ai 100 m^{-2}), imazaquin (5.6 g ai 100 m^{-2}), and atrazine (22.4 g ai 100 m^{-2}). Herbicides were applied March 10, and legume control was visually assessed relative to the non-treated check 2, 4, and 6 weeks after treatment (WAT). A legume-species by herbicide interaction was observed 4 and 6 WAT. In general, bentazon was least injurious to all clover species while dicamba, clopyralid, triclopyr, and atrazine effectively controlled all species. Ball, rabbitfoot, and white -clovers were partially tolerant to 2,4-DB (< 40% control). Other notable results include rabbitfoot clover tolerance to trifloxysulfuron and imazaquin as well as white clover tolerance to MCPA and imazaquin. These results indicate varying tolerances between legume species and common turf herbicides.

Study two evaluated herbicide control of common lespedeza (*Kummerowia striata*) within maintained centipedegrass (*Eremochloa ophiuroides*) turf. Treatments included a non-treated control and eleven herbicide treatments: 2,4-D amine (15.8 g ae 100 m^{-2}), dicamba (11.2 g ae 100 m^{-2}), Trimec® Southern (12.89 g ae 100 m^{-2}; a combination product of MCPA, 2,4-D, and dicamba), Escalade™ 2 (16.82 g ae 100 m^{-2}; a combination product of 2,4-D, fluroxypyr, and dicamba), Celsius™ (2.34 g ai 100 m^{-2}; a combination product of dicamba, thiencarbazone, and iodosulfuron), carfentrazone (0.34 g ai 100 m^{-2}), fluroxypyr (5.26 g ae 100 m^{-2}), chlorsulfuron (0.53 g ai 100 m^{-2}), two rates of aminocyclopyrachlor (0.79 and 1.05 g ai 100 m^{-2}), and atrazine plus bentazon (22.42 and 8.41 g ai 100 m^{-2}, respectively). Herbicides were applied August 4, 2010. Lespedeza control and centipedegrass injury were visually assessed relative to the non-treated check 2, 4, and 6 WAT. Dicamba, fluroxypyr, chlorsulfuron, both rates of aminocyclopyrachlor, atrazine plus bentazon, and Escalade 2 all controlled common lespedeza greater than 78% 6 WAT. Centipedegrass injury (>40%) did occur due to both rates of aminocyclopyrachlor application; however, injury subsided 6 WAT. It should be noted that both rates of aminocyclopyrachlor within this study were greater than current labeled rate for Imprelis™ herbicide (0.53 g ai 100 m^{-2}). Carfentrazone, 2,4-D, Trimec Southern, and Celsius controlled common lespedeza less than 35% across all rating dates.

NEW HERBICIDES FOR THE CONTROL OF KHAKIWEED IN BERMUDAGRASS. **A.J. Hephner*, T. Cooper, L. Beck, J.B. Rotramel, and G.M. Henry; Texas Tech University, Lubbock.**

ABSTRACT

Field experiments were conducted at Meadowbrook Country Club in Lubbock, TX in 2010 to examine the efficacy of postemergence herbicides for the control of khakiweed. Studies were located on established infestations of khakiweed present in a common bermudagrass rough. Plots measured 1.5 m^2 and were arranged in a randomized complete block design with four replications. Treatments were applied using a CO_2 backpack sprayer equipped with XR8004VS nozzles calibrated to deliver 375 L/ha at 221 kPa. Treatments were initiated on June 11, 2010 and consisted of metsulfuron (0.036 or 0.072 kg ai/ha), trifloxysulfuron (0.019 or 0.028 kg ai/ha), carfentrazone + 2,4-D + mecoprop + dicamba (0.45 kg ai/ha), 2,4-D + triclopyr + dicamba + pyraflufen (1.2 kg ai/ha), aminocyclopyrachlor (52.6 g ai/ha), pendimethalin (2.2 kg ai/ha) + [quinclorac + mecoprop + dicamba (0.69 kg ae/ha)], pendimethalin (2.2 kg ai/ha) + BAS 8004H (3.5 g ai/ha), pendimethalin (2.2 kg ai/ha) + quinclorac (0.42 kg ae/ha), and thiencarbazone + iodosulfuron + dicamba (176.5 g ai/ha). Sequential applications were made 3 to 5 weeks after initial treatment (WAIT). Visual estimates of % khakiweed control were taken 1, 2, 4, 6, and 8 WAIT. Data were subjected to analysis of variance (ANOVA) and means were separated using Fisher's Protected LSD at the 0.05 significance level. Thiencarbazone + iodosulfuron + dicamba, 2,4-D + triclopyr + dicamba + pyraflufen, pendimethalin + BAS 8004H, and metsulfuron treatments exhibited 92% control 4 WAIT. All other treatments exhibited 70% control 4 WAIT. Thiencarbazone + iodosulfuron + dicamba, 2,4-D + triclopyr + dicamba + pyraflufen, pendimethalin + BAS 8004H, metsulfuron, pendimethalin + quinclorac + mecoprop + dicamba, pendimethalin + quinclorac, and aminocyclopyrachlor exhibited 92% control 8 WAIT. Trifloxysulfuron treatments exhibited 81 to 87% control, while control with a single application of carfentrazone + 2,4-D + mecoprop + dicamba decreased to 30% 8 WAIT.

AMINOCYCLOPYRACHLOR AND FLUROXYPYR INFLUENCE FENOXAPROP EFFICACY FOR CRABGRASS CONTROL. **P.E. McCullough*, University of Georgia, Griffin, GA J.T. Brosnan, G.K. Breeden, University of Tennessee, Knoxville, TN S.E. Hart, Rutgers University, New Brunswick, NJ.**

ABSTRACT

Fenoxaprop effectively controls crabgrass (*Digitaria* spp.) in tall fescue (*Festuca arundinacea* L.) turf but antagonism with growth regulating herbicides reduces potential to apply fenoxaprop in combination with many herbicides registered for broadleaf weed control. Separate field experiments were conducted in Georgia, New Jersey, and Tennessee to investigate tank-mixtures of fenoxaprop with aminocyclopyrachlor or fluroxypyr for smooth crabgrass and white clover control. Rate titrations of fenoxaprop were applied with or without aminocyclopyrachlor in the first experiment or fluroxypyr in the second experiment. Fenoxaprop alone exhibited substantial activity on smooth crabgrass but control was greater with fenoxaprop + aminocyclopyrachlor treatments. By 4 and 6 WAT, approximately 22 and 44% less fenoxaprop was required to achieve 80% smooth crabgrass control when the herbicide was tank-mixed with aminocyclopyrachlor at 53 and 79 g ai ha^{-1}, respectively. Fenoxaprop did not reduce white clover (*Trifolium repens* L.) control with aminocyclopyrachlor as 97% control was achieved by 4 WAT for all aminocyclopyrachlor + fenoxaprop treatments. In another experiment, smooth crabgrass control following treatment with mixtures of fenoxaprop and fluroxypyr was not significantly different than fenoxaprop alone. Smooth crabgrass control with mixtures of fenoxaprop with 2,4-D, plus dicamba, plus MCPP was nearly 50% less than fenoxaprop alone. White clover was completely controlled from mixtures of fenoxaprop and fluroxypyr which was similar to fenoxaprop applied with 2,4-D plus dicamba plus MCPP. Tall fescue was not injured from any treatment. Results suggest aminocyclopyrachlor enhances fenoxaprop efficacy for smooth crabgrass control in tall fescue while fluroxypyr may also be used in tank-mixtures with fenoxaprop for broadleaf weed control.

MESOTRIONE SYNERGY WITH OTHER HERBICIDES FOR WEED CONTROL IN TURF. **Cheryl L. Dunne*, J. R. James, Gordon D. Vail, Eric K. Rawls, Eric W. Palmer; Syngenta Crop Protection, Greensboro, NC.**

ABSTRACT

Control of problematic weeds in turf and agricultural crops is a continuous challenge. In some cases, herbicidal active ingredients have been shown to be more effective in combination than when applied individually. This is referred to as “synergy”, since the combination demonstrates an activity level exceeding that expected, based on knowledge of the individual activities of the components. Mesotrione, already known individually for its herbicidal properties, displays a synergistic effect when applied in combination with other herbicides. It is known for controlling a wide spectrum of broadleaf weeds at a wide range of growth stages when applied post-emergence in corn. Mesotrione, an HPPD inhibitor, is typically used at rates ranging from 105-225 g ai/ha depending on herbicide formulation and application timing to control weeds. In susceptible weeds, it disrupts carotenoid biosynthesis, an essential process for plant growth, which leads to plant death. Unlike weeds, certain turf grass species and corn plants are able to tolerate mesotrione by rapidly metabolizing the active compound into inactive compounds. Mesotrione (in the form Callisto® 480 SC) was applied either pre or post-emergence to several weed species alone and in tank mixture with various herbicides. Weed control synergy was observed when mesotrione was applied in tank mixture with selected cell division disruptors, auxins, plant growth regulators, photosynthetic and lipid biosynthesis inhibitors.

IMPACT OF BISPYRIBAC-SODIUM ON PHYTOTOXICITY AND DISEASE DEVELOPMENT IN TALL FESCUE. **Matthew Cutulle*, Jeffrey Derr, David McCall, Adam Nichols, Virginia Tech, Virginia Beach; and Brandon Horvath, Univ. Tennessee, Knoxville.**

ABSTRACT

Tall fescue is one of the most commonly-utilized turfgrasses for home lawns and other turf areas in the United States. Tall fescue's popularity is attributed to a deep root system (drought tolerance), relatively low nitrogen requirements, and a resistance to most diseases. However, two pests that are problematic in tall fescue include the fungal pathogen Rhizoctonia solani (causes brown patch) and the cool-season annual grass annual bluegrass [*Poa annua* (L.)]. R. solani infects tall fescue stands during hot humid conditions when tall fescue is under summer stress. The subsequent disease, brown patch, is aesthetically unpleasing and can thin the turfgrass stand, leading to the germination and encroachment of winter annual weeds such as annual bluegrass. Typically, tall fescue is overseeded in the fall, thus the application of preemergence herbicides for control of annual bluegrass is not an option. Currently, there are no postemergence herbicide options for spring/summer control of annual bluegrass in tall fescue. A potential postemergence herbicide for control of annual bluegrass in tall fescue is bispyribac-sodium. However, preliminary reports show that applications of bispyribac-sodium to tall fescue in May increased its susceptibility to brown patch. Chitinase activity is positively correlated with resistance to R. solani in rice, thus if applications of bispyribac-sodium reduce chitinase activity in tall fescue then it may be responsible for the increased brown patch severity. Additionally, applications of bispyribac-sodium caused a flush of growth 5 weeks after application, which may create an environment more conducive to brown patch infection. Experiments evaluating timing and rates of bispyribac-sodium on brown patch severity in tall fescue were performed in greenhouses at Virginia Tech's Hampton Roads Agricultural Research and Extension Center in Virginia Beach. The experimental design was a strip plot. Plants were either inoculated or not inoculated with R. solani. Bispyribac-sodium was applied at rates of 37 and 74 g ai ha-1 either 6, 4, or 0 weeks before inoculation. Plant growth, brown patch lesions and phytotoxicity were recorded. In a separate experiment, bispyribac-sodium was applied at 37 g ai ha-1 to tall fescue. Chitinase activity was taken from treated tall fescue plants or control plants 2 and 7 days after application. In a cultivar response trial three different tall fescue cultivars and annual bluegrass were treated with bispyribac-sodium at a rate of 37 g ai ha-1. Pictures were taken 0 and 10 days after treatment and analyzed using SigmaScan Pro 5.0 for differences in Dark Green Color Index (DGCI). Applications of bispyribac-sodium to tall fescue 6 weeks prior to inoculation resulted in the most brown patch lesions. All plants treated with bispyribac-sodium had more brown patch lesions when compared to the untreated check. Also, tall fescue plants treated with bispyribac-sodium exhibited more shoot growth 6 weeks after application compared to the untreated check. Tall fescue treated with bispyribac-sodium had less chitinase activity than the untreated check. Application of bispyribac-sodium did not have an impact on DGCI in tall fescue; however, annual bluegrass DGCI was reduced.

IMIDAZOLINONE HERBICIDES FOR WARM-SEASON TURFGRASS MANAGEMENT. **J.T. Brosnan*, G.K. Breeden, M.T. Elmore; University of Tennessee, Knoxville.**

ABSTRACT

Zoysiagrasses (*Zoysia* spp.) are commonly used on golf course fairways and roughs in warm-season climates. However, inflorescence (i.e., seedhead) production can compromise the aesthetic and functional quality of zoysiagrass stands. Research was conducted in 2010 evaluating the use of imidazolinone herbicides for zoysiagrass seedhead suppression, growth regulation, and weed control. Field research was conducted at the East Tennessee Research and Education Center (Knoxville, TN) on a mature 'Zenith' zoysiagrass (*Zoysia japonica* Steud.) fairway mowed at 1.5 cm. Mowing ceased after treatment application to facilitate assessments of seedhead suppression. Plots (1.5 x 3.0 m) were arranged in a randomized complete block design with three replications. Treatments included imazamox at 26, 52, and 70 g ai ha^{-1}, imazapic at 52 g ai ha^{-1}, and an untreated control. All treatments were applied with a methylated seed oil surfactant at 1% v/v one day before seedhead emergence on 9 April 2010. Sequential applications were made three weeks later. Treatments were applied with a CO_2 powered boom sprayer calibrated to deliver 280 L/ha using four, flat-fan, nozzles at 124 kPa. Each week seedhead suppression and zoysiagrass injury were visually evaluated on a 0 (no suppression or turf injury) to 100% (complete suppression or complete kill) scale. At 6 weeks after initial treatment (WAIT) seedheads were counted in two 0.09 m^2 sections of each plot. Turfgrass color was assessed visually on a 1 (brown turf) to 9 (dark green turf) from 9 to 17 WAIT as well. Greenhouse research was conducted at the University of Tennessee evaluating the efficacy of imidazolinone herbicides for zoysiagrass growth regulation. Cores (6 x 5 cm) of 'Zenith' zoysiagrass were removed from field plots, potted in a medium of peat moss (55%), perlite (25%), and vermiculite (20%), and placed in a greenhouse with an average day/night temperature of 27/15 C and peak light intensity of 743 µmol m^2 s^{-1} for 3 weeks. During this acclimation time plants were clipped weekly at 2.5 cm. After treatment application, clipping ceased to facilitate assessments of growth regulation. Treatments, arranged in a randomized complete block design with three replications, included imazamox at 26, 52, and 70 g ai ha^{-1}, imazapic at 52 g ai ha^{-1}, trinexapac-ethyl at 96 g ai ha^{-1}, and an untreated control. Treatments were applied with a CO_2 powered boom sprayer calibrated to deliver 280 L/ha using four, flat-fan, nozzles at 124 kPa. Each week zoysiagrass injury was visually evaluated on a 0 (no turf injury) to 100% (complete kill) scale. Canopy height (mm) of each pot was also measured weekly. To quantitatively assess growth regulation, at 8 weeks after treatment (WAT) all aboveground biomass was harvested from each pot, dried at 105 C for 48 hours, and weighed. Late-season field trials were conducted to evaluate weed control with imidazolinone treatments exhibiting efficacy for zoysiagrass seedhead suppression and growth regulation. Research was conducted on mature bermudagrass stands infested with multi-tiller smooth crabgrass (*Digitaria ischaemum* Schreb.) and dallisgrass (*Paspalum dilatatum* Poir.) at the East Tennessee Research and Education Center. Plots (1.5 x 3.0 m) were arranged in a randomized complete block design with three replications. Treatments included imazamox at 52 and 70 g ai ha^{-1}, imazapic at 52, 105, and 175 g ai ha^{-1}, and an untreated control. All treatments were applied with a nonionic surfactant at 1% v/v on 31 August 2010 with a CO_2 powered boom sprayer calibrated to deliver 280 L/ha using four, flat-fan, nozzles at 124 kPa. Weed control and turf injury were visually evaluated on a 0 (no control or turf injury) to 100% (complete kill of all weeds or turf) scale. Imazamox at 52 and 70 g ai ha^{-1} suppressed zoysiagrass seedheads ~100% at 6 WAIT. Imazapic at 52 g ai ha^{-1} responded similarly. Seedhead counts supported visual assessments of seedhead suppression. No imidazolinone herbicide evaluated for seedhead suppression injured zoysiagrass >10%. Additionally, all imidazolinone treatments increased zoysiagrass color compared to the untreated control from 9 to 17 WAIT. In the greenhouse, all imazamox treatments and imazapic (52 g ai ha^{-1}) reduced zoysiagrass canopy height greater than trinexapac-ethyl. Additionally, imazamox at 52 and 70 g ai ha^{-1} and imazapic reduced zoysiagrass biomass greater than trinexapac-ethyl as well. Rates of imazamox demonstrating efficacy for seedhead suppression and growth regulation were active against smooth crabgrass and dallisgrass; however, no imazamox treatment provided greater than 50% control of either species. Imazapic at 175 g ai ha^{-1} controlled both smooth crabgrass and dallisgrass >75%, but resulted in ~20% turfgrass injury. These responses suggest that imazamox can be used for 'Zenith' zoysiagrass seedhead suppression and growth regulation; however, additional research is needed to determine weed control strategies with imazamox.

DIFFERENTIAL RESPONSES OF BERMUDAGRASS TO THREE HPPD INHIBITING HERBICIDES.
J.T. Brosnan*, M.T. Elmore, D.A. Kopsell, G.K. Breeden, and G.R. Armel; University of Tennessee, Knoxville.

ABSTRACT

Bermudagrass (*Cynodon* spp.) is a problematic weed throughout the United States transition zone. The 4-hydroxyphenylpyruvate dioxygenase (HPPD) inhibitor mesotrione has been shown to temporarily injure bermudagrass. Data describing the physiological effects of other HPPD inhibiting herbicide are limited. Separate studies were conducted evaluating the physiological effects of mesotrione, topramezone, and tembotrione applications to 'Riviera' common bermudagrass (*Cynodon dactylon* (L.) Pers.) and 'Tifway' hybrid bermudagrass *(C. dactylon* (L.) Pers. x. *C. transvaalensis* Burtt-Davy). Cores (6 x 5 cm) of each species were transplanted into greenhouse pots containing peat moss (55%), perlite (25%), and vermiculite (20%). Average temperature in the greenhouse measured 29 C. During the three weeks prior to application plants were clipped at 2 cm and fertilized bi-weekly at 5.2 kg N ha^{-1}. Treatments were arranged in a 3 x 3 factorial, randomized complete block design, with three replications. Bermudagrass plants were treated with three rates of mesotrione (0.28, 0.35, and 0.42 kg ha $^{-1}$), topramezone (0.018, 0.025, and 0.038 kg ha $^{-1}$), and tembotrione (0.092, 0.184, and 0.276 kg ha $^{-1}$). The lowest rate of each herbicide represented the maximum-labeled use rate for a single application. All herbicides were mixed with a methylated seed oil surfactant at 0.25% v/v. Treatments were applied with a CO_2 powered boom sprayer calibrated to deliver 280 L ha^{-1} using four, flat-fan, nozzles at 124 kPa. Percent visual bleaching was measured at 3, 7, 14, 21, 28 and 35 days after application (DAA) on a 0 (green leaf tissue) to 100% (white leaf tissue) scale. After visually assessing percent bleaching, leaf tissue above 2 cm was harvested and frozen at -80 C. Chlorophyll and carotenoid pigments in each sample were extracted from these tissues and quantified using high-performance liquid chromatography. Topramezone and tembotrione bleached bermudagrass leaf tissues to a greater degree than mesotrione. Concomitantly, topramezone and tembotrione also reduced total chlorophyll (chlorophyll *a* + *b*), β-carotene, lutein, and total xanthophyll cycle pigment concentrations (zeaxanthin + antheraxanthin + violaxanthin) more than mesotrione. For both topramezone and tembotrione, peak reductions in chlorophyll and carotenoid pigments were detected 14 to 21 DAA when maximum visual bleaching was observed on both grasses. These responses indicate that sequential applications of topramezone and tembotrione should be applied on 14 to 21 day intervals. Topramezone showed greater activity than mesotrione or tembotrione on Tifway hybrid bermudagrass, as the lowest rate of topramezone evaluated (0.018 kg ha $^{-1}$) reduced total chlorophyll, lutein, and total xanthophyll cycle pigment concentrations greater than the lowest rates of either mesotrione (0.28 kg ha $^{-1}$) or tembotrione (0.092 kg ha $^{-1}$) during periods of peak visual bleaching (14 to 21 DAA). In Riviera, topramezone and tembotrione increased the percentage of zeaxanthin + antheraxanthin in the total xanthophyll cycle pigment pool (ZA/ZAV) 7 days after peak visual bleaching was observed, and ZA/ZAV decreased as visual bleaching subsided. Increases in ZA/ZAV were not observed after peak visual bleaching on Tifway hybrid bermudagrass. Increases in photoprotective xanthophyll cycle pigments (ZA/ZAV) 14 to 21 DAA may be a mechanism allowing common bermudagrass to recover from HPPD inhibiting herbicide injury, as all Riviera bermudagrass recovered from treatments by 35 DAA. Data in the current study will allow turf managers to design physiologically validated bermudagrass control programs with HPPD inhibiting herbicides.

SOIL TYPE AND PLANTING DEPTH EFFECTS ON EMERGENCE OF LARGE CRABGRASS (*DIGITARIA SANGUINALIS*), VIRGINIA BUTTONWEED (*DIODIA VIRGINIANA*), AND COCKS-COMB KYLLINGA (*KYLLINGA SQUAMULATA*). **J.A. Hoyle*, J.S. McElroy, E.A. Guertal; Auburn University, Auburn, AL.**

ABSTRACT

Soil types can reduce weed seed germination due to bulk density and water holding capacity. Greenhouse experiments were conducted at Auburn University greenhouses to evaluate the influence of soil type and planting depth on emergence of large crabgrass (*Digitaria sanguinalis*), Virginia buttonweed (*Diodia virginiana*), and cocks-comb Kyllinga (*Kyllinga squamulata*). Treatments for large crabgrass research trials were initiated on March 15 2010 and May 21, 2010, Virginia buttonweed on March 24, 2010 and June 9, 2010, and cocks-comb kyllinga on May 24, 2010 and June 17, 2010. A three by seven factorial design was utilized with soil types; Marvyn loamy sand (fine-loamy, kaolinitic, thermic Typic Kanhapludults), Sumpter silty clay (Fine-silty, carbonatic, thermic Rendollic Eutrudepts) and Sand/Peat mix (85:15, v/v) and planting depths; 0, 0.5, 1, 2, 4, 6, and 8 cm. Soils were gravimetrically weighed and packed into soil columns (inside - 6.2 cm diameter by 20 cm height, 6.35 cm conduit PVC pipe) to insure bulk density was consistent through entire column above and below planting depth. Marvyn loamy sand, Sumpter silty clay, and sand/peat mix obtained bulk densities of 1.6, 1.5, and 1.6 g cc^{-1}, respectively. Soil below planting depth was packed and 25 seeds or fruits from weed species were spaced evenly and away from the edges of the column. Soil was then packed above planting depth as previously stated. Columns were placed in the greenhouse with day and night alternating temperature 32°C and 25°C with 24 hour florescent light. Columns were irrigated by hand to maintain field capacity. Four replicates and two runs were conducted per weed species. Collected data included weekly counts for six weeks. A seed was considered emerged when the epicotyl penetrated out of the soil surface then removed from column to reduce weed competition. Percent emergence was calculated by total number of weeds emerged divided by 25 for large crabgrass and cocks-comb kyllinga or 50 for Virginia buttonweed then multiplied by 100. A significant interaction between planting depth and soil type occurred for each weed species. Emergence of all weed species was reduced with increasing planting depth. Cocks-comb kyllinga resulted in the greatest effect of reducing emergence with increasing planting depth for all soil types, not emerging from 4 cm and greater; was minimal at 2 cm (2, 2, and 1% emergence for Marvyn loamy sand, sand/peat, and Sumpter silty clay, rescpectively). Virginia buttonweed planted in Sumpter silty clay and Sand/peat mix did not emerge at 6 cm planting depth while the Marvyn loamy sand did not stop emergence of Virginia buttonweed until a planting depth of 8 cm. Large crabgrass was inhibited to 0% emergence in Sumpter silty clay at only the 8 cm planting depth. Greatest emergence for cocks-comb kyllinga and Virginia buttonweed occurred on the soil surface for all soil types, resulting in 36, 15, and 51% emergence of Virginia buttonweed for Marvyn loamy sand, sand/peat, and Sumpter silty clay, respectively, and 23, 28, and 34% emergence of cocks-comb kyllinga for Marvyn loamy sand, sand/peat, and Sumpter silty clay, respectively. Greatest emergence for large crabgrass occurred at 0.5 cm planting depth in Marvyn loamy sand and sand/peat resulting in 31 and 42% emergence, respectively. Greatest emergence (23%) of large crabgrass planted in Sumpter silty clay occurred on the soil surface. Differences in percent emergence for various soil types could be due to the differences in the water holding capacity of each soil. Water-holding capacity can vary through the soil profile where weed seed banks are located. Weed seeds located in the soil profile also differ in water imbibing requirements for germination. Also, soils can physically restrict germinated seeds ultimately not emerging from soil surface. These are all factors to consider when exploring soil-heating or solarization. Soils can absorb different amounts of thermal heat along with the effects soil moisture has on heat dissipation. This all plays a role in making sure thermal heat can reach weed seed populations to reduce seed viability. Therefore, knowing the differences in emergence of various weeds in different soil types and depths can help increase precision of thermal heat weed control methods.

METHODS OF ASSESSING THE ACTIVITY OF THREE HPPD INHIBITING HERBICIDES.

Matthew T. Elmore*, James T. Brosnan, Dean A. Kopsell, Gregory K. Breeden and Thomas C. Mueller; University of Tennessee, Knoxville.

ABSTRACT

Mesotrione, topramezone, and tembotrione are herbicides that inhibit 4-hydroxyphenylpyruvate dioxygenase (HPPD), indirectly inhibiting carotenoid biosynthesis. Weed control following treatment with HPPD inhibitors is commonly evaluated through visual ratings or assessments of chlorophyll fluorescence. Minimal information is available regarding the accuracy of these techniques for estimating carotenoid and chlorophyll pigment concentrations after HPPD inhibiting herbicide treatment. Research was conducted in 2009 to determine the accuracy of visual ratings and chlorophyll fluorescence yield (F_v/F_m) measurements for evaluating changes in carotenoid and chlorophyll pigment concentrations in bermudagrass (*Cynodon dactylon* L. Pers. cv. 'Riviera') leaf tissue following treatment with mesotrione, topramezone, and tembotrione. In July 2009, mature bermudagrass plants were transferred to 10 cm pots in a glasshouse (Knoxville, TN) and maintained at a 2 cm height of cut. After acclimating for 4 weeks, plants were treated with three rates of mesotrione (0.28, 0.35, and 0.42 kg ha^{-1}), topramezone (0.018, 0.025, and 0.038 kg ha^{--1}), and tembotrione (0.092, 0.184, and 0.276 kg ha^{--1}) forming a 3 x 3 factorial, randomized complete block design with three replications. A non-treated control was also included for comparison. Percent visual bleaching (VB) and F_v/F_m data were collected 3, 7, 14, 21, 28, and 35 days after application. VB was rated using a 0 (dark green leaf tissue) to 100% (white leaf tissue) scale, while Fv/Fm data were collected using a hand-held pulse modulated fluorometer. Immediately following VB and Fv/Fm data collection, leaf material above 2 cm was harvested and frozen at -80°C. Chlorophyll and carotenoid pigments were extracted from harvested tissue and quantified via high-performance liquid chromatography. Chlorophyll, lutein, β-carotene, and xanthophyll cycle pigment concentrations were regressed over VB and F_v/F_m data. With the exception of zeaxanthin, both VB and F_v/F_m were linearly associated with all carotenoid and chlorophyll concentrations measured between 7 and 28 DAA; few significant relationships were detected at 3 and 35 DAA. R^2 values never exceeded 0.65 on any date, suggesting neither evaluation method can accurately estimate carotenoid and chlorophyll pigment concentrations following HPPD inhibiting herbicide application.

POSTEMERGENCE DALLISGRASS CONTROL WITHOUT MSMA. **Robert Cross*, Alan Estes, and Bert McCarty, Clemson University, Clemson, SC.**

ABSTRACT

Dallisgrass (*Paspalum dilatatum* Poir.) is a warm-season clump-forming perennial weed that is troublesome to control in many turf situations. Its coarse texture and fast growth rate disrupt turf quality in golf course and sports fields. MSMA (monosodium methanearsonate) is an effective herbicide for the control of dallisgrass, but will no longer be a control option in the near future because of its removal from the market. A field study was conducted in Clemson, S.C. in the fall of 2010 to evaluate postemergence dallisgrass control without MSMA in 'Tifway 419' bermudagrass [*Cynodon dactylon* (L.) Pers. X *C. transvaalensis* Burtt-Davy.] using various herbicides. Plot sizes for each treatment were 3.0 m by 2.0 m, with three replications. Treatments were applied using a CO_2 pressurized backpack sprayer calibrated to deliver 20 gallons per acre. The sprayer was calibrated to deliver 1 gallon per 1,000 square feet for spot treatments. Initial and sequential herbicide treatments were made to all plots on September 12 and October 20, 2010, respectively. Treatments included: glyphosate (140 g ai/ha), topramezone (24.5 g ai/ha), topramezone + metribuzin (280 g ai/ha), topramezone + imazamox (105 g ai/ha), topramezone + glyphosate, imazamox + metribuzin, and imazamox + glyphosate. Spot treatments included: foramsulfuron (13 g ai/ha), foramsulfuron + Celsius [iodosulfuron + thiencarbazone + dicamba] (22 g ai/ha), and imazamox (224 g ai/ha). Visual ratings were taken at weekly intervals throughout the study. Percent dallisgrass control was rated on a 0-100% scale with 0% representing no control and 100% being no dallisgrass present. Phytotoxicity to 'Tifway 419' bermudagrass was also measured on a 0-100% scale, with 0% being no damage to bermudagrass turf, and 100% being dead bermudagrass turf. Plots will be evaluated in the spring to determine dallisgrass control based on reemergence. Bermudagrass will also be evaluated for spring green-up. No treatment provided greater than 70% control after the first application. Glyphosate, imazamox + glyphosate, topramezone + glyphosate, and imazamox as a spot treatment all provided greater than 85% dallisgrass control after two applications. These treatments also provided >30% bermudagrass injury. Spot treatments of foramsulfuron and foramsulfuron + iodosulfuron + thiencarbazone + dicamba provided no injury to bermudagrass (0%), but less than 57% dallisgrass control. With the future removal of MSMA from the market, turf managers are likely to incur more turf damage in exchange for dallisgrass control.

RESPONSE OF PATRIOT, RIVIERA AND TIFWAY BERMUDAGRASSES TO AMINOCYCLOPYRACHLOR. **D.P. Montgomery*, G.E. Bell, S.M. Batten and D.L. Martin; Oklahoma State University, Stillwater.**

ABSTRACT

Research was conducted at the Oklahoma State University Turfgrass Research Center in Stillwater to evaluate different rates and sequential applications of Imprelis 2SL and GR (aminocyclopyrachlor) formulations for phytotoxicity on improved bermudagrasses at 100% greenup. The study was conducted on three bermudagrass cultivars, ‘Patriot’, ‘Riviera’, and ‘Tifway’ on different growing sites but within 400 yards of each other. All of the cultivars were mature having been in place for three years or more. However, the Tifway and to some extent the Patriot and Riviera experienced winter damage from an exceptionally cold 2009-10 winter in central Oklahoma. Severely damaged sections were avoided. Herbicide treatments evaluated included Imprelis 2SL at 0.0117, 0.023, and 0.0469 lb.a.i./A, alone, and applied as 4-week sequential treatments at similar rates. Imprelis 0.015G, 0.03G, and 0.05G were also evaluated as initial treatments at 0.0225, 0.045, and 0.075 lb.a.i./A, respectively. Also included for comparison was Imprelis 2SL at 0.0469 lb.a.i./A combined with 2,4-D amine at 0.25 lb.a.i./A plus non-ionic surfactant at 0.25% V/V applied at the time of sequential applications. Initial treatments were applied to the Patriot and Riviera on June 19 and June 18, respectively, with sequential treatments on July 19. Initial treatments were applied to Tifway on June 25 with sequential treatments on July 28. A randomized complete block experimental design with 4 replications of treatments was used. Plot size was 6 x 10 ft. The herbicide applications were applied using a CO2 pressurized R&D Brand bicycle sprayer operating at 22 psi and calibrated to deliver a carrier rate of 30 gpa. Mowing was withheld 2 days prior to and 5 days following applications. Irrigation was withheld for 48 hours following applications. The turf was mowed 1 time per week with clippings returned. Mowing height was 1.5 inches. The study was irrigated as needed to avoid wilting. Nitrogen was applied at 3.0 lb/1000 sq.ft. per year to the Patriot and Riviera blocks during the study. Nitrogen was applied at 4.0 lb/1000 sq.ft. per year to the Tifway to encourage recovery from winter damage. Phytotoxicity was assessed using a 0 to 5 whole number scale in the following manner: 0 = no phytotoxicity, 1 = minor yellowing, 2 = severe yellowing, 3 = <20% brown, 4 = >20% but <50% brown, 5 = >50% brown. A phytotoxicity rating of 1.0 would normally be acceptable to all fine turf areas, a rating of 2.0 would be acceptable for some fine turf areas as long as it was a short term (≤ 14 days) affect and a rating of 3.0 would be unacceptable for most if not all turf areas. The phytotoxic effects on Patriot and Riviera were very minor. Yellowing was present on both cultivars in some plots beginning about 7 days-after-treatment (DAT) (0.3 to 1.0) but not evident at later evaluations. The yellowing was caused by the Imprelis applications but was so slight, especially on Patriot, that it could hardly be seen in photographs and may not have been noticeable if green grass had not been present nearby for comparison. The toxic effects on Tifway, however, were in some cases unacceptable for fine turf areas. Imprelis 2SL at 0.0117 and 0.023 lb.a.i./A produced very minor acceptable phytotoxicity (≤ 1.0) when applied as a single application through 120 DAT evaluations. Imprelis 2SL at 0.0469 lb.a.i./A, applied as a single application, produced an unacceptable level of phytotoxicity of 1.3 (7 DAT), 3.8 (14 DAT) and 3.3 (30 DAT). All phytotoxicity from this treatment had diminished by 60 DAT. The addition of 2,4-D amine at 0.25 lb.a.i./A plus non-ionic surfactant to Imprelis 2SL at 0.0469 lb.a.i./A produced very similar levels and duration of phytotoxicity as that produced by Imprelis 2 SL applied alone at the same rate. Split applications of Imprelis 2SL at 0.0117 lb.a.i./A produced acceptable phytotoxicity throughout all evaluations. Split applications of Imprelis 2SL at 0.023 lb.a.i./A produced unacceptable levels of phytotoxicity of 2.5 (14 DAT) & 2.0 (30 DAT). The split application treatment of Imprelis 2SL at 0.0469 lb.a.i./A produced the greatest amount of Tifway phytotoxicity in this study. Tifway phytotoxicity from this treatment was significantly higher than all other Imprelis 2SL & Imprelis granular formulations with values of 4.0 (14 DAT) and 3.8 (30 DAT). Similar to all other Imprelis treatments all phytotoxicity had diminished by 60 DAT from this treatment. Imprelis granular treatments applied at 0.0225 & 0.045 lb.a.i./A produced no Tifway phytotoxicity throughout the duration of this study. Imprelis granular treatments at 0.0750 lb.a.i./A produced a small amount of phytotoxicity at 14 DAT (1.3) and 30 DAT (1.0). All phytotoxicity had diminished from this treatment at later evaluations.

PRE AND POSTEMERGENCE CONTROL OF DOVEWEED IN BERMUDAGRASS. **Jeffrey L. Atkinson, L. B. McCarty, A. G. Estes, Clemson University, Clemson, SC.**

ABSTRACT

The purpose of this study was to evaluate various pre-emergence and post-emergence herbicides for the control of Doveweed *(Murdannia nudiflora)*. *M. nudiflora* is a problematic weed of golf course roughs, fairways and tees. Little research is present evaluating the efficacy of various herbicides on *M. nudiflora*. Two separate studies evaluated the efficacy of various herbicides on *M. nudiflora* for pre-emergence and post-emergence control. Study 1 included two timings of pre-emergence herbicide application with the early timing initiated on March 17, 2010 and the late timing initiated on April 14, 2010. Pre-emergent treatments included Tower (Dimethenamid) 21 & 32 oz/ac, Tower fb Tower 21 oz/ac, Tower fb Tower 32 oz/ac, Pendulum (Pendimethalin) 3lb ai/ac fb Tower 32 oz/ac, Pendulum + Tower 3 lb ai/ac & 32 oz/ac, Gallery (Isoxaben) 1 lb ai/ac, Barricade (Prodiamine) 1 lb ai/ac, Pennant Magnum (S-metolachlor) 4 pt/ac, Ronstar Flo (Oxadiazon) 3 lb ai/ac, Simazine (Simazine) 2 lb ai/ac, Spectacle (Indaziflam) 24 g ai/ac and Broadstar (Flumioxazin) 150 lb/ac. Sequential applicatios were applied 8 WAIT. Study 2 evaluated post-emergence herbicides for doveweed control. Applications were made on July 14, 2010. Treatments included Surge (Sulfentrazone, 2,4-D, Mecoprop-p and Dicamba) 3.25 pt/ac, Speedzone (Carfentrazone-ethyl, 2,4-D, Mecoprop-p and Dicamba) 4 pt/ac, Onetime (Quinclorac, Mecoprop-p and Dicamba) 64 oz/ac, Dicamba (Dicamba) 1 pt/ac, Buctril (Bromoxynil and MCPA) 2 pt/ac, Revolver (Formasulfuron) 26 oz/ac, MSMA (Monosodium acid methanearsonate) 2 lb ai/ac, Celsius (Iodosulfuron-methyl-sodium, Dicamba) 105 g/ac, Surge + Tower (Dimethenamid) 0.81 lb ai/ac & 21 oz/ac, Speedzone + Tower 0.5 lb ai/ac and 21 oz/ac, Onetime + Tower 1.25 lb ai/ac & 21 oz/ac, Dicamba + Tower 0.5 lb ai/ac & 21 oz/ac, Buctril + Tower 1 lb ai/ac & 21 oz/ac, Revolver + Tower 0.04 lb ai/ac & 21 oz/ac and MSMA + Tower 2 lb ai/ac and 21 oz/ac. Study 1 and Study 2 were conducted on irrigated golf course rough comprise of Tifway-419 bermudagrass. Applications were made using a CO_2 powered sprayer calibrated at 20 GPA. Three treatment replications were applied on 1.5 X 2 meter plots. Visual ratings were taken to evaluate percent *M. nudiflora* control. Ratings were based on 0-100%, 0% indicating no control and 100% indicating complete control. All applications received a non-ionic surfactant at 0.25% V/V. ANOVA was evaluated with alpha at 0.05. Greater than 60% control was not seen in any pre-emergence treatments in the March timing of study 1 at any rating date. Ronstar Flo and Tower 21 oz/ac fb Tower 21 oz/ac 8 WAIT showed 50% control 119 DAI (July 14, 2010). Greater than 70% control was not seen in any pre-emergence treatment in the April timing of study 1 at any rating date. Tower 21 oz/ac fb Tower 21 oz/ac 8 WAIT, Tower 32 oz/ac fb Tower 32 oz/ac 8 WAIT, Specticle, Boradstar showed >60% control 92 DAI (July 14, 2010). No significant control was seen September 9, 2010, regardless of application timing. Celsius demonstrated >80% control 29 DAI in study 2. No other treatments showed >60% control at any rating date. Additional herbicides will continue to be evaluated for pre and post emergence doveweed control along with alternate application timings to target doveweed's late germination period.

BERMUDAGRASS SAFETY TO SEEDED BERMUDAGRASS WITH CERTAINTY. **K.M. Bowie*, A.G. Estes, and L.B. McCarty; Clemson University, Clemson, SC.**

ABSTRACT

The purpose of this research was to investigate the safety of Certainty (Sulfosulfuron) to ‘Riviera’ and ‘Princess” seeded bermudagrass and the control of Cocks-comb Kyllinga (Kyllinga squamulata) and Smooth Crabgrass (Digitaria ischaemum). Cocks-comb Kyllinga is a summer annual with bunch type growth that grows in moist areas and can be unsightly on highly maintained turf areas. Smooth Crabgrass is a widely distributed clumping summer annual that produces unsightly seed heads and disrupts turf uniformity. The study was conducted on seeded ‘Riviera’ and ‘Princess’ Bermudagrass located on the campus of Clemson University. The plot size for each treatment measured 2.0 m by 3.0 m, with four replications. Treatments were applied using a CO2 backpack sprayer calibrated at 20 GPA. Treatments for the study included: Certainty 75 DF at 1.25 oz/A and Certainty at 2.5 oz/A on July 12, 2010 (21 DAE) and Certainty at 1.25 oz/A and Certainty at 2.5 oz/A on July 19, 2010 (28 DAE). Visual ratings were taken throughout the study. Percent cocks-comb kyllinga and smooth crabgrass were rated on a 0 – 100% scale with 0% representing no control and 100% representing complete control of cocks-comb kyllinga or smooth crabgrass. Bermudagrass density was measured on a 0 – 100% scale, with 0% representing no bermudagrass present and 100% representing complete cover. Bermudagrass phytotoxicity was measured on a 0 – 100% scale, with 0% representing no injury to the bermudagrass and 100% representing dead bermudagrass. On August 22, 2010 all treatments containing Certainty resulted in excellent (>90%) cocks-comb kyllinga control. Certainty treatments had no control on smooth crabgrass. The bermudagrass stand density was greater (up to 50%) with treatments containing Certainty compared to the untreated. No phyto was observed with Certainty on either variety of bermudagrass throughout the study. Future research at Clemson University will be to continue to evaluate Certainty safety to other bermudagrass varieties. Continue to evaluate Certainty for weed control efficacy alone and in combination with other herbicides.

YELLOW NUTSEDGE (*CYPERUS ESCULENTUS*), SMOOTH CRABGRASS (*DIGITARIA ISCHAEMUM*), AND GOOSEGRASS (*ELEUSINE INDICA*) CONTROL WITH F9001. **G.K. Breeden*, J.T. Brosnan, M.T. Elmore, University of Tennessee, Knoxville; and F.R. Walls, FMC Corporation.**

ABSTRACT

Smooth crabgrass (*Digitaria ischaemum*), goosegrass (*Eleusine indica*), and yellow nutsedge (*Cyperus esculentus*) are common weeds of both warm and cool-season turf. F9001 is a new herbicide mixture of sulfentrazone (206.3 g ai/l) + dithiopyr (273.5 g ai/l). Research trials were conducted in 2010 evaluating the efficacy of sprayable (SC) and granular (G) formulations of F9001 for control of yellow nutsedge, smooth crabgrass, and goosegrass. Trial #1 was conducted on a mature stand of tall fescue (*Festuca arundinacea*) infested with smooth crabgrass at the East Tennessee Research and Education Center in Knoxville, TN. Plots (1.5 by 3 m) were maintained as a golf course rough and arranged in a randomized complete block design with three replications. Treatments included both SC and G formulations of F9001 (493 g ai/ha, 706 g ai/ha and 908 g ai/ha), dithiopyr (426 g ai/ha), and sulfentrazone (281 g ai/ha) + prodiamine (562 g ai/ha). All treatments were applied at a preemergence (PRE) smooth crabgrass timing on 24 March. Trials #2 and #3 conducted on a mature stand of zoysiagrass (*Zoysia japonica*) infested with goosegrass and yellow nutsedge at the East Tennessee Research and Education Center in Knoxville, TN. Plots (1.5 by 3 m) were maintained as a golf course rough and arranged in a randomized complete block design with three replications. Treatments included both SC and G formulations of F9001 (493 g ai/ha, 706 g ai/ha and 908 g ai/ha) and dithiopyr (426 g ai/ha). Applications were made at PRE, 1-4 leaf (1-4LF), and 1-2 tiller (1-2TL) stages of goosegrass growth on 6 May, 4 June, and 16 June, respectively. Sprayable treatments in all trials were applied with a CO2 powered boom sprayer calibrated to deliver 280.5 L/ha utilizing four, flat-fan, 8002 nozzles at 124 kPa, configured to provide a 1.5-m spray swath. Granular treatments were applied by hand. Weed control and turf injury were visually evaluated in all trials utilizing a 0 (no weed control or turf injury) to 100 % (complete weed control or turf injury) scale at 30, 60, 90, 120, and 146 days after initial treatment (DAIT). At no time during these studies was tall fescue or zoyisagrass injury observed. In Trial #1, all treatments controlled smooth crabgrass ¡Ý97% on all rating dates before 90 DAIT. All treatments controlled smooth crabgrass ¡Ý85% after 90 DAIT through the end of the study. In Trials #2 and #3, all treatments applied PRE controlled goosegrass ¡Ý97% from 30 DAIT through the end of the study. Applied PRE, F9001 SC (706 and 908 g ai/ha) controlled yellow nutsedge ¡Ý85% at 90 and 120 DAIT as well. Applied 1-4LF, F9001SC and G (706 and 908 g ai/ha) controlled goosegrass ¡Ý78% at 60 DAIT through the end of the study. Comparitevely, F9001SC and G (493 g ai/ha) and dithiopyr applied at 1-4LF controlled goosegrass ¡Ü73% on all rating dates. All F9001 treatments applied 1-4LF controlled yellow nutsedge ¡Ý93% 60 DAIT through the end of the study. At 1-2TL all treatments controlled goosegrass ¡Ü22% and yellow nutsedge ¡Ý95% at 60 DAIT through the end of the study. All dithiopyr treatments controlled yellow nutsedge 0% on all rating dates. These data suggest applications of F9001 can provide PRE control of smooth crabgrass, PRE and early postemergence (POST) control of goosegrass, and PRE and POST control of yellow nutsedge.

EXPLORING POSTEMERGENCE WEED CONTROL IN TURF WITH CELSIUS. **L.B. McCarty*, A.E. Estes, J.L. Aitkinson, J.W. Marvin; Clemson University, Clemson, SC.**

ABSTRACT

Celsius 68WDG is a new postemergence herbicide being developed and marketed by the Bayer Environmental Science company. It is a 3-way mixture of iodosulfuron-methyl (1.9%) + dicamba (57.4%) and thiencarbazone-methyl (8.7%). Trials were performed at Clemson University and/or nearby golf courses to evaluate its potential broadleaf weed control and possible deleterious effects on Tifway bermudagrass (*Cynodon dactylon* x *C. transvaalensis*) spring greenup. Plot sizes for each treatment were 2.0 by 3.0 m, with three replications. Treatments were applied using a CO_2 pressurized backpack sprayer calibrated at 20 gallons per acre. Rates evaluated ranged from 2.5 to 4.9 oz/acre. Visual ratings were taken at various intervals throughout the study including weed control from 0-100% with 0% representing no control and 100% being no dallisgrass present. Spring greenup was also rated on a 0-100% scale, with 0% being no bermudagrass green turf and 100% = complete green bermudagrass turf cover. Greater than 90% control occurred for white clover (*Trifolium repens*), dogfennel (*Eupatorium caprillifolium*), spotted spurge (*Chamaesyce maculata*), henbit (*Lamium amplexicaule*), common chickweed (*Stellaria media*), red sorrel (*Rumex acetosella*), and large hop clover (*Trifolium campestre*) with single Celsius applications ranging from 2.5 to 4.9 oz product per acre. Approximately 80 to 90% control occurred for wild garlic (*Allium vineale*) with less than 50% control for annual lespedeza (*Lespedeza striata*) and corn speedwell (*Veronica arvensis*). Trimec Classic 2.72L was used as a standard comparison at 64oz/acre and provided similar weed control as Celsius except for red sorrel (<10% control). Virginia buttonweed (*Diodia virginiana*) control was approximately 70% following two Celsius applications at 3.75 oz/acre while T-Zone 2.51L at 2.25 pts/acre applied twice 4 weeks apart provided 80% control initially but fell to about 50% control 40 days following the sequential application. Similarly, postemergence doveweed (*Murdannia nudiflora*) control was between 80 and 90% with Celsius at 3.75 oz/acre applied twice spaced between 14 and 28 days apart. Doveweed populations slowly recovered but it's not clear if this is from subsequent germination or recovery from existing plants. Tifway bermudagrass spring greenup was unaffected by Celsius applied between 2.5 to 4.9 oz/acre applied in late February followed by a sequential in mid-March. The standard comparison, Trimec Classic at 64 oz/acre provided similar effects on bermudagrass greenup as Celsius. Future research will involve screening additional problematic weeds for control with Celsius alone and in combination with other POST herbicides or preemergence products for extended control. Turf tolerance studies will also continue when questions arise.

AMICARBAZONE, A NEW POSSIBLE POSTEMERGENCE CONTROL. **Robin S. Landry*, L.B. McCarty, A.G. Estes; Clemson University, Clemson, SC.**

ABSTRACT

Annual bluegrass (*Poa annua*) is a widely distributed seed producing winter annual with a tufted growth habit. Roughstalk bluegrass (*Poa trivialis*) is a seed producing perennial that also has a tufted growth habit and yellow-green color. The purpose of this research was to evaluate postemergence control of annual bluegrass and roughstalk bluegrass in creeping bentgrass (*Agrostis stolonifera*) golf course fairways using Amicarbazone (Xecute 70 DF). The study was conducted on creeping bentgrass fairways at Wade Hampton Golf Course in Cashiers, NC. Plot size for each treatment was 2.0 m by 3.0 m with 4 replications. Treatments were applied using a CO<2> backpack sprayer calibrated at 20 GPA. Treatments for the study included: Amicarbazone at 0.044 lbs ai/a applied April 22, 2010 followed by 6, 12, 20 DAI (days after initial application), 0.0875 lbs ai/a applied April 22 and 20 DAI, 0.131 lbs ai/a applied April 22 and 20 DAI and bispyribac-sodium (Velocity 17.6 SG) at 0.022 lbs ai/a applied on April 22 followed by 12, 26, 40 DAI and sulfosulfuron (Certainty 75 WDG) at 0.012 lbs ai/a applied on April 22 and 12 DAI. Visual ratings were taken throughout the study. Percent creeping bentgrass injury was rated on a 0-100% scale with 0% representing no injury and 100% representing the damage to all bentgrass present. Percent annual bluegrass and roughstalk bluegrass control was rated on a 0-100%, with 0% representing no control and 100% percent representing total control. In addition, a composite rating of stand density was taken on a 0-100% scale with 0% representing no green grass (turfgrass and/or *Poa* species) in the stand and 100% representing total stand density. Overall, 20 DAI (days after initial application) saw 65% turf stand injury from amicarbazone (0.044 lbs ai/a) after 3 applications and sulfosulfuron after 2 applications. Injury decreased to ≤ 20%, 33 and 40 DAI for all three rates of amicarbazone. Injury from amicarbazone was more severe than bispyribac-sodium treatments at all rating dates, with the exception of 40 DAI. Amicarbazone reduced overall stand density ~45% more than Velocity and Certainty at 33 and 47 DAI. However, amicarbazone provided greater control for annual bluegrass and roughstalk bluegrass than Certainty and Velocity at ~70%. Future research will be continued at Clemson University and Wade Hampton Golf Course where plots will be evaluated for long term effects of treatments. Turf injury in weed-free creeping bentgrass will be assessed. Repeat treatments of amicarbazone and additional products will be evaluated for timing and control of *Poa annua*.

ZOYSIAGRASS CULTIVAR RESPONSE TO AMINOCYCLOPYRACHLOR AND EVALUATION OF VARIOUS RATING METHODS. **Michael L. Flessner*, J. Scott McElroy, and James D. McCurdy; Auburn University, Auburn, AL.**

ABSTRACT

Differential zoysiagrass cultivar response to herbicide treatment has been reported. Aminocyclopyrachlor (AMCP) is a herbicide that is labeled for use on zoysiagrass; however, some injury has been reported. This study evaluated the response of 'BK-7,' 'Cavalier,' 'Emerald,' 'Empire,' 'Meyer,' and 'Zorro' zoysiagrass cultivars to AMCP. A secondary objective was to compare the two evaluation methods used. Cultivars were grown in 700 cm^3 (79 cm^2 surface area) pots containing native soil in greenhouse conditions (25 to 32C). Pots were mown twice weekly at 4.5 cm and received daily irrigation and weekly fertility. A completely randomized design with 4 replications was utilized. The experiment was re-randomized weekly to account for variations in microclimate. The experiment was conducted twice (repeated-in-time). Treatments included 0, 0.005, 0.02, 0.11, 0.52, 2.4, and 11 kg ai ha^{-1} AMCP, applied to each pot in a 280 L ha^{-1} spray volume. Data were collected 3, 5, and 7 weeks after treatment and included percent visual necrosis (%VN) independently evaluated by two researchers and normalized difference vegetative index (NDVI) assessment. Data were subjected to ANOVA using PROC GLM in SAS. Further analysis was conducted by rating date and data type utilizing a log-logistic regression technique. Pearson's correlation coefficients were calculated to determine if %VN and NDVI responses were related. ANOVA indicated that both %VN and NDVI data could be pooled across experiment repetitions and %VN data could be pooled across researchers. Researchers had a correlation coefficient of 0.958 ($P < 0.001$). Cultivars were found to be significant in the model ($P < 0.001$), indicating that not all cultivars responded similarly to AMCP treatment and that cultivars could not be pooled within species or across genus. A general trend using %VN data across rating dates indicate that Cavalier, Meyer, and Zorro are most tolerant, Emerald and Empire are moderately tolerant, and BK-7 is least tolerant to AMCP, of the cultivars evaluated. All zoysiagrass cultivars evaluated have sufficient tolerance (little to no injury) for the use of AMCP as a weed control agent at the labeled rate of 0.053 kg ha^{-1}. NDVI assessment resulted in a greater standard error compared to %VN and could not differentiate between cultivars at any rating date, possibly due to algae contamination in pots. Therefore NDVI data were not used to rank the relative tolerance of the cultivars. However, NDVI and %VN data were highly correlated (-0.883, $P < 0.001$). NDVI data had lower pseudo R^2 values compared to %VN data. %VN assessment explained more variation with greater precision than NDVI analysis.

ALTERNATIVE GOOSEGRASS (*ELEUSINE INDICA*) CONTROLS WITHOUT MSMA. **J.W. Marvin*, L.B. McCarty, A.G. Estes; Clemson University, Clemson, SC.**

ABSTRACT

The purpose of this study was to evaluate various post emergence herbicides for the control of goosegrass (*Eleusine indica*). *E. indica* is a problematic weed of golf course tees, fairways and greens and tends to thrive in compacted poorly drained soils. Resistance has become a concern, particularly to sulfonylurea herbicides. Two separate studies evaluated the effectiveness on juvenile and mature *E. indica* plants to various post herbicides. Study 1 was initiated June 1, 2010; study 2 was initiated August 2, 2010. Four applications of Acclaim (fenoxaprop) @ 0.015 & 0.029 Lb ai/a, Tenacity (mesotrione) @ 0.047 & 0.062 Lb ai/a, Vantage (sethoxydim) @ 0.063 Lb ai/a, Revolver (foramsulfuron) @ 0.042 Lb ai/a, Illoxan (diclofop) @ 1.05 Lb ai/a, Acclaim + Sencor (Fenoxaprop + Metribuzin) @ 0.015 & 0.25 Lb ai/a, Tenacity + Acclaim (mesotrione + fenoxaprop) @ 0.047 & 0.015 Lb ai/a, Acclaim + Dismiss (fenoxaprop + sulfentrazone) @ 0.015 & 0.25 Lb ai/a and Tenacity + Acclaim + Dismiss + Sencor (mesotrione + fenoxaprop + sulfentrazone + metribuzin) @ 0.047, 0.015, 0.19 and 0.25 Lb ai/a. Sequential applications were applied 14, 28 and 42 days after initial (DAIT). Study 1 was conducted on a non-irrigated fairway comprised of common bermudagrass; study 2 was located on an irrigated fairway consisting of Tifway and common bermudagrass. Applications were made using a CO_2 powered sprayer calibrated at 20 GPA. Three treatment replications were applied on 2 X 3 meter plots. Visual ratings were taken to evaluate percent *E. indica* control and percent bermudagrass phytotoxicity. Ratings were base on 0-100%, 0% indicating no control of phytotoxicity and 100% indicating complete control or phytotoxicity. All applications received a non-ionic surfactant at 0.25 % V/V. ANOVA was evaluated with alpha at 0.05. Illoxan, Revolver, Acclaim + Dismiss, Acclaim + Sencor and Tenacity + Acclaim + Dismiss + Sencor all provided >90% control on Study 1 at the July 20, 2010 rating date. All treatments showed initial phytotoxicity, Acclaim at both rates, Tenacity high rate, Tenacity + Acclaim; and Tenacity + Acclaim + Dismiss + Sencor had >20% phytotoxicity at the June 2, 2010 rating date. Acclaim + Dismiss, Acclaim + Sencor and Tenacity + Acclaim + Dismiss + Sencor remained >30% phytotoxicity as of the June 24, 2010 rating date. Illoxan, Revolver, Acclaim + Dismiss, Acclaim + Sencor and Tenacity + Acclaim + Dismiss + Sencor all provided > 90% control on Study 2 at the September 20, 2010 rating date. Tenacity + Acclaim + Dismiss + Sencor had an initial phytotoxicity rate of ¡Ö 15% on August 12, 2010; all other treatments were <10%. By September 2, 2010 all treatment phytotoxicity decreased below 10%. Plots will continue to be evaluated for long term effects of the products. Repeat treatments and additional screening of products will be continued for timing and control of goosegrass.

APPLICATION TIMING INFLUENCES INDAZIFLAM EFFICACY FOR CRABGRASS CONTROL IN BERMUDAGRASS. **J.B. Workman*, P.E. McCullough, F.C. Waltz; University of Georgia, Griffin.**

ABSTRACT

Smooth crabgrass (*Digitaria ischaemum*) is a low spreading summer annual with a light green color and unsightly seedheads that can become a problematic weed in turfgrass. The objective of this study was to investigate the influence of application timings of indaziflam for smooth crabgrass control in bermudagrass. Indaziflam is a new preemergence herbicide chemistry for smooth crabgrass control with potential activity for use at various application timings in spring. A study was conducted at the University of Georgia Griffin Campus to evaluate indaziflam control of smooth crabgrass using different application timings and rates. Indaziflam was applied at three rates of 0.035, 0.052, and 0.07 kg ai/ha at early, regular, and late preemergence timings. The early PRE timing was February 19, the regular PRE timing was March 16, and the late PRE timing was April 6, 2010. Prodiamine was also applied as a standard comparison at 0.84 kg ai/ha. All indaziflam rates regardless of application timings provided excellent smooth crabgrass control (90% or greater) throughout the summer. Indaziflam at all rates was also comparable to prodiamine regardless of application timings and bermudagrass injury was not observed from any treatment.

POST-EMERGENCE GOOSEGRASS CONTROL IN BERMUDAGRASS TURF. **L.R. Hubbard*, A.G. Estes and L.B. McCarty; Clemson University, Clemson, SC.**

NO ABSTRACT.

INFLUENCE OF TURFGRASS COVERAGE ON PESTICIDE RUNOFF. **Steven M. Borst*, Jeffrey S. Beasley, Ron E. Sheffield, Ron E. Strahan, and Robert P. Gambrell; LSU Agricultural Center, Louisiana State University, Baton Rouge.**

ABSTRACT

Fine turfgrass sites are highly managed for aesthetics and utilitarian purposes with frequent pesticide and nutrient applications. Given more than 16 million ha-1 of managed turf in the United States, pesticide application to these areas represents a potential source for non-point water pollution. Previous research on pesticide runoff from turfgrasses has primarily focused on bare soil and/or mature turfgrass canopies. Research was initiated to evaluate the influence of turfgrass coverage (0, 25, 50, 75, or 100%) and pesticide water solubility on pesticide runoff from a 10% slope in Baton Rouge, LA. Pesticides evaluated in the study, MSMA, metolachlor, and azoxystrobin were selected to represent high, moderate, and low pesticide water solubility classes, respectively. Pesticides were applied using a carbon dioxide pressurized backpack sprayer at 282 L ha-1 24 hrs prior to rainfall simulation. Simulated rainfall was performed using a Tlaloc 3000 rainfall simulator at an intensity of 7.32 cm h-1 for 30 min of continuous runoff. All runoff water and sediment were collected and partitioned for analysis of pesticide residues using gas chromatography. Patterns of decreasing runoff volume and erosion were exhibited with increasing turfgrass coverage. Water runoff volume and sediment losses decreased from 52.2 L to 41.4 L to 20.5 L and 136.9 g to 48.4 to 5 g for 0%, 75% and 100% turfgrass coverage, respectively. Pesticide losses were highest for 0% to 75% turfgrass coverage and did not decline until coverage exceeded 75%. However, pesticide water solubility affected pesticide losses. For turfgrass coverage between 0% and 75%, pesticide losses were 18%, 11%, and 6% of product applied for MSMA, metolachlor and azoxystrobin, respectively, compared to 10%, 4%, and 2% losses for each pesticide at 100% turfgrass coverage. Sediment transport was not the primary mechanism for pesticides runoff losses.

ASSESSING AND MITIGATING THE POTENTIAL OF OFF-TARGET INJURY TO COOL SEASON TURFGRASSES WITH INDAZIFLAM. **David R. Spak*, Don Myers, and Britt Baker; Bayer Environmental Science, Research Triangle Park, NC.**

ABSTRACT

Indaziflam is a new alkylazine herbicide recently registered in the U.S. for preemergence weed control in warm-season turfgrasses. Cool-season turfgrasses exhibit poor tolerance to indaziflam and as a result, are not labeled for this use. In certain regions of the U.S., cool-season turfgrasses, particularly creeping bentgrass (*Agrostis palustris*) and perennial ryegrass (*Lolium perenne*), are utilized for putting greens and/or overseeding of warm-season turfgrasses during the winter. The objective of this research was to determine if indaziflam can be used safely around cool-season turfgrasses areas. Studies were conducted to determine the potential of off-site indaziflam movement and cool-season turfgrasses injury. Greenhouse and field studies included: the effect of irrigation management on indaziflam movement from turf following heavy irrigation or rainfall, tracking potential of indaziflam onto creeping bentgrass putting greens, utilization of activated charcoal to deactivate indaziflam, and assess the sensitivity of bentgrass and ryegrass to indaziflam. The 20WP formulation of indaziflam was used in all studies. Watering-in had the greatest impact on reducing lateral movement of indaziflam. Results indicate that <1% of the applied indaziflam moved laterally from bermudagrass turf following a heavy simulated-rainfall event. There were no differences in lateral movement between dormant and green bermudagrass. Perennial ryegrass was very sensitive to indaziflam, and rates as low as 1 g ai/ha significantly reduced ryegrass emergence. Therefore, the estimated concentration of indaziflam from lateral movement may be enough to prevent ryegrass germination. Established perennial ryegrass and creeping bentgrass were more tolerant and tolerated rates up to 10-15 g ai/ha. Activated charcoal applied at 112 to 336 kg/ha increased ryegrass establishment when applied three weeks after the application of indaziflam. Higher rates of charcoal were needed to deactivate higher rates of indaziflam. On creeping bentgrass, charcoal applied 2 hours after indaziflam greatly reduced turf injury, but charcoal applied after phytotoxic symptoms developed (2 weeks) was less effective. Indaziflam applied at 53 g ai/ha to bermudagrass, either dormant or green, did not track onto putting greens from equipment tire traffic. In summary, indaziflam has a low risk potential to established cool-season turf when used on adjacent warm-season turf areas. Indaziflam movement does have the potential to impact ryegrass overseeding and precautions will need to be taken. Results of these and other studies will be discussed. Bayer CropScience LP. 2 T.W. Alexander Dr., RTP, NC 27709.

POSTEMERGENCE BROADLEAF WEED CONTROL WITH F9009 AUTHORS AND AFFILIATIONS. **G.M. Henry*, Texas Tech University, Lubbock; J.T. Brosnan and G.K. Breeden, University of Tennessee, Knoxville; F.R. Walls, FMC Corporation, Goldboro.**

ABSTRACT

Research was conducted in 2009 and 2010 to evaluate the efficacy of F9009 for the control of ground ivy (Glechoma hederacea L.) at Egwani Farms Golf Course (Rockford, TN). Treatments were applied with a CO_2 powered boom sprayer equipped with four 8002 flat-fan nozzles calibrated to deliver 281 L/ha of spray volume. Treatments were initiated on May 26, 2009 and July 27, 2010 and included metsulfuron at 10.5, 21, and 42 g ai/ha; and F9009 at 183, 290, 300, 323, 430, 440, and 463 g ai/ha. Ground ivy control and bermudagrass injury were rated visually on a 0 (no ground ivy control or turf injury) to 100% (complete kill of all ground ivy or turf) scale relative to the untreated control at 1, 2, 4, and 8 weeks after treatment (WAT). Data were subjected to analysis of variance (ANOVA) and means were separated using Fisher's Protected LSD at the 0.05 significance level. No bermudagrass phytotoxicity was observed in either year regardless of treatment. Over a two year period, ground ivy control with metsulfuron at 10.5, 21, and 42 g ai/ha ranged from 0 to 5% 1 WAT and 12 to 60% 2 WAT. Ground ivy control with F9009 ranged from 40 to 72% 1 WAT and 87 to 100% 2 WAT. Few differences in ground ivy control were detected between treatments 8 WAT in either year. Research was conducted in 2010 to evaluate the efficacy of F9009 for the control of khakiweed (Alternanthera pungens HBK.) and prostrate knotweed (Polygonum aviculare L.) at Meadowbrook Golf Course (Lubbock, TX). Treatments were applied using a CO_2 backpack sprayer equipped with XR8004VS nozzle tips and calibrated to deliver 375 L/ha at 221 kPa. Treatments were initiated on August 18, 2010 and consisted of metsulfuron at 10.5, 21, and 42 g ai/ha; and F9009 at 323 and 463 g ai/ha. Weed control and bermudagrass injury were rated visually on a 0 (no weed control or turf injury) to 100% (complete kill of all weeds or turf) scale relative to the untreated control at 1, 2, 4, 8, and 12 WAT. Data were subjected to ANOVA and means were separated using Fisher's Protected LSD at the 0.05 significance level. No bermudagrass phytotoxicity was observed throughout the length of the trial regardless of treatment. Initial knotweed control with metsulfuron was 33 to 50% 1 WAT, regardless of rate; while initial khakiweed control was 0 to 27%. F9009 exhibited moderate initial khakiweed control (56 to 58%) and knotweed (50 to 52%) 1 WAT, regardless of rate. Long-term control of knotweed with metsulfuron was 83 to 96% regardless of rate, while control with F9009 was 98 to 100% 12 WAT. Long-term control of khakiweed with metsulfuron was 62 to 81% regardless of rate, while control with F9009 was 86 to 91% 12 WAT.

FIELD ASSESSMENT OF FLAZASULFURON AND TRIFLOXYSULFURON SODIUM DRIFT USING A CORN (*ZEA MAYS*) BIOASSAY. **Angela R. Post*, Jennifer L. Jester, Shawn D. Askew, and Melvin D. Grove, Virginia Tech, Blacksburg.**

ABSTRACT

In 2007 flazasulfuron was granted a conditional registration by the United States Environmental Protection Agency (EPA). This product is a sulfonylurea herbicide labeled for use in bermudagrass and zoysiagrass, but the 2007 registration required a 30 m nontreated buffer between treated turf and sensitive plants. In the US, the most common use for flazasulfuron is control of perennial ryegrass in overseeded bermudagrass on golf course fairways. With a 30 m buffer requirement, this use is essentially prohibited since most fairways are less than 60 m wide and typically bordered by sensitive cool-season turf species. A similar herbicide, trifloxysulfuron sodium, has a required buffer of only 7.6 m which is acceptable for use in the golf industry. Field data were needed to replace EPA models if the buffer restriction was to be modified and the product successfully sold in US markets. Our objective was to assess drift of flazasulfuron and trifloxysulfuron sodium using EPA guidelines for application conditions that match label specifications for each herbicide. Corn is sensitive to both herbicides and was chosen as a suitable bioassay species for these drift studies. Two field studies were conducted at the Glade Road Research Facility in Blacksburg, VA in 2008 and 2009. Corn plants were greenhouse grown in 10 cm pots and thinned to one plant per pot. After two weeks, plant sizes were recorded and the study initiated. Studies were conducted as randomized complete block split plot designs with two herbicide main plots and six distance-from-target subplots. Studies included five replications with four plants as subplots within each replication. The herbicide main plots included flazasulfuron (52 g a.i./ha) and trifloxysulfuron sodium (30 g a.i./ha). Herbicides were applied to ‘Riviera’ bermudagrass mown at 1.3 cm. A Toro Multipro turf sprayer was operated perpendicular to prevailing wind direction and corn plants were placed downwind along a transect. Herbicides were applied perpendicular to a 6.4 to 9.7 km hr-1 wind and corn plants were placed at distances between 0 and 30.5 m down-wind from the spray application. Wind speed and direction was determined using wind meters and neutrally buoyant balloons. After spraying, plants were returned to the greenhouse and randomized. Concurrently, a bioassay was conducted to determine corn growth response to herbicide rates. Eleven rates of flazasulfuron and trifloxysulfuron sodium were applied to five replicates each containing four subsamples for a total of 20 plants treated with each herbicide rate. Herbicide rates were based on maximum labeled rates and all treatments included nonionic surfactant at 0.25% by volume. Bioassay corn plants were returned to the greenhouse after spraying and randomized with field drift study plants. Height measurements were taken at weekly intervals for three weeks after treatment. The bioassay based on corn height reduction indicated trifloxysulfuron sodium reduced corn height more than flazasulfuron. In the drift study flazasulfuron drift injury was not detected beyond 4.6 m downwind of application. These results were submitted to EPA along with other data and the label was modified to reduce the buffer restriction to 8 m. Flazasulfuron was released by PBI Gordon in 2010 under the trade name Katana Turf Herbicide®.

EFFECTS OF INDAZIFLAM ON BERMUDAGRASS (*CYNODON DACTYLON* (L.) PERS.) QUALITY AND ROOT STRENGTH. **Angela R. Post*, and Shawn D. Askew, VirginiaTech, Blacksburg.**

ABSTRACT

Bermudagrass root response to herbicides range from decreased and delayed rooting, and malformation of roots, to decreased ability of stolons to root at the nodes. Bensulide, dithiopyr, pendimethalin, oryzalin, prodiamine, and trifluralin in particular are known to adversely affect rooting of some bermudagrass cultivars. Turf managers are sensitive to bermudagrass root response to herbicides so new herbicides should be tested to assess effects on roots. In this study, the new herbicide indaziflam (Specticle, Bayer) was assessed for effects on bermudagrass quality and root strength over multiple years. The trial was established in 2009 on a four year old stand of 'Rivera' bermudagrass with a history of thin turf and weed infestation. The trial was arranged in a randomized complete block design with three replications. Plots were 2m x 2m. Treatment programs included indaziflam (52 g ai/ha in fall) followed by (fb) indaziflam (35 g/ha in spring), indaziflam (35 g/ha in fall) fb indaziflam (52 g/ha in spring), indaziflam (52 g/ha in fall) fb oxadiazon (2244 g/ha in spring), indaziflam (52 g/ha in fall) fb prodiamine (841 g/ha in spring) and an industry standard of prodiamine in fall fb prodiamine in spring (both 841 g/ha). Average bermudagrass cover at initiation was 85%. Initial treatments were made in the fall with follow-up applications in the spring. Assessments of root strength were made 8, 10 and 16 weeks after spring treatments. Root strength was assessed using a digital scale with a 1 inch diameter S-hook inserted into the turf/soil interface and pulled through at a 15 degree angle such that the hook was pulled through the bermudagrass stolons at a low angle. This method attempts to measure a combination of stolon density and root strength of existing stolons. "Bermudagrass Root Strength" was assessed by choosing 5 sites within plots that had good bermudagrass quality and assessing root strength on those chosen plots. A "Plot Root Strength" data point was also taken for each plot by targeting 5 sites pre-chosen from a grid in a non-biased fashion. In many cases, bermudagrass may not have been present in some sites assessed for "Plot Root Strength," so here the focus is on "Bermudagrass Root Strength" rather than "Plot Root Strength." Assessments were made on May 28th, June 15th, and August 4th, 2010. On May 28th the prodiamine program was the only program with lower root strength than the non-treated control (NTC). The same trend was evident on June 15. On June 15, the number of loose stolons in each plot was also counted and data indicate that prodiamine and NTC had equivalent loose stolons while all indaziflam plots had more loose stolons. However, on this date bermudagrass cover in both NTC and prodiamine plots were considerably less than in indaziflam plots due to severe Poa annua infestation in the former. The following equation was used to adjust loose stolon counts to represent a prediction of loose stolons when bermudagrass cover is 100% ((100/actual bermudagrass cover)*stolon count). When this equation was applied, no significant differences were noted in loose stolons for any treatment. Therefore differences in loose stolon counts were attributed to differences in bermudagrass cover. There was less bermudagrass available in prodiamine and NTC plots due to annual bluegrass infestation and so fewer loose stolons were counted on June 15. Further support of this assumption can be found in the August 4, 2010 data where bermudagrass cover was equivalent in all treatments and no differences were noted in loose stolons per plot. On Aug 4, all treatments had equivalent root strength compared to the NTC. Indaziflam followed by oxadiazon had superior root strength to prodiamine followed by prodiamine on this date. These results suggest indaziflam is equivalent or superior to prodiamine in preserving bermudagrass root strength regardless of rates applied fall or spring or sequential programs with other herbicides when applied on bermudagrass turf mown at 1.5 cm. This study is currently in the second year of treatments and will be evaluated next summer to measure effects from a 2-year exposure to these herbicide programs.

INDAZIFLAM FOR PREEMERGENT WEED CONTROL IN WARM SEASON TURFGRASS. **D.F. Lewis*, T.W. Gannon, F.H. Yelverton. North Carolina State University, Raleigh, NC.**

ABSTRACT

Annual bluegrass (*Poa annua* L.) and smooth crabgrass (*Digitaria ischaemum* Schreb. Ex Muhl.) are annual grassy weeds in warm season turfgrass systems. Preemergence (PRE) herbicides are often utilized for controlling these species; however, germination timings vary greatly among species making PRE application timing critical for successful weed control. Indaziflam is a newly registered herbicide by Bayer CropScience for PRE control of numerous broadleaf and grassy weeds in turfgrass systems. Indaziflam inhibits cellulose biosynthesis and belongs to the alkylazine chemical class. Initial research demonstrates indaziflam is a persistent compound offering long-term PRE control and can provide early postemergence (POST) activity. Research was conducted in 2008 to evaluate various timings of single and/or repeat indaziflam applications for annual bluegrass and smooth crabgrass control in bermudagrass (*Cynodon dactylon* (L.) Pers.) fairways. Results indicated single and repeat applications of indaziflam (40 and 60 g ai ha^{-1}) applied late September had early POST activity on annual bluegrass, controlling > 70% 227 days after initial application (DAIA); however, control was ¡Ü 35% for the respective herbicide treatments applied in late October or mid-February indicating mature annual bluegrass is tolerant to POST indaziflam applications. Annual bluegrass control was < 29% 227 DAIA following single and repeat applications of prodiamine (919.5 g ai ha^{-1}) applied late September demonstrating application timing is more critical with this chemical class. Single applications of indaziflam (20-60 g ha^{-1}) controlled crabgrass 65-83% 345 DAIA; however, repeat applications increased control to 76-98%. Single prodiamine applications provided 48% smooth crabgrass control but increased to > 90% with a repeat application in mid February. These data indicate indaziflam offers flexible application timings for annual bluegrass control. Furthermore, fall-applied indaziflam can provide acceptable residual smooth crabgrass control.

EFFECTS OF CUMYLURON ON CREEPING BENTGRASS (*AGROSTIS STOLONIFERA* L.) AND ANNUAL BLUEGRASS (*POA ANNUA* L.) ROOTS. **Brendan M.S. McNulty*, and Shawn D. Askew, Virginia Tech, Blacksburg.**

ABSTRACT

Annual bluegrass (*Poa annua* L.) is a common winter annual grassy weed found in creeping bentgrass (*Agrostis stolinifera* L.) golf course putting greens. Annual bluegrass has long been one of the most troublesome weeds of golf courses due to its ability to adapt to putting green management and compete with creeping bentgrass. There are currently two pre-emergence herbicides that are labeled for annual bluegrass control on creeping bentgrass putting greens; bensulide and oxadiazon. Neither of these products offers post emergence activity on annual bluegrass. Cumyluron is a new herbicide under evaluation by the Helena Chemical Company. It offers pre and post emergence control of annual bluegrass on creeping bentgrass putting greens with safety to the desired turf. Cumyluron typically does not control annual bluegrass in the first season but acceptable control is usually observed in the second year. We hypothesized that this slow multi-seasonal annual bluegrass control may be due to either 1) differential effects on annual bluegrass and creeping bentgrass roots; or 2) differences between annual bluegrass and creeping bentgrass root depth in response to summer stress. An experiment was devised to test the first hypothesis using annual bluegrass and creeping bentgrass plants grown in aeroponics with nutrient solution amended with various rates of cumyluron. Since nutrient solutions containing herbicides were sprayed directly on plant roots, this system tested the direct effects of cumyluron on annual bluegrass and creeping bentgrass root growth. The trial was established on December 4th, 2009 at the Glade Rd. Research Center in Blacksburg, VA. Eight aeroponics units were constructed and placed in a greenhouse maintained at 85F day and 75F night with high intensity fluorescent lights providing 400 micromoles per m^2 of photosynthetically active radiation. Each aeroponics unit contained 16 plants; 8 annual bluegrass and 8 creeping bentgrass. Plants were collected from mature stands and thinned to one tiller each before placing in the aeroponics system. These single-tiller plants were acclimated and allowed to grow on normal nutrient solution for 4 weeks. After 4 weeks, plants had between 30 and 55 tillers and roots were at least 25 cm long. Upon initiation, all foliage was cut to 39 mm and all roots were cut to 52 mm and nutrient solutions were randomly amended to provide a range of cumyluron rates, a comparison of bensulide, and a nontreated check. Cumyluron rates were 1720, 860, 172, 86, 17.2, and 1.72 g ai/ha respectively. The bensulide rate was equivalent to 9000 g ai/ha. Plants were grown in presence of herbicides for 17 days and regrowth of the cut roots and foliage was measured. Visual quality of turfgrass and normalized difference vegetative index (NDVI) was also assessed. Final data included root and foliar dry weight. No species-specific differences were noted at any time for any parameter measured in the study. Data were pooled over species and regressions were used to explain cumyluron rate responses. At 17 days after treatment (DAT) there were no differences in dry foliar biomass. Normalized difference vegetative index (NDVI) and dry foliar weight were poorly correlated to cumyluron rate through the study. Root length and root weight however, exhibited a strong correlation to the rate of cumyluron applied. Overall, increasing the concentration of cumyluron applied directly to roots of creeping bentgrass and annual bluegrass will decrease both the biomass and length of both species. Only 250 g ai/ha cumyluron was needed to reduce root length by 50% and root dry weight by 25%. From this study, we can reject our first hypothesis and conclude that differential selectivity between creeping bentgrass and annual bluegrass is not due to species-specific differences in plant root response to cumyluron.

ALTERNATIVES TO MSMA IN TURF: PART DEUX. **J.S. McElroy and M.L. Flessner; Auburn University, Auburn, AL.**

ABSTRACT

MSMA is a vital herbicide for weed control in warm-season turfgrass because it controls numerous weeds species at a low price. If the planned phase out of MSMA goes according to EPA's plan, alternative postemergence herbicides will be needed for weed control. Of the three groups of weeds controlled by MSMA- grasses, broadleaves, and sedges -grass weeds have the fewest alterative control options. The three primary grass weeds controlled by MSMA in fine turf are crabgrass spp. (*Digitaria* spp.), goosegrass (*Eleusine indica*), and dallisgrass (*Paspalum dilatatum*). For crabgrass spp. control, alterative herbicides include: Drive (quinclorac), Onetime (quinclorac, MCPP, and dicamba), Celsius (thiencarbazone, iodosulfuron, dicamba), and graminicides. For goosegrass control, alternative herbicides include Revolver (foramsulfuron), Dismiss (sulfentrazone), and Illoxan (diclofop). For dallisgrass control, no one specific herbicide can be utilized for control. Thus, research is needed to identify a viable postemergence herbicide treatment for dallisgrass control. Research was conducted to evaluate potential MSMA alternatives for dallisgrass control. A greenhouse and a field study were conducted to test both currently registered and herbicides not registered for turfgrass use. The greenhouse study evaluated single and sequential applications of MSMA at 1.0 lb ai/a, Celsius at 4.9 oz/a, Plateau (imazapic) at 2.0 fl oz/a, Accent (nicosulfuron) at 2.0 oz/a, Clearcast (imazamox) at 16 fl oz/a, and Pursuit (imazethapyr) at 8 oz/a. Applications were applied to 8 week old plants excavated from perennial field plants and sequential applications were made 2 week after initial. The field study evaluated single and sequential applications of MSMA, Celsius, Plateau, and Accent at the same rates. Field research was initiated July 6, 2010 and sequential applications were made 3 weeks after initial. All treatments in both studies were applied at 30 GPA, and all treatments contained 0.25% v/v NIS, except MSMA. Data were subjected to ANOVA ($P = 0.05$) and means were separated using Fisher's protected LSD ($P = 0.05$). In the greenhouse study, no single application treatments controlled dallisgrass greater than 65% at 58 days after treatment (DAT). Dallisgrass control from sequential applications was: MSMA 40%; Celsius 77%; Plateau 72%; Accent 65%; Clearcast 85%; and Pursuit 68%. These data indicate that all of these alternative herbicides have herbicidal activity on dallisgrass. Field results were not as promising as greenhouse results. Celsius, Plateau, and Accent controlled dallisgrass 37 to 43% 83 DAT; while MSMA applied sequentially controlled dallisgrass 85% 83 DAT. It is obvious that the herbicides tested have potential as MSMA alternatives for dallisgrass control. However, it also obvious that our current approach to controlling dallisgrass with these herbicides is ineffective. Future research will focus on applying the herbicides in the fall and winter, when dallisgrass is more susceptible to herbicides.

BEDDING PLANT TOLERANCE TO DIMETHENAMID. **Jeffrey F. Derr*, Virginia Tech, Virginia Beach.**

ABSTRACT

There are limited options for weed control in annual bedding plants. Dimethenamid, recently introduced for preemergence weed control in the nursery and landscape industries, has potential for use in bedding plants. Field experiments were conducted in 2009 and 2010 to evaluate the tolerance of commonly-grown bedding plants to a granular combination of dimethenamid (0.75%) plus pendimethalin (1%). In 2009, this combination product was applied at 2, 4, and 8 kg ai/ha and then plants were overhead irrigated. In the first 2009 study, the trial was planted, mulched (5 cm depth), and then treated. The loam soil had a pH of 4.9 with 2.9% organic matter. Height at treatment in cm was: gazania 'Rose Kiss Hybrid' 8, marigold 'Queen Sophia' 10, vinca 'Pacifica Lilac'15, lanceleaf coreopsis 'Early Sunrise' 13, geranium 'Multibloom Red' 18, and coleus 'Wizard Mix' 10 cm. No injury to any species was seen 8 DAT. There was no reduction in flowering at 20 DAT. At 29 and 51 DAT, flower count in marigold and vinca decreased as the rate increased, but there was no reduction at 2 kg/ha when compared to the untreated. At 41 DAT, vinca flower count decreased as the rate increased. Reduced flowering in gazania was noted at the highest rate at 41 and 51 DAT. There was no effect on plant stand of any ornamental species at 51 or 77 DAT. At 58 DAT, marigold flower count decreased as the rate increased but less reduction in vinca flowering was noted compared to earlier counts. At 60 DAT, there was injury (29%) in coleus at the highest rate, but no injury was noted in marigold, vinca, or lanceleaf coreopsis. In the second field trial, height at treatment in cm was: impatiens 'Dazzler Orange' 8, alyssum 'Wonderland Rose' 8, petunia 'Fantasy Red' 10, vinca 'Pacifica Lilac' 13, geranium 'Multibloom Red' 20, and zinnia angustifolia 'Stargold' 20 cm. At 15 DAT, reduced flowering in impatiens, alyssum, and petunia was noted as the rate increased. AT 27, 37, and 45 DAT, impatiens flower count decreased as the rate increased, but no decrease was seen in petunia, vinca, geranium, or zinnia. At 27 and 37 DAT, there appeared to be a slight decrease in vinca flowering at the highest rate, similar to what was seen with vinca in the first trial. No reduction in stand was noted at 37 or 45 DAT for any of the 6 bedding plant species. At 47 DAT, injury was only seen at the highest rate in impatiens and alyssum, with no injury at lower rates. Application at 2 kg/ha gave excellent control of carpetweed, and significantly reduced stand of yellow nutsedge and Pennsylvania smartweed. At 65 DAT, the lowest rate gave approximately 80% reduction in the number of yellow nutsedge shoots compared to untreated plots. In 2010, this combination product was applied at 3, 6, and 12 kg ai/ha and then plants were overhead irrigated. No mulch was applied in this study. Plant height in cm at treatment was: 'New Carpet of Snow' alyssum 10, 15" wide; 'Super Elfin Hot Mix' impatiens 15, and 'Cocktail Vodka' begonia10 cm. In begonia, flower count and plant stand decreased significantly as the rate increased. In alyssum, flowering decreased as the rate increased. The highest rate reduced alyssum stand. In impatiens, flowering decreased as the rate increased at 30, 41 and 75 DAT. No stand reductions were seen in impatiens. Gazania, geranium, marigold, petunia, vinca, and zinnia have acceptable tolerance to this granular combination product at 2 kg/ha, but some reduction in flowering can occur at four times that rate. Begonia does not have acceptable tolerance to dimethenamid plus pendimethalin. Unacceptable flower reduction can occur in alyssum and impatiens following application of this granular combination product.

DEVELOPING A TOLERANCE PROFILE FOR ORNAMENTAL HERBICIDES. **A. L. Alexander*, M.D. Lees; DowAgroSciences LLC, Indianapolis, IN.**

ABSTRACT

Ornamentals are a high value crop. Ornamental plant growers invest significant time, labor and resources to bring a high quality plant to market. Weed control in such a high value crop can carry significant risks. Many times growers are making herbicide applications right over the top of a broad range of woody plants, trees, shrubs, perennials and annuals. Ornamentals vary widely in their sensitivity to various herbicides by cultivar as well as stage of growth. The dramatic shift from field to container production over the past 30 years has been largely responsible for the major growth in the nursery industry. Liquid and granule herbicide applications are both utilized in container production. Calibration of spreaders and sprayers is not always a common practice making over application of herbicides more probable. Developing an ornamental herbicide tolerance profile for Dow AgroSciences is particularly important given the number and scope of active ingredients produced for the ornamental market by our company. Some of the selective ornamental herbicide active ingredients from Dow AgroSciences include dithiopyr, isoxaben, treflan, oxyflurofen and clopyralid. With the potential for over application, mis-application and various species susceptibilities in the container market, Dow AgroSciences takes a very conservative approach before adding an ornamental plant to our product labels. Ornamental industry experts in the Northwest and Southeast regions of the United States conduct plant tolerance testing of our products. This provides varied environmental conditions, regional species of interest, as well as the input of highly respected industry leaders. Plants are tested at a small stage of growth similar to when an industry grower may make their first herbicide application. Six replicate pots are included in each test assessment. Applications are applied over the top of foliage at two times the maximum label rate, two times thirty days apart. Visual phytotoxicity is assessed through sixty days after the second application. Phytotoxicity is rated on a scale of 0 to 10 with 0 being equal to the untreated and 10 equal to death. For container tolerance an injury rating of 3 or less is commercially acceptable and must not go beyond a 4 throughout all assessments and locations. If at anytime injury is greater than 4 the plant will not be added to the product label as a tolerant species. If injury ranges from 3 to 4 we consider adding the species to the product label for field and landscape use, but not over the top container use. No unacceptable injury can be observed at any assessment timing, or any location to allow for addition to our product labels. Dow AgroSciences has utilized this methodology to confidently add plant species to each of our major product labels. By taking a conservative, focused approach we have been able to expand our product labels to better serve the industry. One example in 2010 was the expansion of our Dimension 2EW® label. Based on the described criteria and methodology we are adding 94 new ornamental species of importance to this product label. Of these, 75 are for over the top and directed use on both container grown and field/landscape ornamentals. This enlarges the list of tolerant ornamental species on the Dimension 2EW® label to over 450 tolerant ornamental plant species.

WEED CONTROL AND ORNAMENTAL TOLERANCE WITH INDAZIFLAM. **Astrid Parker* and Don Myers, Bayer Environmental Science, RTP, NC.**

ABSTRACT

Indaziflam is a new cellulose biosynthesis inhibitor (CBI) under development by Bayer Environmental Science for broadspectrum pre-emergent weed control. Indaziflam is classified as an alkylazine herbicide in WSSA group 29. It works by inhibiting crystalline cellulose deposition in the cell wall which affects cell wall formation, cell elongation and division; thus, only actively growing meristematic regions of roots and shoots of emerging weed seeds are affected. Since 2008, indaziflam has been tested for weed control and plant tolerance in container ornamentals and around field grown nursery trees. To evaluate weed control in container ornamentals, multiple rates of indaziflam G were tested in various potting mixes. Indaziflam G was watered in following the application and weed seeds were surface-sown one to three days later. At rates of 40-60 g ai/ha, indaziflam G provided excellent weed control for 3-5 months against a large variety of weeds, including hard-to-control weeds such as Eclipta (*Eclipta alba*), prostate spurge (*Euphorbia maculata*) and common groundsel (*Senecio vulgaris*). Ornamental tolerance studies were done by applying indaziflam G over-the-top, at rates ranging from 30-160 g ai/Ha, to mature liners transplanted into 1-3 gallon size containers. A second application was made two months later. Plant quality and marketability assessments were made throughout the studies; root quality was evaluated at the end of the studies. To date, 109 plant species/ cultivars have been tested and 40-60 g ai/Ha was safe on 100% of the conifers, 83% of woody ornamentals, 75% of herbaceous ornamentals, and on 70% of the ornamental grasses. Indaziflam 20 WP, at 40-80 g ai/Ha, provided above 90% weed control around field grown nursery trees. Perennial weeds emerging from rhizomes or roots, such as nutsedge (*Cyperus* sp.) or encroaching bermudagrass (*Cynodon dactylon*), were not controlled. Trees were about 3 years old and 5-6 feet tall; injury to trees was not reported. Going forward, additional efficacy and tolerance studies will be conducted.

DIMETHENAMID-P: EVALUATIONS IN LANDSCAPE BEDS WITH LIQUID AND GRANULAR FORMULATIONS. **R.J. Keese, K.E. Kalmowitz, K. Miller and G. Oliver. BASF Corp., Research Triangle Park, NC.**

ABSTRACT

Dimethenamid-P was registered in 2008 as a solo liquid EC product (Tower®) and a combination granular product with pendimenthalin (FreeHand™). Dimethenamid is a preemergence herbicide for ornamental uses including commercial field and container production and non-turfgrass landscape areas. Over-the-top applications are labeled for nursery production and landscape sites. IR-4 researchers previously reported pendimethalin 2G to have broad tolerance to herbaceous annuals and perennial ornamental plants, while metolachlor (EC formulation) demonstrated less plant tolerance to herbaceous annuals. Both dimethenamid-P and metolachlor are Group 15 herbicides. Research objectives in 2009-2010 focused on dimethenamid-P uses for landscape maintenance and tolerance of herbaceous plant materials. Dimethenamid-P was evaluated at use rates of 1.1/1.7 kg ai/ha for the Tower EC formulation and 2, 3 or 3.8 kg ai/ha for the FreeHand GR formulation. 2X rates were included for plant tolerance to both formulations. Herbaceous plant safety increased when plants were established in the landscape compared to applications made to containers. Field trials in NC demonstrated excellent tolerance to Heuchera micrantha, Rudbeckia fulgida, Hemerocallis spp., Aquilegia vulgaris, Muhlenbergia capillaries, Narcissus spp. and Tulipa spp. Veronica spicata, a perennial, showed sensitivity across locations and to all uses and formulations. Tolerance to annuals was demonstrated when dimethenamid-P was applied over-the-top. Tolerance to both liquid and granular formulations was observed in species such as Solenostemon spp (coleus), Gomphrena globosa (globe amaranth), Tagetes spp. (African marigold), Ipomoea (sweet potato vine), Celosia argentea (feathery amaranth), Angelonia spp. (summer snapdragon). Portulaca grandiflora (moss rose), Salvia splendens (salvia), Petunia hybrida, Zinnia linearis, Senecio cineraria (Dusty miller), and Catharanthus roseus (Vinca). Previous container research demonstrated lack of tolerance in several ornamental grasses to both dimethenamid-P-containing products. New evaluations made to two ornamental grasses showed Tower and FreeHand delayed flowering and reduced overall inflorescence production. The response is species specific and additional research will be required before grasses can be added to labels for landscape uses.

FIELD SANDBUR CONTROL AND BERMUDAGRASS RESPONSE TO NICOSULFURON AND METSULFURON-METHYL COMBINATIONS WITH VARIABLE NITROGEN RATES. **A.N. Eytcheson*, N.C. Talley, J.L. Porter, D.S. Murray, Oklahoma State University, Stillwater; and R. Rupp, DuPont Crop Protection, Edmond, OK .**

ABSTRACT

In Oklahoma, approximately 50% of improved pasture owners have field sandbur (*Cenchrus spinifex*) infestations. Infestations of field sandbur are a nuisance to humans and animals, which leads to decreased forage palatability and acceptability. Research was conducted at three locations in central Oklahoma during 2010 to evaluate field sandbur control and bermudagrass response to applications of Pastora herbicide (nicosulfuron and metsulfuron-methyl) and nitrogen fertilizer. Location 1 and 2 had established field sandbur populations. Bermudagrass injury was evaluated 3 WAT and field sandbur control was evaluated 6 and 9 WAT at these locations. Location 3 was a weed free location where bermudagrass yield response was evaluated. All locations had a randomized complete block design with three to four replications. At all locations, 0, 113, 227 and 340 kg nitrogen ha^{-1} as NH_4NO_3 (34-0-0) were included as a factorial arrangement of treatments with herbicide applications. Herbicide treatments at the three locations included; pendimethalin (3.407 kg ha^{-1}) preemergence (PRE) followed by (fb) nicosulfuron + metsulfuron-methyl (0.03 kg ha^{-1} + 0.008 kg ha^{-1}) postemergence (POST), pendimethalin (3.407 kg ha^{-1}) PRE fb nicosulfuron + metsulfuron-methyl (0.038 kg ha^{-1} + 0.01 kg ha^{-1}) POST, nicosulfuron + metsulfuron-methyl (0.038 kg ha^{-1} + 0.01 kg ha^{-1}) POST and an untreated check. At location 1, no interaction of herbicide and nitrogen occurred. Nicosulfuron + metsulfuron-methyl (0.038 + 0.01) applied alone at 3 WAT had the highest injury with 16% bermudagrass injury compared to the untreated check. Pendimethalin fb nicosulfuron + metsulfuron-methyl (0.03 + 0.008) and pendimethalin fb nicosulfuron + metsulfuron-methyl (0.038 + 0.01) were similar and had 12 and 10% bermudagrass injury, respectively. At 6 WAT, nicosulfuron + metsulfuron-methyl treatments with or without pendimethalin had 93 to 94% field sandbur control but by 9 WAT, control increased to 98 to 99%. At location 2, there was an interaction of nitrogen and herbicide 6 WAT. When nicosulfuron + metsulfuron-methyl was applied alone, field sandbur control increased as the nitrogen rate increased, with control increasing from 80% to 93%. All other treatments had no trend in field sandbur control as nitrogen rates increased. At location 3, there was no interaction of herbicide and nitrogen treatments. Bermudagrass yields across all nicosulfuron + metsulfuron-methyl treatments were similar (3,740 to 4180 kg ha^{-1}). However, the nicosulfuron + metsulfuron-methyl treatments were 1, 860 kg ha^{-1} to 2,300 kg ha^{-1} less than the untreated check. Results of these experiments indicate that nicosulfuron + metsulfuron-methyl (Pastora) is a feasible option for field sandbur control with minimal bermudagrass injury and yield reductions. Additionally, nitrogen fertilizer may increase field sandbur control in the absence of a preemergence herbicide.

GRASS AND BROADLEAF WEED CONTROL IN BERMUDAGRASS PASTURES WITH DUPONT PASTORA HERBICIDE. **Michael T Edwards*, Jeff Meredith, J. Dan Smith, and Glenn G. Hammes, Richard M Edmund; E. I. DuPont, Wilmington, DE.**

ABSTRACT

DuPont™ Pastora® herbicide is a new product for broadleaf and grass weed control in bermudagrass pastures. Pastora® is a combination of nicosulfuron and metsulfuron-methyl, formulated as a 71.2% active dry flowable. Use rates are 1.0 – 1.5 oz product per acre (2.5 oz product seasonal maximum), applied with crop oil concentrate or non-ionic surfactants. The current label at 1 ounce per acre, controls - Johnsongrass, Barnyardgrass, Signalgrass, Foxtails, Itchgrass, Panicum (fall and Texas) and Sandbur, and provides suppression of Goosegrass. At 1.5 ounce per acre, Bahiagrasss is controlled, Vaseygrass and Crabgrass are suppressed. From 2004 thru 2010 one hundred and fifty-five trials were conducted in the mid-south and southeast states for control of johnsongrass, vasseygrass, dallisgrass and fourteen other winter and summer annual grass species. Johnsongrass control was 81-85% with Pastora® applied at 1.0, 1.25, 1.5 and 2.0 ounces product per acre at 30-120 DAT – equal to Outrider® and Plateau® and superior to Journey®. Sequential applications of Pastora® at 60-90 days increased Johnsongrass control levels to 88-94%. Tankmixes with glyphosate did not change johnsongrass control levels (90% vs. 92% with glyphosate on johnsongrass control). Control with Pastora® applied at 1.0 and 1.5 ounces product per acre was 67 and 81% on vaseygrass control; rescuegrass control was 89-97% control at 60-120 DAT. Dallisgrass control was 59% with Pastora® applied at 1.0 ounce product per acre and 64% control with Pastora® applied at 1.5 ounces product per acre at 60-120 DAT. Tankmixes with glyphosate did not change vaseygrass or dallisgrass control levels (67% vs. 71% with glyphosate on vaseygrass, 59% vs. 61% with glyphosate on dallisgrass). Six weeks fescue and signalgrass control was > 85% with Pastora® applied at 1.0 ounce product per acre, ratings at 30-120 DAT. Suppression was achieved on goosegrass (69%) , crabgrass (67%), barnyardgrass (75%), green foxtail (56%) and yellow foxtail (72%) with Pastora® applied at 1.5 ounces product per acre. Poor control was found on knotroot foxtail (50%) and broomsedge (0%) with Pastora® applied at 1.5 ounces product per acre. Tankmixes with glyphosate did increase annual grass control levels 15-20% across all species. For best control of annual grasses, follow label recommendation to spray when they are less than 2" in height and actively growing. Bermudagrass response at 15-30 days was 12% with Pastora at 1.0 oz, 16% with Pastora at 1.5 oz. Outrider (5 %) and glyphosate (11%) were lower, with Journey (35%) and Plateau (28%) higher. At 45-60 days the trends remained the same (8% with Pastora at 1.0 oz, 12% with Pastora at 1.5 oz, Outrider at 6 %, glyphosate at 2%, Journey at 16% and Plateau at 26%). The following University and DOT investigators contributed data to this summary: Dr. Stephen Enloe – Auburn University, Dr. John Boyd – University of Arkansas , Dr. B. McCarty – Clemson University , Dr. Tim Murphy – University of Georgia, Dr. Dearl Sanders – Louisiana State University, Dr. John Byrd – Mississippi State University, Dr. Kevin Bradley– University of Missouri, Dr. F. Yelverton – North Carolina State University, Dr. Neil Rhodes – University of Tennessee, Dr. Angela Thompson – University of Tennessee, Dr. Barry Sims – University of Tennessee, Dr. Greg Armel – University of Tennessee, Dr. Paul Baumann – Texas AgriLife Extension, Dr. James Grichar – Texas AgriLife Extension, Dr. John Mason – Texas DOT

AMINOCYCLOPYRACHLOR USE IN PASTURES IN THE SOUTHERN UNITED STATES. **Michael T Edwards*, Jeff Meredith, Robert W Williams, Case R Medlin, Eric P Castner; E. I. DuPont, Wilmington, DE.**

ABSTRACT

DuPont Crop Protection is evaluating an exciting new active ingredient, Aminocyclopyrachlor for broadleaf weed control in pastures. Aminocyclopyrachlor is characterized by low use rates, low toxicity to humans and wildlife and a favorable environmental profile. Aminocyclopyrachlor demonstrates both foliar and residual activity on a broad spectrum of broadleaf weeds including many invasive species. Data presented from 194 trials in the southern states from 2004 – 2010 (12 States = Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, South Carolina, Tennessee, Texas). Majority of trials consisted of 3 -4 replicates, applications made at 20 – 40 PSI and 15-30 GPA using backpack or tractor mounted sprayers. At 1-2 ozai/ac the following species were controlled – dogfennel, horsenettle, Serecia lespedeza, cocklebur, sunflower, silverleaf nightshade, sicklepod, ox-eye daisy, wooly croton, wild carrot, marestail, buttercup, thistles (musk, bull and yellow) and lanceleaf ragweed. Crop response on pasture grasses is minimal at rates up to 2 oz ai/A. Response may take some time to appear, with stunting the primary response. Adjuvant system did not appear to make a difference in levels of crop response. Thank you to all University cooperators who have and continue to work with Aminocyclopyrachlor in the pasture and range markets : Dr. Stephen Enloe – Auburn University, Dr. John Boyd – University of Arkansas, Dr. B. McCarty – Clemson University, Dr. Jay Ferrell – University of Florida, Dr. Brent Sellers – University of Florida, Dr. Tim Murphy – University of Georgia, Dr. Bill Witt – University of Kentucky, Dr. Dearl Sanders – Louisiana State University, Dr. John Byrd – Mississippi State University, Dr. Kevin Bradley– University of Missouri, Dr. Reid Smeda– University of Missouri, Dr. F. Yelverton – North Carolina State University, Dr. Don Murray - Oklahoma State University, Dr. Neil Rhodes – University of Tennessee, Dr. Greg Armel – University of Tennessee and Dr. Paul Baumann – Texas AgriLife Extension.

SAFENING METSULFURON WITH 2,4-D AMINE IN BAHIAGRASS. **B.A. Seller*s, J.A. Ferrell, G.E. MacDonald; University of Florida, Gainesville.**

ABSTRACT

Metsulfuron is a highly effective herbicide that has been labeled for use in bermudagrass pastures for many years. Previous research has found that metsulfuron applied at 0.5 oz/acre provided more consistent and effective long-term control of blackberry species when compared to triclopyr. However, bahiagrass phytotoxicity following metsulfuron application is usually moderate to severe; the level of phytotoxicity appears to be related to the bahiagrass cultivar, the environment, and possible tank-mix partners (antagonism). Preliminary research revealed that the addition of 2,4-D amine to metsulfuron decreased the amount of phytotoxicity in bahiagrass. Therefore, safening metsulfuron by the addition of 2,4-D may be a viable option for blackberry control in bahiagrass pastures. Field experiments were initiated in 2009 near Ona, FL to evaluate the effect of metsulfuron at 0.3, 0.4, and 0.5 oz/acre with or without 1 pt/acre 2,4-D amine on bahiagrass biomass production. Herbicide treatments were applied in late April and early November to a pure stand of 'Pensacola' bahiagrass using an ATV-mounted sprayer calibrated to deliver 30 gallons per acre. The experiment was setup as a 6 x 2 (herbicide treatment x application timing) factorial arrangment of treatments in a randomized complete block design with three replications. Bahiagrass biomass was harvested by clipping a 1.6 by 8 ft area of each plot at 4 week intervals following the spring application and following 12 inch regrowth the following spring after the winter application. The cumulative yield data of two harvests from the spring application and the yield data from the single harvest following the winter application were used to compare treatments. Data were subjected to ANOVA after being converted to percent of the untreated control and means were separated using Fisher's Protected LSD when appropriate. Overall, the spring application of metsulfuron resulted in approximately 40% less biomass than when applied in the fall. When averaged over both application timings, the addition of 2,4-D resulted in at least 32% greater biomass than metsulfuron alone. Although the addition of 2,4-D to metsulfuron resulted in higher bahiagrass yield as compared to metsulfuron alone, bahiagrass yield was 14 to 29% less than the untreated control. In normal situations, a rancher would not find this level of injury to be acceptable. However, dense blackberry infestations often limit the amount of grazing in infested pastures, making the bahiagrass that is present virtually unusable. Therefore, ranchers would most likely accept a reduction in yield when blackberry is the predominant weed present in a particular pasture.

AMINOCYCLOPYRACHLOR FOR RANGE AND PASTURE WEED CONTROL. **Jeff H. Meredith*, Jon S. Claus, Craig Alford, E.I. DuPont, Wilmington, DE**

ABSTRACT

DuPont Crop Protection has discovered and is developing aminocyclopyrachlor for broadleaf weed control in pasture and rangeland. Aminocyclopyrachlor belongs to a novel class of chemistry know as the pyrimidine carboxylic acids. This new generation of synthetic auxin chemistry has unique properties at both the molecular and whole plant level that translates into more potent herbicidal activity. Aminocyclopyrachlor is characterized by low use rates, low toxicity to mammals and a favorable environmental profile. Aminocyclopyrachlor demonstrates both foliar and residual activity on a broad spectrum of broadleaf weeds including many invasive species.

AMINOCYCLOPYRACHLOR FOR WEED CONTROL IN PASTURES AND HAYFIELDS. **Fred Yelverton*, Travis Gannon, and Leon Warren; North Carolina State University, Raleigh.**

ABSTRACT

Aminocyclopyrachlor (AMCP) is a new herbicide developed by DuPont for selective broadleaf weed control. AMCP is currently registered in turfgrass while potential use sites include industrial vegetation management, range and pasture, row crops and specialty crops. AMCP is a synthetic auxin herbicide and a member of the pyrimidine carboxylic acid class. AMCP is root- and shoot-absorbed and is phloem- and xylem-mobile. While AMCP is a postemergence herbicide, it possesses some residual activity. Research trials were initiated in North Carolina to evaluate AMCP for postemergence broadleaf weed control in pastures and hayfields. Field experiments were initiated 2007 through 2010 and evaluated species included horseweed (Conyza canadensis), dogfennel (Eupatorium capillifolium), henbit (Lamium amplexicaule), buckhorn plantain (Plantago lanceolata), buttercup species (Ranunculus spp.), and multiflora rose (Rosa multiflora). AMCP (> 70 g ai/ha) provided excellent horseweed, dogfennel, henbit, buckhorn plantain, and hairy buttercup control while bulbous buttercup control was not acceptable. Further, AMCP (> 105 g/ha) provided acceptable multiflora rose control. Inclusion of an adjuvant did not consistently enhance weed control compared to AMCP alone. These data indicate AMCP will effectively control common and troublesome weed species in pastures and hayfields.

WEED CONTROL IN BERMUDAGRASS PASTURES AND HAYFIELDS USING NICOSULFURON PLUS METSULFURON. **Leon Warren*, Fred Yelverton, and Travis Gannon; North Carolina State University, Raleigh.**

ABSTRACT

Pasture broadleaf weeds can be numerous, noxious, toxic or prickly, thus preventing animal grazing. Grass weeds interfere with pure stands and hay drying and are generally not a health concern with the exception of johnsongrass. There are >20 broadleaf pasture herbicides listed in the 2011 North Carolina Agricultural Chemical Manual. In tall fescue stands, there are no herbicides labeled for grass control. In bermudagrass stands, only one PRE grass herbicide and four POST grass herbicides were available before registration of nicosulfuron plus metsulfuron (Pastora) in 2010. Research was conducted in 2009 and 2010 to determine 'Coastal' bermudagrass tolerance and efficacy of Pastora on common and troublesome winter and summer grass weeds including Italian ryegrass, large crabgrass and goosegrass. In 2009, Italian ryegrass, little barley and large crabgrass were evaluated in a Wake County location, and large crabgrass was evaluated in a Bladen County location. In 2010, goosegrass was evaluated in a Bladen County location, and Italian ryegrass was evaluated in a Sampson County location. Bermudagrass growth response was recorded at each location if any visible symptoms were observed. Treatments were replicated 4 times with plot sizes 6 x 20 ft except for the Sampson County location which was 6 x 15 ft. All treatments were applied at 20 gpa and 32 to 34 psi with a 4-nozzle, 18 in spacing boom containing XR 110002VS nozzles. 1 oz/A Pastora + 0.25% NIS was evaluated in the 2009 Wake County trial. Treatment dates consisted of Apr 15 for Italian ryegrass control and Jun 8 or Jun 15 for large crabgrass control. The 2009 Bladen County large crabgrass trial included 1 and 1.5 oz/A Pastora + 0.25% NIS applied once on Apr 21 and 1 oz/A Pastora + 0.25% NIS applied as a sequential spaced seven weeks apart (Apr 21 and Jun 11). Imazapic (Panoramic) + NIS at 0.25 pt/A + 0.25% was also applied Apr 21. The treatment list for the 2010 Sampson County Italian ryegrass trial included the following: 1 and 1.5 oz/A Pastora + 1% COC, 11 fl oz/A glyphosate (Roundup Weathermax), 0.5 pt/A Panoramic + 0.25% NIS, and 1 qt/A imazapic + glyphosate (Journey) + 0.25% NIS. These treatments were applied Jan 14 and Mar 9. For the 2010 Bladen County goosegrass trial, 1 oz/A Pastora + 0.25% NIS was evaluated on Jun 9, as were 6 fl oz/A Roundup Powermax + 0.25% NIS and 1 oz/A Pastora + 6 fl oz Roundup Powermax + 0.25% NIS. Data presented are visual observations that include percent Italian ryegrass, large crabgrass and goosegrass control on a 0-100 scale with 0 being no control and 100 being complete control, and percent bermudagrass plot cover and stand reduction where 0 = no cover or reduction and 100= complete cover or stand reduction. 2009 Wake County site: Pastora completely controlled 8 to 12 inch tall Italian ryegrass and 3 to 5 inch tall little barley. Pastora provided no large crabgrass control when applied Apr 15 due to winter weed influence on crabgrass germination. Jun applications to 4 leaf, 2 inch tall crabgrass resulted in excellent (99%) control. 2009 Bladen County site: No winter weeds were present so large crabgrass had germinated by mid Apr. 1 oz/A Pastora provided 100% control initially but by Sep control had dropped to 80%. The Pastora sequential treatment provided >90% control through Sep. Panoramic controlled large crabgrass 100% but bermudagrass stand reduction was 62% on May 7 and still 19% on Jul 21. 2010 Sampson County site: Applied in Jan to 3 to 5 inch tall Italian ryegrass, Pastora, Roundup Weathermax and Journey provided excellent control (>90%) with no effects on bermudagrass greenup. Panoramic control was 87%. By Mar, Italian ryegrass was 6 to 8 inches tall and control dropped to 75-80% in Roundup Weathermax and Panoramic treated plots. Pastora and Journey still provided >90% control. Mar-applied Panoramic reduced bermudagrass growth during spring greenup by 30%. 2010 Bladen County site: Treatments containing Pastora controlled goosegrass >90% when applied Jun 9 to plants that averaged 1 tiller and 4 inches in height. Roundup Powermax provided no goosegrass control. In conclusion, 1 oz/A Pastora provided excellent (>90%) control of 4 to 12 inch Italian ryegrass when applied Jan through Apr and 4 inch little barley applied in Apr. 11 fl oz/A Roundup Weathermax and 0.5 pt/A Panoramic provided excellent Italian ryegrass control at 4 inch height applied in Jan but only 76-80% control to 6 inch growth applied in Mar to saturated soils. Mar Panoramic slowed bermudagrass coverage during spring greenup by 30%. 1 oz/A Pastora initially controlled 4 leaf, 2 inch tall large crabgrass 100% with an Apr timing. To maintain >90% control though Sep, a 1 oz/A sequential was needed 7 WA 1st application. The sequential application slightly stunted bermudagrass growth for 2 to 3 weeks. 1 oz/A Pastora controlled 1 tiller, 4 inch tall goosegrass >90%. 6 fl oz/A Roundup Powermax provided no goosegrass control.

PASTURALL (AMINOPYRALID + 2,4-D) FOR WEED CONTROL IN RANGE AND PASTURES. **V. B. Langston, P. L. Burch, D. C. Cummings., M. B. Halstvedt, B. B. Sleugh, and W. N. Kline, Dow AgroSciences LLC, Indianapolis, IN .**

ABSTRACT

PasturAll® specialty herbicide is a new herbicide from Dow AgroSciences LLC for use in rangelands and pastures. It contains two active ingredients, aminopyralid (the active in Milestone® and ForeFront® R&P specialty herbicides) and 2,4-D amine. PasturAll contains 1.5% aminopyralid and 51.6% 2,4-D amine. PasturAll provides a level of control for users that are managing rangeland and pastures land where less in-season herbaceous broadleaf weed control is desired. Extensive research over several years has demonstrated that this combination provides weed control that is equivalent to or better than 2,4-D amine or 2,4-D ester at equivalent rates. Maximum labeled use rate for rangelands and pastures is 3 pints of product per acre and typical use rate for most broadleaf weed complexes will be 2 pints product/acre. ® Trademark of Dow AgroSciences LLC Always read and follow the label directions.

RANGELAND AND PASTURE WEED CONTROL WITH GRAZONNEXT (AMINOPYRALID + 2,4-D). **V. B. Langston, D. C. Cummings., B. B. Sleugh, W. N. Kline and P. L. Burch; Dow AgroSciences LLC, Indianapolis, IN .**

ABSTRACT

Aminopyralid is a systemic herbicide developed by Dow AgroSciences specifically for use on rangeland, permanent grass pasture, Conservation Reserve Program acres, and wildlife management areas. A formulated product (GrazonNext® herbicide) has been developed as a liquid containing 40 g ae/L (0.33 lbs ae/gal) aminopyralid + 320 g ae/L (2.67 lbs ae/gal) 2,4-D. Standard broadcast use rates of this herbicide product range from 1.2 to 3.1 L/ha (1 to 2.6 pints/acre). This herbicide has postemergence activity on established broadleaf plants and provides residual control of susceptible plants that emerge after application. Broadleaf weeds reduce rangeland and pasture carrying capacity by competing with forage grasses and desirable forbs. The control of later emerging weeds can lead to improved access to forage by grazing animals. GrazonNext provides broad spectrum control required to manage weed species complexes. GrazonNext controls many weeds including musk thistle (Carduus nutans), plumeless thistle (Carduus acanthoides), horsenettle (Solanum carolinense), annual broomweed (Gutierrezia dracunculoides), western ragweed (Ambrosia psilostachya), common ragweed (Ambrosia artemisiifolia), spiny amaranth (Amaranthus spinosus), wild carrot (Daucus carota), buckhorn plantain (Plantago coronopus), woolly croton (Croton capitatus), and bitter sneezeweed (Helenium amarum). Once broadleaf weeds are controlled forage legumes can be successfully established following appropriate reseeding guidelines. Legumes are often an important part of the forage resource, but those that occur in degraded, weed-infested pastures are usually controlled along with the weeds when GrazonNext is applied. In many cases improved varieties of forage legumes can be established after weeds are controlled by delaying planting until the growing season following a spring application. GrazonNext is a useful rangeland improvement tool because it provides excellent broadleaf weed control that can lead to increased forage availability and utilization by livestock. GrazonNext at 2.0 to 2.6 pints product per acre provides control or suppression of many woody brush species, including common persimmon (Diospyros virginiana), Chinese tallow tree (Sapium sebiferum), and honey locust (Gleditsia triacanthos). GrazonNext is also a useful pasture renovation tool. ®Trademark of Dow AgroSciences LLC Always read and follow the label directions.

ADVANCEMENTS IN FORMULATION DEVELOPMENT WITH RANGE AND PASTURE HERBICIDES. **Patrick L. Burch*, W. N. Kline, V. B. Langston, D. C. Cummings, B. B. Sleugh, Dow AgroSciences LLC, Christiansburg, VA, Duluth, GA, Woodlands, TX, Perry, OK, West Des Moines, Iowa.**

ABSTRACT

ForeFront® R&P, GrazonNext®, and PasturAll® herbicide products contain the active ingredient aminopyralid. These broadleaf weed control products are formulated at the following concentrations: GrazonNext and ForeFront R&P (aminopyralid at 0.33 lb ae/gal + 2,4-D at 2.66 lb ae/gal), PasturAll (aminopyralid at 0.075 lb ae/gal + 2,4-D at 2.67 lb ae/gal). PastureGard® herbicide (triclopyr 1.5 lb ae/gal + fluroxypyr 0.5 lb ae/gal) is designed for brush and specific weed uses. PastureGard provides excellent control of tough woody species including wax myrtle, sweetgum, persimmon, and osage orange (bois d'arc). It is the standard for sericea lespedeza control. A significant drawback of the current PastureGard formulation is the undesirable odor and increased wear of equipment seals due to solvent system in the formulation. A project was initiated in 2009 to improve the handling characteristics of these products and reduce container usage of these select Dow AgroSciences pasture herbicides. Formulation changes have been successfully developed, tested, and registrations submitted to the US EPA. The more concentrated formulations were achieved by utilizing the 2,4-D DMA rather than 2,4-D TIPA: GrazonNext HL and ForeFront HL (aminopyralid at 0.41 lbae/gal + 2,4-D at 3.33 lbae/gal) and PasturAll HL (aminopyralid at 0.1 lbae/gal + 2,4-D at 3.54 lbae/gal). Improved handling characteristics of PastureGard HL (triclopyr 3.0 lbae/gal + fluroxypyr 1.0 lbae/gal) are the result of utilizing an improved solvent system. The purpose here is to answer the key questions of the field research protocols. The questions were: 1) Do the new formulations provide broadleaf weed control equivalent to the current registered products? 2) Is forage grass tolerance to the new formulations equivalent to the current registered products? Comparisons were made between formulations at equivalent rates of active ingredient. Paired comparisons between formulations applied at equivalent rates were evaluated using Student's t-test. Comparisons were conducted for each formulation by herbicide treatment rate for each species. Weed efficacy and grass tolerance trials were conducted at 34 locations across the United States. No injury was observed on forage grass species evaluated. Overall, there were no differences observed in efficacy of the new formulations compared to the current formulations when applied a same rate of active ingredient per acre. Transition of the Dow AgroSciences product portfolio to the new formulations and replacement of current registered formulations is expected by the end of 2011. Packaging will be differentiated to make the product user aware of the loading and use rates of the new formulations. ® Trademark of Dow AgroSciences LLC Consult the label before purchase or use for full details. Always read and follow the label directions.

BRUSH AND WEED MANAGEMENT IN RANGELAND AND PASTURE WITH AMINOCYCLOPYRACHLOR. **Eric P. Castner, Robert N. Rupp, Case R. Medlin, Jeff H. Meredith, DuPont Crop Protection, Wilmington, DE.**

ABSTRACT

Aminocyclopyrachlor is a new herbicide from DuPont™ Crop Protection for the control of broadleaf weeds and brush in pasture and rangeland. Amincylcopyrachlor has been tested under the DuPont research codes of DPX-MAT28 or DPX-KJM44 since 2005 and has been shown to control annual and perennial weeds as well as numerous brush species. Research trials conducted in Texas, Oklahoma and New Mexico have shown excellent control of key weed species including western ragweed (*Ambrosia cumanensis*), woolly croton (*Croton capitatus*), annual broomweed (*Amphiachyris dracunculoides*) and broom snakeweed (*Gutierrezia sarothrae*). Brush trials conducted in Texas have also demonstrated control of key brush species including honey mesquite (*Prosopis glandulosa*) and huisache (*Acacia smallii)*. Control of weed and brush species with aminoclclopyrachlor has been achieved using various application methods including broadcast and individual plant treatments (IPT).

EFFECT OF PASTORA ON *PASPALUM* SPP. IN SOUTHERN PASTURES . **J.M. Taylor* and J.D. Byrd; Mississippi State University, Mississippi State, MS.**

ABSTRACT

Two experiments were initiated to study the efficacy of Pastora on *Paspalum* spp. in pastures. Pastora is labeled for use in bermudagrass pastures and unimproved bermudagrass and is a prepackaged mixture of 56.2% nicosulfuron and 15% metsulfuron methyl. In Experiment 1, Pastora was applied at 1 or 1.5 oz/A or was tank-mixed with 1 lb ae/A 2,4-D ester, or 0.75% volume to volume (v/v) 32% liquid nitrogen. Cimarron (60% metsulfuron methyl) was applied as a comparison treatment. Treatments were made June 6, 2009 2 wk after plots were clipped and harvested for hay. 'Alicia' bermudagrass was injured 20 to 25% with both rates of Pastora or the tank-mix of 1 oz/A Pastora + 2,4-D ester 12 days after treatment (DAT). When 1 oz/A Pastora was applied with 0.75% v/v liquid N injury was reduced to 3% and Cimarron caused 10% injury. At 21 DAT, injury was 10 to 20% with all treatments except with Pastora tank-mixed with liquid N where injury was not observed. No injury was observed at 35 DAT or later with any treatment. Bahiagrass control was similar with all treatments at 57 or 77 DAT with 90% or greater control at either rating date. Dallisgrass control levels were not as high with 35 to 43% control observed at 77 DAT with all Pastora treatments and no control with the Cimarron treatment. In Experiment 2, the treatments were the same as in Experiment 1 with the addition of a sequential treatment of 1 oz/A Pastora and a tank mix of 1 oz/A Pastora + 8 fl oz/A Roundup Pro (3 lb ae/gal). Although bermudagrass was present in Experiment 2, it was not sufficient enough to get good injury ratings. The initial treatments were applied on Aug 3, 2010 two wk after clipping and harvesting of the hay and the sequential was applied on Aug 26. Vaseygrass was controlled 80 to 88% with the single applications of Pastora or the tank-mix of Pastora + 2,4-D at 36 days after the initial treatment (DAIT). The sequential treatment provided 98% control at this rating date while the tank-mixes with liquid N or Roundup Pro only provided 28 to 58% control. At 86 DAIT, control of vaseygrass with 1 or 1.5 oz/A Pastora was 48 to 50% while the sequential was providing 85% control. The tank-mix with 2,4-D was controlling vaseygrass 65% while the tank-mix with liquid N was providing 40% control. The addition of Roundup had the least control of 25%. Although control of dallisgrass was less than that observed on vaseygrass there was a rate response with 1 oz/A Pastora compared to 1.5 oz/A. At 36 DAIT, dallisgrass control was 48 and 65% with 1 or 1.5 oz/A Pastora, respectively, and at 86 DAIT control was 15 and 40%, respectively. The sequential provided greater control than the single applications with 65% and the addition of 2,4-D also provided greater control with 43%. Roundup Pro did not affect control with the tank-mix providing similar control to Pastora alone.

BROADLEAF WEED CONTROL WITH MAT 28 (AMINOCYCLOPYRACHLOR). **A.G. Estes* and L.B. McCarty; Clemson University, Clemson, SC.**

ABSTRACT

Aminocyclopyrachlor is a new herbicide being developed by Dupont. It is a synthetic auxin herbicide that acts as a plant growth regulator. The herbicide is taken up by the stems, leaves, and roots and is translocated throughout the plant. Herbicide symptoms are typical of synthetic auxin inhibitors with bending and twisting of stems and leaves, stem thickening and leaf cupping, necrosis, and eventual death. The objective of the study was to evaluate the efficacy of Aminocyclopyrachlor for control of broadleaf weeds in pastures. The study was conducted in pastures and unimproved turf areas located in the Upstate of South Carolina. Plots size for each treatment measured 2.0m by 3.0m, replicated three times. Treatments were applied using a CO2 backpack sprayer calibrated at 20 GPA. Treatments for the study1 included: Aminocyclopyrachlor (50 SG) at 0.5 oz ai/A, Aminocyclopyrachlor at 1.0 oz ai/A, Aminocyclopyrachlor at 1.5 oz ai/A, Aminocyclopyrachlor at 0.67 oz ai/A + metsulfuron (60 DF) at 0.1 oz ai/A, Aminocyclopyrachlor at 0.79 oz ai/A + chlorosulfuron (75 WG) at 0.315 oz ai/A, Aminocyclopyrachlor at 0.69 oz ai/A + 2,4-D(3.8 SL) at 5.3 oz ai/A, Milestone (2 SL) at 3 oz/A and 2, 4-D at 1 qt/A. All treatments were applied July 15, 2010. Treatments for Study 2 Included: Aminocyclopyrachlor at 0.5 oz ai/A, Aminocyclopyrachlor at 1.0 oz ai/A, Aminocyclopyrachlor at 1.5 oz ai/A, Aminocyclopyrachlor at 2.0 oz ai/A, Aminocyclopyrachlor at 0.67 oz ai/A + metsulfuron 60 DF at 0.1 oz ai/A, Aminocyclopyrachlor at 0.79 oz ai/A + chlorosulfuron at 0.315 oz ai/A, Aminocyclopyrachlor at 0.69 oz ai/A + 2,4-D at 5.3 oz ai/A, Chlorosulfuron at 0.38 oz ai/A and Weedmaster (3.88 SL) at 1 qt/A. Treatments for Study 2 were applied on August 27, 2010. Visual control ratings were taken throughout the study. Percent control of various broadleaf weeds were rated on a 0 – 100% scale, where 0 representing no control and 100 representing complete control. Broadleaf weeds evaluated in the two studies included, Horsenettle, Cocklebur, Dayflower, and Bitter Sneezeweed. In addition, bermudagrass, phytotoxicity was rated on 0 – 100% scale where 0 = no injury and 100 = dead turf. Future research at Clemson University will be to continue to evaluate Aminocyclopyrachlor for control of various weeds in pastures and other turf situations. Investigate other herbicide combinations with Aminocyclopyrachlor for increased weed efficacy and weed spectrum.

THE CHALLENGES OF MACARTNEY ROSE RESEARCH IN PASTURES. **S. F. Enloe*, Auburn, University, Auburn, AL; W.N. Kline, Dow AgroSciences, Duluth, GA.**

ABSTRACT

Macartney rose (*Rosa bracteata*) is an aggressive, clump forming rose that infests thousands of acres across the Southeastern United States. In Alabama, it is frequently a problem across the Blackbelt region and may cause substantial reductions in pasture utilization due to its thorny nature. Macartney rose control was intensively researched in Texas in the 1970's but there has been very little published since then. Our objective was to evaluate several new herbicides for Macartney rose control. We established two research sites in 2009 near Eutaw, Alabama in mixed bahiagrass / Bermudagrass pastures that were heavily infested with Macartney rose. Due to the clumping nature of Macartney rose, we chose to use individual clumps as experimental units. In pasture one, fifteen treatments were randomly assigned to fifteen rose clumps each for a total of two hundred and twenty five experimental units. In pasture two, each treatment was applied to ten individual rose clumps for 150 total experimental units. To account for variation in the size of individual rose clumps, clump diameter was estimated and clumps were classified according to size: <1 m, 1-2 m, 2-3 m, and 3-4 m. Treatments included metsulfuron (0.02 kg/ha), aminopyralid (0.12 kg/ha), aminopyralid + metsulfuron (0.09 + 0.016 kg/ha and 0.12 + 0.2 kg/ha), aminopyralid + 2,4-D (0.12 + 0.97 kg/ha), picloram + 2,4-D (0.3 + 1.12 kg/ha and 0.6 + 2.24 kg/ha), picloram + fluroxypyr (0.28 + 0.28 kg/ha and 0.38 + 0.38 kg/ha), triclopyr (0.56 and 1.12 kg/ha), aminopyralid + 2,4-D + triclopyr (0.12 + 0.98 + 0.56 kg/ha), aminopyralid + metsulfuron + triclopyr (0.09 + 0.016 + 0.56 kg/ha), an untreated control, and mowing. Treatments were broadcast applied across individual rose clumps in August 2009 with a custom side wing ATV boom sprayer at 327 liters/ha at 290 kPa pressure. The mowing treatment was done with a tractor mounted bush hog at a cutting height of approximately 10 cm. Data was collected in July 2010 at eleven months after treatment (MAT). Visual percent control (where 0 = no control and 100 = complete control) of each rose clump was estimated compared to untreated control clumps of similar size. Visual control evaluations were subjected to ANOVA using PROC MIXED in SAS 9.2. All interactions were tested to assess for the potential effects of pasture location and rose clump size. Significant differences were found between pastures; therefore data is displayed by pasture. No significant clump size effects were seen so sizes were pooled within pastures for analyses. Fisher's Protected LSD ($P<0.05$) was used to separate means and the PDMIX macro was used for letter assignment. At 11 MAT, all treatments provided poor control of Macartney rose. In pastures 1 and 2, the highest level of control among herbicide treatments was 35 and 47%, respectively. The addition of either triclopyr or metsulfuron to aminopyralid did not improve rose control. Mowing alone resulted in regrowth comparable to the size of the untreated controls. These studies suggest that Macartney rose will not be controlled by a single application of the herbicides tested and that an integrated, multiyear management plan will likely be required for successful control.

MANAGEMENT OF WOODY PERENNIALS IN NEGLECTED PASTURES. **Neil Rhodes*, Will Phillips, University of Tennessee, Knoxville; Pat Burch, Dow AgroSciences, Christiansburg, VA.**

ABSTRACT

High quality, productive pastures are critical resources for cattle production in the Southeast. A major factor contributing to pasture productivity and grazing efficiency is level of weed management. Neglected pastures are becoming increasingly common. These pastures are in various stages of old field succession as woody perennial weeds become well-established. Reasons for the increase in neglected pastures over the past decade might include fluctuations in cattle prices and cattle inventories, rising fuel costs, aging producers and lack of interest in cattle production among heirs, and financial insolvency of operations. Typical successors in Tennessee include brambles (*Rubus* sp.), honeylocust (*Gleditsia triacanthos* L.), Japanese honeysuckle (*Lonicera japonica* Thunb.), goldenrod (*Salidago* spp.), sumac (*Rhus* spp.), and sweet gum (*Liquidambar styraciflua* L). Severe problems with these and other woody weeds do not develop overnight, and pastures which are heavily infested with these weeds cannot be reclaimed overnight. Reclamation requires commitment, time and substantial financial investment. Requests from producers regarding the most effective programs for reclamation of neglected pastures are frequent. Because of this, research was initiated in 2008 to identify the most efficacious herbicide combinations for control of selected woody perennials in neglected pastures. All experiments were conducted utilizing natural infestations in either Maryville or Friendsville, TN. Species studied included Japanese honeysuckle, winged sumac (*Rhus copallina* L.), Canada goldenrod (*Solidago Canadensis* L.), bush blackberry (*Rubus argutus* Link) and honeylocust. Experimental design utilized in all trials was a randomized complete block with three replications. Treatments were applied in a water carrier with a backpack sprayer at 15 gallons per acre (GPA) or a tractor mounted sprayer at 20 GPA. Activator 90 was included in all applications at 0.25% v/v. Treatments were evaluated for efficacy visually at the end of the season of application and one year later. The addition of Remedy Ultra (2 pt/A) to ForeFront R&P (2 pt/A) or Chaparral (2.5 oz/A) in trials conducted at Maryville in 2008 gave greater than 85% control of Japanese honeysuckle and 99% control of winged sumac one year after application. Crossbow (8 pt/A) provided 93 and 89% control of Japanese honeysuckle and winged sumac, respectively, one year after application. Research conducted at the same location in 2009 revealed that the addition of Remedy Ultra at 1 pt/A or 2 pt/A to ForeFront R&P (2 pt/A) gave 88 and 99% control, respectively, of bush blackberry one year after application. The addition of Remedy Ultra (1 pt/A) to Chaparral (2 oz/A) gave 99% one year after application compared to 88% control for Chaparral alone. Similar results were observed at Friendsville. Honeylocust was also present at Friendsville. Applications of ForeFront R&P (2 pt/A) with or without Remedy Ultra (1 or 2 pt/A), or Chaparral + Remedy Ultra (3.3 oz/A + 2 pt/A) gave 98% or greater control one year after application. Canada goldenrod was found to be difficult to control in a separate trial conducted at Maryville in 2009. Chaparral at rates of 1.5, 2 or 2.5 oz/A gave 68, 73 and 78% control one year after application. Control with ForeFront R&P (2 pt/A) was 38% one year after application. Weedmaster (2pt/A) gave only 22% control, compared to 72% for Weedmaster + Escort (1 pt/A + 0.25 oz/A) one year after application.

DORMANT-SEASON APPLICATIONS OF PASTORA™ HERBICIDE IN BERMUDAGRASS FIELDS.
Case R. Medlin*, Eric P. Castner, Richard M. Edmund, Michael T. Edwards, Glenn G. Hammes, Jeff H. Meredith, Robert N. Rupp, and Robert W. Williams, DuPont Crop Protection, Wilmington. DE.

ABSTRACT

DuPont™ and university trials were conducted across the Southern region of the U.S. in the fall of 2009 through the spring of 2010 to evaluate the efficacy of DuPont™ Pastora® herbicide for the control of winter annual grass and broadleaf weeds in bermudagrass pastures and hay meadows. Applications were made from November 2009 through April 2010 during the dormant-season of bermudagrass. Pastora® demonstrated good control of winter annual broadleaf weeds including Carolina geranium (*Geranium carolinianum*), henbit (*Lamium amplexicaule*), common chickweed (*Stellaria media*), and buttercup (*Ranunculus spp.*), as well as winter annual grasses including little barley (*Hordeum pusillum*), Italian ryegrass (*Lolium multiflorum*), and annual bluegrass (*Poa annua*). Dormant-season applications made prior to bermudagrass green-up resulted in excellent crop safety and have excellent potential to result in a cleaner first-cutting of bermudagrass hay.

UTILITY OF AMINOCYCLOPYRACHLOR FOR HORSENETTLE AND TALL IRONWEED MANAGEMENT IN COOL-SEASON GRASS PASTURES. **Will Phillips*, Neil Rhodes, Tom Mueller, Greg Armel, University of Tennessee, Knoxville; Jonathan Green, Bill Witt, University of Kentucky, Lexington.**

ABSTRACT

Horsenettle (*Solanum carolinense* L.) and tall ironweed (*Vernonia gigantea* (Walt.) Trel.) are very difficult to manage in pastures due to their tolerance of most herbicides, their capacity to store ample carbohydrates in rhizomes and roots, and the fact that most animals will not graze them. Aminocyclopyrachlor, a new herbicide from DuPont, is showing promise for management of these and other broadleaf weeds in pastures. Research was conducted in 2010 to identify optimum rates and application timings of the herbicide for control of horsenettle and tall ironweed in cool-season grass pastures. All experiments were conducted on naturally-occurring infestations. Horsenettle studies were conducted at Alcoa, Greenback, and Sweetwater, TN, while tall ironweed studies were conducted at Pulaski, TN, and London, KY. A randomized complete block design with four replications was utilized in all studies. Experimental units were 15 feet wide by 30 feet long; the center 10 feet was treated. Treatments were applied using a CO2 backpack sprayer and a six-nozzle boom calibrated to deliver 15 gallons of spray solution per acre. Two untreated control plots were included in each replication. All treatments included Induce at 0.25% (v/v). Treatements were as follows: aminocyclopyrachlor (0.7 oz ai/a) with and without 2,4-D amine (5.3 oz ai/a), aminocyclopyrachlor (1.4 oz ai/a) with and without 2,4-D amine (10.6 oz ai/a), and Milestone (1.25 oz ai/a). Horsenettle application timings were vegetative (June), early flower (mid July), and early berry (September). Tall ironweed application timings were vegetative (early June) and full flower (late August). All horsenettle treatments applied at the vegetative stage gave greater than 90% control 6 WAT with no significant differences among treatements. Horsenettle treatments applied at the early flower stage gave 84% control or better 6 WAT with no differences among treatments. Those same treatments applied to horsenettle in the early berry stage provided control ranging from 54 to 84% control 6 WAT, with aminocyclopyrachlor at 1.4 oz ai/a (alone and with 2,4-D) and Milestone providing significantly better control than aminocyclopyrachlor at 0.7 oz ai/a. When treatments were evaluated in October, the vegetative treatments were showing the best control, ranging from 81 to 94%. There were no significant differences among treatments. All treatments applied to vegetative tall ironweed gave excellent control at 6 WAT (98 or 99%). Applications at full flower gave control ranging from 78 – 88% at Pulaski 6 WAT and 80 – 96% at London 6 WAT, with no significant differences among treatments. End of season ratings at Pulaski revealed that all vegetative treatments gave 97% control or better, and full flower treatments gave 78-88% control. At London, there were no significant differences among any of the treatments when rated in October, with the exception of the full flower timing of Milestone, which gave 80% control. All other treatments gave 88 % control or better. In this 2010 study, the optimum application timing for horsenettle control was vegetative, with all treatments providing good control. In regard to tall ironweed, the vegetative application timing gave the best in-season control. However, when there was adequate soil moisture in late summer for the full flower application, control was also very good. Within the above application timings, aminocyclopyrachlor at 0.7 and 1.4 oz ai/a (with or without 2,4-D) gave good control of horsenettle and tall ironweed, and was comparable to Milestone at 1.25 oz ai/a. All 2010 experiments will be evaluated for year-after control in 2011 by visual ratings, weed stand counts, weed heights, and weed biomass.

ALICIA BERMUDAGRASS QUALITY AND YIELD RESPONSE TO NICOSULFURON + METSULFURON. **D.E. Sanders* and A.K. Whitehead; LSU AgCenter, Clinton, LA.**

ABSTRACT

Cool season grasses and broadleaf weeds interfere with the production of weed-free hybrid bermudagrass throughout Louisiana. The presence of heavy infestations of cool season weeds often delays green-up of bermudagrass, reduces yield and leaves unwanted weeds in the hay produced, especially in the first harvest of the season. A strip trial conducted in 2008 indicated some potential for cool season weed control using a combination of nicosulfuron plus metsulfuron. A replicated dormant season trial was initiated in 2009 with applications on 12/16/2009 and 2/8/2010. Initial weed reductions were noted but significant weed re-infestations were noted in all plots by 2/25/2010. A second larger trial was initiated to determine if applications made closer to green-up would control weeds and help eliminate re-infestation problems. Applications were made on 3/5/2010, 4/6/2010 and 5/5/2010 of the following treatments: 1. nicosulfuron at 0.56 ozai/A + metsulfuron at 0.15 ozai/A 2. nicosulfuron at 0.84 ozai/A + metsulfuron at 0.22 ozai/A 3. imazapic at 01.0ozai/A, a "weed free" glyposate at 6.0 ae/A and an untreated check. The trial was conducted in a commercial hybrid bermudagrass (*Cynodon dactylon*) var. Alicia with a uniform infestation of annual ryegrass (*Lolium multiflorum*), rescuegrass (*Bromus catharticus*), buttercup (*Ranunculus* sp.) and ball clover (*Trifolium nigrescens*). The March and April applications were made prior to green-up of the bermudagrass with the May application made shortly after green-up. Plots were rated weekly and two harvests were made, first on 5/19/2010 and again on 6/29/2010. Following the May harvest a subsample was taken and percent bermudagrass vs percent weeds was determined. The March and April applications of nicosulfuron plus metsulfuron at both rates provided greater than 95% of all weeds at first harvest compared to 70-75% control of all weeds with imazapic or 40% control with the "weed free" glyphosate treatment. The May application of both rates of nicosulfuron plus metsulfuron provided significantly less weed control of rescuegrass and annual ryegrass. Yields reflected weed control ratings with both March and April applications of both rates of nicosulfuron plus metsulfuron yielding an average of 7,000 lbs/A dry matter compared to an average of 3,500 lb/A dry matter for the imazapic treatments and an average of 4,500 lb/A dry matter for both the "weed free" glyphosate and untreated checks once the weed component was removed. Re-infestations of annual ryegrass occurred in all the "weed free" glyphosate plots. Applications of nicosulfuron plus metsulfuron controlled cool season weeds and increased yields for first harvest when made prior to but near green-up of hybrid bermudagrass.

SOIL PH IMPACTS SMUTGRASS COMPETITION WITH BAHIAGRASS. **N. Rana*, B.A. Sellers, University of Florida Range Cattle REC, Ona; J.A. Ferrell and G.E. MacDonald, University of Florida, Gainesville.**

ABSTRACT

Smutgrass species often invade bahiagrass pastures, resulting in forage loss, reduced grazing, and lower calf weaning weight. Information on pH affecting bahiagrass–smutgrass competitive interactions might aid in developing improved weed management systems. A controlled environment study was conducted to examine the effect of three levels of pH (4.5, 5.5 and 6.5) on the competitive ability of two smutgrass species (small and giant) grown with bahiagrass. The study was conducted in a replacement series design with bahiagrass and each smutgrass species grown at three pH levels and 2 density levels; 4 and 8 plants per pot with four planting ratios of bahiagrass:smutgrass (100:0, 75:25, 50:50, 25:75), and three replications. Relative yields and aggressivity of giant smutgrass were higher than bahiagrass at planting ratios of 50:50 and 25:75 at both densities across all pH levels. However, at planting ratio of 75:25, relative yields and aggressivity of giant smutgrass were lower than bahiagrass at density 4 of pH 5.5 and 6.5, indicating high competitive ability of bahiagrass at lower densities. The competitive ability of small smutgrass was greater than bahiagrass only when the planting ratio 25:75 is compared with 75:25 across all pH levels and at the highest planting density of 8 plants/pot. At pH 5.5, giant smutgrass biomass was 76% and 87% higher than bahiagrass at planting ratios of 2:2 and 4:4, respectively. At pH 6.5, giant smutgrass biomass was 52% and 70% greater than bahiagrass at planting ratios of 2:2 and 4:4, respectively. Giant smutgrass biomass was not different from bahiagrass at pH 4.5. In general, small smutgrass responded differently than giant smutgrass. At pH 4.5, small smutgrass biomass was 93% and 63% lower than bahiagrass at planting ratios of 2:2 and 4:4, respectively. At pH 5.5, small smutgrass biomass was 75% and 59% lower than bahiagrass at planting ratios of 2:2 and 4:4, respectively. At pH 6.5, mean weight per plant of both species were not significantly different. These results suggest that the pH levels and planting ratios that favor smutgrass species over bahiagrass might deserve greater attention when managing for smutgrass control. The information gained from this study can be used to advise farmers of the importance of strategic control of smutgrass, particularly at lower densities of bahiagrass where pH is critical for optimum growth.

METSULFURON EFFECTS ON SEEDHEAD SUPPRESSION IN TALL FESCUE. **L.C. Coats*, J.D. Byrd, and J.M. Taylor; Mississip State University, Mississippi State, MS.**

ABSTRACT

A field trial was established in Prairie, MS in 2010 to evaluate the effects of metsulfuron for suppression of seedheads in Kentucky 31 (KY-31) tall fescue (*Festuca arundinacea*). Plot size for treatments was 7 by 30 feet. Two weeks prior to initiation of the trial, plots were mowed to 5 inches in height. A backpack sprayer was used to apply two formulations of metsulfuron to the split plots. Each plot received no treatment, Cimarron, or Chaparral. Cimarron (60% metsufuron) was applied at 0.25 oz wt/A, and Chaparral (62.13% aminopyralid + 9.45% metsulfuron) was applied at 1.5 oz wt/A on March 1. All herbicide treatments included 0.25% v/v nonionic surfactant. Subsequent applications were applied on March 15, April 1, and April 15. Evaluation of the plots began 15 days after initial treatment (DAIT) and continued until 84 DAIT. Each plot was evaluated for KY-31 foliage height reduction at 42 days after treatment (DAT). Significant height reduction compared to the untreated control was seen on all plots; however, the two treatments were only significantly different 42 DAT from the March 15 applications with reductions of 52% for the Cimarron treatments and 41% for the Chaparral treatments. Plots were also evaluated for KY-31 plant density. At 70 DAIT, the plots did not show significant differences in the plant population density. Upon reevaluating at 84 DAIT, significant differences were seen between the untreated control and Cimarron treatments applied March 15 (untreated 85%, Cimarron 68%) and April 15 (untreated 83%, Cimarron 63%) as well as between the untreated control and Chaparral treatments applied March 15 (untreated 85%, Chaparral 75%), April 1 (untreated 88%, Chaparral 75%), and April 15 (untreated 83%, Chaparral 58%). Seedhead reduction was evaluated as the number of KY-31 seedheads per 9 square feet. 84 DAIT, the treated plots showed a significant reduction in number of seedheads compared to untreated plots with a greater decrease in plots treated at later dates. In Cimarron treatments the number of seedheads was 31 for the March 1 applications and 5 for the April 1 applications; in the Chaparral treatments the number of seedheads were 21 for the March 1 applications and 12 for the April 1 applications. Metsulfuron shows potential for the reduction of seedheads in tall fescue. Applications made early during the growing season reduce the number of seedheads, yet allow KY-31 foliage to rebound from the treatment. Future research should include evaluation of ergovaline levels in treated plants to determine if reduction of seedhead also reduces the toxins. The reduction of the toxin levels would decrease the number of cases of fescue toxicosis.

FERTILIZER N AND HERBICIDE EFFECTS ON BOTANICAL COMPOSITION IN DEGRADED STARGRASS PASTURES . **E. Valencia* and M.L. Lugo, University of Puerto Rico, Mayaguez.**

ABSTRACT

Stargrass (*Cynodon nlemfuensis* Vanderyst var. *nlemfuensis*) removes large amounts of N (as much as 400 kg ha^{1} yr^{-1}) when stocked every 21-d. If stargrass pastures are not fertilized with N, degradation (e.g., ingress of unpalatable weedy grasses such as *Paspalum fasciculatum* Wild. ex.Flugee; Mexican crown grass) is common in Puerto Rico. It is not known if a degraded stargrass pasture can revert to a productive stage with N fertilization. Field studies were conducted on 12 (0.50 ha) 10-yr-old stargrass-*Panicum maximum* Jacq. pastures growing on a very-fine, mixed, active isohyperthermic Aquic Hapluderts and arranged in a randomized complete block with three replicates. The objective of the study was to assess the effects of four N rates on dry matter yield (DMY) and botanical composition. In June and October of each year, *Paspalum millegrana* Schrad tufts were treated with glyphosate (wick application rate of 25:75 v:v) and N rates [0 (Control), 56 (L), 112 (M) and 168 (H) kg ha-*1* N; in two split applications] were broadcast applied. Prior to grazing (every 28 d), DMY was estimated using a double sampling technique (30 disk height measurements and three height and clipping of grass in a 0.25 m^2 in each pasture). In addition, visual estimates of percentage stargrass and weedy-grass components in four permanently marked 2.5m^2 area were used to estimate botanical composition (initiation of the study and every 120-d after for two-yrs). The control did not differ in DMY from that of the L rate (avg. 3.0 Mg ha^{-1}). After the second split application in both years, there was a linear effect ($P<0.05$) on DMY for L, M and H rates of N (2.7, 3.4, 3.7 and 5.0 Mg ha^{-1}). Herbicide and N applications showed changes in botanical composition of weedy grasses during the two-year evaluation (reducing by 50%), with an increase in stargrass. The results show that N can be useful in increasing yield and CP of stargrass. However, major changes in the botanical composition of the aggressive and unpalatable grasses maybe require a long-term effort of both glyphosate and N to reduce the existing high seed population of weedy *Paspalums*.

EVALUATING THE EFFECT OF TANK-MIXTURE PARTNERS ON UPTAKE AND TRANSLOCATION OF SAFLUFENACIL ON GLYPHOSATE RESISTANT HORSEWEED (*CONYZA CANADENSIS*). **Brock S. Waggoner*, Gregory R. Armel, Lawrence E. Steckel, Thomas C. Mueller; University of Tennessee, Knoxville .**

ABSTRACT

Glyphosate resistant (GR) horseweed (*Conyza candensis*), has caused producers to change management of vegetation prior to planting from glyphosate only herbicide applications to achieve acceptable weed control. Saflufenacil is a new herbicide for pre-plant burndown and/or preemergence (PRE) weed control in corn (*Zea mays* L.), soybean [*Glycine max* (L.) Merr], and cotton (*Gossypium hirsutum*). Studies were initiated to determine the uptake and translocation of saflufenacil alone and when mixed with glyphosate and paraquat using C^{14} saflufenacil on GR horseweed from Tennessee. It was found that glyphosate plus saflufenacil had a greater absorption of saflufenacil at 2 and 8 HAT. By 24 HAT there were not any differences found in the amount of saflufenacil absorbed into GR horseweed between each of the three treatments. Translocation data also confirmed that the majority of saflufenacil stayed in the treated leaf by 72 HAT.

EFFECTS OF THE AGLYCONE OF ASCAULITOXIN ON AMINO ACID METABOLISM IN *LEMNA PAUCICOSTATA*. **S.O. Duke*, F.E. Dayan, and A.M. Rimando, USDA-ARS, Oxford, MS; A. Evidente and M. Fiore, Univ. Naples Fedrico II, Italy; N. Christiansen, Metanomics GmbH, Berlin, Germany, and R. Looser, and K. Grossman, BASF, Limburgerhof, Germany.**

ABSTRACT

Ascaulitoxin and its aglycone (2,4,7-triamino-5-hydroxyoctanoic acid, CAS 212268-55-8) are potent phytotoxins produced by Ascochyta caulina, a plant pathogen being developed for biocontrol of weeds. The mode of action of this non-protein amino acid was studied on Lemna paucicostata. Ascaulitoxin is a potent growth inhibitor, with an I_{50} for growth of less than 1 uM, almost completely inhibiting growth at about 3 uM. Its action is slow, starting with growth inhibition, followed by darker green fronds, and then chlorosis and death. Most amino acids, including non-toxic non protein amino acids, reversed the effect of the toxin when supplemented in the same medium. Supplemental sucrose slightly increased the activity. D-Amino acids were equally good inhibitors of ascaulitoxin activity, indicating the amino acid effects may not be due to inhibition of amino acid synthesis. Oxaloacetate, the immediate precursor of aspartate, also reversed the activity. LC-MS did not detect interaction of the compound with lysine, an amino acid that strongly reversed the effect of the phytotoxin. Metabolite profiling revealed that the toxin caused distinct changes in amino acids. Here, reduction in alanine, paralleled by enhanced levels of the branched chain amino acids valine, leucine and isoleucine and nearly unchanged levels of pyruvate, might indicate that the conversion of pyruvate to alanine is affected by ascaulitoxin aglycone. In addition, reduced levels of glutamate/glutamine and aspartate/asparagine might suggest that synthesis and interconversion reactions of these amino group donors are affected. However, neither alanine aminotranferase nor alanine:glyoxylate aminotransferase were inhibited by the toxin in vitro. Our observations might be explained by three hypotheses: 1) the toxin inhibits one or more aminotransferases not examined, 2) ascaulitoxin aglycone affects amino acid transporters, 3) ascaulitoxin aglycone is a protoxin that is converted in vitro to an aminotranferase inhibitor.

PALMER AMARANTH; IF YOU CAN'T BEAT IT, EAT IT. **L. M. Sosnoskie, Daniel D. MacLean, A. Stanley Culpepper, Timothy L. Grey, University of Georgia, Tifton; Theodore M. Webster, USDA-ARS, Tifton, GA.**

NO ABSTRACT.

Glyphosate-resistant Palmer amaranth populations occur on more than 2 million Ha of agronomic land in the SE and Mid-south US. A few growers have begun to speculate about the nutritive potential of the species in hopes of finding an unconventional use for this pest. The goals of this study were to: 1) explore the phytonutrient content of Palmer amaranth and 2) compare it to other human and animal food sources common to the SE US. Freshly harvested tissues of greenhouse grown Palmer amaranth, kale, turnip greens, millet and rye were ground under liquid nitrogen, extracted (1:10 w/v) in 60 MeOH:37 H2O: 3 formic acid for 1 hr at 37°C, and then clarified by centrifugation. Antioxidant capacity was determined using two methods: 1) DPPH radical scavenging assay and 2) total phenolics using Folin Ciocalteu's reagent. Antioxidant content was determined using HPLC-DAD; peaks were quantified using standard curves and expressed as chlorogenic acid (330 nm), quercetin 3-galactoside (350 nm) and cyandin 3-galactoside (520 nm) equivalents. Results from the DPPH and FC assays suggest that Palmer amaranth has as high, or higher, an antioxidant capacity as some common human and animal foods. With respect to percent (%) DPPH scavenging: Palmer (51%) > turnip (48%) > kale (46%) > millet (40%) > rye (29%). With respect to total phenolics content (gallic acid equivalents; mg L^{-1}): rye (137) > millet (127) > Palmer (91) > kale (84) > turnip (77). For both assays, the antioxidant/total phenolic content of Palmer amaranth did not differ statistically from either kale or turnip greens. HPLC data showed that Palmer amaranth contains high levels of hydroxycinnamic acids (2785 µg g^{-1} chlorogenic acid equivalents), relative to kale (1502), but less than turnip (3723), millet (3408), and rye (3136). Indigenous leafy amaranths are crucial to food security in many regions of the world including: sub-Saharan Africa, Southeast Asia, India, China, and the Caribbean. A lack of knowledge regarding production practices, harvest methods, animal preference, and nitrate accumulation, plus growers' negative perceptions, will must be overcome before its use as an alternate crop can be explored fully.

THE IMPACT OF GLYPHOSATE SELECTION PRESSURE ON THE *EPSPS* GENE OF GLYPHOSATE-RESISTANT AND –SUSCEPTIBLE ITALIAN RYEGRASS (*LOLIUM PERENNE* SSP. *MULTIFLORUM*). **RA Salas*, NR Burgos, TM Tseng, RC Scott, University of Arkansas, Fayetteville; and F Dayan, USDA-ARS, Oxford, MS.**

ABSTRACT

Ryegrass escaping burndown treatments with glyphosate had been reported by growers in Arkansas as early as 2007. Preliminary tests showed elevated tolerance to glyphosate in some populations. In 2009, glyphosate-resistant populations were confirmed in Desha County. A glyphosate resistance survey is underway. This research aimed to examine the impact of glyphosate selection pressure on its target site, *EPSPS*, in Italian ryegrass populations. Specifically, the *EPSPS* gene of resistant (R) and susceptible (S) populations was sequenced and analyzed for polymorphisms and divergence. The gene sequence would reveal if a target site mutation has caused glyphosate resistance in ryegrass, besides showing potential population divergence. The *EPSPS* enzyme activity and dose response to glyphosate were also evaluated. The *EPSPS* gene sequence did not show any point mutation that has previously been associated with resistance to glyphosate in *Lolium* or other species. Although the *EPSPS* sequence separated the populations into fiver clusters, the R and S biotype differentiation did not originate from this target site. Substitution of Ala_{67} with Glu was observed in 2 of 13 R individuals in the Des14 population. This mutation may be associated with glyphosate resistance, but needs further verification. The*EPSPS* enzyme activity assay on Des03 population revealed that R individuals have six times higher enzyme activity than their S counterparts from the same population, but their I_{50} values in response to glyphosate are similar. This suggests that the mechanism of resistance for these individuals is partly due to increased enzyme production. We are not yet certain if this increase in enzyme activity (6-fold) *per se* can convey the level of whole-plant resistance observed in the population. Des03 shows 23x resistance level to glyphosate on whole plant bioassay. It is possible that other mechanisms such as reduced glyphosate absorption or translocation also contribute to the resistance. This is the first documentation of elevated *EPSPS* activity in glyphosate-resistant ryegrass and supports the hypothesis that multiple mechanisms of resistance could occur within one population or within the same plant.

NUCLEOTIDE POLYMORPHISMS IN THE ALS GENE OF *FIMBRISTYLIS MILIACEA* RESISTANT TO PYRAZOSULFURON-ETHYL . **Carlos E. Schaedler*, Universidade Federal de Pelotas, Brazil; Nilda R. Burgos, Te Ming Tseng, University of Arkansas, Fayetteville; and Jose A. Noldin, Universidade Federal de Pelotas, Brazil.**

ABSTRACT

Weeds resistant to ALS herbicides are the most widespread relative to species with resistance to other herbicide modes of action. *Fimbristylis miliacea* (FIMMI) is one of the most troublesome weeds in rice fields in southern Brazil. Acetolactate synthase (ALS)-inhibiting herbicides are widely used to control weeds in this crop. The continuous use of these ALS-inhibiting herbicides has led to the evolution of herbicide-resistant FIMMI. The objective of this research is to compare the ALS gene nucleotide sequences between resistant and susceptible FIMMI biotypes. To confirm the resistance of FIMMI to ALS inhibitors, whole-plant bioassays were conducted in 2008 and 2009. In the bioassay experiments we used two resistant (FIMMI 10 R and FIMMI 12 R) and one susceptible (FIMMI 13 S) biotypes to ALS-inhibiting herbicides. The FIMMI 10 R biotype showed cross resistance to three ALS chemical families while FIMMI 12 R biotypes showed cross resistance to two chemical families of ALS-inhibiting herbicides. To determine if target site mutation is the mechanism of resistance in F. miliacea the ALS gene was partially sequenced and compared between the susceptible and resistant biotypes. Analysis of the nucleotide and amino acid sequences between the biotypes indicated that a single point mutation, Thymine-Adenine, in the FIMMI 10 R biotype resulted in an amino acid substitution, Asp376Glu, in the region between the C, A, D and B, E domains. Follow-up experiments will be conducted if this mutation plays a role in resistance to some ALS herbicides.

GROWTH AND REPRODUCTION OF BARNYARDGRASS (*ECHINOCHLOA CRUS-GALLI*) UNDER DIFFERENT SOYBEAN DENSITIES AND DISTANCES FROM SOYBEAN ROWS. **Muthukumar V. Bagavathiannan*, Jason K. Norsworthy, University of Arkansas, Fayetteville; Kenneth L. Smith, University of Arkansas, Monticello.**

ABSTRACT

Barnyardgrass is an important weed in soybean production fields in the Midsouth. Herbicide-resistant populations of barnyardgrass are widespread in Arkansas rice, and the evolution of glyphosate-resistant barnyardgrass is likely in Roundup Ready® soybean systems. A barnyardgrass resistance simulation model is being developed at the University of Arkansas, and parameterization of the model requires a thorough understanding of the dynamics of barnyardgrass. In this view, experiments were conducted in the summer of 2010 at the Agricultural Experimental Station, Fayetteville, AR, to a) determine the growth and reproduction of barnyardgrass under different times of emergence in soybean planted at different densities, and b) estimate the growth and reproduction of barnyardgrass emerging at different distances from soybean rows under different times of emergence. Two experiments were conducted. In the first experiment (RCBD with three replications), soybean was drilled seeded at three densities (25, 37, and 47 plants m^{-2}) with seven times of barnyardgrass emergence (0, 7, 14, 21, 28, 35, and 42 days after soybean emergence [DAE]). Additionally, barnyardgrass was sown to emerge without soybean at comparable timings (control plots). The second experiment (RCBD with six replications) was carried out in row-seeded soybean with three distances from the soybean rows (0, 24, and 46 cm) and nine times of barnyardgrass emergence (0, 7, 14, 21, 28, 35, 42, 49, and 56 DAE). The results showed that the effects of daylength and inter- and intra-specific interference on the seed production potential of barnyardgrass are tremendous. At 0 DAE, barnyardgrass seed production in the absence of soybean was about 8.5-fold greater (about 266,000 seeds $plant^{-1}$) compared to the maximum seed production in plots with soybean (about 31,400 seeds $plant^{-1}$). In drill-seeded soybean, at 0 DAE, barnyardgrass established in 47 soybean plants m^{-2} produced about 32% less seeds compared to those established in 25 plants m^{-2}. In addition, the distance of barnyardgrass emergence from the soybean rows is an important factor governing barnyardgrass seed production. For instance, at 0 DAE, the seed production potential of barnyardgrass established within the crop row was only 31% (about 9,850 seeds $plant^{-1}$) of those established at 46 cm from crop rows (about 31,500 seeds $plant^{-1}$). Comparing the different times of emergence, barnyardgrass seed production was almost negligible when barnyardgrass was established after 28 DAE in drill-seeded soybean and after 42 DAE in row-seeded soybean. Overall, the study provides valuable information on the dynamics of barnyardgrass under different production scenarios, and the findings will be useful for parameterizing models simulating the population dynamics of barnyardgrass.

HERBICIDE EFFECT ON NAPIERGRASS (*PENNISETUM PURPUREUM* SCHUM.) GROWTH MEASURED BY CO2 ASSIMILATION. **G.S. Cutts, III, University of Georgia, Tifton; W.K. Vencill, University of Georgia, Athens; T.M. Webster, USDA-ARS, Tifton, GA; and T.L. Grey, University of Georgia, Tifton.**

ABSTRACT

Greenhouse experiments were conducted to determine the effect of herbicides on napiergrass growth by measuring carbon dioxide (CO_2) assimilation. Napiergrass stems containing three lateral nodes were planted in pots and greenhouse grown. Two weeks prior to herbicide treatment, plants were pruned to uniform size. Hexazinone, glyphosate, and imazapic were applied POST at 200, 869, and 70 g ai ha^{-1}, respectively, and CO_2 assimilation was measured with the use of an open-flow gas-exchange system up to 22 d after treatment (DAT). A decline in CO_2 assimilation of 93% occurred for hexazinone at 1 DAT. Glyphosate and imazapic CO_2 assimilation was reduced 97 and 75% at 10 DAT, respectively. All herbicide treatments were different from one another and the non-treated control. Carbon dioxide assimilation was reduced to zero, indicating plant death, for hexazinone- and glyphosate-treated napiergrass by 2 and 12 DAT, respectively. Imazapic-treated napiergrass CO_2 assimilation declined to a constant rate by 22 DAT, but never reached zero. Greenhouse results indicated multiple modes of action could be effective in reducing napiergrass growth, but were inconsistent with field results. Further field studies are needed to derive conclusive methods of napiergrass control.

ABSORPTION AND TRANSLOCATION OF IMAZETHAPYR IN RED RICE AS AFFECTED BY SAFLUFENACIL AND LIGHT INTENSITY. **Edinalvo Camargo*, Texas A&M University, College Station, TX, Conselho Nacional de Desenvolvimento Científico e Tecnológico, Brazil; Scott Senseman, Texas A&M University, Texas AgriLife Research, College Station, TX; Garry McCauley, Texas AgriLife Research, Eagle Lake, TX; Steven Bowe, John Harden, BASF Corporation, Research Triangle Park, NC; and John B. Guice, BASF Corporation, Winnsboro, LA.**

ABSTRACT

Saflufenacil is a member of the pyrimidinedione family of herbicides, which inhibits protoporphyrinogen oxidase (PPO) enzyme. PPO inhibition leads to accumulation of protoporphyrin IX (Proto IX) in the cytoplasm. Light absorption by accumulated Proto IX, the first light-absorbing chlorophyll precursor, induces production of triplet stage Proto IX and singlet oxygen causing lipid peroxidation. Hence, membrane leakage occurs resulting in rapid disintegration of cells and cell organelles. In rice, saflufenacil could be used in combination with herbicides like imazethapyr where additional activity on dicotyledon weeds is needed. However, interaction of saflufenacil, a light-dependent, membrane disruptor herbicide, could affect imazethapyr absorption and translocation depending on light availability. The objective of this study was to investigate the effects of saflufenacil postemergence application on imazethapyr absorption and translocation in red rice plants under four light intensities. Treatments included two herbicide combinations (imazethapyr alone and imazethapyr plus saflufenacil) and four levels of light intensity (1066 µmol m^{-2} s^{-1}, 677 µmol m^{-2} s^{-1}, 259 µmol m^{-2} s^{-1}, and 106 µmol m^{-2} s^{-1}). Imazethapyr was applied at 70 g ha^{-1} and saflufenacil at 12.5 g ha^{-1}. Methylated seed oil (MSO) at 1% v/v was included in all herbicide treatments. Light intensity treatments were obtained by placing shade cloths over the top of the plants inside of the growth chamber. No shade, 30%, 70%, and 90% shade cloths were used in the study. Red rice seeds (TX4 ecotype) were seeded in deep cones containing potting mix. Red rice plants were grown in growth chambers under a 14-h photoperiod and 30 C day/ 25 C night temperature regime. Herbicide applications were made at the 3- leaf stage of red rice plants using an air-driven spray chamber delivering 140 L ha^{-1} of solution. Within 0.5 hours after application of the formulated products, 5 µL of ^{14}C-imazethapyr solution with 835 kBq $µmol^{-1}$ of specific activity was applied in three positions to the adaxial surface of the middle leaf. Red rice plants were placed and maintained under light regimes according to treatments until harvest. Plants were harvested at 1, 6, 24, 72, and 168 hours after treatment with ^{14}C-imazethapyr. The treated leaf was excised and washed with deionized water followed by methanol to remove ^{14}C-imazethapyr from leaf surface and epicuticular wax, respectively. Ten mLs of liquid scintillation cocktail was added to the leaf washes. Plants were sectioned into 1) treated leaf, 2) portion of plant above-treated leaf, 3) aerial portion of plant below-treated leaf, and 4) roots. Plant sections were dried in an oven at 55 C for 72 h. Dried samples were combusted with a biological sample oxidizer. Sample radioactivity was quantified by liquid scintillation spectrometry. Absorption and translocation of ^{14}C-imazethapyr increased over time, but less than 15% of radioactive imazethapyr was absorbed and less than 10% was translocated at 168 hours after treatment. Imazethapyr plus saflufenacil treatment provided a higher uptake and translocation of ^{14}C-imazethapyr than imazethapyr alone. From the radioactive imazethapyr absorbed, a higher percentage translocated to the above-treated leaf section at 72 and 168 hours in the imazethapyr plus saflufenacil combination. Harvest timing and light intensity affected translocation of imazethapyr below-treated leaf. At higher light intensity translocation of absorbed ^{14}C-imazethapyr to below-treated leaf was faster than under lower light intensity. Saflufenacil enhances absorption and translocation of imazethapyr in red rice plants.

DIFFERENTIAL ABSORPTION AND TRANSLOCATION OF ^{14}C–GLYPHOSATE IN SOURGRASS BIOTYPES FROM BRAZIL. **Leonardo Bianco de Carvalho*, Sao Paulo State University, FCAV/UNESP, Brasil; Hugo Cruz-Hipolito and Fidel González-Torralva, University of Cordoba, ETSIAM/UCO, Spain; Pedro Luis da Costa Aguiar Alves, Sao Paulo State University, FCAV/UNESP, Brasil; Pedro Jacob Christoffoleti, University of Sao Paulo, ESALQ/USP, Brasil; and Rafael De Prado*, University of Cordoba, ETSIAM/UCO, Spain.**

ABSTRACT

Sourgrass (*Digitaria insularis*) is a perennial weed infesting annual and perennial crops in Brazil. Three biotypes (R1, R2 and R3) of sourgrass suspected to be glyphosate–resistant and another one (S) from a natural area without glyphosate application, in Brazil, were tested for detection of resistance to glyphosate based on dose–response and shikimic acid assays, also evaluating the role of absorption and translocation of 14C–glyphosate as mechanisms of resistance. Dose–response assays confirmed the glyphosate resistance in sourgrass biotypes. Dose–response assay indicated a resistance factor of 2.33, 3.90 and 3.89 for biotypes R1, R2 and R3, respectively. The hypothesis of a glyphosate resistance was provisionally corroborated on the basis of shikimic acid accumulation, where biotype S accumulated 3.3, 5.0 and 5.7 times more shikimic acid than biotypes R1, R2 and R3, respectively, 168 hours after treatment at 157.50 g of ae ha-1 of glyphosate. D. insularis biotypes showed a distinct pattern of absorption and translocation. However, there was no difference in absorption of among the biotypes after 72 HAT; and at 96 HAT, 48.4, 46.5, 44.6 and 47.7% of the recovered radioactivity had penetrated into the leaf tissue of biotypes S, R1, R2 and R3, respectively. After 48 HAT, there was a difference in percentage of 14C–glyphosate translocated from the treated leaf to the roots and rest of shoot for S and R1 biotypes compared to R2 and R3 biotypes; at this time, 53.8, 58.1, 79.2 and 71.8% of 14C–glyphosate absorbed remained in the treated leaf for S, R1, R2 and R3 biotypes, respectively. In addition, 23.7, 23.4, 11.7 and 14.5% had been translocated to roots; and 22.4, 18.5, 9.1 and 13.7% had been translocated to rest of shoot. We concluded that: (1) the results confirm the resistance of sourgrass to glyphosate in Brazil; (2) absorption does not play a role as mechanism of resistance; and (3) translocation is the main mechanism of resistance studied in biotypes R2 and R3.

POPULATION GENETICS OF GLYPHOSATE-RESISTANT PALMER AMARANTH WITH DIFFERENT LEVELS OF RESISTANCE AND GEOGRAPHIC ORIGINS. **E.A.L. Alcober* N.R. Burgos, T.M. Tseng, R.A. Salas, University of Arkansas, Fayetteville; A. Lawton-Rauh, B. Rauh, K. Beard, Clemson University, Clemson .**

ABSTRACT

The spread of glyphosate-resistant Palmer amaranth populations is a circumstance needing urgent solutions. It has been reported and confirmed in 8 states. Understanding the unprecedented rapid diversification and spread of this species is critical in dealing with the issue of resistance to herbicides, which has become a threat to crop production. The target enzyme, 5-enolpyruvylshikimate-3- phosphate synthase (EPSPS), is one source of information on the impact of this type of selection pressure on weed populations. This project is conducted to determine EPSPS gene variations of Palmer amaranth populations relative to different levels of resistance and geographic origin. Degenerate primers were designed to amplify fragments of the Palmer amaranth EPSPS gene. This information was then used to design specific primers for Palmer. Five populations representing different geographies and cropping systems are included. There are two susceptible (S) and three resistant (R) populations. Each population was represented by five plants and at least eight EPSPS clones per plant were analyzed. EPSPS clones between populations were 98% identical at the nucleotide level. Nucleotide and amino acid polymorphisms were higher in the S populations than the R populations. There were 69 nucleotide and 33 amino acid polymorphisms detected in the S population from South Carolina and 15 nucleotides and eight amino acid polymorphism detected in the S population from Arkansas. The SC population has not been exposed to glyphosate while the S population from Arkansas had intermittent exposure to glyphosate as it was collected from a field with a vegetable-soybean-corn cropping system. The different degrees of mutations between two S populations with different selection pressure intensities from glyphosate (none vs. moderate) demonstrates the significant impact of glyphosate on its target site in Palmer amaranth. The resistant Grady population had only two nucleotide polymorphisms while none was detected in the Mississippi population. These populations were growing with glyphosate-resistant crops for over 10 years. The Lonoke resistant population had nine nucleotide polymorphisms and two amino acid polymorphisms. This indicates that tremendous selection pressure resulted in a more homogeneous EPSPS gene of the resistant populations. Indications are that some R populations from Arkansas are independently derived. Thus, resistance is spreading by both gene flow and independent selection events. None of the mutations in the R populations analyzed were among those associated with glyphosate resistance. Preliminary results of EPSPS enzyme assays indicated that the R population (Lonoke) has 53 times the level of activity of EPSPS from the S population (Crawford). This indicates that at least, for this population, the resistance mechanism is due to elevated EPSPS expression.

VARIATION IN HAIRY VETCH SEED WEIGHT ALTERS GERMINATION AND SEEDLING GROWTH RESPONSE TO AN ALLELOCHEMICAL. **R.D. Williams*, P.W. Bartholomew, USDA-ARS, Langston, OK.**

ABSTRACT

The inhibition of seed germination by an allelochemical is generally greater in small seeds than in large seeds. This response may have significant impact on weed control by allelopathic cover crops where the small-seeded weeds would be controlled more effectively than large-seeded species. In our studies, hairy vetch (Vicia villosa Roth.) seed were separated into three classes that varied in seed weight (large, 54 mg; medium, 40 mg; and small, 26 mg) to compare their germination response to coumarin at 10^{-3} and 10^{-5} M. There was no significant difference in germination at 10^{-5} M concentration with respect to seed size. However the 10^{-3} M concentration delayed and reduced seed germination and this effect was more noticeable in the small seed class. Expressed as a percent of control, germination for large, medium and small seed was 72%, 76%, and 55%, respectively, and germination of the small seed was delayed by two days. There was no difference in shoot lengths between the 10^{-5} M coumarin and the control treatments for either the small or medium sized seed, but there was a difference in the large seed. Shoot length was significantly reduced by the 10^{-3} M coumarin regardless of seed size. Root length appeared to be more sensitive to coumarin than shoot length. The 10^{-5} M coumarin did not reduce root length in either the small or medium sized seed, but did in the large seed. Coumarin at 10^{-3} M reduced root length regardless of seed size. These results confirm those reported in the literature based on seed of a number of species with different size seed. Small seed do appear to have a greater sensitivity to an allelochemical, and this sensitivity is selective within a species with respect to its small versus large seed. This selection pressure could have significant impact on the weed community over time.

EPSPS GENE AMPLIFICATION INHERITANCE IN GLYPHOSATE-RESISTANT *AMARANTHUS PALMERI* FROM MISSISSIPPI. **Daniela N. Ribeiro*, Mississippi State University, Starkville; Franck E. Dayan, Zhiqiang Pan, Stephen O. Duke, USDA-ARS, Oxford, MS; David R. Shaw, Mississippi State University, Starkville; Vijay K. Nandula, Mississippi State University Delta Research and Extension Center-Stoneville; Brian S. Baldwin, Mississippi State University, Starkville.**

ABSTRACT

Glyphosate is considered by many as the most important herbicide ever developed. Multiple glyphosate applications impose strong selection pressure for evolution of resistant populations, representing a major agronomic concern. The aim of this study was to determine the inheritance and mechanism of evolved resistance in glyphosate-resistant (R) Palmer amaranth populations (R1 and R2) from Mississippi. The GR_{50} values of the R1 and R2 populations were 17- and 14-fold greater than the sensitive (S) population, respectively. The F_1 generations were created by reciprocally crossing R maternal parents with S paternal parent (R/S) and crossing S maternal parent with R paternal parents (S/R). Individuals from the F_1 populations were submitted to a glyphosate dose-response assay. A range of phenotypes from R to S were observed, with strong dependence on the direction of the parental cross. Dose response results support a maternal inheritance model. Maternal inheritance of herbicide resistance is atypical and was only confirmed for PSII-inhibitor resistance. This led us to investigate the mechanism involved in the regulation of maternal inheritance. The *EPSPS* gene was amplified and sequenced in six R1, six R2 and, eleven S individuals. Sequence comparisons of the predicted *EPSPS* mature protein coding regions from R1, R2, and S did not identify a target site mutation known to confer resistance in R populations. Young, expanding leaf tissues were sampled in triplicate from R1, R2, S, and F_1 plants for extraction of genomic DNA, RNA and protein; RNA was used as a template for cDNA synthesis. Quantitative RT-PCR was used to measure *EPSPS* genomic copy number relative to *ALS* and cDNA expression level of *EPSPS* relative to *ALS*. The relative gene copy numbers and expression level were derived by using the formula $2^{\Delta Ct}$, where ΔCt is the difference in threshold cycles required to detect amplification product from *ALS* as compared with *EPSPS*. Genomes of R plants ranged from 59 to 32 more copies of the *EPSPS* gene than S plants; R/S varied from 43 to 37, and S/R from 19 to 1. Thus, R and R/S contained more copies of *EPSPS* gene than S and S/R, supporting a maternal mode of *EPSPS* copy number inheritance. The levels of *EPSPS* expression were higher in R1 and R/S, although they were lower in S, S/R, and R2. Protein was extracted and fractioned with ammonium sulfate. A continuous assay for inorganic phosphate release was used to assay *EPSPS* enzyme activity in total soluble protein. Each sample was assayed in triplicate at eight glyphosate concentrations from 0 to 1 mM. In the absence of glyphosate, *EPSPS* specific activity was lower in S and S/R than in R and R/S; all were equally inhibited by the presence of glyphosate (LSD-test on IC_{50}, $P > 0.05$). Consequently, elevated *EPSPS* copy number correlated with expression level ($r = 0.87$, $P < 0.0001$) and with *EPSPS* enzyme activity ($r = 0.87$, $P < 0.0001$) in most studied populations, with the exception of R2. These results suggest that increased copy number alone does not automatically confer resistance to glyphosate. Therefore, another mechanism is probably involved in resistance to glyphosate besides the increased *EPSPS* gene copy number. Such information may be useful in the development of management strategies for glyphosate resistance in weeds, as well as in the prospect of designed alterations in the genome of crop plants to establish desired herbicide resistance.

^{13}CARBON ISOTOPE DISCRIMINATION IN MAJOR C_4 WEEDS OF RICE - IMPLICATIONS FOR ROOT INTERFERENCE STUDIES. **D.R. Gealy*, USDA-ARS, Stuttgart, AR.**

ABSTRACT

Assessing below ground plant interference in rice has been difficult in the past because separation of intertwined weed and crop roots is nearly impossible. A simple ^{13}C-depletion method was previously developed for simultaneous quantification of barnyardgrass and rice roots in flooded fields. This research investigated the feasibility of extending this methodology to other rice weed species. d^{13}C (an expression of ^{13}C:^{12}C ratios) levels in roots and leaves of rice were compared to those of ten weed species grown in monoculture in greenhouse and/or field. C_4 species included the tropical grasses, barnyardgrass, bearded sprangletop, Amazon sprangletop, broadleaf signalgrass, fall panicum, and large crabgrass, as well as yellow nutsedge. C_3 weed species included red rice, gooseweed, and redstem. Rice root d^{13}C levels averaged ~-28‰ indicating that these roots were highly ^{13}C-depleted. Root d^{13}C levels in the C_4 species ranged from -10‰ in yellow nutsedge to -17‰ in bearded sprangletop, indicating that these species were much less ^{13}C-depleted than rice, and were suitable for a ^{13}C discrimination approach to root interactions with rice. d^{13}C values for all species tested were strikingly consistent from year to year and in different environments. Shoots of rice tended to be slightly more ^{13}C-depleted than roots. Corrective mathematical 'mixing' equations derived from inputs including the weights, carbon mass, % carbon content, and d^{13}C levels of roots and soil were developed to improve the accuracy of root weight and root d^{13}C levels estimated from soil-contaminated samples.

THE EFFECT OF DICAMBA ON GLYPHOSATE EFFICACY OF VARIOUS GRASS SPECIES. **C.S. Smith*, D.B. Reynolds, J.T. Irby, and R.C. Storey; Mississippi State University, Mississippi State.**

NO ABSTRACT.

EFFICACY OF HERBICIDES APPLIED AT DIFFERENT TIMINGS ON GREENBEANS. **L. E. Estorninos Jr*., N. R. Burgos, E. A. L. Alcober, and T. M. Tseng, University of Arkansas, Fayetteville.**

ABSTRACT

An experiment was conducted in 2009 and 2010 at the Arkansas Agricultural Research and Extension Center, Fayetteville to evaluate the tolerance of greenbeans (*Phaseolus vulgaris* L.) and the efficacy of herbicides when applied preplant (PPL), preemergence (PRE), and postemergence (POST). The herbicides used were: Valor (flumioxazin), Reflex (fomesafen), Prefix (*S*-metolachlor + fomesafen), Goaltender (oxyfluorfen), and Sharpen or Kixor (saflufenacil). Dual magnum (*S*-metolachlor) and Command (clomazone) were added in the 2010 test. The stand reductions in 2009 caused by PRE applications of Reflex at 0.211kg ai/ha (39%) and Prefix at 0.420 + 0.027 kg ai/ha (11%) were relatively low but the visual injury ratings were high (85% and 86%, respectively). The yields from these treatments were very low (502 and 485 kg/ha, respectively). Valor at 0.211 kg ai/ha applied PRE and Reflex applied PPL had slight or no effect on the crop, had sustained weed control, and produced higher yields of greenbeans (5600 and 5200 kg/ha, respectively). In 2010, Sharpen (0.07 kg ai/ha) applied PPL and 0.14 kg ai/ha PRE killed the crop. Greenbeans showed better tolerance to the lower rate of Sharpen when applied PRE. Prefix (1.12 + 0.24 kg ai/ha) applied PPL controlled the weeds and did not affect the crop. The PPL timing of Prefix application produced 3700 kg/ha of greenbeans, which was comparable to that of the weed-free check (4600 kg/ha). Prefix, PRE, had sustained weed control, caused slight injury (8%), and produced comparable yield (3200 kg/ha) to that of Prefix, PPL. Herbicide performance differed between years; thus, the experiment will be repeated in 2011. It may be that the PRE application of Prefix to greenbeans will cause variable injury levels depending on the climatic conditions around the time of application and early crop growth. Such injury could be manifested in different levels of yield reduction.

EVALUATION OF HERBICIDE TANK MIXTURES FOR WEED CONTROL AND GRASS SUPPRESSION IN GRAPE ROW MIDDLES. **J.J. Vargas*, G.R. Armel, J.T. Brosnan, D.W. Lockwood; University of Tennessee, Knoxville.**

ABSTRACT

Field studies were conducted in 2010 evaluating tall fescue (*Festuca arundinacea*) suppression in grape (*Vitis spp.*) row middles with reduced rates of postemergence (POST) herbicides. Trial sites were established at the University of Tennessee Plateau Research & Education Center in Crossville, Tennessee. All treatments were applied POST to tall fescue infested with buckhorn plantain (*Plantago lanceolata*), dandelion (*Taraxacum officinale*), and white clover (*Trifolium repens*) measuring 3 inches in height at the time of application. Field plots were 10 by 20 feet and arranged in a randomized complete block design with three replications. Herbicide treatments in these trials included glyphosate at 110 and 220 g ai/ha, sethoxydim at 132 g ai/ha, clethodim at 68 g ai/ha oxyfluorfen at 560 and 1120 g ai/ha, rimsulfuron at 9 and 18 g ai/ha mixtures of glyphosate at 110 g ai/ha + sethoxydim at 132 g ai/ha, glyphosate at 220 g ai/ha + sethoxydim at 132 g ai/ha, glyphosate at 110 g ai/ha + clethodim at 68 g ai/ha, glyphosate at 220 g ai/ha + clethodim at 68 g ai/ha, glyphosate at 110 g ai/ha + rimsulfuron 9 g ai/ha, glyphosate at 110 g ai/ha + rimsulfuron at 18 g ai/ha, glyphosate at 110 g ai/ha + oxyfluorfen at 560 g ai/ha, glyphosate at 110 g ai/ha + oxyfluorfen at 1120 g ai/ha, rimsulfuron at 9 g ai/ha + oxyfluorfen at 560 g ai/ha, sethoxydim at 132 g ai/ha + oxyfluorfen at 560 g ai/ha, clethodim at 68 g ai/ha + oxyfluorfen at 560 g ai/ha, and three way mixtures of glyphosate at 110 g ai/ha + rimsulfuron at 9 g ai/ha + oxyfluorfen at 560 g ai/ha, glyphosate at 110 g ai/ha + sethoxydim at 132 g ai/ha + oxyfluorfen at 560 g ai/ha, and glyphosate at 110 g ai/ha + clethodim at 68 g ai/ha + oxyfluorfen at 560 g ai/ha. An untreated control was included for comparison. All treatments were applied with a CO2 powered backpack sprayer calibrated to deliver 215 liters per hectare. All herbicide treatments contained crop oil concentrate at 1% v/v. Fescue suppression and weed control were evaluated 7, 14, 28 and 56 days after treatment (DAT). By 28 DAT, glyphosate applied in combinations with clethodim provided the greatest suppression of tall fescue (32%). Rimsulfuron, sethoxydim and oxyfluorfen applied alone did not provide adequate suppression of tall fescue by 28 DAT. By 56 DAT, tall fescue was still suppressed (15 to 23 cm) with treatments containing glyphosate or clethodim alone or mixtures together or when either herbicide was applied in combination with oxyfluorfen when compared to the untreated check (30 cm). By 56 DAT broadleaf weed control no treatment control buckhorn plantain, clover and dandelion greater than 31%.

SUSTAINABILITY OF METHYL BROMIDE ALTERNATIVES FOR TOMATO. T. Jacoby*, A.W. MacRae, R.O. Kelly, C. Alves, and C. Hunnicutt, University of Florida, Balm.

ABSTRACT

With the potential for increased costs and a drop in efficacy for current methyl bromide alternatives, it is important to develop systems with long term success. The objective of this research is to determine the long term sustainability of four methyl bromide alternative programs in a double crop system. In August of 2008 a trial was initiated to further analyze four methyl bromide alternatives' sustainability. The experiment is a split plot design with the main plot being initial fumigation and the split plot being herbicide application. The initial treatments consisted of five fumigant systems and a non-treated control: 1) Methyl Bromide 67:33 @ 175lbs/A (MB), 2) Paladin Pic @ 60 gal/A, 3) Midas 50:50 @ 160 lbs/A, 4)Telone II @ 12 gal/A + Chloropicrin @ 150 lbs/A (2-Way), 5)Telone II @ 12 gal/A + Chloropicrin @ 150 lbs/A + KPam @ 60 gal/A (3-Way), 6) Non-treated Control. All treatments were placed 8 inches below the top of the bed except Telone II which was placed 12 inches below the bed top and KPam which was applied through the drip tape. Herbicide treatments were applied to one half of each 300 foot long bed and consisted of V-10142 @ 0.3 lbs ai/A and Devrinol at 1 gal/A in year one. Fomesafen @ 0.25 lbs ai/A was used in years two and three instead of V-10142. The main plots consisted of three beds by 300 feet long. Beds were on five foot centers with a 28 inch bed top. In years one through three, the application of the herbicide under the plastic mulch increased annual grass control for most treatments. Only those fumigant treatments that provided excellent control did not see this increase. Paladin Pic and the non-treated control had similar annual grass counts. All other fumigation treatments had lower annual grass counts and were similar to each other. For the purple nutsedge counts , the application of the herbicide under the plastic generally improved nutsedge control. Only the 2-Way applied without herbicides in year three had purple nutsedge counts similar to the non-treated control. This may show a lack of sustainability over the long term. For marketable yield (mediums + large + extra large), all fumigation treatments, when applied in combination with herbicides, produced greater yield than the non-treated control. The 3-Way treatment provided the most consistent weed control and high yields in years one and two. Paladin Pic produced high yields but also had high weed counts. These weed counts were greatly reduced with the addition of a herbicide and it would be expected that this product will be required to have a herbicide program as part of its weed control efforts. After year three of this trial, the 2-Way system is starting to break down when used without a herbicide program, while all other fumigant systems showed good signs as a methyl bromide alternative. A herbicide program will be required for all fumigant systems to improve sustainability.

SUSTAINABILITY OF METHYL BROMIDE ALTERNATIVES FOR BELL PEPPER. **C. Alves*, A.W. MacRae, T. Jacoby, R.O. Kelly, and C. Hunnicutt, University of Florida, Balm.**

ABSTRACT

With the phase out of methyl bromide, research is being conducted to find solutions that equal the demand for pest control alternatives in plasticulture production. However, studied products often show lower efficacy and, as substitutes for methyl bromide, potential for higher costs. Therefore, in order to provide economical and biological benefits for the growers, the cropping system must be maximized in yield potential and pest control. The objective of this field study was to determine the sustainability of four methyl bromide alternatives in bell pepper in a plasticulture production system. A study was initiated in the summer of 2008 to evaluate the long term potential of four possible methyl bromide alternative fumigant systems. These systems are repeated annually to the same piece of land to determine their sustainability over a period of five years. We are currently in the midst of year three. Treatments included Methyl Bromide 67:33 at 175 lbs/A, Paladin Pic at 60 gal/A, Midas 50:50 at 160 lbs/A, Telone II at 12 gal/A plus Chloropicrin at 150 lbs/A plus KPam at 60 gal/A (3-Way), Telone II at 12 gal/A plus Chloropicrin at 150 lbs/A (2-Way), and a non-treated control. All treatments were placed 8 inches below the top of the bed except Telone II which was placed 12 inches below the bed top and KPam which was injected into the beds using double drip tape. The experiment design was a split plot, with each treatment divided into herbicide and no herbicide subplots. In year one there was no herbicide program evaluated in conjunction with the fumigant systems. In years two and three herbicides were applied before plastic mulch installation and consisted of fomesafen (0.25 lbs ai/A) and napropamide (2 lbs ai/A). Data collected consisted of annual grass counts, of which the population was composed by 85% of goosegrass, nutsedge counts, of which the population was composed of 90% purple nutsedges, and bell pepper marketable yield. Marketable yield consisted of the combination of large, extra-large, and jumbo grades. Year 1. Only Paladin Pic had annual grass counts similar to the non-treated control, all other treatments provided excellent control of grasses. There were no differences between treatments for nutsedge counts nor marketable yield. Year 2. With the addition of the herbicide program only Paladin Pic was similar to the non-treated control for annual grass counts. Without the herbicide program the 2-Way system was also similar to the non-treated control for annual grass counts. The 2-Way system without a herbicide program was similar to the non-treated control for nutsedge counts, with all other treatments providing control similar to the Methyl Bromide standard. When applied with the herbicide all fumigant treatments had similar yields except Paladin Pic, which had lower yield than the methyl bromide standard due to the lack of annual grasses control. Without a herbicide program, both the 2-Way and Paladin Pic had reduced yields compared to the standard. Year 3. When applied with a herbicide only the 3-Way and Midas fumigant systems had similar control of annual grasses when compared to the methyl bromide standard. Without a herbicide only Paladin Pic did not have similar annual grass control to the standard. Midas provided the best nutsedge control with the 3-Way and methyl bromide having similar control when applied with the herbicide program. Without a herbicide, only the 3-Way system provided similar control to Midas. When applied with a herbicide, methyl bormide and the 3-Way system had similar yields to the Midas treatment. Without a herbicide, Midas has the best yield of bell pepper compared to all treatments. This result was most likely caused by the time of application. All treatments, except Midas, were applied just three days prior to a four inch rainfall event. Midas was not applied until three weeks later due to Department of Transportation restriction on the shipment of Midas within the state of Florida. The rainfall event caused the field to remain flooded for two days after treatment thus reducing the efficacy of the fumigant treatments. Midas was not subject to this weather event and thus had no reduction in its efficacy. All fumigant treatments showed an improvement in weed control with the addition of a herbicide. After year 2 of this trial, all fumigant systems showed good signs as a methyl bromide alternative, but it looks as though a herbicide program will be required for all fumigant systems to improve sustainability. Bell Pepper will require a postemergence grass herbicide for the 2-Way and Paladin Pic to provide good control. Overall, the Methyl Bromide, 3-Way and Midas treatments, when supplemented by the herbicide, provided the most consistent weed control and higher yields.

TRANSPLANTED CUCURBIT TOLERANCE TO FOMESAFEN APPLIED UNDER POLYETHYLENE MULCH . **C. Hunnicutt*, A.W. MacRae, T. Jacoby, R.O. Kelly, and C. Alves, University of Florida, Balm.**

ABSTRACT

Weeds are becoming increasingly difficult to control in the post-methyl bromide era. Both nutsedge species and annual broadleaf weeds are escaping control with the currently available methyl bromide alternatives. Growers are needing new herbicides to help maintain the sustainability of these fumigants. The objective of this study is to determine the tolerance of cucurbits to under poly ethylene mulch applications of fomesafen. Four experiments were conducted in the fall of 2010 to determine the tolerance of transplanted cantaloupe, cucumber, summer squash, and watermelon to preemergence applications of fomesafen applied under plastic mulch. Each experiment contained only a single crop. Treatments included fomesafen alone at 0.19, 0.25, 0.31, 0.375, 0.5, and 0.75 lbs ai/A, fomesafen at 0.25 lbs ai/A plus metolachlor at 0.95 lbs ai/A, metolachlor at 0.95 lbs ai/A, and a non-treated control. The test site was prepared with conventional tillage and then fumigated with methyl bromide:chloropicrin (50:50 formulation) at 250 lbs/A. Treatments were applied with a CO2 powered backpack sprayer calibrated to deliver 30 gallons/A at 36 psi using TeeJet 11003XR tips. Treatments were applied to the top of the final finished bed top just prior to laying the polyethylene mulch (Pliant Blockade 1.1 mil) Data collected were plant height or vine length, stand counts, and crop yield. Cantaloupe. There were no differences in crop stand. Metolachlor alone and the non-treated control had the longest vines. A rate response was found for fomesafen with a range of 34% to 62% vine length reduction, compared to the non-treated control. Fruit number and total weight had a rate response for fomesafen. For fruit weight this response ranged from 24 to 66%. Cucumber. There were no differences in crop stand. The non-treated control had the longest vine length. There was a rate response for fomesafen ranging from 32 to 51%. Metolachlor alone reduced vine length 24%. There was a rate response for crop yield with total weight reduction ranging from 52 to 86%. Summer Squash. There were no differences observed for stand count, vine length, or crop yield. Watermelon. There were no differences in stand count. Vine length was similar between the non-treated control, fomesafen at 0.19, 0.25, 0.31 and 0.375 lbs ai/A, and the treatments containing metolachlor. Fomesafen at 0.5 and 0.75 lbs ai/A reduced vine length 23 and 36%, respectively. The differences observed with the vine length did not directly relate to a reduction in yield, except for the 0.75 lbs ai/A rate of Fomesafen which had a yield reduction of 27%. Fomesafen is too injurious for either transplanted cantaloupe or cucumber at the rates and method of application tested. According to our results, transplanted summer squash is tolerant to fomesafen and metolachlor. Transplanted watermelon is tolerant to metolachlor at 0.95 lbs ai/A and fomesafen up to 0.375 lbs ai/A.

CANTALOUPE TOLERANCE TO ADJUVANT FORMULATIONS WHEN TANK MIXED WITH CLETHODIM. **A.W. MacRae*, T. Jacoby, R.O. Kelly, C. Alves, and C. Hunnicutt, University of Florida, Balm.**

ABSTRACT

In recent years we have observed an increase in the incidence of crop injury from adjuvant formulations when tank mixed with sethoxydim and clethodim formulations. The most common conditions for this injury is an application to a cucurbit crop followed by a period of weather which includes sunny skies. This injury can be more severe when the weather is hot, but some of the worse injury cases in Florida have been on days with only a daily high of the mid 70s. Cantaloupe is especially sensitive to this injury. The objective of this study is to determine which commonly used adjuvant formulations are the least injurious to young cantaloupe plants. Due to variable conditions in the field, a combined greenhouse/field experiment was conducted in the winter of 2010. Treatments and rates are listed below. Plants were grown from seed in speedling trays and then transplanted to 6 inch pots. Each treatment had 40 cantaloupe plants. When cantaloupe was 2-leaf, plants were moved outside and the treatments applied within 2 hours of their movement. The cantaloupe plants were left outside for three days in which the weather was mostly sunny and then moved inside the greenhouse prior to a rainfall event that was to occur on the fourth day. On day five, plants were rated for injury. Crop Oils: Agridex (1% v/v) and Herbimax (1% v/v) Vegetable Oils: Dyne-amic (0.5% v/v) and Soydex Plus (1% v/v) Non-ionic Surfactants: Activator 90 (0.25% v/v), Ad-Spray 80 (0.25% v/v), Induce (0.25% v/v), Kinetic (0.25% v/v), and Scanner (0.25% v/v) Organosilicone: Freeway (0.25% v/v), Sil Energy (0.125% v/v), and Tactic (0.125% v/v) Combination Products: LI700 (0.25% v/v), Liberate (0.25% v/v), NuFilm (0.25% v/v), and Phase (0.25% v/v) Comparison Treatments: Bravo WeatherMax (3 pt/A), Bravo Weather Max (3 pt/A) + Malathion 8 (1.75 pt/A), SelectMax (16 oz/A), and a non-treated control Dyne-Amic caused 20% injury to the crop followed by Induce (7.5%) and Activator 90 (5.5%). The only treatments similar to the non-treated control and caused 2.4% injury or less were: Ad-Spray 80, LI700, Liberate, Nu Film 17, SoyDex Plus, and Tactic. The remainder of the adjuvants caused injury ranging from 2.5% to 4.1%. The amount of injury observed in this trial is similar to most field injury complaints. Under certain weather conditions we have observed injury in excess of 20%, often related to hot weather. Our weather conditions were sunny, with the daily high temperature ranged from 66 to 73F.

WILD WATERMELON GERMPLASM LINES WITH HIGH LEVELS OF CLOMAZONE TOLERANCE. **H.F. Harrison*, C.S. Kousik, and A. Levi, U.S. Vegetable Laboratory, USDA-ARS, Charleston, SC.**

NO ABSTRACT.

EFFECTIVENESS OF ALLYL ISOTHIOCYANATE AND METAM SODIUM AS METHYL BROMIDE ALTERNATIVES FOR WEED CONTROL IN PLASTICULTURE BELL PEPPER. **P. Devkota*, J.K. Norsworthy, D.B. Johnson, S.S. Rana, S.K. Bangarwa; University of Arkansas, Fayetteville.**

ABSTRACT

Methyl bromide (MeBr) was classified as a Class I ozone-depleting substance and a ban on further production was mandated. Therefore, at present, it is not an economically feasible preplant soil fumigant for commercial vegetable production in the United States. With the loss of this compound and unavailability of effective MeBr alternatives, optimum weed control has been a major challenge for commercial bell pepper production. A field experiment was conducted at Fayetteville, AR, in summer 2010, to evaluate the effectiveness of allyl isothiocyanate (ITC) and metam sodium as MeBr alternatives for yellow nutsedge (*Cyperus esculentus* L.), large crabgrass (*Digitaria sanguinalis* (L.) Scop.), and Palmer amaranth (*Amaranthus palmeri* S. Wats.) control in plasticulture bell pepper. Experimental treatments consisted of allyl ITC at 450, 600, and 750 kg/ha; metam sodium at 180, 270, and 360 kg/ha; a standard treatment of MeBr plus chloropicrin (67% and 33%, respectively) at 390 kg/ha; and a non-treated weedy check. Ratings were taken for crop injury and weed control at 2, 4, 6, and 8 wk after transplant (WATP). Marketable fruits were harvested, graded according to USDA standard, weighed, and subjected to yield analysis. Additionally, at the end of the season, five soil cores (0.075-m diameter and 0.15-m depth) were removed from each plot, washed, and viable yellow nutsedge tubers were recorded. Allyl ITC and metam sodium did not noticeably injure bell pepper. Weed control was rate dependent for both chemicals, and higher rates provided more weed control. Moreover, the highest rate of metam sodium and allyl ITC had weed control similar to that of MeBr. At 8 WATP, yellow nutsedge control was similar in plots treated with allyl ITC at 750 kg/ha, metam sodium at 270 and 360 kg/ha, and MeBr. For controlling large crabgrass, allyl ITC at 750 kg/ha and metam sodium at 360 kg/ha were as effective as MeBr. Palmer amaranth was controlled equally by allyl ITC at 600 and 750 kg/ha, metam sodium at 270 and 360 kg/ha, and MeBr. Total marketable fruit yield of 34,399; 36,057; 37,575; and 41,047 kg/ha were obtained from allyl ITC at 750 kg/ha; metam sodium at 270 and 360 kg/ha; and MeBr, respectively, and these treatments did not differ for yield. Yield from the non-treated check was 13,155 kg/ha. Viable yellow nutsedge tubers/m^2 were 45 for MeBr, 107 for allyl ITC at 750 kg/ha, 156 for metam sodium at 270 kg/ha, 53 for metam sodium at 360 kg/ha, and 231 for non-treated check. Except for the non-treated check, viable yellow nutsedge tubers did not differ significantly for the above treatments. This experiment shows that allyl ITC at 750 kg/ha and metam sodium at 360 kg/ha have potential for controlling weeds effectively and providing yield similar to that of MeBr for plasticulture bell pepper production.

CROP TOLERANCE OF FOMESAFEN IN WATERMELON, TOMATO, AND OTHER VEGETABLE CROPS. **Jason C. Sanders*, Syngenta Crop Protection, Greenwood, MS; Don Porter, Syngenta Crop Protection, Greensboro, NC; Brad Minton, Syngenta Crop Protection, Cypress, TX; Henry McLean, Syngenta Crop Protection, Perry, GA; James Holloway, Syngenta Crop Protection, Jackson, TN.**

NO ABSTRACT.

EFFECT OF DRIP APPLIED HERBICIDES ON PLASTICULTURE TOMATO AND YELLOW NUTSEDGE CONTROL. **P.J. Dittmar*, University of Florida, Gainesville; D.W. Monks, K.M. Jennings, North Carolina State University, Raleigh.**

ABSTRACT

Field studies were conducted in 2009 and 2010 to determine tomato tolerance and yellow nutsedge control from drip-applied halosulfuron, imazosulfuron, and trifloxysulfuron herbicides. Drip-applied treatments were halosulfuron at 13, 26, and 53 g ai/ha; imazosulfuron at 112, 224, and 336 g ai/ha; and trifloxysulfuron at 5, 11, and 16 g ai/ha. Additional treatments were the lowest two rates of each herbicide applied POST-DIR to the tomato and a nontreated. No tomato injury was observed during the experiment. Total tomato yield ranged from 62722 to 80328 kg/ha and did not differ among treatments. Yellow nutsedge control studies were conducted in 2010 with the same herbicide treatments as those in the tomato tolerance field experiment. Yellow nutsedge plants were counted the day of herbicide application and 56 d after treatment (DAT). Percent increase in yellow nutsedge density was then calculated [(final count-initial count)/initial count]. Drip-applied halosulfuron (72 and 95% at Clinton and Kinston, respectively) and imazosulfuron (267 and 354, respectively) had lower percent increase in yellow nutsedge density than the nontreated (270 and 876%, respectively). Yellow nutsedge suppression was similar for POST and drip-applied halosulfuron, imazosulfuron, and trifloxysulfuron. Greenhouse studies were conducted in 2010 at the Mary Anne Fox Greenhouses, Raleigh, NC to determine the effect of soil and POST applied herbicides on photosynthetic rate of tomato and yellow nutsedge. Herbicide treatments in this study were the highest rates used in the tomato tolerance field experiment. Photosynthetic rate was measured using a LICOR 6400 Portable Photosynthesis System. Tomato photosynthetic rate was measured 0, 3, 5, 7, 10, and 16 DAT and yellow nutsedge photosynthetic rate was measured 1, 4, 7, 11, and 14 DAT. Tomato photosynthetic rate was not different among treatments. For yellow nutsedge, photosynthetic rate was different among treatments at 14 DAT. The nontreated yellow nutsedge photosynthetic rate was 26.2 mol/m^2/s. Treatments that were different were halosulfuron POST (22.6 mol/m^2/s), soil-applied imazosulfuron (22.5 mol/m^2/s), soil applied trifloxysulfuron (23.0 mol/m^2/s) and POST trifloxysulfuron (22.4 mol/m^2/s). Drip-applied halosulfuron, imazosulfuron, and trifloxysufluron suppressed yellow nutsedge and were safe to tomato in our study. Further research should investigate how these treatments can be incorporated into weed management strategies.

EVALUATION OF NONSSYNTHETIC HERBICIDES IN HOT PEPPER (*CAPSICUM CHINENSE*) PRODUCTION AT THE TUCKER VALLEY FARM PROJECT. **M. Bradford, W. P. Isaac, R.A.I Brathwaite; The University of the West Indies, St. Augustine, Trinidad.**

ABSTRACT

Weed management is one of the major limitations in *Capsicum chinense* (Jacq.) production at the Tucker Valley Farm Project, Chaguaramas, Trinidad and Tobago. There is an urgent need to implement alternative non-chemical management strategies that are environmentally safe. Preliminary experiments were conducted to evaluate the efficacy of selected non-synthetic herbicides for weed management in hot pepper. Treatments included: acetic acid (30%) + clove oil (18%), pelargonic acid (57%), Eugenol (clove oil) (21.4%) + 2- phenethyl propionate (21.4%) and Eugenol (clove oil) 50%. They were all applied POST at approximately fourteen and twenty - eight days after transplanting respectively. Generally, after the first application of herbicides, acetic acid + clove oil had the greatest control (50 - 60 %) of all weed types, followed by Eugenol + 2- phenethyl propionate (40- 50 %), pelargonic acid (30- 40 %) and Eugenol (10-20 %). After the second application, Pelargonic acid had the greatest control (50- 60 %) followed by Acetic acid + clove oil and Eugenol (40-50 %) and Eugenol + 2- phenethyl propionate (10-20%). Portulaca oleracea was the most susceptible to these herbicides, whereas Mimosa pudica was the least sensitive. Acetic acid + clove oil was found to be phytotoxic to broadleaf weeds. The efficacy of acetic acid + clove oil could lead to the adoption by farmers to reduce their labour, production costs and incorporated as part of an ecological integrated weed management system in crop production.

BUCKHORN PLANTAIN CONTROL IN BERMUDAGRASS OR BAHIAGRASS ROADSIDES. **R.S. Wright*, J.D. Byrd, Jr., and J.M. Taylor; Mississippi State University.**

ABSTRACT

Three experiments were conducted to evaluate buckhorn plantain (*Plantago lanceolata*) control in bermudagrass or bahiagrass roadsides. Applications were made with a CO_2 pressurized backpack sprayer, and four nozzle boom that delivered 236 L/ha. Visual evaluations were made on a scale that ranged from 0 to 90% (0% = no visual control; 90% = complete control visually) for each experiment. The first experiment was initiated March 12, 2004 with the treatments: glyphosate + 2,4-D (Campaign 3.1L) at 48 or 64 fl oz/A, glyphosate (4 L) at 16.0 fl oz/A, chlorsulfuron (75 DF) at 0.5 oz/A, dicamba + diflufenzopyr (Overdrive 70 DF) at 4.0 or 6.0 oz/A, triclopyr (3 A) at 16.0 fl oz/A, or flazasulfuron (25 DF) at 3.0 oz/A. All treatments were applied in conjunction with a 90/10 non-ionic surfactant at a rate of 0.25% V/V. Glyphosate + 2,4-D at 48 or 64 fl oz/A provided 70 or 80% control of buckhorn plantain, while other treatments provided 60% or less control 26 days after treatment (DAT). Glyphosate + 2,4-D at 48 or 64 fl oz/A provided 90% and glyphosate alone provided 85 or 90% control of buckhorn plantain 54 or 84 DAT. The second experiment was initiated on June 21, 2004. Treatments consisted on trifloxysulfuron (75 DF) at 0.56 oz/A, metsulfuron (60 DF) at 0.5, 0.75, or 1.0 oz/A, metsulfuron at 0.5 oz/A combined with glyphosate (4 L) at 12 fl oz/A, metsulfuron at 0.5 oz/A combined with dicamba + diflufenzopyr (70 DF) at 6.0 oz/A, glyphosate at 12.0 fl oz/A, or dicamba + diflufenzopyr at 6.0 oz/A. All treatments were applied in conjunction of a 90/10 non-ionic surfactant at a rate of 0.25 V/V. Metsulfuron methyl at 1.0 oz/A or metsulfuron at 0.5 oz/A combined with glyphosate at 12.0 fl oz/A provided 90% buckhorn plantain control and metsulfuron methyl at 0.5 oz/A alone or combined with dicamba + diflufenzopyr at 6.0 oz/A provided comparable control (88%) by 30 days after treatment (DAT). Metsulfuron methyl at 0.75 or 1.0 oz/A, metsulfuron methyl at 0.5 oz/A combined with glyphosate at 12.0 fl oz/A, and metsulfuron methyl at 0.5 oz/A combined with dicamba + diflufenzopyr at 6.0 oz/A provided 90% buckhorn plantain control, and treatments that provided comparable control were metsulfuron methyl at 0.5 oz/A (80%), or dicamba + diflufenzopyr at 6.0 oz/A (70%) 94 DAT. The third experiment was initially designed as a randomized complete block with factorial arrangements of treatments. Initial plans were to make applications in March and September, but due to dry weather conditions that began mid-summer no evaluation were taken for the September applications. Applications that will be discussed were made March 4, 2010. The treatments consisted of aminocyclopyrachlor (50 SG) at 3.76 oz/A combined with chlorsulfuron (75 DF) at 1.0 oz/A or metsulfuron methyl (60 DF) at 1.0 oz /A, aminopyralid (2 L) at 3.5 fl oz/A alone or combined with metsulfuron methyl at 0.5 oz/A. All treatments were applied in conjunction with a 90/10 non-ionic surfactant at a rate of 0.25% V/V. Higher control levels of buckhorn plantain were observed when treated with aminocyclopyrachlor at 3.76 oz/A combined with chlorsulfuron or metsulfuron at 1.0 oz/A (70%) compared to aminopyralid at 3.5 fl oz/A (28%) or aminopyralid at 3.5 fl oz/A combined with metsulfuron methyl at 0.5 oz/A (53%) 33 days after treatment (DAT). Similar results were observed 99 DAT, aminocyclopyrachlor at 3.76 oz/A combined with chlorsulfuron or metsulfuron methyl at 1.0 oz/A provided 90% control of buckhorn plantain which was higher than aminopyralid alone at 3.5 fl oz/A or aminopyralid at 3.25 fl oz/A combined with metsulfuron methyl at 0.5 oz/A. All treatments provided 85 to 90% control of buckhorn plantain 216 DAT.

UTILITY OF AMINOPYRALID + METSULFURON FOR WEED CONTROL, SEEDHEAD AND GRASS HEIGHT SUPPRESSION IN BAHIA AND FESCUE ROADSIDES. **W.N. Kline*, B.B. Sleugh, V.F. Peterson, P.L. Burch, Dow AgroSciences, Duluth, GA, West Des Moines, IA, Mulino, OR, Christiansburg, VA; J. Belcher, S.F. Enloe, Auburn University, AL; J.A. Ferrell, University of Florida, Gainesville; F.H. Yelverton, L.S. Warren, N.C. State University, Raleigh; R.J. Smeda, University of Missouri, Columbia.**

ABSTRACT

Roadside managers have dual objectives to control weeds and reduce tall vegetation that affect visibility, aesthetics, and safety on roadways. These objectives are often achieved by a combination of mowing and herbicide applications. Mowing has become more costly with recent fuel prices and increases exposure of crews on roadsides to traffic hazards. In addition to weed control, grass height management is required because overgrown vegetation limits motorist visibility and increases hazards. Herbicide applications containing sulfometuron-methyl, imazapic, chlorsulfron, and metsulfuron-methyl have been used as plant growth regulators (PGR's) to suppress grass growth and seed head development on many cool- and warm-season grasses found on roadside rights-of-way. Aminopyralid + metsulfuron (Opensight®) is a new herbicide product from Dow AgroSciences for control of weeds and certain woody plants, including invasive and noxious weeds, on non-cropland areas including roadsides, electric utility and communication transmission lines, pipelines, railroads, non-irrigation ditch banks, natural areas, and grazed areas in and around these sites. Trials were established in 2010 in Alabama, Florida, Missouri, Mississippi and North Carolina to compare performance of Opensight to commercial standards for weed control, grass height and grass seed head suppression. Opensight and mixtures with Opensight provided better weed control efficacy when compared to imazapic on weeds such as goldenrod (*Solidago canadensis*), narrow-leaf plantain (*Plantago lanceolata*), common catsear (*Hypochoeris radicata*), cudweed (*Gnaphalium* sp.), poison hemlock (*Conium maculatum*), curly dock (*Rumex crispus*), hop clover (*Trifolium aureum*) and others. In addition to weed control, Opensight provided excellent foliage height and seedhead suppression on both fescue (*Schedonorus phoenix*) and bahiagrass (*Paspalum notatum*). Across all trials, growth suppression was generally equivalent between Opensight and imazapic up to about 70 DAT. Based upon these field trials, foliage injury to tall fescue from Opensight® or Plateau was minimal and should not be a concern. Foliage injury to bahiagrass from Opensight® or Plateau is significant enough to create a visual impact on roadside turf and can last for approximately 2 months. Observations from these trials, suggest that bahiagrass injury is transient, recovering after approximately 60 DAT. In one trial with common bermudagrass (Cynodon dactylon), imazapic significantly injured (clorosis) and thinned the bermudagrass stand. This allowed tall growing weeds to flourish and negate the effect of this treatment to reduce mowing frequency. For roadside turf management, Opensight provides weed control, grass height and seed head suppression without the need for adding imazapic. Use of Opensight will result in cost savings while delivering broad spectrum weed control and grass growth suppression. ®Trademark of Dow AgroSciences LLC When treating areas in and around roadside or utility rights-of-way that are or will be grazed or planted to forage, important label precautions apply regarding harvesting hay from treated sites, using manure from animals grazing on treated areas or rotating the treated area to sensitive crops. See the product label for details. State restrictions on the sale and use of Opensight apply. Consult the label before purchase or use for full details. Always read and follow label directions.

BUCKHORN PLANTAIN CONTROL ON ALABAMA HIGHWAY RIGHT-OF-WAYS. **Jason L. Belcher, Robert H. Walker; Auburn University, Auburn, Alabama.**

ABSTRACT

Buckhorn plantain (*Plantago lanceolata* L.) is a cool-season perennial species that has become increasingly more common on Alabama roadsides. While herbicides such as metsulfuron and 2,4-D have activity against this weed, repeat applications are often needed to prevent regrowth from occurring. Research was conducted winter 2009-2010 to evaluate herbicide treatments for control of buckhorn plantain. Two different locations were chosen for this study. The first location was on the campus of Auburn University in Alabama. The soil at this location is a sandy loam with a pH of 6.3. The second location was located in the Black Belt region of Alabama, near White Hall. This site has a silty clay soil with pH of 7.4. Several herbicides and herbicide combinations were tested. Treatments and rates evaluated were: Milestone VM (aminopyralid) at 7 fl oz/A, Escort XP (metsulfuron) at 0.5 oz/A, Opensight (aminopyralid + metsulfuron) at 3 oz/A, Garlon 3A (triclopyr) + DMA 4 IVM (2,4-D) at 1 pt/A + 2 pt/A, Milestone VM + Escort XP at 5 fl oz/A + 0.5 oz/A, Milestone VM + DMA 4 IVM at 5 fl oz/A + 2 pt/A, DMA 4 IVM + Escort XP at 2 pt/A + 0.5 oz/A, Perspective (aminocyclopyrachlor + chlorsulfuron) at 4.75 oz/A, and Streamline (aminocyclopyrachlor + metsulfuron) at 4.75 oz/A. Visual estimates of control were taken on a 0-100% scale, with 0% = no control. Results from the two studies were not consistent and therefore data could not be pooled. Generally, control at the White Hall location was less with all treatments than that observed at the Auburn location. The only treatments to provide consistent control at both locations were Streamline and Perspective. At the Auburn location, control 135 days after treatment (DAT) was >97% with both products. At the White Hall site, control was 85% with Perspective and 90% with Streamline. Control with all other treatments at White Hall was <71%. Several treatments at the Auburn site provided good-excellent control for the same period. Treatments and control at Auburn were: Milestone VM (63%), Escort XP (92%), Opensight (93%), Garlon 3A + DMA 4 IVM (70%), Milestone VM + Escort XP (88%), Milestone VM + DMA 4 IVM (94%), and DMA 4 IVM + Escort XP (84%). Control ratings taken at 146 DAT in Auburn revealed that control with Streamline and Perspective was still >97%. However, all other treatments had fallen significantly, all below 72%. Control at White Hall followed a similar trend with later ratings revealing poor control with all products except Streamline and Perspective (90 and 85%, respectively, 186 DAT). These results show that buckhorn plantain can regenerate from a single application of many products used on Alabama highway rights-of-way. However, repeating herbicide applications is generally not feasible for the Alabama Department of Transportation. Therefore, in areas where buckhorn plantain populations are high, fall applications of Streamline and Perspective show the greatest promise in reducing this weed. Research is planned to repeat these studies in order to further determine effective herbicide treatments as well as explore the difference seen between the two sites.

NEW DEVELOPMENTS IN WOODY BRUSH CONTROL WITH AMINOPYRALID TANK MIXES.
W.N. Kline*, P.L. Burch, V.F. Peterson, Dow AgroSciences, Duluth, GA, Christiansburg, VA, Mulino, OR.

ABSTRACT

Aminopyralid (Milestone® VM Herbicide) is a herbicide developed by Dow AgroSciences for managing broadleaf weeds and brush in rights-of-way, range & pasture, forestry site (state SLN labels) and other non-cropland sites. Aminopyralid has good utility in herbaceous weed and brush management programs. The weed spectrum is broadened when combined with certain other active ingredients. A new product with aminopyralid and metsulfuron (Opensight® Herbicide) has demonstrated excellent potential as a brush control tank-mix partner. Research was conducted in 2009 to evaluate efficacy of tank mixtures containing Milestone VM and Opensight on economically important woody brush species. Comparisons were made to current market standards and aminocyclopyrachlor. Experiments were conducted in two nursery tree field trials in Virginia and Georgia; and in one natural area strip plot field trial in Georgia. Brush species evaluated in the Virginia and Georgia nursery tree trials were sweetgum (LIQST), red maple (ACRRB), red oak (QUEFC), yellow poplar (LIRTU) and loblolly pine (PIUTD). Species evaluated in the Georgia strip plot trial were sweetgum (LIQST), red oak (QUEFC), white oak (QUEAL) and cherry (PRNSO). Opensight + Accord, Opensight + Accord + Arsenal and Milestone VM + Accord + Arsenal provided excellent control across all species in nursery tree trials and the strip plot trial. Mixtures with Milestone VM or Opensight provided 88 to 100% control at 414 DAT across all species. Aminocyclopyrachlor provided 26 to 67% control of red oak, sweetgum, red maple, yellow poplar and loblolly pine and 87 to 97% control of white oak and cherry in the Strip Plot trial only. Escort did not improve control (41 to 75%) of red oak, sweetgum, and loblolly pine when applied with aminocyclopyrachlor, but improved red maple control from 30 to 76% and yellow poplar control from 37 to 78% compared to aminocyclopyrachlor alone. Arsenal at 24 fl oz/acre applied with aminocyclopyrachlor + Escort improved control of sweetgum, red oak, white oak, and yellow poplar compared to aminocyclopyrachlor + Escort. Aminopyralid product mixtures provided better control over a broader spectrum of brush species than aminocyclopyrachlor products. ® Trademarks of Dow AgroSciences LLC Always read and follow the label directions.

AMINOCYCLOPYRACHLOR INJURY POTENTIAL IN ROADSIDE TURF. **Michael W. Durham, Jason Ferrell, Greg MacDonald, Brent Sellers, University of Florida, Gainesville, FL.**

ABSTRACT

Aminocyclopyrachlor (MAT 28) is a synthetic auxin herbicide that is being positioned for weed control along rights-of-ways. MAT 28 is a highly effective herbicide, but has been shown to injure bahiagrass or bermudagrass turf when applied at high rates. Since many of these rights-of-ways will also receive plant growth regulators, such as imazapic or sulfometuron, it is unknown if the addition of the MAT 28 will exacerbate the injury caused by plant growth regulators alone. In 2010, experiments were conducted near Gainesville, FL to determine the injury potential of MAT 28 (0.94, 1.88, and 3.76 oz ai/a) and imazapic (0.5 and 1.0 oz ai/a) or sulfometuron (0.375 and 0.75 oz ai/a) combinations. Herbicides were applied with a CO2 backpack sprayer at 20 gallons per acre and plot sizes were 6.6 feet by 10 feet. Visual ratings of % stunting and % injury (chlorosis), blade height and seed head counts (for bahiagrass only), were taken every thirty days until frost. Initial bahiagrass stunting and injury were noted in all treated plots. At 14 days after treatment (DAT), injury from MAT 28 alone was only 5% to 10% and stunting was 40%, regardless of application rate. Injury from imazpic alone was 10% and stunting was 40% for both rates. Sulfometuron applied alone at the low rate showed 10% injury and 40% stunting and 20% injury and 65% stunting at the high rate. Injury and stunting increased in all combinations of MAT 28 and imazapic with the most dramatic being MAT 28 (3.76 oz) plus imazapic (1 oz) with 20% injury and 70% stunting. There was no increase in injury or stunting in any of the MAT 28 and sulfometuron combinations over sulfometuron alone. At 30 DAT, bahiagrass had recovered from the two lower rates of MAT 28 alone, but the injury increased to 20% and stunting to 50% with the high rate. This was similar to imazapic alone which resulted in 25% to 30% injury and 50 to 60% stunting. MAT 28 at all rates plus the low rate of imazapic show injury at 30% and stunting ranging from 50% to 60%. At both rates of sulfometuron plus the high rate of MAT 28, injury increased to 25% to 30%. By 60 DAT all plots had recovered from injury. Stunting still occurred in all plots with the high rate of MAT 28 (20% to 50%), in plots with imazapic (10% to 50%), and with sulfometuron at the high rate, or mixed with the high rate of MAT 28 (15% to 20%). Bahiagrass seedhead reduction occurred for all treatments containing imazapic and sulfometuron. Seedhead reduction was not influenced by including MAT 28. However, by 60 DAT, MAT 28 applied alone reduced the number of seedheads by 65% at the medium rate and by 84% at the high rate. The bermudagrass showed injury (0% to15%) at 30 DAT regardless of treatment. The plots that were treated with the highest rate of MAT 28 showed the most stunting (20% to 30%). Applied alone, imazapic and sulfometuron, at both rates, showed little injury (0% to 5%) and the sulfometuron showed the most stunting (15%) at the high rate. By 60 DAT all plots had recovered from injury and stunting was less than 20% for all treatments.

POSTEMERGENT CONTROL OF JOHNSONGRASS WITH NICOSULFURON AND METSULFURON METHYL COMBINATIONS ON OKLAHOMA ROADSIDES. **C.C. Evans*, D.P. Montgomery, and D.L. Martin, Oklahoma State University, Stillwater .**

ABSTRACT

A research study was conducted during 2010 to evaluate the effectiveness of several herbicide treatments for selective postemergence control of johnsongrass (*Sorghum halepense*). The treatments were applied to plots on May 25, 2010 when johnsongrass was 8-20 inches tall. This trial received adequate rainfall for the first six weeks, followed by moderate heat and drought stress through the final six weeks of the study. Treatments were applied using a CO2 pressurized sprayer calibrated to deliver 20 gallons of water/A. The experimental design was a randomized complete block with three replications of treatments. Herbicide treatments included three combinations of DPX-V9360 (nicosulfuron) + DPX-T6376 (metsulfuron methyl), at 0.56 oz a.i./A + 0.15 oz a.i./A, 0.84 oz a.i./A + 0.23 oz a.i./A and 1.13 oz a.i./A + 0.3 oz. a.i/A, respectively. Additional treatments included Outrider® (sulfosulfuron) at 0.75 oz a.i./A, Oust XP® (sulfometuron) at 0.75 oz a.i./A and Plateau® (imazapic) at 1.0 oz a.i./A. All herbicides or herbicide combinations were mixed with Roundup Pro Concentrate® (glyphosate) at 8.13 oz a.i./A with the exception of Plateau® (imazapic) that was combined with Roundup Pro Concentrate® (glyphosate) at 6.25 oz. a.i./A. Plots were visually evaluated at 13, 30, 59 and 92 days after application (DAA) for percent weed control as compared to untreated plots. While the herbicide treatment vs non-treated control effect was highly statistically significant, there were no statistical differences at the p = 0.10 (90% certainty level) amongst the various herbicide treatments within dates at 13, 30, 59 and 92 DAA. Statistical differences in herbicide treatment effect were present relative to phytotoxicity with p values of 0.08, 0.03 and 0.004 at 13, 30 and 59 DAA. Up to 30% phytotoxicity is acceptable provided recovery occurs within 30-35 DAA. All treatments exhibited acceptable (0-14%) phytotoxicity levels at all rating dates throughout the length of the trial. This study was conducted under good growing conditions including normal rainfall amounts during the first half of the trial and below normal rainfall during the second half of the trial. Temperatures were within normal seasonal ranges throughout the trial. At 13 DAA all herbicide treatments were well below acceptable levels of johnsongrass control (80%). Treatments of sulfosulfuron (0.75 oz a.i./A) and sulfometuron (0.75 oz a.i./A) + glyphosate (8.13 oz a.i./A) resulted in 67 and 79% control respectively. Imazapic at 1.0 oz a.i./A + glyphosate (6.25 oz a.i./A) resulted in 68% control. The lowest rate of nicosulfuron (0.56 oz a.i/A) + metsulfuron methyl (0.15 oz a.i./A) + glyphosate (8.13 oz a.i./A) yielded 75% control. Middle rates of nicosulfuron (0.84 oz a.i/A) + metsulfuron methyl (0.23 oz a.i./A) + glyphosate (8.13 oz a.i./A) yielded 64% control. The highest rates of nicosulfuron (1.13 oz a.i/A) + metsulfuron methyl (0.3 oz a.i./A) + glyphosate (8.13 oz a.i./A) yielded 73% control. At 30 DAA all herbicide treatments were well above acceptable levels of johnsongrass control (80%). Treatments of sulfosulfuron (0.75 oz a.i./A) and sulfometuron (0.75 oz a.i./A) + glyphosate (8.13 oz a.i./A) resulted in 94 and 93% control respectively. Imazapic at 1.0 oz a.i./A + glyphosate (6.25 oz a.i./A) resulted in 93% control. The lowest rate of nicosulfuron (0.56 oz a.i/A) + metsulfuron methyl (0.15 oz a.i./A) + glyphosate (8.13 oz a.i./A) yielded 89% control. Middle rates of nicosulfuron (0.84 oz a.i/A) + metsulfuron methyl (0.23 oz a.i./A) + glyphosate (8.13 oz a.i./A) yielded 89% control. The highest rates of nicosulfuron (1.13 oz a.i/A) + metsulfuron methyl (0.3 oz a.i./A) + glyphosate yielded 90% control. At 59 DAA all herbicide treatments were again well above acceptable levels of johnsongrass control (80%). Treatments of sulfosulfuron (0.75 oz a.i./A) and sulfometuron (0.75 oz a.i./A) + glyphosate (8.13 oz a.i./A) resulted in 97 and 92% control respectively. Imazapic at 1.0 oz a.i./A + glyphosate (6.25 oz a.i./A) resulted in 91% control. The lowest rate of nicosulfuron (0.56 oz a.i/A) + metsulfuron methyl (0.15 oz a.i./A) + glyphosate (8.13 oz a.i./A) yielded 96% control. Middle rates of nicosulfuron (0.84 oz a.i/A) + metsulfuron methyl (0.23 oz a.i./A) + glyphosate (8.13 oz a.i./A) yielded 95% control. The highest rates of nicosulfuron (1.13 oz a.i/A) + metsulfuron methyl (0.3 oz a.i./A) + glyphosate (8.13 oz a.i./A) yielded 89% control. At 92 DAA all herbicide treatments were again well above acceptable levels of johnsongrass control (80%). Treatments of sulfosulfuron (0.75 oz a.i./A) and sulfometuron (0.75 oz a.i./A) + glyphosate (8.13 oz a.i./A) resulted in 96 and 86% control respectively. Imazapic at 1.0 oz a.i./A + glyphosate (8.13 oz a.i./A) resulted in 87% control. The lowest rate of

nicosulfuron (0.56 oz a.i/A) + metsulfuron methyl (0.15 oz a.i./A) + glyphosate (8.13 oz a.i./A) yielded 92% control. Middle rates of nicosulfuron (0.84 oz a.i/A) + metsulfuron methyl (0.23 oz a.i./A) + glyphosate (8.13 oz a.i./A) yielded 93% control. The highest rates of nicosulfuron (1.13 oz a.i/A) + metsulfuron methyl (0.3 oz a.i./A) + glyphosate (8.13 oz a.i./A) yielded 90% control. All three combinations of nicosulfuron + metsulfuron methyl + glyphosate are effective at controlling johnsongrass. There were no significant differences between rates indicating nicosulfuron (0.56 oz a.i/A) + metsulfuron methyl (0.15 oz a.i./A) + glyphosate(8.13 oz a.i./A) would likely be the most cost effective treatment combination for Oklahoma roadsides.

EFFECT OF AMINOCYCLOPYRACHLOR CUT STEM TREATMENTS ON SELECTED WOODY SPECIES. **Rory L. Roten*, Robert J. Richardson; North Carolina State University, Raleigh.**

ABSTRACT

Field studies were conducted to determine the response of selected woody plant species to the methyl-ester formulation of aminocyclopyrachlor. Species evaluated were sweetgum (*Liquidambar styraciflua*), black locust (*Robinia pseudoacacia*), and Ailanthus (*Ailanthus altissima*). All species included are prone to stump sprouting and can be problematic in rights-of-way, range, and pasture settings. Treatments were applied by hand with a foam paint brush immediately after cutting the stem between 2 and 5 inches above soil level. Treatments included aminocyclopryachlor at rates of 2.5, 5, 10, and 15% V/V as well as triclopyr-butoxyethyl ester (bee) (30% V/V), triclopyr-bee (10%) plus imazapyr (1%), and triclopyr-bee (20%) plus imazapyr (1%) for comparison Remaining solution volume was filled with a commercial grade basal bark oil. Treatments were replicated three times and a separate trial was conducted for each species. Trials were visually rated at eight and twelve months after treatment for percent control (0-100%). Stem height and number of stems per plot were also recorded. All data was subjected to analysis of variance and Fisher's Protected LSD was used for mean separation. At 12 MAT, Ailanthus was controlled between 88 and 100% with all treatments regardless of rate. All aminocyclopryachlor treatments controlled sweetgum between 43 and 55%, while triclopyr-bee controlled sweetgum 84%. Height and stem counts were also lowest with triclopyr-bee. Black locust control was best with triclopyr-bee (10%) plus imazapyr (1%) at 92%. Height and stem counts were also lowest at this rate. Based upon these results, aminocyclopyrachlor applied as a cut stem treatment effectively controlled Ailanthus, but control of sweetgum and black locust was lower than would be desired commercially.

EFFECT OF APPLICATION TIMING ON THE EFFICACY OF FORESTRY SITE PREPARATION TREATMENTS USING CHOPPER GEN2. **A.W. Ezell, Mississippi State University, J.L. Yeiser, Stephen F. Austin Stae University,and D.K. Lauer, SylvaAnalytic.**

ABSTRACT

Imazapyr has been an important herbicide for forestry uses for more than 20 years. Chopper GEN2 is the most recent formulation of imazapyr to be registered for use n forestry. The relative efficacy of this product has been tested, but the effect of application timing on competition control and subsequent growth of pine seedlings has not been previously evaluated. A single treatment of Chopper GEN2 was installed at locations in Virginia, Mississippi and Louisiana at three different timings ranging from early summer to early fall. All applications were completed by the same equipment and personnel. Pine seedlings were planted during the winter following application. Herbaceous weed control and woody cometition control were evaluated during the growing season following application. Results of the study demonstrated that pine seedlings grew very well following site preparation using Chopper GEN2 with stem volume increases of 5X-10X as compared to control plots. Application timing did not result in any consistent differences in competition control or pine survival or growth among the three sites.

USE OF MILESTONE VM PLUS IN FORESTRY SITE PREPARATION MIXTURES. **A.W. Ezell, Mississippi State University and V. Langston, DowAgrisciences.**

ABSTRACT

Milestone VM Plus is a new product registered for use in forestry. It is a mixture of aminopyralid and triclopyr and could have potential as an effective tank mix ingredient for site preparation applications. Treatments were applied on a recent cutover in Mississippi whic hahd a substantial amount of hardwood species competition. Treatmentswere applied in August and control of woody species was evaluated 1YAT. Results indicate that the mixture of Milestone VM Plus and glyphosate is not as effective as mixes of imazapyr and glyphosate or a three-way mix of Milestone VM Plus, imazapyr,and glyohosate. None of the treatments were as effective as high rates of imazapyr and glyphosate.

CONTROL OF KUDZU, TRUMPETCREEPER, OR POISON IVY USING AMINOCYCLOPYRACHLOR. **R.S. Wright*, J.D. Byrd, Jr.; Mississippi State University.**

ABSTRACT

Two experiments were conducted to evaluate aminocyclopyrachlor alone or in combination with other products for kudzu, trumpetcreeper, or poison ivy control. Applications were made with a CO_2 pressurized backpack sprayer that delivered 236 L/ha. Visual evaluations were made on a scale ranging from 0 to 90% (0% = no visual control; 90% = complete control visually) for both experiments. Initial spring kudzu treatments were made May 7, 2010 and sequential fall treatments were made September 10, 2010 at identical rates. The treatments were as follows: aminocyclopyrachlor 50 SG at 0.13 kg ai/ha combined with metsulfuron methyl 60 DF at 0.042 kg ai/ha, aminocyclopyrachlor at 0.26 kg ai/ha combined with metsulfuron methyl at 0.084 kg ai/ha, and metsulfuron methyl at 0.168 kg ai/ha. All treatments provided excellent kudzu control (87 or 90%) 33 days after initial treatment (DAIT). Metsulfuron methyl provided the lowest level of kudzu control (57%) 126 DAIT. After fall sequential treatments were applied, all treatments provided 90% kudzu control 182 DAIT. The second experiment was initiated June 2, 2009. The treatments are as follows: aminocyclopyrachlor 50 SG at 0.066, or 0.132 kg ai/ha, aminocyclopyrachlor at 0.033 kg ai/ha combined with chlorsulfuron 75 DF at 0.013 kg ai/ha or metsulfuron methyl 60 DF at 0.011 kg ai/ha, aminocyclopyrachlor at 0.066 kg ai/ha combined with chlorsulfuron at 0.026 kg ai/ha or metsulfuron methyl at 0.021 kg ai/ha, aminocyclopyrachlor at 0.132 kg ai/ha combined with chlorsulfuron at 0.053 kg ai/ha or metsulfuron methyl at 0.042 kg ai/ha, aminocyclopyrachlor at 0.053 kg ai/ha combined with rimsulfuron 25DF at 0.035 kg ai/ha, aminocyclopyrachlor at 0.105 kg ai/ha combined with rimsulfuron at 0.070 kg ai/ha, aminopyralid 2L at 0.123 kg ai/ha combined with metsulfuron methyl at 0.021 kg ai/ha, or aminopyralid at 0.123 kg ai/ha. Aminocyclopyrachlor at 0.066 or 0.132 kg/ha provided 80 or 85% control of trumpetcreeper 72 or 91 days after treatment (DAT). Combinations of aminocyclopyrachlor with chlorsulfuron, metsulfuron methyl, or rimsulfuron did not result in higher control of trumpetcreeper compared to aminocyclopyrachlor alone 72 or 91 DAT. Aminopyralid at 0.123 kg/ha provided 37% trumpetcreeper control and control was significantly less compared to either rate of aminocyclopyrachlor alone 72 DAT. Treatments that contained aminocyclopyrachlor at a rate no less than 0.105 kg/ha seemed to provide greater poison ivy control 35 or 91 DAT.

PINE SEEDLING RESPONSE TO POST-PLANT HERBACEOUS WEED CONTROL IN EAST TEXAS. **J.L. Yeiser*; Stephen F.; Austin State University, Nacogdoches, TX.**

ABSTRACT

Six sites in east Texas were chemically prepared for machine planting with loblolly pine seedlings. Post plant herbicides were applied in early April over the top of newly planted seedlings for control of unwanted herbaceous weeds. The objective of the original studies was to screen prospective products and rates for efficacy and seedling performance. The objective of this project was to summary weed control and seedling performance for labeled herbicide rates used today. Herbaceous vegetation control (HVC) was best early and declined sharply at approximately 90 days after treatment (early July). Lower rates were colonized more aggressively than higher rates. For products commonly in use today, age 5 volume index increased as June bare ground increased. HVC was the difference in planting success and failure at 1 of 6 sites. Over all sites and labeled products and rates, HVC increased survival (6.5%) and seedling performance (h>2,7FT, GLD>.73in, VI 1.15 cub ft).

CUT STUMP TREATMENTS WITH MAT28. J.L. Yeiser*; Stephen F.; Austin State University, Nacogdoches, TX.

ABSTRACT

The objective of this study was to cut stump apply different rates of MAT28, Garlon 4 and Stalker each with basal oil for control of unwanted rootstocks of yaupon, sweetgum and Chinese tallowtree. Test treatments were: 1) MAT28 2.5%+oil, 2) MAT28 5%+oil, 3) MAT28 10%+oil, 4) MAT28 15%+oil, 5) Garlon 4 Ultra 30%+oil, 6) Garlon 4 Ultra 20%+Stalker 1%+oil, 7) MAT28 10%+Stalker 1%+oil, and 8) check (chain sawed only). On private lands near Timpson, TX, 10 rootstocks in each of the 1-, 2- and 3-inch GLD classes were cut with a chain saw to a 4-inch height and the entire surface and 2-inch stump sides treated with herbicide. Product was applied February 4, 2009 using a CO2 backpack sprayer with a 5500 adjustable conejet nozzle with orifice 10 and psi 11. Stumps were evaluated for sprout frequency, sprout average total height and percent height reduction at 90, 180, 365 and 545 days after treatment (DAT). For Chinese tallowtree, no new sprouts appeared 365 DAT. For all evaluations, no sprouting occurred for rootstocks treated with: MAT28 10%, Garlon 30%, Garlon+Stalker 20%+1%, or MAT28+Stalker 10%+1%. These treatments exhibited total control during the same period checks had recovered 90% of their original total heights. In contrast, 545 DAT sweetgum rootstocks exhibited new sprouts in all MAT28 treatments but not Garlon treatments. For yaupon, no new sprouts were detected >365 DAT. Yaupon sprout average total height and percent height reduction were similar for all herbicide treatments. In conclusion, the MAT28 10% mixture was probably the best stand-alone rate of MAT28 tested. The MAT28 15% mixture was difficult to keep in solution. Sweetgum was not readily controlled while Chinese tallowtree and yaupon were controlled with a cut stump application of MAT28. MAT28 shows excellent potential for controlling cut stumps and sprouts of unwanted hardwoods.

BEACH VITEX CONTROL WITH IMAZAPYR. **T. Whitwell, J. A. Briggs, and M.M. Cousins: Clemson University, Clemson, SC.**

ABSTRACT

Beach Vitex (*Vitex rotundifolia*) was introduced into the coastal communities of the Carolinas in the 1980's after hurricane 'Hugo' to help prevent beach erosion. Beach Vitex is a salt-tolerant, perennial invasive shrub that reproduces by rooted runners and seed and has naturalized in other areas of the southeastern coastal United States. The objective of this research was to evaluate herbicides and method of application to control beach Vitex. Greenhouse and field studies evaluated cut stem applications and foliar sprays for effectiveness. Using both methods, greenhouse studies evaluated the herbicides: carfentrazone, glyphosate + carfentrazone, dicamba, fluroxypyr, glyphosate, imazamox, imazapyr, and triclopyr. Foliar sprays were applied at the concentrations 2.5% and 5 % v/v and 100% concentration was used in cut stem applications. Inconsistent vitex control was observed in greenhouse studies probably due to the growth habits of beach Vitex under greenhouse conditions. However, imazapyr was the most consistent herbicide whether by foliar application or cut stem treatment. Imazapyr was evaluated for control in field studies of well-established beach Vitex plants in Clemson SC. Cut stem applications were made at three-treatment dates- June, September, and November 2007. Two types of cut stem applications were evaluated. One type involved 90 cm pruners dipped in imazapyr concentration of 20% and stems were then cut with the herbicide coated blades. The other application involved cutting the stem with pruners and then applying the 0.5 ml of the herbicide concentration (20% v/v) directly to the cut stems with a pipette. Treatments were replicated 4 times in a randomized complete block design (RBCD). In June 2009, foliar sprays were evaluated. Imazapyr, imazapyr + triclopyr, and triclopyr were applied to fully leafed out beach Vitex plants using a hand pump up sprayer at the rate of 250 l/ha. Herbicides and surfactant were at the 5% v/v and (0.5%) v/v, respectively. Treatments were replicated five times in a RCBD. Visual control ratings were taken on a scale of 0 to 100% with 0 being no control and 100% complete control. Vitex regrowth was harvested at one year after treatment and fresh weight recorded. Data was subjected to analysis of variance and means separated by LSD at the P = 0.05. Imazapyr effectively controlled (100%) beach Vitex with cut stem treatments at all three dates of treatment. The pruner-herbicide dipped treatments did not effectively control (60%) beach Vitex at the June application date but was effective (<90%) for the September and November treatment dates. Beach Vitex regrowth followed the visual control ratings. Foliar treatments of imazapyr (5% v/v) in June provided excellent (100%) beach Vitex control by October and one year after application. Triclopyr was not effective but the triclopyr + imazapyr provided greater than 90 % control one year after application. Regrowth amounts followed visual control ratings one year after application.

RESPONSE OF OLD WORLD CLIMBING FERN (*LYGODIUM MICROPHYLLUM*) AND NATIVE VEGETATION TO REPEATED GROUND APPLIED HERBICIDE TREATMENTS. **J.T. Hutchinson* and K.A. Langeland, University of Florida, Center for Aquatic and Invasive Plants, Gainesville, FL.**

ABSTRACT

Old World climbing fern [*Lygodium microphyllum* (Cav.) R. Br.; OWCF] is one of the most aggressive, invasive plants in natural areas of central and southern Florida. We evaluated ground herbicide treatments of OWCF using glyphosate, metsulfuron, triclopyr and imazapic alone or as tank mixes. Pre-treatment monitoring was conducted during September/October 2006 and the plots were sprayed immediately following evaluation. During February-March 2007, September-October 2007, and February-March 2008, all plots were re-evaluated. All live OWCF were re-treated during 6, 12 and 18 month evaluations with a final evaluation at 24 months. Native species cover, richness and evenness were also analyzed. One replication of each herbicide treatment and a control were randomly assigned to plots at each of the seven study sites. Herbicide treatments were applied on a spray-to-wet basis over OWCF in 20 m^2 plots. Data was analyzed using a repeated measures analysis of covariance. No treatment differences ($P = 0.44$) were detected for OWCF cover at the end of the study with percent reduction of OWCF cover being greater than or equal to 94% for all treatments at 24 months. No herbicide treatment eliminated OWCF and new growth from spores was common at the end of the study. There were treatment differences ($P < 0.05$) for native vegetation cover among plots at 24 months post-treatment, but percent change in native cover was highly variable and ranged from +20% for metsulfuron to -42% for metsulfuron + glyphosate. Native plant ground cover shifted from primarily native ferns at the start of the study to ruderal, early successional species at the end of the study. There were differences in native species richness ($P < 0.05$) and evenness ($P < 0.05$) at 24 months, but these were due to a decrease in OWCF and native ferns with a concomitant increase in ruderal species. In summary, the 12 treatments in this study using glyphosate, metsulfuron, triclopyr and imazapic alone or in combination, applied four times each at six month intervals were equally effective for control of OWCF over a 24-month period. There was also a shift in native species such as ferns typical of the habitats in the study prior to treatment to ruderal species at the end of the study. Management of OWCF with herbicide will require follow-up treatments at 6-12 months after the initial treatment due to new growth from spores.

MOVEMENTS OF NATURAL AREA PLANTS WITHIN THE GREATER CARIBBEAN: NEW INVASIVE SPECIES OR NEWLY INVADIBLE HABITATS. **Colette C. Jacono*, University of Florida Center for Aquatic and Invasive Plants, Gainesville.**

ABSTRACT

Sauer's model of geographic patterning in seed plants proposes seed dispersal as the positive force in natural migrations and the environment as the negative force by regulating germination and establishment. Sauer's model is highly applicable to wetlands where hydrology is usually the driving environmental variable that selects for life history traits and in so doing defines the presence of a particular species. *Luziola subintegra*, *Hymenachne amplexicaulis*, and *Scleria lacustris* are native wetland species in the Greater Caribbean that have become invasive in natural areas in Florida. Their recent movement has not been accounted for by human means and we hypothesize that a natural force of geographic patterning may be at play. In testing the model, we employed in- and ex-situ storage treatments and controlled emergence trials with seed of *S. lacustris*. Results demonstrated the direct influence of hydrology on colonization of the species. A weaker, yet significant effect was demonstrated by the storage environment on the fate of seeds, their regeneration and their persistence in the seed bank. Our experiments explained how wetland hydrology can work to promote the recruitment of a single species at near monoculture levels. As Florida's wetlands continue to change from human disruption of their natural hydrologic fluctuations and the lowering of the groundwater table, they could, by shifting restriction of environmental control, potentially offer newly invadible habitat to the natural migration patterns of seed dispersal in the Greater Caribbean.

PREVENTING THE NEXT KUDZU: A NOVEL BIOFUEL SPECIFIC RISK ASSESSMENT.

Jacob Barney*, Virginia Tech; Joseph DiTomaso, University of California.

ABSTRACT

The global demand for biomass-based renewable energy continues to grow in an effort to reduce petroleum product dependence, stimulate rural economies, and stabilize national security. Therefore, research effort is focused on identifying crops that will maximize yield while allowing cultivation on less productive, marginal lands. The most promising crops are perennial rhizomatous grasses that exhibit rapid growth rates, possess broad climatic tolerance, tolerate poor growing conditions, harbor few pests, and require minimal inputs. However, many of these agronomically desirable traits are shared by many of our worst invasive species. Therefore, a system needs to be in place to screen biofuel crops, both existing and future, to evaluate their invasive potential to allow entry and commercialization of low risk taxa while preventing dissemination of high risk taxa. We have created a risk assessment system specifically for biofuel crops to evaluate invasiveness in an ecoregional context. We have parameterized the risk assessment using known invasive species, which were intentionally introduced for agronomic purposes as positive controls, as well as other agronomic crops that were introduced but never became weedy as negative controls. Finally, we screened the leading biofuel candidate crops through the assessment. We have an additional level of complexity that most risk assessments do not consider by adding a spatial layer that allows assessment on an ecoregional scale instead of for the whole country. Our assessment was robust in “rejecting” known weeds and “accepting” non-weeds. Our assessment found that many of the candidate crops have a high invasive potential in many ecoregions of the US, suggesting that caution should be exercised if commercialization of these crops in the susceptible regions is pursued. This assessment provides a robust spatially relevant evaluation of the (qualitative) invasive potential of existing and new biofuel crops.

COGONGRASS GENOTYPE RESPONSE TO SOIL FERTILITY AND GLYPHOSATE TREATMENT .

Jatinder S. Aulakh*, Auburn University, Auburn, AL Stephen F. Enloe, Auburn University, Auburn, AL Nancy Lowenstein, Auburn University, Auburn, AL Andrew J.Price, USDA-ARS,Auburn, AL.

ABSTRACT

A field study was initiated in 2007 at Brewton Agricultural Research Unit of Auburn University, to evaluate a potential cogongrass genotype response to soil fertility and glyphosate treatment. The experimental site has been a long–term soil fertility study since 1929. The long–term Fertility treatments consisted of six rates of nitrogen, three rates of phosphorus and five rates of potassium. Six different cogongrass genotypes included selections from Auburn, AL, Florida, Mobile, AL, Louisiana, the horticultural cultivar 'Red Baron', and a B genotype from AL. The experimental design was RCB with split plot-strip block treatment restriction with two replicates. Fertility treatments were in main-plot (17'x 20'), genotypes were in subplot (10'x 5') and sub-subplot (5'x 5') had glyphosate treatment. Genotypes were planted in March 2007 in two blocks and in two different blocks in 2008. Glyphosate (4 lb/acre) was applied as a strip treatment with an ATV mounted boom sprayer at 20 gallons per acre in October 2008 two first two blocks and to second two blocks in 2009. The measurements were made 24 months after planting on shoot biomass, rhizome biomass, and tiller count per square meter. Data on per cent live cogongrass cover reduction was recorded 8 and 12 month after glyphosate treatment. Statistical analysis was done using Proc GLIMMIX in SAS with PDIFF option for treatment separation. The results revealed a linear decrease in rhizome and shoot dry weight with increase in nitrogen rates and a increase with increase in potassium. Red Baron genotype recorded a significantly lower rhizome biomass, shoot biomass and tiller number than other five cogongrass genotypes. Glyphosate resulted in a uniform decrease in cogongrass cover in all the genotypes but all of them recovered at least 20% growth a year after treatment. There was some indication of differential recovery among genotype with Auburn genotype recovering much faster than others and this need be further investigated. These results indicate that cogongrass did not be benefit by increased nitrogen fertilization but did respond positively to increased potassium. Further, most of the genotypes in this study demonstrated similar spread with the exception of red baron which produced significantly lower rhizome biomass, shoot biomass and tiller number. Additionally, not all genotypes responded similarly to glyphosate application. This research indicates the need to further investigate the role of nitrogen, phosphorus and potassium on cogongrass growth and genotypic variation in terms of cogongrass susceptibility to glyphosate application.

CHINESE PRIVET RESPONSE TO CUT STUMP AND BASAL BARK HERBICIDE TREATMENTS.
S.F. Enloe,* S. O'Sullivan, N. J. Loewenstein and E. Brantley; Auburn University, Auburn, AL.

ABSTRACT

Chinese privet *Ligustrum sinense* Lour. is an invasive shrub that is found throughout the southeastern United States. Chinese privet tends to dominate the midstory and understory of bottomland hardwoods and riparian areas and reduces native plant diversity and may reduce hardwood recruitment. It is a strong resprouter following mechanical removal and treating stumps with an herbicide following cutting is critical for control. Two key herbicides used for cut stump treatments are glyphosate and triclopyr amine. However, there is very little published research on cut stump herbicide treatments for Chinese privet and optimal timings are unknown. Additionally, rate recommendations may range from 20 to 100% v/v for commonly used glyphosate (480 g/L) and triclopyr amine (360 g/L) formulations. Our objectives were to compare cut stump treatments of glyphosate and triclopyr amine at spring and fall timings across a range of privet sizes for privet control. Additionally, we were interested in comparing patterns of resprouting (from the stump versus lateral roots) over time between herbicide treatments. We established two research sites in Auburn, Alabama on the campus of Auburn University. Site one was a bottomland hardwood riparian area and Site two was an upland hardwood site. At both sites, privet dominated the understory and midstory. Treatments included glyphosate (25% v/v solution of Accord Concentrate) and triclopyr amine (25% v/v solution of Garlon 3A). A non-ionic surfactant was added to each herbicide treatment at 0.5% v/v. Treatment timings included spring (April 2008) and fall (November 2008). Privet stems were cut approximately 2.5 cm above the soil surface and treated within 30 seconds. Herbicide treatments were applied to the entire stump top in a spray to wet manner with a single nozzle backpack sprayer. Individual privet stems were considered experimental units and each treatment at each timing was applied to fifty replicate stems. An additional fifty stems were cut without herbicide treatment at each timing and served as controls. Additionally, the root collar diameter of each privet stem was measured at the time of cutting. Privet response data was taken at six, twelve, and eighteen months after treatment (MAT). We measured the height of all privet resprouts originating from the stump and all privet shoots originating from lateral roots within a 30 cm radius of each stump. Seedlings were not counted and were removed before establishment. Data were modeled as percent privet resprouted following herbicide treatment using general linear mixed models methodology as implemented in PROC GLIMMIX in SAS v.9.2. Both glyphosate and triclopyr amine were extremely effective and resulted in greater than 94% privet control. Both treatment timings were also effective. However, fall timing resulted in slightly fewer lateral and total resprouts compared to the spring timing. Lateral resprouts also accounted for most of the resprouting with very few stump resprouts following herbicide treatment. For treated cut stumps, resprouting from stumps and lateral roots increased between six and eighteen months after treatment, which suggested that followup treatments will be required to eliminate some resprouts. In summary, these studies indicate that cut stump treatments of glyphosate and triclopyr amine are extremely effective for Chinese privet control with spring or fall timings at rates well below current label recommendations.

METERED ULV HERBICIDE INCISION TECHNIQUES TO CONTROL INVASIVE ARBOREAL AND SHRUB TARGETS IN THE PACIFIC. **James Leary, University of Hawaii Cooperative Extension Service, Maui County.**

NO ABSTRACT.

VARIATION IN VIGOR, COMPETITIVE PERFORMANCE AND HERBIVORE DEFENSE TRAITS OF PURPLE LOOSESTRIFE (*LYTHRUM SALICARIA*) FOLLOWING THE INTRODUCTION OF BIOCONTROL AGENTS AS A MANAGEMENT TOOL. **G. Quiram*, R. Shaw, J. Cavender-Bares; Department of Ecology, Evolution and Behavior, University of Minnesota, St. Paul, MN.**

NO ABSTRACT.

ANOVA UNDER DIFFERENT APPROACHES OF EXPRESSING TREATMENT MEANS AS A PERCENTAGE OF CONTROL MEAN. **Rakesh K. Godara*, James P. Geaghan, Louisiana State University, Baton Rouge; and Billy J. Williams, Louisiana State University AgCenter, Baton Rouge.**

NO ABSTRACT.

A PUBLISHED GUIDE FOR IDENTIFYING HERBICIDE DRIFT IN RICE. **J.B. Hensley*, E.P. Webster, J.C. Fish, and N.D. Fickett, Louisiana State University Agricultural Center, Baton Rouge.**

ABSTRACT

Four studies were conducted at the LSU AgCenter Rice Research Station near Crowley, Louisiana to evaluate the physiological effects of simulated herbicide drift on 'Cocodrie' rice. The objective of these studies was to observe and photographically document the visual symptoms expressed in susceptible rice when exposed to sub-lethal doses of the herbicides glyphosate, imazethapyr, glufosinate, and imazamox. It was observed that the translocated herbicides glyphosate, imazethapyr, and imazamox resulted in differing visual symptoms when applied at vegetative compared with reproductive growth stages. The herbicide glufosinate, with more contact activity, generally resulted in only foliar injury near the site of droplet deposition, regardless of plant growth stage at time of application. Since the herbicides imazethapyr and imazamox are chemically similar, the two could not be differentiated based on visual observation of symptoms. Key symptoms were observed allowing for differentiation between glyphosate and imazethapyr or imazamox at vegetative and reproductive growth stages; however, at the reproductive growth stages, these herbicides expressed similar visual symptoms. The injury symptoms observed on plants treated with glyphosate during vegetative growth were a general chlorosis in the uppermost leaves to plant death. If the plant survives the herbicide treatment the newest leaf to emerge following treatment often emerged tightly rolled. The injury symptoms observed with imazethapyr or imazamox on plants treated during vegetative growth were interveinal chlorosis in the uppermost leaves to plant death. Leaves of treated plants often exhibited small, narrow reddish-brown leaf lesions similar to those associated with leaf blast disease of rice. Subsequent tillers on recovering treated plants often emerged along a single plane resulting in a flat, fan-shaped appearance in plants. Visual symptomology observed on plants treated with glyphosate and imazethapyr or imazamox at reproductive growth stages were various forms of foliar and inflorescence malformations. Foliar symptoms were plants having multiple shoots arising from the secondary nodes of the main stem. The flag leaf on the main stem and secondary shoots would often appear wrinkled, contorted, or rolled. In some instances secondary shoots were stunted or both stunted and malformed. At maturity some panicles failed to fully exert beyond the flag leaf sheath or emerged from the side of the sheath. Often with imazethapyr or imazamox panicles failed to initiate emersion from the flag leaf sheath and decomposed in the leaf sheath causing necrosis of the flag leaf if the plants were treated at the boot growth stage. Individual florets malformations that were observed were florets that were void of a developing grain with only a bleached lemma and palea remaining with glyphosate, and individual florets with tips of the lemma excessively curved toward the palea with glyphosate and imazethapyr or imazamox causing an appearance often referred to as "parrot-beaked" when observed in association with the straighthead physiological disorder of rice. Foliar symptoms observed on rice plants treated with glufosinate begin as small reddish-brown lesions within 2 days after treatment (DAT) becoming irregularly shaped chlorotic lesions within 7 DAT on affected leaves. By 14 DAT, new leaf growth had initiated in plants with chlorotic lesions increasing in size on the lower leaves ultimately resulting in necrosis of the leaf. By 28 DAT, visual symptoms were often undetectable, compared with nontreated plants. Based on the symptomology observed in these studies a LSU AgCenter Extension publication was developed to assist growers, consultants, and extension personnel with identification of a herbicide drift event occurring to rice.

HERBICIDE RESISTANCE EDUCATION AND TRAINING MODULES SPONSORED BY WSSA.

John Soteres*, Monsanto Company; Wes Everman, Michigan State University; Les Glasgow, Syngenta Crop Protection; Jill Schroeder, New Mexico State University; David Shaw, Mississippi State University; Jeff Stachler, North Dakota State University; and Francois Tardif, University of Guelph.

ABSTRACT

Grower and agrichemical retailer herbicide resistance education and training and has been identified as a critical path in advancing the adoption of proactive best management programs to delay or mitigate the development of herbicide resistant weeds. Universities, private sector companies, crop commodity groups, and other groups have all been active in developing and distributing training materials to growers and the agricultural community at large. In February 2010, a proposal was made and accepted by the WSSA Herbicide Resistant Plants Committee (E12) and the special task force on Herbicide Resistance Education (S71) to form a team of public and private sector weed scientists (see list of authors) to review current web-based herbicide resistance training modules, with the intent to update and modify these modules as appropriate. The broad goals of the effort are to: (1) provide the most up-to-date information on causes and best methods for managing resistance, (2) increase consistency of basic messages to growers and retailers, (3) demonstrate to the public a unified public and private sector message of a science-based approach to managing resistance, and (4) increase incorporation of herbicide resistance training into formal certification programs such as the Certified Crop Advisor program. The team is developing five modules around the following questions: (1) Why is proactive resistance management important? (2) How do herbicides work and what is herbicide site-of-action? (3) What is herbicide resistance? (4) How do I identify resistance to herbicides? , and (5) How do I manage resistance? In addition, the team, in cooperation with other weed scientists and agronomists, is developing a separate module to address the specific issue of the impact of resistance management practices on conservation tillage. Each of these modules will be developed in multiple formats (web-based training, PowerPoint slides, and videos). The modules will be made available to all who wish to use them and will be maintained and freely distributed by the WSSA. WSSA will also work with grower organizations and others to develop and distribute these materials.

PICLORAM DRIFT. J.W. Boyd, Weed Research LLC, Little Rock AR and F.W. Baldwin, Practical Weed Consultants, Austin AR.

ABSTRACT

On April 8, 2010 an aerial applicator using a fixed-wing aircraft applied a mixture of picloram and 2, 4-D at the rate of 0.13 + 0.5 lb/ai/a to 60 acres of pastureland in Arkansas. Drift from this application caused herbicide injury to 170 acres of soybeans and green beans that either had not been planted or had not emerged at the time the pasture was sprayed. Symptoms became obvious during the first week of May. Damage was more or less uniform across the entire area. The distance of the affected crops from the treated pasture ranged from 0.5 miles to 1.5 miles. Symptoms disappeared when the crops in the path of the drift shifted from soybeans to wheat. The bean fields were sprayed with paraquat, allowed to dry, and disked in late May. Soybeans were replanted around June 10, 2010. Herbicide symptoms persisted through the growing season. However, only a slight yield reduction was seen and that was restricted to the field nearest the treated pasture land. Soybeans planted in soil collected on September 15, 2010 from a home garden less than one-half mile from the application site did not display growth regulator herbicide symptoms at four weeks after planting.

BEST MANAGEMENT PRACTICES HAVE REDUCED RUNOFF OF CHLOROTRIAZINE HERBICIDES TO SURFACE WATER. **Richard S. Fawcett, Fawcett Consulting, Huxley, IA.**

ABSTRACT

Concentrations of the chlorotriazine herbicide, atrazine, have declined in U.S. surface water during a period when widespread usage continued. The annual mean atrazine concentrations in Rathbun Lake in Iowa declined by 85% from 1996 to 2009. The U.S. Geological Survey measured a 61% decline in atrazine concentrations in Midwestern rivers from 1989 to 1998. Atrazine concentrations in untreated water from 103 community water systems utilizing surface water declined significantly from 1994 to 2006. This improvement in water quality is due, at least in part, to the adoption of best management practices (BMPs) by growers who value and use atrazine as a foundation for weed control in corn and sorghum. BMPs effective in reducing runoff of herbicides into surface water include but are not limited to conservation tillage, buffers and vegetated filter strips, constructed wetlands, terraces, contour planting, postemergence application, application timing, drainage improvement, and mechanical incorporation. The U.S. Department of Agriculture Natural Resources Conservation Service concluded that current adoption of soil conservation practices alone has resulted in a 51% reduction in atrazine loads in the Mississippi River. Efficacy of BMPs has often depended on site conditions. Soil type and structure, topography, and antecedent soil moisture have all influenced the efficiency of BMPs. Published natural rainfall runoff studies over 9 site-years of data reported an average 75% reduction in runoff of atrazine and simazine with no-till compared to moldboard plowed plots. In 18 filter strip studies, retention of atrazine averaged 68%. In 8 studies, reductions in runoff of atrazine with mechanical incorporation into the soil averaged 51%. Use of BMPs has dramatically reduced atrazine concentrations in surface water while continued use of atrazine has allowed economic benefits through improved weed control and environmental benefits through facilitation of conservation tillage.

WATER, SEDIMENT, AND METOLACHLOR TRANSPORT FROM WIDE- AND NARROW-ROW COTTON. **L. Jason Krutz*, USDA-ARS, Stoneville, MS; Martin A. Locke, Robert W. Steinriede, Jr., USDA-ARS, Oxford, MS; Krishna Reddy, Lynn Libous-Bailey, USDA-ARS, Stoneville, MS, and Ian C. Burke, Washington State University, Pullman.**

ABSTRACT

Planting cotton [*Gossypium hirsutum* (L.)] in narrow rather than wide rows may reduce erosion and off-site agrochemical transport, but this hypothesis needs to be evaluated under Mid-South cropping conditions. Field studies were conducted near Stoneville, MS on a Dundee silty clay loam in 2006 and 2007 to evaluate sediment, water and metolachlor [2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl) acetamide] loss in narrow (38 cm) and wide-row (102 cm) cotton. One day after a post-emergence metolachlor application over 4- to 6-leaf stage cotton, 60 mm h^{-1} of simulated rainfall was applied until 25 min of runoff was generated per plot. Sediment loss regardless of year was at least 38% lower from narrow- than wide-row cotton. Depending on year, planting cotton on narrow rows either had no effect or reduced cumulative runoff by 25% compared to the wide-row system. Cumulative metolachlor loss was 27% higher in narrow- relative to wide-row cotton in 2006, but the trend was reversed in 2007. Our results indicate that nearly flat seedbeds in narrow-row systems can reduce sediment loss relative to wide-row cotton planted on slightly raised seedbeds. Moreover, planting cotton on narrow rather than wide rows may reduce the loss of metolachlor applied post-emergence if cumulative runoff is reduced in the former and factors governing mixing-zone pesticide concentrations are similar between row spacings, i.e., canopy coverage and/or antecedent soil moisture levels.

SOIL PERSISTENCE OF AMICARBAZONE USING BENTGRASS(*AGROSTIS PALUSTRIS*) AS A BIOASSAY. **T.L. Grey* and T.R. Murphy; University of Georgia.**

ABSTRACT

Amicarbazone will be used for control of annual bluegrass in creeping bentgrass fairways. Following control of annual bluegrass, large bare areas or voids will occur and creeping bentgrass will need to be re-established (seeded) in these amicarbazone-treated fairways. There is little information about the effect of soil pH, clay and organic matter on seed-back intervals for creeping bentgrass following use. A bioassy method was used to determine the effect of amicarbazone on bentgrass for soils from California, Georgia, Kentucky, Illinois, New Jersey and Texas. Soils were amicarbazone treated then maintained at field capacity for 10, 20, 30, or 40 days, with intermittent drying intervals for the 20, 30, and 40 day treatments. Overall data indicated major differences for soil amicarbazone activity and bentgrass sensitivity. High pH, with moderate to high CECs, with higher levels of Na (alkaline) and Ca seemed to have prolonged residual amicarbazone activity; verses lower pH, low CEC soils had less amicarbazone residual activity. For soils with pH greater than 6.5 and above, the potential for injury increased. In soils with high Na content, further research is needed to identify potential use rates and limits.

DOWNWARD MOBILITY OF SELECT HERBICIDES IN A BERMUDAGRASS FAIRWAY VERSUS A FALLOW SYSTEM. **Travis Gannon*, Fred Yelverton, and Jerome Weber; North Carolina State University, Raleigh, NC.**

ABSTRACT

Traditionally, turfgrass pesticide regulations were based on row crop agriculture environmental fate data. Previous research has demonstrated this may be inaccurate as select pesticides have been documented to behave differently in a fallow system (bare ground) compared to an established turfgrass system. In established turfgrass environments, pesticides are intercepted and may be retained or absorbed by the plant canopy. Further, established turfgrass systems typically possess a larger, more diverse microbial population and greater organic matter content near the soil surface which may adsorb more pesticides compared to a fallow system. The objective of this research was to compare downward mobility of select herbicides in fallow bare ground and an established bermudagrass (Cynodon dactylon (L.) Pers.) fairway after summer and winter applications. Bermudagrass was actively growing during summer while dormant during winter applications. Evaluated herbicides included atrazine, MSMA and sulfentrazone. Field lysimeters comprised of 88% sand were utilized and irrigated immediately after herbicide application to simulate a worst-case leaching scenario. Lysimeters were removed 120 days after treatment and divided into respective depth increments. Atrazine and sulfentrazone concentrations were determined for each soil depth utilizing published extraction and analytical methodology while MSMA samples were analyzed for total arsenic (As). Greater downward mobility occurred in fallow bare ground compared to an established bermudagrass system indicating leaching potential of evaluated herbicides was greater in fallow bare ground. Regardless of system, minimal atrazine was recovered after summer applications while twice the amount of atrazine was recovered in bermudagrass compared to a fallow bare ground system after winter applications. Of recovered atrazine, 90% was recovered in surface soil (0 – 4 cm) or above ground bermudagrass vegetation whereas only 60% was recovered in surface soil in a fallow bare ground system. When sulfentrazone was applied to dormant bermudagrass, 78% more was recovered compared to a fallow bare ground system during winter. Additionally, 45% was recovered in surface soil or aboveground bermudagrass vegetation compared to only 19% in surface soil of a fallow bare ground system. Increased arsenic concentrations from MSMA applications were not reported deeper than 45 cm, regardless of system or season. Further, 84% of As was present in vegetation or surface soil of bermudagrass system compared to only 58% present in surface soil in a fallow bare ground system. These data indicate downward mobility of select herbicides vary among established bermudagrass and fallow bare ground systems likely due in part to increased organic matter content as well as larger, more diverse microbial populations in established turfgrass systems. Knowledge of herbicide downward mobility may allow one to devise more comprehensive integrated pest management principles to minimize the risk of adverse environmental effects. Future research should evaluate additional herbicides in various systems and compare the results to predictive models.

UNDERSTANDING THE FATE AND TRANSPORT OF GLYPHOSATE IN RELATION TO WATERSHED CHARACTERISTICS IN AGRICULTURAL AREAS. **Richard H. Coupe, U.S. Geological Survey, Jackson, MS.**

NO ABSTRACT.

AMINOPYRALID PERSISTENCE IN TWO KENTUCKY SOILS AS MEASURED BY SOYBEAN BIOASSAY. **M. E. Edwards, W. W. Witt*, J. D. Green; University of Kentucky, Lexington.**

ABSTRACT

Aminopyralid is an effective herbicide for annual, biennial, and perennial broadleaf weed control in equine and beef pastures in Kentucky. Milestone contains only aminopyralid while ForeFront is a mixture of aminopyralid plus 2,4-D and both products are registered for use permanent grass pastures in Kentucky. Specific wording on both labels make it clear that rotational crops are not to be planted in fields treated with aminopyralid containing products. Further, both labels contain language pertaining to the movement of animals grazing on aminopyralid treated pastures. However, there were cases in which fields were rotated to other crops, manure/muck spread on crop fields, and drift onto fields that were subsequently planted to crops. The number of instances in which these problems occurred is few, there was interest on our part to determine if a bioassay plant could be found that was sensitive to aminopyralid so that aminopyralid could be detected in soils. Species evaluated were red clover (Kenland), white clover (Regal), tobacco seeds, tobacco transplants, and soybean. Soybean was chosen as the species for aminopyralid in soil persistence experiments because of its uniform, large seed size which made planting easier and resulted in more uniform germination and emergence. Aminopyralid dissipation in soil at two sites was initiated in March 2009. One site was near Lexington on a Maury silt loam (fine, mixed, mesic Typic Paleudult) and one near Princeton on a Crider silt loam (fine-silty, mixed, mesic Typic Paleudult). Aminopyralid was applied at a rate of 120 g ae/ha on March 18 and 19, 2009 for Princeton and Lexington, respectively. Soil samples were collected at 0, 1, 2, 4, 8, 16, 32 and 52 weeks after application and were frozen until analyzed. A soybean bioassay was used to assess aminopyralid concentration in soil. Aminopyralid concentrations of 0, 0.125, 0.25, 0.5, 1, 2 and 4 ppb (eight replications per concentration) were used to develop standard curves based on soybean dry weight. Aminopyralid dissipation was rapid with less than 20% remaining two weeks after application. Aminopyralid was not detected with the soybean bioassay 16 weeks after application at the Lexington site and after four weeks at the Princeton site. A half-life for aminopyralid in soil at the Lexington site was calculated to be 11.5 days. A half-life for aminopyralid could not be calculated at the Princeton site because of the rapid degradation in less than four weeks. The soybean bioassay worked wll for the dissiaption studies; however, it is not sensitive enough to determine aminopyralid in soil for tobacco. Visual injury of tobacco can be noted at aminopyralid concentrations less than those that reduce growth of soybean.

HERBICIDES AND THE ENDANGERED SPECIES ACT; PROCESS, PROGRESS AND CHALLENGES . **D. Campbell*; Syngenta Crop Protection, Greensboro, NC.**

NO ABSTRACT.

ATRAZINE UPDATE. **D. Campbell*; Syngenta Crop Protection, Greensboro, NC.**

NO ABSTRACT.

MODELING RUNOFF . **J. W. Wells*; Syngenta Crop Protection, Greensboro, NC.**

NO ABSTRACT.

GLYTOL GLYPHOSATE RESISTANT TRIAT AND STACKS WITH OTHER BAYER CROPSCIENCE COTTON TECHNOLOGIES. **Gary Henniger*, Walt Mullins, Jonathan Holloway, and Linda Trolinder; Bayer CropScience, Lubbock, TX.**

NO ABSTRACT.

REDUCING HERBICIDE PARTICLE DRIFT WITH COMBINATIONS OF APPLICATION EQUIPMENT AND HERBICIDE FORMULATION INNOVATIONS. **Stephen L. Wilson*, Kuide Qin, and Brandon Downer, Dow AgroSciences, Indianapolis, IN.**

NO ABSTRACT.

LABORATORY EVALUATIONS OF NEW FORMS OF 2,4-D FOR VOLATILITY AND POTENTIAL TO DAMAGE NON-TARGET PLANTS. **David G. Ouse*, Jim Gifford, Ayesha Ahmed and Curtiss Jennings, Dow AgroSciences, Indianapolis, IN.**

NO ABSTRACT.

SAFLUFENACIL HERBICIDE TECHNOLOGY: TIMING, ADJUVANT, COVERAGE, TANK-MIX PARTNERS FOR OPTIMUM BURNDOWN PERFORMANCE . **G.S. Stapleton*, A.R. Rhodes, C.D. Youmans; BASF Corporation, RTP, NC.**

ABSTRACT

Kixor herbicide technology (saflufenacil) inhibits the protoporphyrinogen oxidase (PPO) enzyme, is a member of Herbicide Group 14 and is the only active ingredient in the pyrimidinedione class of chemistry in the North American Market.It was commercially introduced in 2010 in a family of products including two solo products, Sharpen™ herbicide for use in most major row crops and Treevix™ herbicide for use in tree fruit and tree nut, and two pre-mix products, Integrity™ herbicide (saflufenacil + dimethenamid-P) for use in corn and OpTill™ herbicide (saflufenacil + imazethapyr) for use in soybean and pulses. Approximately ten million acres of crops were treated the United States in 2010 making Kixor herbicide technology the biggest herbicide launch in twenty years. In 2011 the Integrity herbicide trade name will be changed to Verdict™ herbicide and will continue to be used in corn, but will also be registered for soybeans. Commercial experience in the first year of use provided critical learnings for optimizing Kixor performance. For excellent burndown performance, Kixor must be applied with an adjuvant system of methylated seed oil (MSO) at 1% v/v plus ammonium sulfate (AMS) or urea ammonium nitrate (UAN). A minumum of 1 pint/A of MSO should be used if carrier volumes are less than or equal 12.5 gallons per acre. However, to provide thorough coverage of weeds, a minimum of 15 gallons per acre of water is recommended particularly when high populations, dense canopies and larger weed sizes exist. Because Kixor herbicides are for broadleaf weed burndown, it is important to tank-mix Sharpen, Treevix, Verdict, and OpTill with glyphosate or another non-selective herbicide to maximize weed efficacy and broaden the spectrum of weed control, particularly for grasses. Timing of the preplant burndown applications should be made according to label recommendations when broadleaf weeds are six inches or less and a partner may be needed to enhance performance when weeds get to large to provide complete control.

AN ECONOMIC DECISION CHOICE MODEL FOR SELECTION OF WEED CONTROL PROGRAMS. **Jose Mite*, Michael E. Salassi, Michael Deliberto, and James L. Griffin; LSU AgCenter, Baton Rouge, LA.**

ABSTRACT

Economic research was conducted to determine cost per acre estimates associated with fallow sugarcane weed control programs for Louisiana. The 2010 projected costs represent those associated with the various phases of sugarcane fallow using different machinery, implements, and weed control practices and which are used by most growers in the sugarcane production area of Louisiana. For bermudagrass and johnsongrass weed control treatments, herbicides applied were Roundup Original Max at 46 oz/A, generic glyphosate at 64 oz/A, DuPont K4 60DG at 4 lb/A, Trifluralin 4EC at 4 qt/A, and EPTC at 3.5 pt/A. Roundup Original Max at 46 oz/A applied for perennial weed control was more expensive by $30.40 and $15.20 per acre compared with generic glyphosate (4L) treatments applied at 64 oz/A. Treatments including Roundup Original Max had a higher sugarcane fallow cost compared with treatments including generic glyphosate at current fuel, labor and herbicide input prices. A spreadsheet decision aid was developed which summarizes sugarcane fallow field operations and weed control costs, including equipment used, performance rates, and herbicides applied. These data can be entered by the user for specific farm situations and calculations are made for variable tillage and weed control costs per acre. Binary and non-binary linear programming (LP) was used to determine optimal sugarcane fallow weed control programs for bermudagrass and johnsongrass control. The non-binary LP model selected treatments to achieve desired control of bermudagrass and johnsongrass along with the minimum cost program. In comparison, the binary LP model selected only one treatment that had minimum fallow field operation and weed control costs while satisfying minimum weed control levels. Generic glyphosate cost was found to be sensitive to price increases to $0.27 oz/A or above for bermudagrass control and $0.33 oz/A for johnsongrass. Fuel prices, directly impacting tillage costs, were found to not be sensitive in determining optimal weed control choices.

VINDICTA: A NEW RICE HERBICIDE FROM VALENT USA.

Frank Carey, Valent USA, Olive Branch, MS, Jeff Smith, Valent USA, Atlanta, GA, Bill Odle and Ronnie Jones, Valent USA, Dallas, TX.

ABSTRACT

Imazosulfuron is a newly labeled herbicide for use in dry-seeded rice, water-seeded rice and turf. Imazosulfuron can be applied in rice as both a pre-emergence or post-emergence herbicide for the control of many broadleaf weeds and sedges including hemp sesbania, jointvetch species, Mexicanweed, yellow nutsedge and annual sedge species. Imazosulfuron rates range from 0.15 to 0.3 lbai/Ac when applied pre-emerge and 0.15 to 0.2 lbai/Ac when applied postemerge to rice and weeds. An adjuvant is required for post-emergence weed control. Imazosulfuron will share the approved adjuvant list used with Regiment Herbicide. Rice is very safe to imazosulfuron with no phyto issues. Soybeans are sensitive to post-emergence imazosulfuron applications, therefore care should be taken to avoid off target drift crops such as soybeans. STS soybeans are tolerant to post-emergence applications of imazosulfuron at rates lower than 0.003 lbai/Ac. Imazosulfuron should be used as part of an overall weed management program for control of all rice field weeds.

POSTEMERGENCE GRASS AND BROADLEAF WEED CONTROL IN DUPONT™ INZEN™ AII AND INZEN™ Z HERBICIDE TOLERANT SORGHUM IN SOUTHERN AND SOUTHWESTERN STATES. **Robert Rupp*, Eric Castner, Richard Edmund, Michael Edwards, Case Medlin and David Saunders, DuPont Crop Protection, Wilmington, DE.**

ABSTRACT

Postemergence control of grasses in sorghum has been identified by as a highly prioritized research need by sorghum producers. To meet this need, two new herbicide tolerance traits are under development by DuPont that will enable postemergence control of grass weeds in sorghum. The two separate traits were first identified by researchers at Kansas State University and confer tolerance to quizalofop and sulfonylurea herbicides. In 2010, DuPont and University researchers evaluated one-pass postemergence and two-pass preemergence followed by postemergence herbicide programs for grass control in grain sorghum. Data will be presented supporting the use of quizalofop and sulfonylurea herbicides in grain sorghum containing the tolerance traits as new tools for postemergence grass control across the United States. Data will also be presented showing that SU tolerant sorghum has tolerance to residues of ALS herbicides in the soil which may allow for shortened rotational crop intervals following applications of herbicides such as chlorsulfuron and pyrithiobac sodium. Seed products with the tolerance traits will be available for sale pending development by seed companies. DuPont Crop Protection herbicides for use on the tolerant sorghum are being evaluated and will be available for sale pending EPA registration. Robert.N.Rupp@usa.dupont.com

STEWARDSHIP OF DUPONT™ INZEN™ AII AND INZEN™ Z HERBICIDE TOLERANCE TRAITS IN SORGHUM. **Raymond Forney*, Christine Hazel, Robert Rupp and David Saunders, DuPont Crop Protection, Wilmington, DE.**

ABSTRACT

Sorghum growers consistently highly rank the need for postemergence grass control technology. Scientists at Kansas State University developed sulfonylurea- and quizalofop-tolerant sorghum breeding lines by integrating native traits. Each trait provides differential tolerance within the herbicide modes of action. The quizalofop tolerance trait does not provide tolerance to the cyclohexanedione herbicides. DuPont is commercializing the technologies. Anticipated benefits include that sorghum producers will have greater opportunity for a better crop, yield and profit, with proven herbicide active ingredients that are new for sorghum. Growers will have more options to clean up grasses that come up in the crop. Stewardship has been recognized since project inception as a critical success factor. Staggered launch will establish a foundation for stewardship best management practices. Sustainably achieving the technology benefits requires substantial collaboration among numerous stakeholders. Several factors are considered "in scope" for stewardship effort, including: 1) trait expression (consistent, reliable, dependable performance of traited seed); 2) absence of unacceptable metabolites or unintended constituents; 3) accurate prediction of weed shifts; 4) potential evolution of resistant weed biotypes based on gene flow in *Sorghum spp.*; 5) potential evolution of R biotypes based on herbicide selection pressures in *Sorghum spp.*: 6) practical, effective weed management strategies and recommendations; 7) marketing/promotion consistent with data; and 8) technical and public acceptance/support of stakeholders. The risk of pollen-mediated trait transfer among *Sorghum spp.* is among the most significant of these, especially considering the prior presence of glyphosate-resistant johnsongrass (*Sorghum halapense*) in some sorghum growing states. Among many tactics that are important for weed resistance management, three are considered by DuPont Crop Protection to be fundamental on any given field: 1) use of an effective alternate mode-of-action herbicide (MOA) to control known herbicide-resistant weeds; 2) including an effective alternate MOA at least every-other year for "at-risk" weeds; and 3) scouting fields to monitor effectiveness of the herbicide program. Stewardship best management practices are expected to include: 1) planting traited seed only in fields where crop rotation allows for use of an effective alternate mode-of-action herbicide within a warm season between successive sorghum crops; 2) planting traited seed only where glyphosate-, quizalofop-, or ALS-resistant johnsongrass is not already present; 3) preventing *Sorghum spp.* weeds from flowering within a certain distance during the pollination window of the sorghum crop; 4) scouting and rapid response to identify and prevent reproduction of potentially resistant escapes and volunteers; and 5) ongoing research to understand and refine the stewardship best practices that can ensure sustainability for the technology.

AN INTRODUCTION TO BASF'S NEW QUINCLORAC FORMULATION AND ITS PERFORMANCE IN RICE. **J.C. Braun* BASF Corporation, Benton, AR; A. Rhodes BASF Corporation, Jackson, MS; C.Ryan Bond and J.S. Harden, BASF Corporation Raliegh, NC.**

ABSTRACT

Quinclorac is important herbicide chemistry for southern growers to control broadleaf and grass weeds in rice. Greenhouse and field trials were conducted to compare the relative differences in either uptake and/or weed control between two quinclorac formulations; dry flowable (DF) and soluble liquid (SL). Greenhouse 'wash-off' trials resulted in increased uptake (4 HAT) of quinclorac and control of large crabgrass (*Digitaria sanguinalis*) when applied as SL at an equivalent rate (0.5 lb ai/A) of DF. Since 2006, field trials across mid-southern locations resulted in improved residual and foliar efficacy of barnyardgrass (*Echinochloa crus-gali L.*) broadleaf signalgrass (*Brachiaria platyphylla*) and hemp sesbania (*Sesbania exaltata*). Averaged across years and locations, barnyardgrass control was 88% with the SL versus 86% with the DF when applied EPOST (1-2 inch weed height). However, greater average broadleaf signalgrass control (93%) was recorded with the SL over the DF (85%). EPOST applications for hemp sesbania control resulted in an average 92% (SL) and 89% (DF) control. Unconventional LPOST (10 inch grass height) applications (0.5 lb ai eq./A) resulted in 12% greater barnyardgrass control with the SL (53%) over the DF (45%). When applied at rates less than commercially acceptable (<0.5 lb ai eq./A), the SL (45%) formulation provided 17% greater large crabgrass control over the DF (28%) indicating the SL formulation resulted in greater uptake of quinclorac than the DF. Quinclorac is currently registered for use as an herbicide in rice and marketed by BASF as Facet®

CHARACTERIZATION OF A SUSPECTED HERBICIDE RESISTANT HYBRID WATERMILFOIL POPULATION (*MYRIOPHYLLUM SPICATUM X M. SIBIRICUM*). **Sarah Berger*, Greg MacDonald, University of Florida, Gainesville; Michael Netherland, US Army ERDC, Gainesville, FL.**

ABSTRACT

There are several species of watermilfoils that occur throughout the US and Canada, but only 2 (*Myriophyllum spicatum* and *M. aquaticum*) are considered invasive. These invasive watermilfoils grow rapidly and overtake water bodies through displacement of native vegetation, inhibition of recreational use and obstruction of natural water flow. Within the past 10-15 years genetically verified hybrids of the native Northern Watermilfoil (*M. sibiricum*) and the exotic invasive Eurasian watermilfoil (*M. spicatum*) were documented in the Midwestern United States. The hybrid plant appears to exhibit the invasive characteristics of Eurasian watermilfoil, thus requiring a similar level of control. A number of herbicides have been used to control both the hybrid and Eurasian watermilfoils, with the herbicide fluridone being a common choice by water managers due to low use rates and minimal damage to desirable native plants. Fluridone herbicide was also used extensively for hydrilla management in Florida, but the development of wide-spread resistance has eliminated its effectiveness. In May 2010, a lake containing documented hybrid watermilfoil was treated with fluridone in central Michigan. The population of milfoil on this lake survived normally lethal rates of fluridone. This raises serious concerns that fluridone resistance has developed in another submersed aquatic species, but confirmation and characterization of this phenomenon is needed. To characterize the level of resistance, suspected resistant and known susceptible populations were treated with a range of fluridone concentrations. Biomass samples confirmed differences in response to fluridone from the suspected resistant population and the susceptible populations. A PAM fluorometer was used to measure fluorescence of treated plants in an attempt to develop a less time consuming method of fluridone resistance confirmation. Susceptible plants showed decreased fluorescence when treated with fluridone while resistant plants did not exhibit the same response. Pigment analysis of chlorophyll and carotenoids is ongoing to confirm the results of the PAM fluorometer.

TWO WEB-BASED DATABASES FOR INVASIVE AQUATIC PLANT LOCATIONS AND INFORMATION. **John D. Madsen*, Gary N. Ervin, Ryan M. Wersal, Geosystem Research Institute, Mississippi State University; and Pam Fuller, Southeast Ecological Science Center, U.S. Geological Survey, Gainesville, FL.**

NO ABSTRACT.

RESPONSES OF MONOECIOUS HYDRILLA, FILAMENTOUS ALGAE, AND OTHER AQUATIC WEEDS TO FLUMIOXAZIN. **Justin J. Nawrocki*, Robert J. Richardson, Steve T. Hoyle, Sarah L. True; North Carolina State University, Raleigh.**

ABSTRACT

Flumioxazin is a protoporphyrinogen oxidase inhibitor currently under development for use in aquatic weed management. Field and greenhouse trials were preformed to evaluate the response of hydrilla (*Hydrilla verticillata*), cabomba (*Cabomba caroliniana*), variable leaf-milfoil (*Myriophyllum heterophyllum*) and several species of filamentous algae to flumioxazin. A greenhouse trial evaluated the response of monoecious hydrilla to flumioxazin and bispyribac applied alone or in mixture. Treatments included flumioxazin alone at rates of 100 to 200 ppb, flumioxazin plus bispyribac with rates of 60 to 100 ppb and 25 to 45 ppb, respectively, and bispyribac alone at rates of 35 to 55 ppb. A second greenhouse trial was conducted to evaluate the response of *Oscillatoria* spp. and *Pithophora* spp. to flumioxazin. Flumioxazin rates ranged 100 to 200 ppb and two pH levels were maintained, 6 or 7. In field trials, one pond containing an invasive biotype of cabomba was treated with 200ppb of flumioxazin applied to the surface of the water. In addition, 4 ponds containing variable leaf-milfoil were also treated with flumioxazin either alone or in combination with diquat. These treatments included flumioxazin alone at 200ppb, and flumioxazin plus diquat with rates of 100 to 200ppb and 100 to 200ppb, respectively. In the greenhouse hydrilla trial, all treatments containing flumioxazin significantly reduced biomass at two weeks after treatment (WAT). Similar results were observed in the algae trial. Both algal species were found to be extremely sensitive with greater than 95% control 2 WAT. In the field trials, cabomba biomass was reduced an average of 65% at 8 WAT and 100% control was achieved on variable leaf-milfoil by 3 months post treatment. In summary, flumioxazin was able to control a broad range of nuisance plant and algal species and further research is needed to refine the use pattern including minimum rates required and optimal timing of application.

RESPONSES OF FOUR AQUATIC WEEDS AND THREE DESIRABLE PLANTS TO AMINOCYCLOPYRACHLOR. **Trevor D. Israel*, Robert J. Richardson, and Steve T. Hoyle; North Carolina State University, Raleigh.**

ABSTRACT

Chemical options in aquatic environments are limited because only twelve herbicides are currently registered for aquatic use. Aminocyclopyrachlor is an auxin mimic herbicide under development for many non-cropland sites that may be useful in aquatic situations. The objective of this research was to quantify the responses of four aquatic weeds and three desirable plants to aminocyclopyrachlor. Field and greenhouse trials were performed on the invasive species alligatorweed [*Alternanthera philoxeroides* (Mart.) Griseb.], creeping water primrose [*Ludwigia grandiflora* (Michx.) Greuter & Burdet], parrotfeather [*Myriophyllum aquaticum* (Vell.) Verdc.], and water hyacinth [*Eichhornia crassipes* (Mart.) Solms]. Greenhouse trials were conducted on the desirable species soft rush (*Juncus effusus* L. var. *solutus* Fernald & Wiegand), lizard tail (*Saururus cernuus* L.), and pickerelweed (*Pontederia cordata* L.). Percent control/injury ratings were determined for every trial, where 0% equals no visible injury and 100% equals complete plant death. Greenhouse trials were carried out for five weeks and dry weights were determined. Alligatorweed, creeping water primrose, and parrotfeather field trials were carried out for eight weeks, with parrotfeather sample weights collected pretreatment and eight weeks after treatment (WAT). Water hyacinth field trials were carried out for twelve weeks, with dry weights determined 12WAT. All data was subjected to an analysis of variance and standard errors were calculated for ratings data. Fisher's protected LSD test (P=0.05) was used for mean separation on independent treatments. Greenhouse root dry weight data was subjected to non-linear regression analysis using the equation $y=a/1+(x/x_o)^b$. Based upon results, alligatorweed and water hyacinth were controlled at least 80% with 4 oz ai/A. Creeping water primrose was controlled with 0.5 and 3 oz ai/A in the greenhouse and field, respectively. Parrotfeather was controlled in the greenhouse with 0.5 oz ai/A, while a subsurface application rate of 200ppb was effective in the field. Significant injury to pickerelweed and lizard tail was observed with rates of 0.5 and 6 oz ai/A, respectively. Soft rush injury was minimal at all rates tested. These findings indicate that aminocyclopyrachlor has potential utility for controlling several aquatic invasive plants and has selectivity to soft rush.

MANAGEMENT OF PERENNIAL WEEDS IN ORGANIC TRANSITION. **W. C. Johnson, III*; USDA-ARS, Coastal Plain Experiment Station, Tifton, GA.**

ABSTRACT

Common bermudagrass [*Cynodon dactylon* (L.) Pers.] is a troublesome perennial grass common in the southeastern U. S. and extremely difficult to control in organic crop production systems. Research trials in a site heavily infested with common bermudagrass were conducted from 2008 to 2010 to evaluate systems of perennial weed control during fallow organic transition. Treatments evaluated were all possible combinations of two primary tillage implements (power spader, disk harrow), summer weed control (solarization, fallow tillage with a peanut digger, and non-treated control), and winter tillage (fallow tillage with a peanut digger and non-tilled control). Weed control parameters were measured the following spring, ten months after trial initiation. Common bermudagrass densities were reduced by combinations of summer solarization or summer tillage with a peanut digger, followed by winter tillage with a peanut digger. The peanut digger displaced common bermudagrass and exposed the vegetative material to desiccation. However, control was not sufficient enough to prevent re-infestation by survivors. Primary tillage with a power spader reduced perennial nutsedge tuber densities compared to the disk harrow. Summer tillage with a peanut digger reduced perennial nutsedge (*Cyperus* spp.) tuber densities, although this is not conclusive due to non-uniform infestations at this site. These results indicate that an integrated system of summer solarization or summer tillage with a peanut digger, followed by winter tillage with a peanut digger reduce densities of common bermudagrass. However, using systems of this type for only one season are not effective and the weed will repopulate.

COVER CROP AND ORGANIC WEED CONTROL INTEGRATION IN TOMATO. **Andrew J. Price* and Ted S. Kornecki; USDA-ARS, Auburn, AL.**

ABSTRACT

The increased adoption of conservation tillage in organic vegetable production requires more information on the role of various cover crops in weed control, tomato quality and yield. An experiment was established in autumn 2005 and 2006 at the North Alabama Horticulture Experiment Station, Cullman, AL. Plot size at both locations was 2.5 by 6 m containing a single row of tomatoes with 0.5 m spacing between plants. The three winter cover crops [cereal rye cv Elbon, crimson clover cv AU Robin and turnip (Brassica rapa L subsp. rapa cv Civastro)] were compared to black polythene mulch for their weed suppressive potential and effect on yield and grade of fresh market tomatoes. In addition, organic weed control treatments consisting on corn gluten applied PRE alone, flaming, hand weeding, or corn gluten applied PRE followed by flaming were compared. A standard herbicide regime consisting of a PRE application of S-metolachlor (1.87 kg a.i./ha) followed by an EPOST metribuzin (0.56 kg a.i./ha) application, followed by a LPOST application of clethodim (0.28 kg a.i./ha) was also included for comparison. Results indicate that early smooth pigweed, crabgrass, and yellow nutsedge were adequately control in clover, plastic and rye systems when corn gluten followed by hand weeding was utilized compared to the herbicide standard. Marketable organic yield was lowest in systems that utilized flaming and all organic systems yielded less compared to the conventional herbicide treatment in each system.

EVALUATION OF NON-SYNTHETIC HERBICIDES IN HOT PEPPER (*CAPSICUM CHINENSE*) PRODUCTION . **Maudvere Bradford*, Wendy-Ann P. Isaac, Richard A.I. Brathwaite, The University of The West Indies, St. Augustine, Trinidad.**

ABSTRACT

Weed management is one of the major limitations in *Capsicum chinense* (Jacq.) production at the Tucker Valley Farm Project, Chaguaramas, Trinidad and Tobago. There is an urgent need to implement alternative non-chemical management strategies that are environmentally safe. Preliminary experiments were conducted to evaluate the efficacy of selected non-synthetic herbicides for weed management in hot pepper. Treatments included: acetic acid (30%) + clove oil (18%), pelargonic acid (57%), eugenol (clove oil) (21.4%) + 2- phenethyl propionate (21.4%) and eugenol (clove oil) 50%. They were all applied POST at approximately fourteen and twenty - eight days after transplanting respectively. Generally, after the first application of herbicides, acetic acid + clove oil had the greatest control (50-60 %) of all weed types, followed by eugenol + 2- phenethyl propionate (40-50 %), pelargonic acid (30-40 %) and eugenol (10-20 %). After the second application, Pelargonic acid had the greatest control (50-60 %) followed by acetic acid + clove oil and eugenol (40-50 %) and eugenol + 2- phenethyl propionate (10-20%). *Portulaca oleracea* was the most susceptible to these herbicides, whereas *Mimosa pudica* was the least sensitive. Acetic acid + clove oil was found to be phytotoxic to broadleaf weeds. The efficacy of acetic acid + clove oil could lead to the adoption by farmers to reduce their labour, production costs and incorporated as part of an ecological integrated weed management system in crop production.

EXTRACTS OF (*AGAVE LECHEGUILLA*) FOR WEED CONTROL IN BEANS (*PHASEOLUS VULGARIS*) . **Antonio Buen Abad Dominguez*, Miguel Angel Tiscareño-Iracheta, Carlos Villar-Morales, Juan Carlos Rodriguez-Ortiz, Jose Luis Lara-Mireles. Universidad Autonoma de San Luis Potosi, Mexico.**

ABSTRACT

Beans are a crop of economic and social importance in Mexico, being grown on 1.67 million hectares. In Mexico, there are more than 260 weed species in several botanical families associated with bean fields, causing yield losses as high as 82% if not removed during the first 30 days of the crop season. *Agave lechuguilla* Torr. is a plant native to arid and semi-arid zones of Mexico, utilized to obtain fibers of high resistance and durability as raw material for many products; *A. lechuguilla* is known to contain natural substances with herbicide activity (saponins). The objective of this study was to evaluate POST-applied extracts from *A. lechuguilla* (concentrations of 5, 10, 20, 30, 40, 50, and 60%) on weed control efficacy and phytotoxicity to the crop. The treatments were established in a complete randomized blocks design with four replications, where the experimental unit consisted of 3 rows 5-m long. We evaluated phytotoxicity at 24 and 72 h after application of the *A. lechuguilla* extract and weed control by species (using the scale of the European Weed Research Society) at 7, 14, 21, 28, y 35 d after application. Our results show that the *A. lechuguilla* extract did not cause crop phytotoxicity, and that best weed control by 35 d after application was achieved using the 20% concentration of the *A. lechuguilla* extract. Among the weeds controlled by the extract were *Amaranthus* sp., *Helianthus* sp., and *Malva* sp. As compared to the yield of the control (2.16 t/ha), the highest yield was found when using the extract of *A. lechuguilla* at the 30% concentration (2.59 t/ha) Keywords: Beans; lechuguilla; natural herbicide; organic agriculture.

EFFECTS OF SOIL-INCORPORATED RESIDUES OF *CROTALARIA JUNCEA* ON PAPAYA (*CARICA PAPAYA*). **Cecilia C. Diaz-Candelas*, J. Pablo Morales-Payan, University of Puerto Rico-Mayaguez.**

ABSTRACT

Crotalaria juncea is a leguminous cover crop used, among other purposes, to suppress weed growth. Prior to planting a commercial crop, the *Crotalaria* cover crop is usually incorporated in the soil to serve as a soil amendment. There was no literature found on the effects of *Crotalaria* cover crop amendments on growth of fruit crop seedlings. In this work we compared the effects of different times of soil incorporation of fresh *Crotalaria* biomass on the growth of papaya (*Carica papaya*) transplants. The research was conducted at the Alzamora Teaching & Research Farm and at the Fruit Crops Laboratory at the University of Puerto Rico, Mayaguez Campus. *Crotalaria* seeds from Brazil were sown in the field weekly for four weeks and plucked off with roots at 5 weeks after emergence. 'Red Lady' papaya seedlings were grown to produce for 6-week old transplants. Plastic bags (polypots) 24 x 11 cm (=0.80 gal) were filled with a substrate of sandy-loam soil and compost (1:2 ratio); freshly cut *Crotalaria* biomass (20 g, with 2% dry weight) were buried in the first 20 cm of the substrate 3, 2, 1, and 0 weeks prior to planting the papaya in the amended substrate. The treatments were established in a completely randomized design with 5 replications. Papaya plant height, leaf number, and survival percentage were determined weekly after transplanting the papaya. Regression analysis (InfoStat) was performed on the data. Amending the substrate with fresh *Crotalaria* biomass 1-3 weeks prior to transplanting the papaya did not affect the survival and growth of the crop and weeds started to emerge during the first week after the substrate was amended. In contrast, transplanting the papaya the same day the substrate was amended resulted in the death of the papayas before one week had elapsed, and weeds did not emerge on that substrate for 2 weeks.

WEED MANAGEMENT DURING THE ESTABLISHMENT OF ORGANIC PRODUCTION. **Robert Duncan*, Tony Provin and Daniel Hathcoat, Texas AgriLife Extension, College Station TX.**

ABSTRACT

Organic wheat production has increased from 8,281 acres in 2000 to 33,506 acres in 2008. Similar increases have occurred in corn, sorghum and cotton within Texas. However, organic research and extension efforts within Texas have been minimal, leaving organic producers with few extension resources to utilize. In response, an organic research and extension center is being setup at Texas A&M University, in College Station. This area is under organic certification, and has been a Bermudagrass (*Cynodon dactylon*) pasture for many years. The main objective of this research is to convert this bermudagrass pasture into a productive organic production site. Thus, an experiment comparing weed management strategies has been setup to determine the best method of weed control for initialization of crop production on this site. Treatments include an untreated control, a 10% acetic acid treatment, clear plastic solarization for 4 and 8 weeks, black plastic solarization for 4 and 8 weeks, a single tillage treatment and two bermudagrass mulch treatments at 2 and 4 inches. Ratings were recorded following the completion of the solarization treatments, prior to a fall cover crop planting and during the winter growing season. Efficacy ratings on bermudagrass, pigweed and henbit have been recorded. The most effective bermudagrass and pigweed suppression occurred with the eight week black plastic solarization. Solarization was also effective for limiting henbit germination and emergence. Actetic acid and mulch treatments have proved ineffective to this point. These results and their implications will be discussed in further detail.

USING BIOSTIMULANTS TO REDUCE WEED INTERFERENCE IN ORGANIC HORTICULTURAL CROPS. **J. Pablo Morales-Payan*, University of Puerto Rico-Mayaguez.**

ABSTRACT

The objective of this research was to study the effects of two commercially available crop stimulators accepted for organic production on the interference of selected horticultural crops with purple nutsedge. An extract of the macroalga *Ascophyllum nodosum* and gibberellic acid 3 (GA) were sprayed at several rates on the leaves of broadleaf cilantro (*Eryngium foetidum*) and papaya (*Carica papaya*) in nursery, and then separately transplanted onto soil where purple nutsedge (*Cyperus rotundus*) grew alongside the crops. Purple nutsedge interference reduced biomass accumulation in papaya and broadleaf cilantro, but plants treated with the GA and the macroalga extract accumulated more biomass than their untreated counterparts. These results indicate that growth stimulators applied prior to transplanting may provide a competitive advantage to crops facing purple nutsedge interference.

DO OR DIE: WEED MANAGEMENT IN ORGANICALLY-MANAGED TROPICAL HORTICULTURAL CROPS. **J. Pablo Morales-Payan*, University of Puerto Rico-Mayaguez.**

ABSTRACT

Management of weeds is frequently among the first three most important hurdles mentioned by organic growers of horticultural crops. The high yield losses suffered when weeds are allowed to grow unchecked alongside horticultural crops and the impossibility of using selective synthetic herbicides forces organic growers to use other means of weed suppression allowed in organic systems. Such alternative means of weed suppression may be more demanding on labor time and effort, but may also be highly efficacious. Aside from using the traditional hoeing and manual weed removal, alternatives such as using cover crops, applying plant extracts used as vegetation desiccants or physiological disruptors and selective pathogens ("organic herbicides"), flaming, rotavating, false bedding, trimming, and mulching with polyethylene or with organic materials, among others, have been shown able to significantly reduce weed interference with horticultural crops and provide weed suppression and yields comparable to those attained in conventional systems. Research is still needed to systematically evaluate integrated weed management strategies and to assess yield and quality losses due to weed interference in organic systems in which said integrated strategies are implemented.

EFFICACY AND ECONOMICS OF A CULTIVATION-BASED WEED CONTROL PROGRAM FOR ORGANIC PEANUT. **D.Q. Wann*, R.S. Tubbs, A.R. Smith, N.B. Smith, A.K. Culbreath, University of Georgia, Tifton; W.C. Johnson, III, USDA-ARS, Coastal Plain Experiment Station, Tifton, GA.**

ABSTRACT

Tine cultivation is an effective non-chemical method of reducing in-row weed populations in several crops. It has also shown potential for weed control in organic peanut (*Arachis hypogaea*). Field trials conducted in 2008 and 2009 in Tifton, GA, evaluated the effects of various frequencies and durations of tine cultivation on annual weed populations and pod yield of peanut under organic management. Economic analyses evaluated the fiscal feasibility of each cultivation treatment and how each treatment compared to an average conventional crop. ‘Georganic’ and ‘Tifguard’ peanut cultivars were grown both years. Two cultivation frequencies (weekly and twice weekly) and three durations (3 wk, 4 wk, and 5 wk) were initiated 7 to 10 days after planting. All cultivated plots were cultivated once with flat sweeps and received one hand weeding mid-season. A non-cultivated, non-weeded control was included for comparison. Weed density measurements were conducted in 2008 and 2009 for Florida pusley (*Richardia scabra*), smallflower morningglory (*Jacquemontia tamnifolia*), and “annual grasses” (composed of 65% crowfootgrass [*Dactyloctenium aegyptium*], 25% southern crabgrass [*Digitaria ciliaris*], and 10% goosegrass [*Eleusine indica*]). However, annual grass densities were too low to estimate in 2009. All cultivated treatments significantly reduced annual grass densities (1.4 plants/m^2 to 4.0 plants/m^2) compared to the control (12.3 plants/m^2) in 2008, but differences among cultivated treatments were not significant. Florida pusley control did not differ among treatments in 2008, but all cultivated treatments provided significantly greater control in 2009 (57 to 83%). Cultivation effects on smallflower morningglory were varied, but insignificant. Peanut yields under cultivation (3420 kg/ha to 4340 kg/ha) were greater than the non-cultivated control both years (1140 kg/ha and 2220 kg/ha), but varied little among cultivated treatments. Adjusted net revenues were greater with cultivation ($3229/ha to $3516/ha) than without ($1795/ha). On average, organic revenues in cultivated treatments, (including premiums for certified organic product), were twice those of an average conventional peanut crop. These results indicate that a combination of flex-tine cultivation (at least once weekly for 3 wk), flat sweep cultivation, and a single hand-weeding can provide sufficient, economical weed control and significantly improve both yield and net revenue of peanut grown organically.

INTEGRATED WEED MANAGEMENT STRATEGIES IN TRANSITIONAL AND ORGANIC PEANUT PRODUCTION. **R.S. Tubbs*, N.B. Smith; University of Georgia, Tifton W.C. Johnson III; USDA-ARS, Coastal Plain Experiment Station, Tifton, GA.**

ABSTRACT

Organic peanut (*Arachis hypogaea*) production in the southeastern U.S. has renewed potential with the recent release of highly disease resistant cultivars. Weed management is still a large obstacle to traverse, however. The transitional period from conventional to organic certification is critical for suppressing weed densities to allow for optimal control during the certification year when peanut is grown. The objective of these experiments was to evaluate four cropping systems/rotations for weed control and production potential of multiple peanut cultivars for weed control managed with heavy cultivation. Trials were conducted in Dodge, Irwin, and Tift counties in Georgia from winter 2007 and continued until peanut harvest in fall 2010, with all organic certification practices followed for the duration. All locations included the same four crop rotations as the main plot treatment effect during the 2008-2009 crop seasons (fallow-fallow, pearl millet [*Pennisetum glaucum*]-cowpea [*Vigna unguiculata*], cowpea-pearl millet, or bahiagrass [*Paspalum notatum*]-bahiagrass). The Dodge and Irwin county locations were planted to 'Georgia-06G' and 'Georganic' peanut cultivars in 2010, while Tift county was planted to Georgia-06G, 'Georgia-04S', and 'Tifguard'. All plots were managed during peanut growth with the same weed management strategy, consisting of flex-tine and flat sweep cultivation along with hand weeding. Visual weed estimates were made just prior to peanut digging. Weed pressure (primarily southern crabgrass [*Digitaria cilialis*]) at the Dodge county location was severe with total crop loss. Palmer amaranth (*Amaranthus palmeri*) was more severe in cowpea-pearl millet rotation than the other cropping systems. There were also heavy densities of both crabgrass and Florida pusley (*Richardia scabra*) at the Irwin county location, where the pearl millet-cowpea rotation (720 kg/ha) yielded higher than the bahiagrass rotation (300 kg/ha). Bahiagrass plots had the lowest control of crabgrass (<23%), but highest control of Florida pusley (>71%), likely because the crabgrass outcompeted this broadleaf during the peanut season. Cultivar differences were only observed for late leaf spot (*Cercosporidium personatum*) incidence, in which Georganic (2.4 on Florida 1-10 scale) outperformed Georgia-06G (2.7), yet both of these results would be adequate levels of control in organic production where no synthetic fungicides are applied. Highest yields were achieved at the Tift county location (1450-1640 kg/ha), but there were no differences among systems. Tifguard (1680 kg/ha) yielded more than Georgia-04S (1430 kg/ha), while Georgia-06G (1550 kg/ha) was not significantly different than the other cultivars. Tifguard also had lower late leaf spot incidence (2.2) than either Georgia-04S (2.4) or Georgia-06G (2.4), but again, all leaf spot levels were acceptable for organic production. These data indicate that the appropriate cropping system can reduce weed pressure when transitioning to organic peanut certification. However, these data also demonstrate that despite great strides made in determining best management practices for maximizing yield potential and reducing pest incidence for organic peanut production, vast improvements are required. It is noted that some management practices at the various locations differed during the transition process, likely resulting in weed pressure and yield differences at the various locations. Intensive weed management, especially timeliness of cultivation and uniform crop stand establishment, is critical to ensuring economic stability in the transitional and organic production processes for peanut.

ECONOMIC ANALYSIS OF SUMMER COVER CROP FALLOWS FOR ORGANIC WEED MANAGEMENT IN FLORIDA. **Alyssa H. Cho*, Alan W. Hodges, Carlene A. Chase, University of Florida, Gainesville.**

ABSTRACT

Organic produce is growing in popularity among consumers, and organic growers are benefitting from the price premiums they receive for their crops. Growers must follow the guidelines of the National Organic Program to ensure their produce can be marketed as organic. A major constraint for all growers, organic or conventional, is weed management. Weed populations that are not managed effectively can reduce cash crop yields and, thereby, the economic feasibility of crop production. Weed management in organic systems must first utilize rotations, mulches, mechanical techniques, and hand weeding. If these practices are proven to be insufficient in managing weeds, permitted botanical and biological substances can be applied. In Florida, fields are typically left fallow during the hot, humid summer months. The use of a weedy fallow can lead to high weed populations in the following cash crops. Utilization of a summer cover instead of a weedy fallow could reduce weed populations while providing additional ecological services to the cropping system such as providing soil stability, nutrient cycling, water retention, and reducing pest and disease pressures in the following cash crops. While the use of a summer cover crop would add to the costs associated with production, generally no marketable yield is obtained that could provide a return on the investment. While several studies outline the benefits of cover crops, their economic feasibility is not well documented. The objective of this study was to conduct an economic analysis of the costs and benefits associated with several summer fallow treatments with a subsequent cash crop of squash. Four cover crop fallow treatments, including sunn hemp (*Crotalaria juncea* L.), velvet bean [*Mucuna deeringiana* (Bort) Merr.], cowpea [*Vigna unguiculata* (L.) Walp. cv. Iron Clay], sorghum sudangrass [*S. bicolor* x *S. bicolor* var. *sudanese* (Piper) Stapf.], were compared to tillage. These summer fallow treatments were analyzed for their ability to contribute nitrogen to the following cash crop, biomass production for weed suppression. Conservative estimates were made regarding the nitrogen contributions and the weed suppression from the various treatments. Partial budgets were compiled to assess the benefits that could accrue following the various treatments that could lead to a reduction in costs for the production of squash. The results indicated that certain summer fallow treatments were expensive to implement, but when the benefits taken into consideration, they compensated for the costs of implementation and management. When only considering the costs of the summer fallow treatments, tillage was the least expensive for managing weeds, followed by sorghum sudangrass, cowpea, sunn hemp, and lastly, velvetbean. After accounting for reduced costs of weed management and nitrogen inputs in the squash crop following each summer fallow treatment, the least expensive overall budget (summer treatment and cash crop) was sunn hemp, followed by velvetbean, cowpea, sorghum sudangrass, and finally tillage. Evaluation of their economic value is vital for demonstrating the potential benefits to the overall production system of utilizing cover crops for weed management.

INTEGRATED PEST MANAGEMENT AND BIOLOGICAL CONTROL. **Grodowitz, M. J. and Shearer, J.; U.S. Army Engineer Research and Development Center, Vicksburg, MS.**

ABSTRACT

A simple, yet often used concept of integrated pest or plant management (IPM) is one where all available management options are considered as part of a toolbox or arsenal. These "tools/weapons" are then used singly or in combination in an effort to maximize control without impacting the use of one or more strategies. While this approach can be effective, it tends to provide only short term control by neglecting the underlying reasons for the formation of the infestations. A more prudent and ecologically compatible approach would be the use of an ecosystem based IPM program that relies heavily on ecosystem management and restoration strategies and addresses causative factors that allow such formations. A key component of an ecosystem approach to managing aquatic plants is the use of host-specific biological control agents. Most of the economically important invasive/nuisance aquatic plants are introduced species that have escaped their host-specific herbivores and pathogens. In addition to their high intrinsic rates of increase this lack of sustained feeding and resultant damage allows the formation of extensive monospecific infestations. By reestablishing a complex of host-specific herbivores and pathogens and implementing re-vegetation using native plants these invasive species can be held at non-problem levels. This presentation will discuss this approach in detail as well as provide information on operational biocontrol agents applicable to aquatic plants invasive in the southern US.

ASSISTING WITH MANAGEMENT OF VARIOUS AQUATIC MACROPHYTES IN THE CARIBBEAN REGION. **Terry L. Goldsby; President / Senior Biologist; Aqua Services, Inc.**

ABSTRACT

In 2007 a need was identified on Great Exuma of The Bahamas to control widgeongrass (*Ruppia maritima* L.) due to its negative impact on the Anopheles larval control program. On May 15th, 2008, Aqua Services, Inc. (Aqua Services) was contracted to conduct a preliminary vegetation survey and to investigate other environmental parameters. After it was determined that an integrated herbicidal/biological control plan would likely be effective on the widgeongrass, Aqua Services' personnel returned in August 2009 to train The Bahamas Department of Environment and Health personnel. Aqua Services also assisted with initial herbicide applications and stocking of grass carp at that time. Additional information on that program is to be presented by Mr. Andrew Thompson of The Bahamas Department of Environment and Health. In 2010, Aqua Services was asked to assist with lake improvement at the Yucatan Country Club and Resort near Merida, Mexico. An initial investigation of water quality parameters indicated that aeration of the lakes and addition of polyacrylamide bricks would improve both water quality and water clarity. A coinciding vegetation survey determined that numerous emergent species were having a negative impact on the lakes. Planktonic and blue-green filamentous algal species were also problematic. In addition, an invasive species, fanwort (*Cabomba caroliniana* L.) was discovered and deemed to pose a serious threat to the resort water bodies. A plan was developed to treat numerous areas on the resort with a variety of herbicides that were legal and available in Mexico. Emergent species such as cattails and umbrella flat-sedge were controlled using glyphosate products. Algacides and soil sterilants (exposed bottom) were used where appropriate to address algal problems. Of particular significance and interest was the use of the new aquatic product, flumioxazin. Fanwort was completely controlled by the application of flumioxazin at the rate of 200 ppb in infested ponds.

APPLICATION OF FLURIDONE AND CURRENT FOR THE CONTROL OF WIDGEONGRASS AND MUSKGRASS, RESPECTIVELY. **Andrew Thompson; Assistant Director; The Bahamas Department of Environment and Health.**

ABSTRACT

The explosive growth of Widgeongrass (*Ruppia maritima* L) and Muskgrass (*Chara hornemanii*) throughout three (3) ponds in Exuma was identified as a possible hindrance to effective Anopheles larval control . Aqua Services Inc was contracted and on May15th 2008 to conduct a preliminary survey of the environment features, positively identified aquatic weed species and advised on intervention measures. Taking into consideration the survey outcome and cost parameters, it was determined that herbicidal treatment for initial control, visual inspection and spot treatment application on an as needed basis, along with the introduction of triploid Grass Carp (*Cyprinus carpio*) for maintenance control, would be employed. Floridone (White Cap) at a rate of 32 ounces per acre, per 4 feet avg. depth and chelated copper (current) at a rate of 2 gallons per acre were used for Widgeongrass and Muskgrass respectively. The application was via first air boat equipped with a 50 gallon capacity Honda powered spray system. The application resulted in both Widgeongrass and Muskrgrass being controlled after the requisite amounts of chemical and retention or contact time and concentration levels (50 ppb for white cap) was met. However due to increased salinity of the ponds (from an average of 4ppt during survey time to an average of 12 ppt at treatment period), relatively short acclimation period, and shipping period (24hrs), the biological control with the grass carp was unsuccessful; the fish died within hours. Generally the intervention for the control of the identified aquatic vegetation was successful as the ponds were cleared within a month.

NON-TARGET TOXICITY OF HERBICIDES REGISTERED FOR AQUATIC USE. **R.J. Richardson; North Carolina State University, Raleigh.**

ABSTRACT

Since aquatic herbicides, by their nature, are applied in and around water, the non-target toxicological properties of these chemicals are very important. There are currently 12 EPA and state registered aquatic herbicides for the Southern U.S. and two that are pending EPA and/or state registrations. As a group, these products have very favorable environmental profiles given laboratory toxicity levels as well as field use patterns. Five of these have an in-water half life shorter than 1 day. Twelve have a rabbit dermal toxicity level that exceeds the maximum testing required by EPA. Seven have a rat oral toxicity that exceeds the maximum testing required by EPA. Nine have a bird oral toxicity that exceeds the maximum testing required by EPA. Seven of the twelve with in-water uses have use rates less than 0.38 ppm. Only endothall-amine and certain copper products have use rates and toxicity levels that overlap; use rates of other products are generally well below toxicity levels for non-plants. Environmental considerations are also very important for toxicity. For example, in laboratory testing of endothall toxicity, the initial treatment concentration of 2 ppm is likely to be constant for a 96 hour trial. However, following field applications of 2 ppm endothall, concentrations may be undetectable after 96 hours. Water alkalinity can also be a very important factor for toxicity. When alkalinity levels are less than 20 ppm, copper is highly toxic to many fish species. However, copper toxicity is much lower when alkalinity levels exceed 50 ppm. Two areas where non-target toxicity may pose a challenge to field applications are selectivity to desirable plants and oxygen depletion following an effective application of fast-acting herbicides. Herbicide selection, use rate, and application timing may help to mitigate these two issues.

AQUATIC WEEDS OF CONCERN IN TROPICAL FRESHWATER SYSTEMS. **W. Robles; Department of Crops and Agroenvironmental Sciences, University of Puerto Rico, Mayagüez, PR.**

ABSTRACT

Tropical freshwater ecosystems located in Caribbean islands like Puerto Rico are commonly threatened by the introduction of aquatic weeds. The aquarium and horticultural trade, as well as travel and commerce via air and marine transportation are common on this region which facilitates the introduction of aquatic weeds. In Puerto Rico, the problem rise with limited citizen awareness, wrong public perception to available management techniques, as well as eutrophic man-made water bodies serving as suitable habitat for aquatic weeds. Therefore it is important to identify, document the extent of the problem and raise citizen awareness to minimize the impact caused by aquatic weeds. Among many aquatic plant species present in Puerto Rico, waterhyacinth (*Eichhornia crassipes*), waterlettuce (*Pistia stratiotes*), alligatorweed (*Alternanthera philoxeroides*), hydrilla (*Hydrilla verticillata*) and giant salvinia (*Salvinia molesta*) are the species of concern. Nuisance problems of all five species have been documented in tropical and subtropical regions including southeastern states of US. The presence of waterhyacinth and waterlettuce has been documented in Puerto Rico since the early 1900's. Both species are free-floating aquatic weeds well established in man-made lakes such as La Plata, Guayabal, Carraízo and Cartagena Wildlife Refuge. Alligatorweed has been observed at many water bodies and drainage canals; however, its area of infestation has decreased due a successful biocontrol agents. Recent introductions of the submersed aquatic weed, hydrilla, and the aquatic floating fern, giant salvinia are limited to a few locations in northern Puerto Rico. Although these two species are not well distributed in Puerto Rico, successful outreach programs and aggressive management plan are recommended to prevent further nuisance problems.

SURVEY AND MAPPING TECHNIQUES FOR USE IN AQUATIC PLANT MANAGEMENT. **R.M. Wersal: Mississippi State University, Mississippi State, MS.**

ABSTRACT

Understanding the dynamics of macrophyte populations in a given water body has become increasingly important due to the introduction and spread of numerous non-native species. Non-native plants affect aesthetics, drainage, fishing, water quality, fish and wildlife habitat, flood control, human and animal health, hydropower generation, irrigation, navigation, recreation, and ultimately land values. As the threat of non-native plant species increases, the development and refining of methods to detect and monitor these species to mitigate negative impacts is critical. The use of quantitative methods for aquatic plants has not become as standardized as other components in the aquatic systems or those used in terrestrial plant research. Although many of the same concepts and methods traditionally used in terrestrial settings can be used in aquatic environments; often times there are special adaptations or equipment needed to address the problems associated with surveying and mapping plants in water. Therefore, this presentation offers information on survey and mapping techniques that are currently being used in aquatic plant management programs. Pursuant to this, advantages and disadvantages of sampling designs are also presented in order to ensure that quantifiable data are collected in order to monitor plant populations over time and note changes in community composition.

USE OF HERBICIDES TO CONTROL EMERGENT, FLOATING, AND SUBMERSED AQUATIC PLANTS: SPECIAL CHALLENGES POSED BY THE AQUATIC ENVIRONMENT. **M.D. Netherland, US Army Research and Development Center, Gainesville, FL.**

ABSTRACT

The aquatic environment poses both regulatory and technical challenges when using herbicides to control emergent, floating, and submersed invasive plants. Moreover, applying herbicides directly to or over water can be controversial, and therefore the added human dimension of enhanced public scrutiny and the requirement for public education is a serious consideration for agencies and individuals responsible for plant control. There are currently 12 herbicides representing 8 modes of action that are registered for aquatic use in the United States. Half of these products have received aquatic registrations in just the last seven years. The path to an aquatic registration typically starts by evaluating a product that has been registered for agricultural use and determining if it has environmental properties and a use pattern that would fit in aquatic plant management. To receive an aquatic registration, several additional and unique studies are required in the aquatic environment and recent history shows this process can take from 3 to 10 years depending on the molecule. Based on the additional registration data, aquatic herbicide labels are established and these labels define use sites, use rates, target plants, and also address issues associated with consumptive use of water for drinking, fishing, and irrigation. The resultant use recommendations and use restrictions can vary significantly between the products. Once a product is labeled, state regulatory agencies generally require permits for herbicide applications and they can also place additional use restrictions on individual herbicides. In April 2011, new Federal requirements to obtain an NPDES permit will be initiated and each state is responsible for developing a plan to implement this permitting program. The impact of this new law on aquatic plant management activities is not yet known, but predictions have ranged from a smooth transition to complete chaos depending on the state. While the regulatory and stakeholder challenges are numerous and daunting, the technical challenges to managing aquatic plants are also diverse and complex. Regardless of whether the plants are emergent, floating, or submersed, one of the key challenges in aquatic plant management is generally targeting a single plant species while minimizing damage to a range of non-target plant species. Development of these selective use patterns often requires many years of research and demonstration, and it is paradoxical that once these use patterns are developed, it becomes very difficult to convince managers to rotate modes of action. Unique challenges associated with management of emergent plants include: 1) plants are often very large in size with extensive underground biomass; 2) systemic herbicides often translocate poorly from the emerged tissue to the submerged tissue; and 3) emergent plants often make up a large and diverse component of the non-target plant community. Control of floating plants is not typically considered technically challenging; however examples of problems associated with water hyacinth (Eichhornia crassipes) becoming intermixed with important emergent native plant species, the expansion of the newly invasive and difficult to control Nymphoides cristata in large water bodies, and giant salvinia (Salvinia molesta) growing in largely inaccessible areas will be provided. Lastly, the challenges associated with managing submersed plants are the most technically complex and costly, and examples of high flow rates impacting herbicide residence time for control of Hygrophila polysperma, multiple environmental and technical considerations associated with large-scale applications to control Hydrilla verticillata, feasibility of hydrilla eradication programs, and treating small newly discovered infestations of submersed plants in larger water bodies will be addressed. Acknowledgements - Support for this research was provided by the US Army ERDC Aquatic Plant Control Research Program and the University of Florida Center for Aquatic and Invasive Plants.

HERBICIDE ACTION AND MECHANISMS OF RESISTANCE IN AQUATICS. . **Greg MacDonald, Agronomy Department and Center for Aquatic and Invasive Plants, University of Florida, Gainesville.**

ABSTRACT

Aquatic herbicides represent a unique and extremely limited group of compounds for controlling nuisance wetland and aquatic vegetation. These herbicides control plants across a wide range of habitats, ranging from rooted ditchbank plants, rooted emergent, free-floating and finally completely submersed plants. Most aquatic herbicides were developed for terrestrial systems, and fall into the categories of contact and systemic herbicides, although the term systemic is not well defined in these plants. Unlike terrestrial plants, many aquatic plant species lack xylem tissue, which limits movement from apoplastic herbicides. Another important aspect is the concept of concentration exposure time, whereby an herbicide must be present and available, albeit at very low concentrations (ppb), for uptake over a long period of time (i.e. days or weeks). In many cases, control is dictated more by exposure time and often cannot be overcome but increasing concentrations. Currently there are 12 herbicides registered for aquatic use in the U.S. Endothall, diquat, acrolien, copper, carfentrazone and flumioxazin are herbicides that require limited exposure time and are considered contact in activity. Herbicides that require longer exposure, and often termed systemic, include glyphosate, triclopyr, 2,4-D, fluridone, penoxsulam, and imazamox. In both categories, a range of mode-of-action is found, from cell membrane disruption to amino acid inhibition and pigment synthesis inhibition. Rece nt registrations have increased the number of mode-of-actions, which was spurred by the development of resistance by hydrilla (*Hydrilla verticillata*) to fluridone herbicide. Currently there are 4 known or strongly suspected species that have developed resistance or enhanced tolerance to aquatic herbicides. The first known case was fluridone resistance in hydrilla, which was the first reported case of resistance to the pigment inhibiting herbicides and the first reported case of resistance development in a vegetative only propagated plant. Resistance was attributed to amino acid substitutions within the target enzyme phytoene desaturase. Diquat resistance also developed to spotted duckweed (*Landoltia punctata*) with limited uptake hypothesized to be the causal mechanism. Most recently, hydrilla appears to have tolerance to endothall and current investigations are underway to determine the level of tolerance and potential causal mechanisms. These cases were discovered, and currently limited to the state of Florida. In other areas, particularly the upper Midwest, herbicide resistance is suspected for Euarasian water milfoil (*Myriophyllum spicatum*) to fluridone herbicide.

100 YEARS OF AQUATIC WEED CONTROL IN FLORIDA. **William T. Haller*; University of Florida, Gainesville.**

ABSTRACT

Water lettuce and water hyacinth have been in Florida's canals, rivers and lakes for over 100 years. These floating weeds, primarily water hyacinth, created serious interference to water transportation and flood control in both Louisiana and Florida prompting the US Congress in the 1890's to charge the U.S. Army Corps of Engineers with maintaining navigable waterways in the U.S. Throughout the period 1900-1950, control of these weeds consisted of various mechanical devices the lifted, chopped, harvested or otherwise destroyed the plants. Chemical control was practiced on a limited basis and utilized the spraying of acids, bases and various toxic inorganic salts such as sodium arsenate applied to the foliage of the weeds. The advancement of modern organic chemistry in the 1950's developed several organic chemical herbicides that provided a much safer and reliable means to control these and additional invasive aquatic weeds. The passage of the Federal Insecticide, Fungicide and Rodenticide Act (1974) by the U.S. Congress gave authority to the USEPA to evaluate and register aquatic herbicides. Over time, the number of registered aquatic herbicides has decreased as the studies to re-register products have become more numerous, complicated and expensive to conduct. The additional research, required by the Food Quality Protection Act (1996), has resulted in the labels of new and re-registered aquatic herbicides having very clear statements of how to use and apply these products in water used for irrigation and potable/domestic purposes.

FUTURE OF 2,4-D – NEW USES AND NEW TECHNOLOGIES. **J.S. Richburg; Dow AgroSciences, Headland, AL.**

ABSTRACT

Dow AgroSciences is developing a family of herbicide tolerance traits, commonly referred to as Dow AgroSciences Herbicide Tolerance (DHT) traits, that provide tolerance to various broadleaf and grass herbicides, including the phenoxy auxins (e.g., 2,4-D, MCPA) as well as the aryloxyphenoxypropionate grass herbicides (e.g., quizalofop, haloxyfop), depending on the trait. Two traits, DHT1 and DHT2, have been introduced recently for corn and soybean/cotton, respectively. The basis for herbicide tolerance for each trait is a rapid, single-step metabolic detoxification of the herbicides of interest. The DHT traits may also be stacked with glufosinate and glyphosate tolerance traits. Dow AgroSciences scientists have developed a new proprietary formulation of 2,4-D and a brief discussion of particle drift and volatility research in 2010 will be discussed. Candidate herbicide systems enabled by the traits coupled with new 2,4-D proprietary formulation developments will have broad utility in enhancing the performance of current weed control systems and in improving the durability of the glyphosate and glufosinate cropping system in the future.

DISCOVERY AND EVOLUTION OF 2,4-D - A BRIEF HISTORY. **C. Gerwick*; Dow AgroSciences, Indianapolis, IN.**

ABSTRACT

The synthesis of 2,4-D in 1940 by Pokorny not only revolutionized weed control, but gave rise to the discipline of Weed Science and an entire industry. In fact, the impact of weeds on the yield of crops was not widely appreciated until the advent of the phenoxy herbicides. Research groups in the U.K. and U.S. working largely independently co-discovered the auxin herbicides which were originally pursued as plant growth enhancing chemicals. Starting with Darwin's recognition that a substance produced in the tip of plants was responsible for seedling response to light, to the proposal by Krause (U.S.) and Templeman (U.K.) that synthetic auxins might be effective for control of weeds, the discovery of 2,4-D involved insights and serendipitous observations from a number of scientists on both continents. While much of this discovery story was initially held in secret because of WW II, these scientists changed the path of agriculture and their story is shared in this presentation.

2,4-D MODE OF ACTION – RECENT ADVANCES IN UNDERSTANDING HOW AUXIN HERBICIDES WORK IN PLANTS. **D. Simpson; Dow AgroSciences, Headland, AL.**

ABSTRACT

Auxin herbicides such as 2,4-D control a wide variety of primarily dicotyledonous weeds by eliciting effects on plants similar to excessive treatment with the endogenous plant hormone, auxin (indole-3-acetic acid, IAA). Via a series of elegant genetic and biochemical studies in the model dicot plant Arabidopsis thaliana, the molecular receptors for IAA and 2,4-D have recently been discovered. The auxin receptors are integral components of the cellular ubiquitin ligase complex and modulate the specific proteolytic degradation of auxin-responsive transcriptional regulators, leading to profound changes in gene expression. Recent advances in the understanding of the molecular mode of action of auxin herbicides with respect to 2,4-D will be described.

2,4-D PAST AND PRESENT. STATUS OF ONE OF THE WORLD'S MOST WIDELY USED HERBICIDES. **J.S. Richburg; Dow AgroSciences, Headland, AL.**

NO ABSTRACT

DEVELOPMENT OF WEED RESISTANCE TO THE AUXIN HERBICIDES: HISTORICAL PERSPECTIVES, GENETICS AND MECHANISMS OF WEED RESISTANCE. **D. Riechers, M. Jugulam, J. Christopher Hall and W.G. Johnson, University of Illinois, Urbana.**

ABSTRACT

Auxinic herbicides are widely used for control of broadleaf weeds in cereal crops and turfgrass. These herbicides are structurally similar to the natural plant hormone auxin (IAA), and induce many of the same physiological and biochemical responses at low concentrations. After several decades of research to understand the auxin-mediated signal transduction pathway, only recently have the receptors for auxin binding and resultant biochemical and physiological responses been discovered in plants. However, the precise mechanism of action for auxinic herbicides is not fully understood despite their extensive use in agriculture for over six decades. Compared with other herbicide families, the incidence of weed resistance to auxinic herbicides is relatively low, with only 29 auxinic herbicide-resistant weed species discovered to date. Most of these auxinic-resistant broadleaf weeds display resistance ratios smaller than with resistance to other herbicide chemistries, such as ALS inhibitors or triazines. Auxinic herbicide-resistant weed biotypes offer excellent model species for uncovering the mechanism of action as well as resistance to these compounds. The relatively low incidence of weed resistance to auxinic herbicides has been attributed to the presence of rare alleles imparting resistance in natural weed populations, the potential for fitness penalties due to mutations conferring resistance in weeds, and the complex mechanism of action of auxinic herbicides in sensitive dicot plants. Information about the genetics and inheritance of auxinic herbicide resistance and case studies examining the mechanism of resistance in auxinic herbicide-resistant weed biotypes will be summarized. Additionally, agronomic implications of the evolution of resistance to these compounds are discussed in light of new auxinic herbicide-resistant crop varieties that will be commercialized in the near future.

2,4-D PUBLIC PERCEPTIONS – ISSUES, CHALLENGES AND REALITIES. **L. Hammond; Industry Task Force II on 2,4-D Research Data, Indianapolis, IN.**

ABSTRACT

According to a recent article in a conservative activist publication, Helium, "2,4-D is toxic to just about everything. In people, it can cause cancers, liver and kidney damage, reproductive problems, birth defects, and irritation. It's also toxic to birds, bees, insects and fish." The author gives no references for her statements. All of her allegations are incorrect. Public perception is often based on scare tactics and mis-leading statements originating from anti-pesticide organizations and conservative opinion articles. The challenge is communicating quality research, Good Laboratory Practice (GLP) studies and understanding risk assessment based on exposure and not hazard. Also the challenge is gaining public acceptance of the findings of government regulatory agency evaluations. The reality is that 2,4-D has a trustworthy history of over 65 years of registered use; and the US EPA and Health Canada PMRA along with the European Commission have all re-evaluated 2,4-D and published that 2,4-D can continue to be registered.

WEED CONTROL AND CROP TOLERANCE WITH 2,4-D TODAY IN THE SOUTHEAST AND MIDSOUTH. **A.S. Culpepper, University of Georgia, Tifton and L.E. Steckel, University of Tennessee, Jackson.**

ABSTRACT

The first patent for 2,4-D occurred in 1944 and within three years, nearly half of the presentations at the Southern Weed Conference (today's SWSS) included 2,4-D as part of the presentation title. With the development of Dow AgroSciences Herbicide Tolerance (DHT) traits, there has been increased interest in 2,4-D. Today, the primary use of 2,4-D for weed management in the United States occurs in pastures, small grains, turf, corn, right of ways, and preplant burndown. Specifically in the Southeast and MidSouth, 2,4-D is used more commonly in small grains, orchards, pastures and rangeland, burndown (primarily for cotton), and turf. In small grains, 2,4-D is the most effective option to control wild radish and mustards. Ester formulations are most often used because they mix well with liquid fertilizers. Applications must be timely, applied to fully tillered grains, to avoid crop injury issues. Apple, pecan, and peach orchards utilize 2,4-D for the control of weeds such as cutleaf eveningprimrose, morningglory, radish, and glyphosate-resistant horseweed. Applications include an amine formulation of 2,4-D applied alone to remove broadleaf weeds in the grass strips planted between orchard trees. Alternatively in orchards, the herbicide strip around the tree often includes applications of 2,4-D mixed with glyphosate. Regardless of application method, growers are careful to not contact the tree with 2,4-D and specific application timings during the season are adhered to carefully. Forage producers utilize 2,4-D to remove weeds such as thistles, ragweed, cutleaf eveningprimrose, dandelion, horseweed, buttercup, and spiny amaranth from their pastures. Most often, 2,4-D is a tank mix partner with other herbicides for broad spectrum control. Numerous benefits from 2,4-D are realized by growers as 2,4-D offers low cost, short soil persistence, and minimal grazing restrictions. Many major warm and cool-season turf species are treated with 2,4-D to control annual and perennial broadleaf weeds. Applications on St. augustinegrass, centipedegrass, and bentgrass must be timely and must follow recommended use rates or injury may occur. Use on lawns, golf courses, sports fields, and sod farms are also common. Similar to forges, mixtures of 2,4-D with other chemistries are the most common use of 2,4-D. Burndown of cotton is a primary focus point for 2,4-D usage in the South. Cutleaf eveningprimrose and wild radish are present on many acres. Glyphosate alone often does not provide adequate control of these two weeds but mixtures of glyphosate plus 2,4-D provide excellent control economically. 2,4-D is also used for burndown of glyphosate-resistant horseweed in the south. Used at higher rates of 32 oz/A it has provided fair control. Many crops, like cotton, require a time interval to pass between application and planting or crop injury can occur. The authors would like to thank Drs. Dallas Peterson, Tim Murphy, Patrick Mccullough, Eric Prostko, Lynn Sosnoskie, Alan York and Wayne Mitchem for there contributions.

MANAGING GLYPHOSATE-RESISTANT ITALIAN RYEGRASS IN THE MIDSOUTH. **Jason A. Bond*, Thomas W. Eubank, Vijay K. Nandula, and Robin C. Bond, Mississippi State University Delta Research and Extension Center, Stoneville.**

ABSTRACT

Italian ryegrass (*Lolium perenne* ssp. *multiflorium*) is often planted as a cover crop, as a temporary lawn grass, for roadside restoration, or for soil enrichment; however, it often escapes cultivation and becomes established in fallow fields as a winter weed. Italian ryegrass has a wide range of adaptability to soils, and it thrives in fertile soils in regions with mild climates. Plants emerge in the fall and grow vigorously through winter and early spring. Individuals of the species are highly competitive for nutrients, water, and sunlight. Glyphosate-resistant (GR) Italian ryegrass was first documented in the United States in Oregon in 2003. Regionally, two populations of GR Italian ryegrass exhibiting a three-fold resistance were identified in field crops in Washington County, Mississippi, in 2005. Since the initial confirmation in 2005, field observations suggest some populations are resistant to much higher glyphosate rates. Survey data from 2009 indicate that GR Italian ryegrass is now present in 12 counties in the Mississippi Delta. It has also become problematic in other southern states. Populations of GR Italian ryegrass have been confirmed in at least one county/parish in Arkansas, Louisiana, and North Carolina during the last three years. Dense populations of GR Italian ryegrass are problematic for producers. This weed can jeopardize burndown programs, and few affordable postemergence herbicides are available. Fields containing GR Italian ryegrass not controlled at burndown will have significant plant residue at planting. Residue will impede planting practices, contribute to competition between crop seedlings and established GR Italian ryegrass, and hinder herbicide programs due to inadequate coverage. Research to address management of GR Italian ryegrass was initiated at the Delta Research and Extension Center in Stoneville, Mississippi, in 2005. The major conclusions of research from 2005 through 2008 were (1) postemergence options in the spring are extremely limited and require at least two herbicide applications to approach complete control and (2) residual herbicides applied in the fall offer the best opportunity for controlling GR Italian ryegrass. More recently, the research emphases have transitioned to focus on programs for managing GR Italian ryegrass. These include integration of postemergence and residual herbicides, tillage, and sanitation. A GR Italian ryegrass management program should begin with residual herbicides applied when weather permits between mid-October and mid-November. Depending on rainfall totals through the fall and winter months, residual herbicides [Dual Magnum (S-metolachlor), Treflan (trifluralin), and Command (clomazone)] applied in the fall prior to GR Italian ryegrass emergence may provide control that lasts until spring. Dual Magnum (1.27 lb ai/A) or Treflan (1.5 lb ai/A) should be utilized in fields that will be planted to cotton or soybeans the following year. Dual Magnum is the only fall residual herbicide for GR Italian ryegrass that may be safely applied if the field will be planted in corn. In fields where the following year's crop will be rice, Command (0.75 lb ai/A) is the only fall residual herbicide option. Few effective spring management options are available for GR Italian ryegrass, and spring herbicide programs often require sequential applications. Gramoxone Inteon (paraquat) and Select Max (clethodim) are the most effective postemergence herbicide options for GR Italian ryegrass. However, depending on the timing of application, postemergence treatments often do not provide complete control. Scouting for GR Italian ryegrass that escaped the fall residual herbicide application should begin in January. Sequential spring herbicide programs for controlling GR Italian ryegrass should include either glyphosate (0.77 lb ae/A) plus Select Max (0.094 to 0.125 lb ai/A) followed 4 to 6 weeks later by Gramoxone Inteon (1 lb ai/A) or sequential applications of Gramoxone Inteon (1 followed by 1 lb/A) spaced 7 to 10 days apart. Regardless of the program utilized, all ryegrass should be completely controlled prior to planting. Glyphosate-resistant Italian ryegrass represents a serious threat to crop production systems in the Midsouth. The presence of this weed also jeopardizes traditional glyphosate-based burndown programs. Management of GR Italian ryegrass requires a multi-faceted approach. Herbicide options are limited and Italian ryegrass has a history of rapidly developing resistance to multiple herbicide chemistries. With that in mind, tillage should be an integral component of GR Italian ryegrass management strategies.

GLYPHOSATE-RESISTANT PALMER AMARANTH MANAGEMENT IN COTTON. **A.S. Culpepper, University of Georgia, Tifton; Alan C. York, N. C. State University, Raleigh; and L.E. Steckel, University of Tennessee, Jackson.**

ABSTRACT

Glyphosate-resistant Palmer amaranth infests cotton throughout the Southeast and MidSouth. The use of residual herbicides is essential for successful management regardless of cotton technology being produced. In Roundup Ready cotton, the concept of overlapping residual herbicides throughout the season is essential. For example, recommended programs in the Southeast often include Valor or diuron applied preplant, combinations of at least two residual herbicides such as Reflex plus diuron, Prowl, Staple, or Cotoran or Prowl plus diuron plus Staple applied preemergence, Roundup mixed with Dual Magnum, Warrant or Staple applied early POST, often a mid-POST application of Roundup plus Dual Magnum or Warrant; and a layby application of diuron plus MSMA. Programs are similar in the MidSouth except that Reflex cannot be used PRE on medium- and fine-textured soils. Thus, Reflex is often applied 14 days before planting with a greater use of Cotoran or Caparaol PRE. Ignite-based programs are gaining in popularity as Ignite is an effective tool to control Palmer amaranth that is 3 inches in height or less. Recommended Ignite-based programs continue to use residual herbicides throughout the crop and most often include at least four herbicide modes of action. Programs encourage the use of at least two residual herbicides PRE, an application of Ignite plus Dual Magnum early POST, Ignite MPOST, and diuron plus MSMA at layby. Although Ignite-based programs are growing in popularity, most Ignite-based programs are used in Phytogen's Widestrike cotton with estimates of at least 0.75 million acres of Widestrike cotton treated with Ignite during 2010. Where tolerance of Liberty Link cotton to Ignite is exceptional, Widestrike cotton is nearly always injured by Ignite applications. Although injury commonly occurs, impacts can be avoided if applications are made with Ignite at 29 oz/A alone and growers make no more than two applications with the final application being no later than the 8-leaf stage of cotton growth. Controlling Palmer amaranth solely with herbicides is no longer an effective management approach in some cotton producing areas. Growers are being required to develop integrated programs to reduce the populations of Palmer amaranth that are now present in many areas. Herbicide input costs often exceed \$60 per acre and growers still have to hand weed their crop. For example, a Georgia grower survey conducted after the 2010 crop noted 92% of Georgia growers handweeded 53% of the cotton crop with an expenditure of \$16 million. These hand-weeding expenses are following a \$15 million expenditure for hand-weeding during 2009. In Tennessee, at least 20% of the cotton crop was hand-weeded with expenditures exceeding \$3 million. Incorportion of residual herbicides by tillage is also expanding in Georgia, with over 25 counties incorporating a yellow herbicide on over 30% of the cotton acres in those counties. Both deep tillage (moldboard plow) and heavy cover crop residues are also growing in popularity as these management tactics can reduce Palmer amaranth emergence 50 to 60% and thereby improve control in Roundup Ready systems 17 to 19%.

HOW FUTURE HERBICIDE TOLERANT TRAITS MAY EFFECT GLYPHOSATE-RESISTANT WEED MANAGEMENT. **L. E. Steckel; University of Tennessee, Jackson, TN; A. S Culpepper; University of Georgia, Tifton, and A. York; North Carolina State University, Raleigh.**

ABSTRACT

Glyphosate-resistant (GR) weed management has become very challenging for South-east and Mid-south cotton and soybean producers. Currently those producers are spending $35.00/A more in herbicides to manage GR weeds in soybeans and $50.00/A more to manage GR weeds in cotton above when glyphosate provided effective control. Even with these additional herbicides used in soybeans and cotton GR weed control is still inconsistent and often requires hand weeding to raise a crop. There are no new herbicide mode of actions on the horizon to help manage these GR weeds. Therefore the new herbicide tolerant traits 2,4-D tolerance, dicamaba tolerance and HPPD tolerance provide the best hope for new tools to manage GR weeds. The Dow Herbicide Trait (DHT) provides soybeans and cotton tolerance to the herbicide 2,4-D. Monsanto is developing a trait that will provide cotton and soybean with tolerance to dicamba. A herbicide resistant trait for the mode of action HPPD or bleaching herbicide is also being developed by several companies. Early research would indicate that all three of these traits utilized in a systems approach will be welcome tools to help manage GR weeds. However, neither 2,4-D, dicmaba or the bleaching herbicides will control some GR weeds particularly Palmer amaranth as well as glyphosate did before resistance was developed. However in a systems approach that includes a pre applied herbicide in combination with glufonsiante tankmixed in with 2,4,-D or dicmaba good control can be achieved on larger Palmer amarnanth than can currently be contolled today.

GLYPHOSATE RESISTANT JOHNSONGRASS MONITORING AND MANAGEMENT. **D.O. Stephenson, IV and J. Griffin, LSU AgCenter; N. R. Burgos, Univ. of Arkansas.**

ABSTRACT

In 2008, crop producers began to report glyphosate failures for controlling rhizome and seedling johnsongrass (*Sorghum halepense*) in Louisiana. Suspected glyphosate resistant populations were located in Rapides Parish and Pointe Coupee Parish, Louisiana. These populations had survived multiple applications of labeled and above labeled rates of glyphosate. Rhizome and seed samples were collected from these populations and subjected to dose response experiments by researchers with the LSU AgCenter and the University of Arkansas. Glyphosate doses utilized by LSU AgCenter scientist ranged from 13 to 13,450 g/ha in both rhizome and seedling dose response experiments. Treatments were applied to 5-7 leaf rhizome johnsongrass and 2-4 leaf seedling johnsongrass. Mortality was determined 21-28 d after treatment in Louisiana. In Arkansas, rhizome and seedling johnsongrass was subjected to glyphosate doses ranging from 840 to 3362 g/ha and 210 to 3362 g/ha, respectively. Application timing of glyphosate in Arkansas was similar to Louisiana. Mortality was recorded 28 and 14 d after treatment for the rhizome and seedling johnsongrass , respectively, in Arkansas. The lethal dose required to kill 50% (LD50) of the Pointe Coupee population was 10.2 times greater than the labeled rate of 840 g/ha for a resistant/susceptible (R/S) ratio of 10.5. In addition, the LD50 for seedling johnsongrass collected in Pointe Coupee Louisiana was 3 times the normal glyphosate use rate yielding a R/S ration of 3.1. For the Rapides Parish population, a glyphosate dose that was 7.2 times the normal glyphosate use rate (R/S ratio of 28.7) was required for rhizome johnsongrass was observed. Furthermore, University of Arkansas scientists observed similar results with many clones from the Rapides Parish Louisiana populations surviving a 4x labeled rate of glyphosate. Seedlings from these resistant rhizome johnsongrass plants were observed to have a glyphosate R/S ratio of 3.6 to 8.2. It can be concluded from these data that glyphosate-resistant glyphosate has been confirmed in two Louisiana parishes. Research was initiated by LSU AgCenter scientists to determine glyphosate-resistant johnsongrass management practices for crop producers in 2009 and 2010. Multiple experiments were initiated in corn, cotton, and soybean in central and south Louisiana. Summarizing the data across all trials indicated that at least two co-applications of a graminicide with glyphosate provided acceptable control of glyphosate-resistant johnsongrass in Louisiana cotton and soybean. In corn, herbicides that contain nicosulfuron and thiencarbazone-methyl provided the most consistent control of glyphosate-resistant johnsongrass. Utilizing glufosinate in glufosinate-resistant corn, cotton, and soybean yielded mixed results. In many instances, glufosinate provide initial control of glyphosate-resistant johnsongrass, but multiple applications (at least 2-3) were required to achieve 80% control of johnsongrass at crop harvest. These data indicate that graminicides are the best option Louisiana producers have for controlling glyphosate-resistant glyphosate, but LSU AgCenter scientists are warning Louisiana producers that overuse will yield ACCase-inhibitor resistance in johnsongrass if not managed properly.

GRASP® XTRA TANK MIXES WITH NEWPATH OR BEYOND FOR WEED CONTROL IN CLEARFIELD RICE. **R.B. Lassiter*, A.T. Ellis, R.K. Mann, J.D. Siebert, L.C. Walton; Dow AgroSciences LLC, Indianapolis, IN.**

ABSTRACT

Grasp® *Xtra* is a new broad spectrum penoxsulam based weed control product for postemergence foliar applications in rice and was launched in the southern US rice growing states in 2010. Grasp® *Xtra* is a 2.31 lb ai/gallon SC (Suspension Concentrate) formulation premix containing 0.25 lb ai penoxsulam + 2.06 lb ai (1.5 lb ae) triclopyr triethylamine salt per gallon. Currently in the southern US (AR, MS, MO, LA, and TX), it is estimated that Clearfield rice is planted on greater than 50% of the rice acres. In addition to red rice control, Newpath and Beyond provide control of some broadleaf weeds and sedges, but do not provide broad spectrum control resulting in the need for tank mixtures for controlling several key weeds in these geographies. In 2010, eight in-crop field studies were conducted in the Southern US to evaluate Grasp® *Xtra* alone and Grasp® *Xtra* tank mixed with Newpath or Beyond in preflood or postflood applications respectively. Grasp® *Xtra* tank mixed with Newpath (preflood) or Beyond (postflood) expands the effective weed control spectrum of either of the single herbicides alone and demonstrates an effective weed management program for Clearfield rice in the Southern US. ® Trademark of Dow AgroSciences LLC Grasp *Xtra* is not registered for sale or use in all states. Contact your state pesticide regulatory agency to determine if a product is registered for sale or use in your state. Always read and follow label directions.

CONFIRMATION OF GLYPHOSATE RESISTANT RYEGRASS IN ARKANSAS. **James W. Dickson*, Robert C. Scott, University of Arkansas Cooperative Extension Service, Lonoke; Nilda R. Burgos, Reiofeli A. Salas, University of Arkansas, Fayetteville; and Brad M. Davis, University of Arkansas Cooperative Extension Service, Lonoke.**

ABSTRACT

In the spring of 2009, several populations of Italian ryegrass in southeast Arkansas survived applications of glyphosate. Seeds of these populations were harvested for herbicide-resistance screening in a greenhouse near Lonoke, Arkansas. Nine populations of Italian ryegrass from Desha County, Arkansas were confirmed to be resistant to glyphosate at 0.84 kg ae ha^{-1}. The population that had the highest percentage of glyphosate-resistant plants was DES03 (80% resistant). A whole-plant bioassay was conducted on this population to determine its level of glyphosate resistance. Italian ryegrass seeds from the glyphosate-resistant population and a glyphosate-susceptible population obtained commercially (COM01) were seeded into flats measuring 25 cm long by 25 cm wide by 5 cm deep filled with commercial potting medium. Individual seedlings at the 2- to 3-lf growth stage were transplanted to styrofoam cups measuring 12 cm in diameter by 17 cm deep. Seventeen rates of glyphosate were evaluated, which ranged from 0.009 to 35.9 kg ae ha^{-1}. The formulation of glyphosate used did not contain an adjuvant (MON0139); therefore, an adjuvant (MON2139) was included at 0.5% v/v. Treatments were completely randomized, replicated four times, and repeated once. Treatments were applied at the 2-tiller growth stage with a hand-held boom and CO_2 pressurized back-pack sprayer calibrated to deliver 94 L ha^{-1}. Fresh-weight measurements of above-ground plant tissue were taken 40 days after treatment, and a GR50 analysis was conducted using Sigma Plot. The dose of glyphosate required to achieve 50% control of the glyphosate-susceptible population (COM01) was 0.171 kg ae ha^{-1}. The dose of glyphosate required to achieve 50% control of the glyphosate-resistant population (DES03) was 3.886 kg ae ha^{-1}. The glyphosate-resistant population was 23 times less sensitive to glyphosate than was the glyphosate-susceptible population. Compared to the traditional 1x rate of 0.84 kg ae ha^{-1}, this glyphosate-resistant population was 4.5 times more resistant.

GLUFOSINATE TIMING FOR PALMER AMARANTH (*AMARANTHUS PALMERI*) CONTROL. **W. K. Vencill; University of Georgia, Athens.**

ABSTRACT

Field studies were conducted to determine the optimum time of glufosinate application for Palmer amaranth control in cotton. Treatments were set up so that each plot received a single glufosinate application at five-day intervals after the initial flush of Palmer amaranth for 30 days. Glufosinate was applied at 480 g ai/ha. Palmer amaranth height was measured at each application and visual control was evaluated five days after treatment. The final height of Palmer amaranth after 30 days growth was 140 cm equivalent to 4.8 cm per day. After 10 day after germination, glufosinate control decreased 1.7% per day. This study confirms the small window of application of glufosinate to obtain optimum Palmer amaranth control in cotton.

GLYPHOSATE RESISTANT PIGWEED CONTROL IN SOYBEAN. **Troy W. Dillon*, Robert C. Scott, James W. Dickson, and Nathan D. Pearrow; University of Arkansas Cooperative Extension Service, Lonoke.**

ABSTRACT

Glyphosate-resistant Palmer amaranth (*Amaranthus palmeri*) (AMAPA) was first discovered in Arkansas in 2006. Since then, glyphosate-resistant AMAPA has been confirmed in 21 Arkansas counties. Several non-glyphosate control options exist, but are based on residual herbicide programs. With the introduction of Liberty Link® soybean (Glycine max) varieties in 2009, producers have a new postemergence option with Ignite® (glufosinate) herbicide. However there is still a need to control glyphosate-resistant pigweed in Roundup Ready and conventional soybean. The objective of this research was to evaluate AMAPA control using conventional herbicides in combination with glyphosate in the Roundup Ready system. Two studies were conducted near Widener, Arkansas in 2010 on a confirmed glyphosate and ALS-resistant AMAPA site evaluating AMAPA control in Roundup Ready soybean using residual herbicides and glyphosate herbicide. Study 1 evaluated residual herbicides for efficacy on AMAPA. Treatments were applied either PPI or PRE. Study 2 evaluated program approaches for AMAPA control using PPI, PRE, and POST options. Study design was randomized complete block with 4 replications. Treatments were applied with a CO2 backpack sprayer calibrated to deliver 10 GPA. Study 1, all treatments provided 86% or greater control of AMAPA at 23 DAE. Flexstar, Dual + Sharpen, Prefix, Envive, Flexstar GT, Fierce, and Treflan all controlled AMAPA at 69% or greater at 70 DAE. Valor, Sharpen, Dual, Authority, and Prowl H20 controlled AMAPA less than 63% at 70 DAE. Study 2, at 32 DAE, only the residual treatment or treatments containing fomesafen (Flexstar, Flexstar GT, and Prefix) was controlling AMAPA over 80%. By 69 DAE the residual "programs" followed Flexstar GT or Prefix or Sequence was providing acceptable commercial control of AMAPA. AMAPA can be controlled with residual herbicides in Roundup Ready and conventional soybean systems. However season long control will not be achieved with a single residual application. AMAPA can be controlled with various residual treatments fb tank mixes containing fomesafen containing products + glyphosate. Due to label restrictions, care should be taken to use the fomesafen component of the program postemerge as it was the only viable POST option evaluated on resistant AMAPA.

COMPARISON OF ROUNDUP READY® AND LIBERTY LINK® SOYBEAN SYSTEMS. **Nathan D. Pearrow*, Jeremy Ross, Robert C. Scott, and Brad M. Davis; University of Arkansas Cooperative Extension Service, Lonoke.**

ABSTRACT

With the introduction of Roundup Ready® soybeans in 1996, producers were provided with one of the most valuable technologies for weed control in the 20th and 21st centuries. This technology was rapidly and widely accepted across North America. However, the sole use of this technology magnified the selection pressure for biotypes of glyphosate-resistant weed species. To date, there are 12 weed species in the United States that are resistant to glyphosate, six of which occur in Arkansas. The rapid adoption of the Roundup Ready® technology also resulted in some inferior varieties of soybean being planted resulting in lower than normal yields. Liberty Link® soybean varieties were introduced in 2009, which provided producers a new, but similar technology for weed control. Studies were conducted in 2009 and 2010 in Arkansas to compare yields of these two technologies and determine if there was an associated "yield lag" with the Liberty Link® technology. The Liberty Link soybean varieties evaluated in this research were Hornbeck HALO 4.84, 5163, and Merschman Orlando1048. Merschman Orlando 1048 was replaced with LL4861 in 2010. The Roundup Ready soybean varieties evaluated were Delta Grow 4970RR, Pioneer 95Y01, Progeny 5115RR, and Asgrow 4703. The Roundup Ready varieties were chosen based on University of Arkansas yield trial data and having a similar maturity grouping to Liberty Link varieties. These varieties were planted near Newport, AR and Weiner, AR in both 2009 and 2010. The Weiner, AR location was irrigated as needed both years; whereas the Newport location was non-irrigated. The varieties were planted at 60 lb/A into plots that measured 5 ft wide by 25 ft long. Treatments were arranged in a randomized split-block design according to herbicide tolerance. Prefix herbicide at 32 oz/A was applied preemergence across the entire study at both locations in both years. Ignite at 22 oz/A or Roundup WeatherMAX at 22 oz/A was applied early postemergence and mid postemergence to maintain weed-free plots. Yields for Liberty Link soybean varieties were comparable to yields of Roundup Ready soybean varieties in 2009 at both Newport and Weiner, with the exception of Delta Grow 4970RR. The low yield of this variety may be due to a 46% stand reduction. This stand reduction probably was due to low seed germination. Yields for Liberty Link soybean varieties were comparable to yields of Roundup Ready soybean varieties in 2010 at both Newport and Weiner, as well. Adequate rainfall and mild temperatures in 2009 promoted high yields at both Newport and Weiner. Conversely, deficit rainfall and excessively high temperatures in 2010 contributed to lower than normal yields at both Newport and Weiner. The Liberty Link soybean varieties observed in this research do not appear to have a "yield lag" associated with this new technology.

INFLUENCE OF PLANT POPULATION AND HERBICIDE PROGRAM ON PALMER AMARANTH CONTROL IN SOYBEAN. **A. Hoffner*, A.C. York, D.L. Jordan, R. Seagroves, and J. Hinton, North Carolina State University, Raleigh.**

ABSTRACT

Effective weed management continues to be an important component of profitable soybean production in North Carolina. In recent years herbicide resistant weed populations have developed and have limited the effectiveness of herbicide options for growers. Although benefits of high soybean populations in minimizing weed interference are well documented in the peer-reviewed literature and Cooperative Extension production guides, interactions of soybean population and herbicide programs in Roundup Ready and LibertyLink production systems have not be evaluated in North Carolina. Therefore, research was conducted at five locations in North Carolina during 2010 to compare Palmer amaranth control and soybean yield with combinations of preemergence (PRE) and postemergence (POST) applied to Roundup Ready and LibertyLink cultivars are at seeding rates of approximately 55,000 and 120,000 plants/acre. The specific hypothesis tested in this research was that higher soybean populations would be more effective in protecting soybean yield from Palmer amaranth interference. Five experiments were conducted in the coastal plain of North Carolina in fields with natural and relatively high populations of Palmer amaranth. Treatments consisted of two levels of soybean trait (cultivars expressing either glyphosate or glufosinate resistance), two levels of soybean population (approximately 55,000 and 120,000 plants/acre), three levels of PRE herbicides (None, S-metolachlor, S-metolachlor plus fomesafen), and four levels of POST herbicides (none, single POST application, sequential POST application, and glyphosate or glufosinate plus imazethapyr). Plot size was eight rows with a 8 inch spacing (two locations) or 6 rows with a 15 inch spacing (three locations) by 30 ft. Data collected included soybean and weed density three weeks after planting immediately prior to the first POST herbicide application, visual estimates of percent Palmer amaranth control immediately prior to initiation of POST herbicide applications (0 to 100% where 0 = no control and 100% = complete control), two weeks after the final POST herbicide application, and at 4 and 6 weeks after final POST herbicide application. Soybean yield was determined in 4 experiments and converted to bushels/acre. Means of significant main effect and interactions were separated using Fisher's Protected LSD test at $p < 0.05$. The objective of this study was to determine if lower seeding rates of soybean were as effective as higher seeding rates under conditions where Palmer amaranth was the dominant weed. The stated hypothesis that higher soybean populations would be more effective in protecting soybean yield from Palmer amaranth interference was not clearly tested in these experiments. Although in some instances Palmer amaranth control and soybean yield were higher when the soybean population was increased, the poor yield of soybean under dry conditions in 2010 prevented making sound conclusions. Therefore, these experiments will be repeated in 2011 in anticipation of more favorable growing conditions allowing clearer separation of treatment comparisons.

INFLUENCE OF WATER QUALITY ON ITALIAN RYEGRASS CONTROL BY GLYPHOSATE.
G.B.S. Chahal*, D.L. Jordan, J.D. Burton, and A.C. York, North Carolina State University, Raleigh, NC.

ABSTRACT

Water is the main carrier used for most of the herbicide applications and makes up over 99% of the spray solution. Quality of water can affect herbicide efficacy, with glyphosate being one of the most notable examples. Defining the role of water quality on glyphosate efficacy is important. Presence of different divalent cations like Ca^{2+}, Mn^{2+}, Zn^{2+}, pH, presence of calcium carbonate which is responsible for water hardness, carbonate and bicarbonate levels that determine the alkalinity of the water, and presence of suspended matter that can lead to turbidity are constituents of water quality. Hard-water cations, such as Ca^{2+} and Mg^{2+} present in the spray solution can greatly reduce the efficacy of glyphosate. Cations interact with glyphosate structure and decrease its absorption and translocation in weeds. The influence of water quality on glyphosate efficacy has not been documented extensively in North Carolina. The objectives of this research were to determine if glyphosate efficacy is affected by water sources collected across North Carolina Field and greenhouse experiments were conducted to address the stated objectives. Thirty-seven water sources and four fertilizer solutions (boron, calcium, manganese, and zinc) were used as carriers to compare efficacy of glyphosate with application in deionized water. All treatments were applied at recommended rate. Quality of these water sources and fertilizer solutions were analyzed for sodium adsorption ratio, hardness, total alkalinity, total nitrogen (both inorganic and organic), and the elements P, K, Ca, Mg, S, Fe, Mn, Zn, Cu, B, Na, and Cl. Greenhouse experiments were conducted to determine if Italian ryegrass growth stages of heading, jointing, tillering and seedling affected response. Treatments were applied with a CO_2-pressurized backpack sprayer calibrated to deliver 94 L/ha. Glyphosate was applied as at 0.63 and 0.79 kg ae/ha for field and greenhouse experiments, respectively. Visual estimates of percent Italian ryegrass control were recorded at 21 days after application using a scale of 0 (no control) to 100 (complete death of all plants or no plants present) for both field and green house experiments. Plant samples from greenhouse experiments were dried for 48 hrs at 60 C to determine dry biomass. Field and greenhouse experiments were conducted by using a randomized complete block design with four replications, and each experiment was repeated twice. Means were separated using Fishers Protected LSD test at p value less than or equal to 0.05. In these studies, glyphosate efficacy was affected by some of the water sources. In field and greenhouse studies, almost 50% decrease in Italian ryegrass control was observed when glyphosate was applied with fertilizer solutions (calcium, manganese and zinc). Greenhouse studies showed that fertilizer solutions consistently reduced glyphosate efficacy irrespective of the growth stage of Italian ryegrass. Boron had the least affect on glyphosate efficacy. Biomass reduction of Italian ryegrass was higher at seedling and tillering stages compared to heading and jointing growth stages irrespective of all the treatments.

RECOVERY OF SELECTED PALMER AMARANTH BIOTYPES FROM DROUGHT STRESS. **A. Chandi*, D.L. Jordan, A.C. York, J.D. Burton, S. Milla-Lewis, and J.F. Spears, North Carolina State University, Raleigh.**

ABSTRACT

Palmer amaranth (*Amaranthus palmeri* S. Wats.) is an economically important weed to manage in crop production systems in North Carolina due to its competitive ability and presence of resistance to herbicides representing different modes of action including glycines, dinitroanilines, herbicides that inhibit acetolactate synthase and photosynthetic inhibitors. In some cases herbicide resistant weed biotypes carry a fitness penalty compared with non-resistant wild types. Comparing vegetative and reproductive characteristics of biotypes expressing various levels of herbicide resistance collected from different regions can provide information useful in predicting changes in populations and development of herbicide resistance. Effective weed management strategies can be designed by exploiting traits that can cause reduced ecological performance. Previous research suggested that biotypes differ in competitive ability and subsequent effects on crop yield. A greenhouse experiment was conducted to determine recovery of Palmer amaranth populations [five populations each expressing confirmed glyphosate resistance (G-R), acetolactate synthase (ALS) resistance (ALS-R), and susceptibility to both ALS-inhibiting herbicides (ALS-S) and glyphosate (G-S)] collected in North Carolina from various levels of soil moisture stress. Seeds of Palmer amaranth plants collected across North Carolina were planted in excess in 15 cm round pots containing commercial potting mix making sure that all pots contain same weight of soil. Eight days after emergence (DAE) seedlings were thinned to one per pot and ten DAE plants were fertilized for optimum growth. Fourteen days after emergence (DAE), plants were not watered in order to induce soil moisture stress for 0, 1, 3, 5, 7, and 9 days after which soil was brought back to full saturation and maintained at a moisture status to ensure optimum growth for the remainder of the experiment. Plant height (cm) was recorded 14, 16, 18, 20, 22, 24, and 30 DAE. Above-ground fresh and dry weights were determined 30 DAE. Photosynthetic carbon assimilation (umolCO_2 $m^{-2}s^{-1}$) and stomatal conductance (molH_2O $m^{-2}s^{-1}$) were determined in a preliminary experiment to document stress for one susceptible population at 14, 16, 18, 20, and 22 DAE as well as 24 DAE after bringing plants back to saturation. The fourth fully expanded leaf from top of each plant was used for measurements which were made between 10.00 and 14.00 hrs EST in the greenhouse using portable photosynthesis system and a leaf chamber fluorometer with equipped with Version 6.2 software. Each measurement was taken over a 30 second period of time, during which average photosynthetically active radiation (PAR), block temperature, and relative humidity were 1500 (mmol s^{-1} m^{-2}), 36 °C, and 50%, respectively. There were five replicate plants per treatment and six measurements per plant were taken. The experimental design was randomized complete block with ten replications and the experiment was repeated. Percent reduction in height and fresh and dry weight were calculated relative to the non-stressed control. Data were subjected to analysis of variance testing main effects and interactions of biotypes and moisture stress treatment. Two analyses were performed on the data. In one analysis the 15 biotypes, irrespective of herbicide resistance characteristics, were subjected to ANOVA to test main effects and interactions associated with moisture stress treatment. In a second analysis, biotypes were grouped based on herbicide resistance characteristics (G-R, ALS-R, and ALS-S/G-S) and tested for main effect and interactions with moisture stress treatment. Means of significant main effects and interactions were separated using Fisher's Protected LSD test at $p < 0.05$. As suspected, significant variation in recovery from different periods of moisture stress was noted for the 15 Palmer amaranth biotypes. However, of particular interest in this study was the relationship of herbicide resistance characteristics and recovery from moisture stress. When biotypes were grouped as G-R, ALS-R and ALS-S/G-S (5 biotypes in each group), the interaction of biotype group by levels of moisture stress for percent reduction in height, fresh and dry weight was not significant. However, main effects of biotype group and duration of moisture stress were significant. The percent reduction in height 24 DAE for the G-R group was less compared with reduction in height for ALS-S/G-S and ALS-R groups. By 30 DAE, the G-R group maintained an advantage over the ALS-S/G-S group but reduction in height did not differ for G-R and ALS-R groups. While differences in reduction in fresh with were not observed when comparing resistance groups, dry weight of both

ALS-R and G-R groups were affected less by moisture stress than the ALS-S/G-S group. When subjected to moisture stress for up to 5 days, plant height and fresh weight were not reduced when observations were recorded 30 DAE. Moisture stress for 7 and 9 days resulted in 12% and 19% reduction in height (24 and 30 DAE) and 16% and 27% reduction in fresh weight (30 DAE), respectively. When pooled over biotype groups based on resistance characteristics, moisture stress of 5 or more days reduced dry weight of Palmer amaranth irrespective of biotype group. Reduction in fresh weight of 16%, 21%, and 33% were observed for moisture stress periods of 5, 7, and 9 days, respectively. Moisture stress for 5, 7, and 9 days reduced photosynthesis and stomatal conductance. Photosynthesis was reduced 25%, 61%, and 76% by a moisture stress of 5, 7, and 9 days, respectively. The reduction in stomatal conductance by these respective moisture regimes was 38%, 71%, and 93%. However, plants resumed normal photosynthesis and stomatal activity one day after bringing them back to full soil saturation. Visually, plant wilting was noticed 5 days after moisture stress was induced corresponding with 18 DAE. Collectively, these data suggest that herbicide resistance and recovery from stress may be related to some degree. However, the number of biotypes in each group was limited to 5 in this study. A more comprehensive screening of a higher number of biotypes with extended moisture stress past 9 days would be more informative in defining relationships of herbicide resistance and ability to recover from drought stress.

WEED CONTROL AND YIELD COMPARISONS OF GLYPHOSATE-RESISTANT AND GLUFOSINATE-RESISTANT CORN GROWN CONTINUOUSLY AND IN ROTATION. **Krishna N. Reddy, Crop Production Systems Research Unit, USDA-ARS, Stoneville, MS.**

ABSTRACT

Glyphosate-resistant (RR) and glufosinate-resistant (LL) corn weed management systems have advantages and limitations. Glufosinate also controls broad spectrum of weeds and is an alternative to glyphosate. Since glufosinate acts like a contact herbicide with limited translocation, thorough spray coverage is required for complete kill of targeted weeds. Due to limited translocation, glufosinate is not as effective on perennials as glyphosate. Over-reliance on either glyphosate- or glufosinate-based programs could lead to problems such as weed species shifts and evolution of resistant weeds. RR and LL corn offers growers advantages of rotating herbicide with different mode of action. This study examines weed control, soil seedbank, and yield responses in RR and LL corn rotation systems using glyphosate POST and glufosinate POST applications either alone or following PRE herbicides under a reduced tillage system. A 6-yr field study was conducted from 2004 to 2009 on a Dundee silt loam soil near Stoneville, MS. The four rotation systems were continuous glyphosate-resistant corn (RRRRRR), continuous glufosinate-resistant corn (LLLLLL), glyphosate-resistant corn with glufosinate-resistant corn (RLRLRL), and glufosinate-resistant corn with glyphosate-resistant corn (LRLRLR) and two herbicide programs were postemergent-only herbicides (POST) and preemergent herbicides followed by POST (PRE + POST). The experiment was conducted in a split-plot arrangement of treatments in a randomized complete block design with rotation as main plot and herbicides as the subplot with four replications. Each subplot consisted of eight rows of corn spaced 102 cm apart and 39.6 m long. After the fall of 2003, the experimental area received no tillage operations except re-bedding after harvest to main as reduced tillage system. The POST-only treatment included two applications of glyphosate at 0.87 kg ae/ha in RR corn and two applications of glufosinate at 0.41 kg ai/ha in LL corn. The PRE + POST treatment included atrazine at 1.82 kg ai/ha plus s-metolachlor at 1.41 kg ai/ha followed by two applications of glyphosate at 0.87 kg/ha in RR corn or two applications of glufosinate at 0.41 kg/ha in LL corn. PRE herbicides were applied immediately after planting. First POST and second POST treatments were applied at 3-4 and 5-6 weeks after planting corn, respectively. Weed control was visually estimated 2 wk after second POST. Corn was harvested from all eight rows with a combine. Overall effect of rotation systems on weed seedbank was assessed at the end of a 6-yr rotation. Nine soil cores (9.2 cm diameter and 10.2 cm deep) were collected from each plot after corn harvest in 2009, soil was spread in flat trays in greenhouse, and emerged weeds were counted for 12 months. Control of 11 dominant weed species (grass and broadleaf) in RR and LL corn was >95%, regardless of herbicide program. Control of johnsongrass (71 to 100%) and yellow nutsedge (66 to 85%) was lower in continuous LL system compared to LRLRLR, RLRLRL, and RRRRRR rotation systems. Yellow nutsedge control was higher with PRE + POST (89 to 99%) compared to POST only (72 to 86%) treatment. In 2004 and 2005, corn yields were 27-35% higher in RR corn compared to LL corn regardless of rotation, mainly due to differences in yield potential of two hybrids with different traits. When RR and LL stacked hybrid was used in 2006-2009, corn yields were similar regardless of rotation. Between herbicide programs, PRE + POST program gave 5 to 10% higher yield than POST only program in 4 of 6 years. The seedbank for yellow nutsedge, and dominant grass and broadleaf weeds was not significant among four rotation systems. Seedbank for broadleaves was similar in POST and PRE + POST treatments. Seedbanks for grasses and yellow nutsedge were higher in POST only program (20.5 and 1.8 per core, respectively) compared to PRE + POST program (9.5 and 0.4 per core, respectively). These results indicate that johnsongrass and yellow nutsedge control could reduce in continuous LL corn system and could be mitigated by rotating LL corn with RR corn. With the availability of stacked gene corn hybrids, both glyphosate and glufosinate could be used alternatively on same corn to manage these weeds.

COMMON SUNFLOWER INTERFERENCE IN FIELD CORN: ECONOMIC ASSESSMENT. **Todd J. Cogdill, Nyland R. Falkenberg, M. Edward Rister, and James M. Chandler, Texas A&M University, College Station, Texas.**

ABSTRACT

Field studies were conducted at the Texas AgriLife Research Farm in Burleson County near College Station, TX, in 2006 and 2007 to evaluate the economic impact of common sunflower interference in field corn. Components of interference evaluated were the impact of common sunflower density and duration of competition on corn, corn density on common sunflower, and herbicide treatment intensity. Statistical regression and marginal economic analyses were the principal methods employed to evaluate the economic impacts of common sunflower. A density of one common sunflower per 6 m of crop row caused a yield loss of 293 kg ha^{-1}. Estimated losses at a net corn price of \$0.20 kg^{-1} was \$230 ha^{-1} for infestation levels of 4 common sunflower plants per 6 m of row. Corn yield was increased by 32 kg ha^{-1} by each 1,000 plant ha^{-1} increase in corn planting density. Corn planting densities of 49,400 and 59,300 plants ha^{-1} provided the greatest net returns with or without the presence of common sunflower competition. For each additional week of common sunflower competition, there was a decrease in net returns, but at a decreasing rate, in both years. Control for various herbicide treatments provided net returns ranging from \$1,203 to \$1,906 ha^{-1} in 2006 and \$1,212 to \$1,938 ha^{-1} in 2007. No common sunflower control resulted in net returns of \$609 and \$653 ha^{-1} in 2006 and 2007, respectively. Determining the economic impact of common sunflower interference in field corn allows producers to estimate the overall net return based upon duration of common sunflower interference and density, while considering varying net corn prices, crop planting density, and herbicide application costs.

SURVEY OF JOHNSONGRASS IN ARKANSAS FOR HERBICIDE RESISTANCE. **D.B. Johnson, J.K. Norsworthy, R.C. Scott, J. Wilson, C. Starkey, and J. Devore; University of Arkansas, Fayetteville.**

ABSTRACT

Before glyphosate-resistant soybean was brought to market by Monsanto in 1996, johnsongrass (*Sorghum halepense*) had long been one of the most troublesome grass weeds to control. Because of the large acreage of glyphosate-resistant crops and the effectiveness of glyphosate on this weed, it has not been a problem in recent years. In the fall of 2007, a population of johnsongrass located in a field near West Memphis, AR, in Crittenden County was confirmed to be glyphosate resistant (designated sample J0). This was the first documented case of glyphosate-resistant johnsongrass in Arkansas. The purpose of this study was to determine the geographical distribution of glyphosate-resistant johnsongrass in Arkansas and screen for resistance to several other herbicides. In the fall of 2008, 2009, and 2010 johnsongrass panicles were collected from eleven counties in Arkansas along the Mississippi River. Samples were collected from the following counties in Arkansas: Arkansas, Crittenden, Chicot, Desha, Jackson, Lee, Lonoke, Monroe, Mississippi, Phillips, Prairie, and St. Francis. A total of 201 samples were collected but due to poor germination only 122 of the samples could be screened. Seeds were planted in a greenhouse in Fayetteville, AR, and seedlings were sprayed with glyphosate (0.39 lb ae/A), clethodim (0.061 lb ai/A), imazethapyr (0.063 lb ai/A), and fluazifop (0.188 lb ai/A). Plants were sprayed inside a spray chamber at 20 gal/A at the 2- to 3-leaf stage. Visible control ratings were taken at 14 and 21 days after treatment (DAT). At 21 DAT, average johnsongrass control across accessions was 97% for glyphosate, 95% for imazethapyr, and 99% for both fluazifop and clethodim. The J47 accession appeared to have higher tolerance to glyphosate compared to the other accessions, with only 58% control at 21 DAT. Additionally, J49 appeared to have reduced sensitivity to imazethapyr, with only 75% control at 21 DAT. A dose response experiment was conducted to further evaluate the J47 and J49 accessions. Twenty seedlings from J47 and J49 and a susceptible biotype were sprayed at the 3-leaf stage with a range of glyphosate or imazethapyr rates to produce a dose response curve based on death of the treated plants at 21 DAT. The lowest rate corresponded to 1/128X the normal use rate and the highest rate was 16X the normal use rate. The lethal dose needed to kill 50% of the plants of each population (LD_{50}) was determined using Probit analysis. The J47 accession had an LD_{50} of 0.923 lb/A glyphosate, which was 6.6-fold greater than the susceptible population, which was 0.14 lb/A glyphosate. The J49 accession had an LD_{50} of 0.04 lb/A imazethapyr, which was 2.9-fold greater than the LD_{50} of the susceptible population, which was .14 lb/A imazethapyr. Results of field trials conducted in West Memphis, AR, in the summer of 2009 and 2010 showed that the J0 accession appeared to have minimal response to fluazifop. A greenhouse experiment was conducted in the fall of 2010 to further evaluate the J0 accession using multiple rates of fluazifop compared to a susceptible standard. The rates ranged from 1/64X to 8X the normal use rate of fluazifop. Fluazifop at the labeled rate of 0.188 lb/A killed 100% of the susceptible plants and only 65% of the J0 plants. Twenty percent of the plants from the J0 accession were able to survive an application of fluazifop at 0.75 lb/A, which corresponds to 4X the labeled. Preliminary data indicates that accession J0 is resistant to both glyphosate and fluazifop, which would be the first global case of multiple-resistance in johnsongrass.

PALMER AMARANTH EMERGENCE AS INFLUENCED BY SOYBEAN PRODUCTION SYSTEM AND DEEP TILLAGE. **Justin D. DeVore*, Jason K. Norsworthy, D. Brent Johnson, Clay E. Starkey, M. Josh Wilson, and Griff M. Griffith; University of Arkansas, Fayetteville.**

ABSTRACT

Glyphosate-resistant Palmer amaranth has become a major problem for Arkansas crop producers. With Arkansas soybean producers relying heavily on glyphosate-resistant soybean, an alternative solution to controlling resistant Palmer amaranth is needed. A field experiment was conducted at Marianna, AR, in 2009 and 2010 in which various soybean production systems were tested in combination with deep tillage and no tillage to determine the impact on Palmer amaranth emergence. This experiment was organized in a split-plot design replicated four times. The main factor was deep tillage using a mouldboard plow or no deep tillage. The subplot factor was the four production systems: early-season soybean planted in April, full-season soybean, with and without a rye cover crop, planted in May, and soybean double-cropped with wheat planted in June. A 1-m^2 area was marked in the center of each plot (4.5 by 30 m) by GPS. Once marked, 250,000 glyphosate-resistant Palmer amaranth seed were placed within the m^2, and then the plot was disked twice. Half of the plots were deep tilled and half were not. During the growing season, five counts were taken to determine the number of Palmer amaranth that emerged within each plot. Production systems, such as full-season soybean with a rye cover crop or soybean double-cropped with wheat, which had high amounts of plant residue on the soil surface provided the greatest reduction in Palmer amaranth emergence. When used in combination with deep tillage, these systems reduced Palmer amaranth emergence by 98 and 97%, respectively, in 2009 and by 73 and 82%, respectively, in 2010. Deep tillage alone caused an 81% reduction in emergence over both years. The treatment that provided the best result was soybean double-cropped with wheat used in combination with deep tillage which provided a 95% reduction in Palmer amaranth emergence over the two years. This research shows that deep tillage in combination with soybean production systems that have high amounts of residue on the soil surface without spring tillage is an alternative means for providing a high level of control of glyphosate-resistant Palmer amaranth. In the future, integration of these best management practices with other non-glyphosate herbicides should be investigated as a means to further improve Palmer amaranth control.

PALMER AMARANTH POLLEN DISPERSION IN THE FIELD: SUMMARY OF RESEARCH IN NORTH CAROLINA. **A.M. Stark*, L. Wang, D.L. Jordan, R.J. Richardson, J.F. Spears. and M.G. Burton, North Carolina State University, Raleigh.**

ABSTRACT

Managing herbicide-resistant Palmer amaranth has become one of the most important challenges in southern crop production. Spread of glyphosate-resistant Palmer amaranth through pollen movement contributes to this problem. Increased understanding of pollen-mediated gene flow may contribute to overall management of Palmer amaranth. The objective of this study was to determine factors influencing Palmer amaranth pollen dispersal within 50 m of the source and up to 3.75 m above the soil surface. On four days in 2008 and 15 days in 2009, Palmer amaranth pollen was collected in a compass rose array of traps at heights of 0.75, 1.75, 2.75, and 3.75 m above the soil surface at distances of 1, 2, 10, 25, and 50 m from a densely planted pollen source containing 37 male Palmer amaranth plants. Pollen was collected on glass slides. Four randomly selected 3.05 sq. mm viewing areas on the sample slide were chosen and Palmer amaranth pollen grains in those areas were counted. These counts were averaged to determine density of Palmer amaranth pollen (grains/viewing area) at each trap. Empirical data did not consistently correlate with relative humidity, dew point, prevailing wind direction, ambient temperature, or wind speed observed in the field or using the North Carolina State Climate Office database. Pollen was found at the outermost extremities of the trap array (50 m laterally and 3.75 m above the ground), suggesting that Palmer amaranth pollen dispersion extends beyond the area considered in this study. Seventy-five percent of pollen was captured at canopy level (0.75 m above soil surface) with 10% or less at 1.75, 2.75, or 3.75 m above soil surface. Future research focusing on comprehensively defining factors that affect dispersion and viability of Palmer amaranth pollen is needed.

CALLISTO®: NEW SUGARCANE HERBICIDE WITH PREEMERGENCE AND POSTEMERGENCE ACTIVITY. **E.K. Rawls, J.B. Taylor, V.K. Shivrain, S. H. Martin, B. W. Minton, G.D. Vail; Syngenta Crop Protection, Greensboro, NC.**

ABSTRACT

Herbicide options for weed control in US sugarcane production are limited. Callisto® was registered for use in the US sugarcane market in 2008. Callisto is a systemic pre-emergence and post-emergence herbicide. Mesotrione, the active ingredient in Callisto, has a unique HPPD mode of action which makes it an excellent choice for controlling weed biotypes resistant to ALS-inhibiting and triazine herbicides. Other benefits of the product include: flexibility of pre and post emergence application timing; potential for reducing the use of atrazine and 2, 4-D; low use rates which can reduce total herbicide load per acre; tank mix flexibility; and excellent crop tolerance. The use rates range from a single 6.0 - 7.7 fl oz/A rate applied preemergence, or up to two applications applied at 3.0 fl oz/A applied postemergence. Callisto is primarily a broadleaf herbicide with significant activity on several grass and sedge species. Key weed species controlled or partially controlled by Callisto include pigweed (Amaranthus sp.), common lambsquarters (Chenopodium album), nightshade (Solanum sp.), ragweed (Ambrosia sp.), morningglory (Ipomoea sp.), large crabgrass (Digitaria sanguinalis), broadleaf signalgrass (Brachiaria platyphylla), fall panicum (Panicum repens), and yellow nutsedge (Cyperus esculentus). Sugarcane field trials have been conducted since 2004 in Florida, Louisiana, and Texas. Results indicate that Callisto alone can provide effective control of many broadleaf weed species, along with several grass and sedge species. However, overall weed spectrum and control can be improved with the addition of tank mixture partners. Some of these tank mixture options include: atrazine (Aatrex®), ametryn (Evik®), metribuzin (Sencor®), pendimethalin (Prowl®), trifloxysulfuron (Envoke®), or asulam (Asulox®). The addition of atrazine at 1.0 lb ai/A and/or ametryn at 0.25 – 0.75 lb ai/A can significantly improve preemergence and postemergence weed spectrum and overall weed control compared to Callisto alone. Callisto alone or in combination with other herbicides can give US sugarcane growers another management tool for controlling some of their most problematic weeds. AAtrex, AAtrex 4L, and AAtrex Nine-0 are Restricted Use Pesticides. Trademarks are the property of their respective owners.

IMPACT OF GROUND SPEED AND SPRAY VOLUME ON SPRAY DROPLET DEPOSITION.
T. W. Eubank*, J. A. Bond, Mississippi State University, Stoneville; S. J. Thomson, and Y. Huang USDA-ARS, Stoneville, MS.

ABSTRACT

Historically, tillage was the primary means of weed control in the majority of row crop producing states in the Mid-South. However, tillage practices were not only time consuming but also had intensive labor and equipment requirements. Glyphosate-tolerant crops have allowed producers to reduce equipment costs and labor requirements by removing the need for regular tillage events by simply spraying glyphosate to control troublesome weeds. Initially these glyphosate applications were made by utilizing the same tractors previously used for tillage and converting them to sprayers. While this reduced fuel demands it did not immediately reduce labor and equipment expense. As technology progressed large high clearance sprayers began to emerge as the vector of choice for applying glyphosate. These apparatus' employ large spray tank capacities often over 1,000 gallons and spray booms spreading to 120' to cover more acres faster. Additionally, these sprayers can operate at speeds in excess of 20 mph. Air-induction (AI) nozzles would often be utilized which produce coarse to very coarse droplet sizes so as to prevent potential drift issues while traveling at such high speeds. Similarly, lower spray volumes have been widely adopted to facilitate covering more acres with fewer stops. As glyphosate-resistant (GR) weeds continue to spread the need to utilize alternative herbicide modes-of-action has been stressed by many university scientists. Often times these alternative chemistries include the use of contact herbicides, such as glufosinate and fomesafen, to control GR weeds. These herbicides typically recommend higher spray volumes and medium droplet size with a volume median diameter (VMD) of 250 to 350 µm. Given the current trend in high clearance applicator usage significant changes may need to be made in the manner by which herbicides are applied. The objective of this study was to determine if ground speed and spray volume have an impact of spray droplet deposition. Studies were conducted using a tractor equipped with a wet-boom assembly and a high-flow Ace® hydraulic pump. A factorial arrangement of treatments was utilized with spray volume [10, 15, 20 gallons per acre (GPA)] being the first factor and the second factor being ground speed [5, 10, 15 miles per hour (MPH)]. TeeJet XR flat fan spray tips were used in this experiment and ranged in tip size from 8002 to 8010. Tips and spray volumes were calibrated to deliver the desired GPA at the determined speeds. A spray solution containing 5% v/v spray dye was used to project a visible droplet pattern onto a 2 x 2" piece of photo paper. Sprayed cards were analyzed using a camera-based imaging system and SigmaScan. Data were analyzed using ProcMixed procedure in SAS. Results indicate that percent spray coverage was greatest with 20 GPA at 5 and 10 MPH and were significantly better than 20 GPA at 15 MPH. When analyzing volume median diameter (VMD) there were no interactions between GPA and MPH; however, there were differences in main effects of GPA and MPH. VMD averaged 460 µm at 20 GPA and was significantly higher than 10 and 15 GPA at 375 and 373 µm, respectively. Additionally, higher ground speeds resulted in a progressive increase in VMD from 324, 384 and 499 with 5, 10 and 15 MPH, respectively. Analysis of relative span found that values were more consistent at highest ground speed (15 MPH) and water volume (20 GPA) which may simply be a function of fewer of the smallest droplets making it onto the target and is further supported by the previous stated VMD. This data suggests that higher ground speeds could negatively affect the deposition of spray droplets within the desired range of 250 to 350 µm.

***ECHINOCHLOA* DIVERSITY IN THE MISSISSIPPI DELTA.** **Charles T. Bryson*, Krishna N. Reddy; USDA-ARS, Stoneville, MS.**

ABSTRACT

Currently there are about 50 species of *Echinochloa* worldwide. Of these species, barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.] and junglerice [*Echinochloa colona* (L.) Link.], both non-native, are considered to be the most troublesome *Echinochloa* weeds in the southern US. The taxonomy of *Echinochloa* has been controversial and common names have been used loosely for the species. To address this issue and to determine the diversity, distribution, and frequency of *Echinochloa*, a survey was conducted in the Delta Region of Mississippi in 2008-2010. Each of the 19 counties or parts of counties in the Delta Region of Mississippi was surveyed and more than 200 vouchers were made to evaluate the taxonomy and frequency of each species. Junglerice was the most commonly encountered species in row crop production and was also the most common species in corn, cotton, rice, sorghum, and soybean fields and along field margins. Rough barnyardgrass [*Echinochloa muricata* (Beauv.) Fern.] was the second most frequently encountered species; however, it was found almost exclusively in areas with standing water, including persistently wet roadside ditches, rice fields, catfish pond margins, and natural wetland areas. Barnyardgrass was less common than junglerice and rough barnyardgrass and was found in similar habitats as rough barnyardgrass. Coast cockspur [*Echinochloa walteri* (Pursh) Heller] and two varieties of gulf cockspur [*Echinochloa crus-pavonis* (Kunth) Schultes] [var. *crus-pavonis* and var. *macera* (Wiegand) Gould] were also less frequently encountered than junglerice and rough barnyardgrass. Of these three, gulf cockspur var. macera was the most frequently encountered and similar in occurrence to barnyardgrass. Coast cockspur and gulf cockspur were found in habitats similar to those of barnyardgrass and rough barnyardgrass. With the increased reports of *Echinochloa* becoming late-season weed problem in row crops and the potential for developing herbicide resistance, it is important to track the frequency and distribution of these species. Based on this survey, jungle rice is the most frequent and widely distributed species of *Echinochloa* in the Delta Region of Mississippi followed by rough barnyard, barnyard and one variety of gulf cockspur, and then coast cockspur and the other variety of gulf cockspur.

PIGWEED MANAGEMENT IN SOYBEAN WITH PREEMERGENCE AND POSTEMERGENCE HERBICIDE PROGRAMS. **D. L. Jordan*, A. C. York, J. Hinton, R. Seagroves, P. M. Eure, and A. Hoffner, North Carolina State University, Raleigh.**

ABSTRACT

Management of Palmer amaranth has been one of the most challenging tasks in North Carolina and other southeastern and mid-south states of the US. Prior to widespread resistance to several important herbicides, total postemergence programs were generally effective in managing weeds, including Palmer amaranth, in soybean. However, in recent years Palmer amaranth resistance to glyphosate has been confirmed in many southern states. In North Carolina during the fall of 2010, 47% of 272 fields sampled across the Piedmont and Coastal Plain for seed collection had Palmer amaranth present. In a second survey throughout eastern North Carolina, primarily along the I-95 corridor, 15% of acres in 2,512 fields had at least one pigweed plant, although considerable amount of variation in infestation was observed. With the widespread distribution of Palmer amaranth in the state coupled with resistance to glyphosate, developing herbicide programs that include preemergence and postemergence components is critical in managing Palmer amaranth in soybean. The objective of this poster is to present results from visual estimates of percent Palmer amaranth control recorded late in the season from industry sponsored trials where Palmer amaranth was the primary weed. Experiments were conducted at the Upper Coastal Plain Research Station near Rocky Mount in 2010 using small-plot research techniques in narrow row soybean (8-inch spacing) planted in early June in conventional tillage. Plot size was 8 by 30 feet and treatments within each trial were replicated three or four times. Results are from only one experiment in 2010 and should be considered in that respect. Valor SX, Authority MTZ, Envive, Dual Magnum plus Linex, V-10233, and Boundary controlled Palmer amaranth at least 83% by late August. LP16338, Prefix, Reflex, Canopy, and Dual Magnum plus Spartan Charge controlled Palmer amaranth between 55 and 70%. Valor SX alone or with V-10206 and V-10233 controlled Palmer amaranth completely while Prefix controlled Palmer amaranth 88%. Authority Assist and Optill X controlled Palmer amaranth 64 to 65%. When applied alone, Valor SX and Valor XLT controlled Palmer amaranth 94 to 100% while Prefix and Reflex controlled Palmer amaranth 70%. Authority First and Dual Magnum controlled Palmer amaranth 38 to 56%. Ignite 280 applied postemergence either as single or sequential applications improved control in some but not all instances. Single and sequential applications of Ignite 280 without a residual herbicide applied at planting controlled Palmer amaranth 64 to 66%. Single and sequential applications of Ignite 280 at 29 or 36 oz/A (rates at the first of two applications) controlled Palmer amaranth 84 to 100% and were more effective than sequential applications of Ignite initiated at 22 oz/A. Applying Ignite 280 as either two or three sequential treatments controlled Palmer amaranth at least 83%. Results from these experiments provide information on performance of traditional and relatively new herbicide options for controlling Palmer amaranth in narrow row soybean. Rainfall was limited during the duration of these experiments and results most likely would be different under different rainfall patterns.

OBSERVATIONS FROM THE BENCHMARK STUDY IN NORTH CAROLINA: WEED POPULATIONS, CROP YIELD, AND ECONOMIC RETURN (2006-2009). **R. Seagroves*, D.L. Jordan, North Carolina State University, Raleigh; M.D. Owen, Iowa State University, Ames; R. Wilson, University of Nebraska, Scottsbluff; B. Young, Southern Illinois University, Carbondale; S. Weller, Purdue University, West Lafayette; and D. Shaw, Mississippi State University, Starkville.**

ABSTRACT

Results are a component of a six-state research effort to better understand weed population dynamics and subsequent effects on crop yield and economic return in glyphosate-based weed management systems. The following information summarizes research conducted from 2006-2009 with farmers in North Carolina in continuous cotton, continuous soybean, and a rotation of corn and soybean. Farmers were asked to split fields in half and manage weeds as they normally would on one side (considered the farmer approach) while on the other side of the field farmers followed university recommendations (considered the university approach). In general, the university approach included additional preplant (PPL), preemergence (PRE) or postemergence (POST) herbicides which included a wider diversity of herbicide active ingredients and modes of action (MOA). Most fields were in reduced tillage production irrespective of rotation system. Weed populations were determined four times each year by sub-sampling a small section on each acre of each side of the field. Data for weed management cost, crop yield, net return at each crop price, weed populations both prior to POST herbicide applications and late in the season, and the number of active ingredients were subjected to analysis of variance to compare the main effect of weed management approach (university vs. farmer). Farm cooperator was considered a replication in the analysis. In the rotation of corn and soybean, data for yield of each crop were compared individually. However, data for all other variables were pooled over site/year combinations irrespective of crop in this rotation. In both theoretical terms and in practice, a greater diversity of herbicides will pay dividends from a resistance management standpoint in the long term. However, more intensive weed management with a greater diversity of MOA is often considered as insurance and not essential by some growers and their advisors. This perception that more expensive and diverse programs do not add value has contributed to undesirable shifts in weed populations and development of herbicide resistant biotypes. Results from these farmer-scale trials with continuous cotton and continuous soybean demonstrate that long-term approaches to resistance management and product stewardship, in this case more residual herbicides either at PPL, PRE, or POST, also create economic benefits in the short term through protection of crop yield from weed interference. Although on the surface there appears to be no advantage to the more intensive and diverse university approach in the rotation of corn and soybean, no difference in net return with this more expensive approach suggests that long-term resistance management and product stewardship benefits do not come at the expense of short-term economic considerations.

GLYPHOSATE RESISTANT PALMER AMARANTH IN LOUISIANA. **Daniel O. Stephenson, IV, Randall L. Landry, Brandi C. Woolam; Louisiana State University Agricultural Center, Alexandria.**

ABSTRACT

Palmer amaranth (*Amaranthus palmeri*) has been documented as resistant to glyphosate in many states, specifically Arkansas and Mississippi. In 2009, a Palmer amaranth population growing in a cotton field in Concordia Parish, Louisiana was suspected to be resistant to glyphosate. Two applications of glyphosate (one at 840 g/ha and the second at 1680 g/ha) failed to control 4-6 leaf Palmer amaranth. Suspected resistant Palmer amaranth plants were collected and transported to a greenhouse to produce seed for resistance evaluation. Glyphosate-resistance screening experiments were conducted at the LSU-Alexandria greenhouse facility in 2010 to confirm glyphosate-resistance in the Concordia Parish Palmer amaranth population by quantifying the level of glyphosate resistance. To determine if glyphosate resistant existed in the population, an absence/presence experiment was conducted. Seed were sown in a potting mixture and plants were treated with 840 g/ha of glyphosate at the 5 to 7 leaf stage (7 to 11 cm tall). A known glyphosate-susceptible population was treated also. Following application, plants were returned to the greenhouse for an additional 21 days. Absence/presence experiments indicated the probable existence of glyphosate-resistance. To quantify the level of glyphosate resistance, dose response experiments were conducted. Glyphosate doses ranged from 1/50 to 16 times the recommended glyphosate dose (876 g/ha) for the glyphosate formulation used. Data indicated that the LD50 for the susceptible and resistant biotypes was 59.3 and 3220 g/ha of glyphosate. The resistant biotype was 54 fold less sensitive to glyphosate compared to the susceptible biotype. Increasing glyphosate use rate is not a viable option for controlling this resistant Palmer amaranth population. A systems approach which includes residual herbicides applied preplant burndown, preemergence, and postemergence should be utilized for its management.

INFLUENCE OF ADJUVANTS WHEN CO-APPLIED WITH SAFLUFENACIL AND GLYPHOSATE ON BURNDOWN WEED CONTROL. **Daniel O. Stephenson, IV, Louisiana State University Agricultural Center, Alexandria; Donnie K. Miller; Louisiana State University, St. Joseph; Randall L. Landry; Louisiana State University Agricultural Center, Alexandria; Marcia S. Mathews, Louisiana State University Agricultural Center, St. Joseph.**

ABSTRACT

Research was conducted at the LSU AgCenter Dean Lee Research and Extension Center in Alexandria, LA and the Northeast Research Station in St. Joseph, LA in 2010. The objective was to determine if methylated seed soil (MSO) and/or spray-grade ammonium sulfate (AMS) is needed when saflufenacil is applied alone or co-applied with a surfactant-containing glyphosate. The experiment was a 2 x 2 x 2 factorial arranged in a randomized complete block design with four replications. Factor 1 consisted of saflufenacil (25 g/ha) and saflufenacil plus glyphosate (860 g/ha). The surfactant-containing glyphosate formulation used in experiments was Roundup PowerMax®. Factor 2 included the absence or presence of MSO (1% volume/volume). Factor 3 was the absence or presence of AMS at 10 g product/L spray solution. All treatments were applied in late March to replicate a spring burndown application timing in Louisiana. Weeds rated included annual bluegrass (*Poa annua*) and henbit (*Lamium amplexicaule*) at both locations, prickly lettuce (*Lactuca serriola*) and *Ranunculus* spp. at Alexandria, and shephard's-purse (*Capsella bursa-pastoris*) and mouseear chickweed (*Cerastium fontanum* spp. *vulgare*) at St. Joseph. AMS did not influence efficacy for any weed evaluated. The addition of MSO to saflufenacil increased control of annual bluegrass and henbit 14 DAT. However, adding MSO when co-applying saflufenacil and glyphosate did not increase control of either annual bluegrass or henbit. Annual bluegrass and henbit control by all treatments was 100% 28 DAT at St. Joseph. However, only treatments containing glyphosate provided 100% control of these weeds at Alexandria 28 DAT. The addition of MSO to saflufenacil increased control of prickly lettuce and *Ranunclus* spp. at Alexandria 14 and 28 DAT, but MSO was not needed to maximize control when saflufenacil was coapplied with a surfactant-containing glyphosate. Shephard's-purse and mouseear chickweed control was 100% following saflufenacil plus MSO and for both glyphosate-containing treatments at St. Joseph 14 DAT. All treatments provided 100% of shephard's-purse and mouseear chickweed 28 DAT at St. Joseph. Data indicates that MSO should be added to saflufenacil when applied alone. If saflufenacil is co-applied with the surfactant-containing glyphosate formulation utilized in these experiments, MSO was not needed to maximize weed control.

PLANTING DATE, CULTIVAR, AND HERBICIDE TREATMENT EFFECTS ON THE PERFORMANCE OF SWEET SORGHUM IN THE ARKANSAS DELTA. **L. E. Estorninos Jr*., N. R. Burgos, and E. A. L. Alcober, University of Arkansas, Fayetteville; L. D. Earnest, and R. N. Cingolani, Southeast Research and Extension Center, Rohwer.**

ABSTRACT

An experiment was conducted at the University of Arkansas Southeast Research and Extension Center at Rohwer in 2010 to evaluate the herbicide treatment effects (*S*-metolachlor and *S*-metolachlor + mesotrione) and the performance of Dale, M81-E, and Topper 76-6 sweet sorghum cultivars [*Sorghum bicolor* (L.) Moench] when planted April 15, April 29, May 13, May 26, June 9, and June 24, 2010. The most common weeds in all the six planting dates were barnyardgrass (*Echinochloa crus-galli*), Palmer amaranth (*Amaranthus palmeri*), and broadleaf signalgrass (*Brachiaria platyphylla*). At 28 d after planting (DAP), Palmer amaranth was the predominant weed on the April 15, April 29, May 13, and June 24 plantings while barnyardgrass was most prevalent on the May 26 and June 9 plantings. Total weeds present were highest in the April 15 planting ($306/m^2$) and lowest in May 26 planting ($59/m^2$). Better herbicide activity (90 – 96%) was observed during the May 13 planting, except for Palmer amaranth control (81%) by *S*-metolachlor alone on Topper 76-6. Lesser herbicide activity was observed during the mid-June planting when a number of control ratings were less than 90% including the 69% control of Palmer amaranth by *S*-metolachlor alone on Topper76-6. At 28 DAP, the herbicide treatments affected the sweet sorghum at some planting dates. Averaged over three cultivars, *S*-metolachlor + mesotrione treatment caused greater injury than *S*-metolachlor alone when sweet sorghum was planted on May 13 (14% difference) and June 24 (11% difference). Dale and M81-E planted on June 9 had relatively lower injury, only up to 8%, with *S*-metolachlor + mesotrione compared with other planting dates. However, weed control was mostly below 90%. Weed control was slightly better overall at the May 13 planting, but crop injury was also high (23 to 50%). Based on stand count in the nontreated check, June 24 planting had higher crop stand (34 – 42 plants/2 m row) than the May 26 planting (14 – 15 plants/2 m row). However, the highest fresh biomass yields were obtained from Dale (62000 kg/ha) and Topper 76-6 (66000 kg/ha) planted on April 29 and treated with *S*-metolachlor + mesotrione herbicides. M81-E produced the highest biomass (46000 kg/ha) at the late planting (June 24) with *S*-metolachlor + mesotrione treatment, but this was much lower than what was obtained from the late April planting. This indicates that planting sweet sorghum late allows good stand establishment, but the summer heat and water stress could dampen crop growth and result in lower biomass. The combination of *S*-metolachlor and mesotrione may cause some crop injury, but will control weeds better and produce more crop biomass than with either herbicide applied alone.

MANAGEMENT OF RESISTANT PALMER AMARANTH WITH FLUMIOXAZIN IN REDUCED TILLAGE COTTON. **J.D. Smith*, J.R. Cranmer, V.F. Carey; Valent U.S.A. Corporation, Walnut Creek, CA.**

ABSTRACT

Glyphosate-resistant Palmer amaranth (*Amaranthus palmeri* S. Wats.) (GRPA) is now present in all cotton producing counties of Georgia. Management of GRPA is particularly difficult in reduced-till dry-land cotton. Previous research has shown that a systems approach is needed to manage GRPA in reduced-till dry-land cotton including the use of cover crop, residual and post-emergence herbicides, and hand weeding. The availability of improved transgenic cotton varieties now allows growers the option of using herbicide programs based around postemergence applications of glyphosate or glufosinate. Use of residual herbicides such as flumioxazin (marketed under the trade name of VALOR® SX Herbicide) will still be critical in either program to manage GRPA and achieve profitable yields. However, the timing and combination of herbicides for each program has not been completely researched to determine the best control options for each program. Therefore, research was conducted to determine the best fit for flumioxazin when used pre-plant burndown (PPBD) in a glyphosate or glufosinate based program. In the glyphosate based program, flumioxazin applied PPBD after the strip-tillage operation followed by diuron + pyrithiobac sodium + pendimethalin pre-emergence (PREE), followed by S-metolachlor + glyphosate early-postemergence (EPOT), followed by MSMA + diuron layby (LB) provided significantly better control of GRPA compared to a straight PREE program, which correlated into higher yields. In the glufosinate based program, there was no difference in total control of GRPA and yields between PPBD applications of flumioxazin and straight PREE residual programs. The results show that PPBD applications of flumioxazin followed by a strong PREE program can significantly improve control of Palmer amaranth and increase yields compared to a PREE alone program in a glyphosate based program.

COMPARISON OF RESIDUAL HERBICIDES FOR CONTROLLING PALMER AMARANTH AND BARNYARDGRASS. **C. Starkey*, J. K. Norsworthy, D. B. Johnson, P. Devkota; University of Arkansas, Fayetteville, AR.**

ABSTRACT

As the spread of herbicide-resistant Palmer amaranth (*Amaranthus palmeri*) and barnyardgrass (*Echinochloa crus-galli*) continues throughout the Midsouth, use of residual herbicides is one feasible method for control. We compared thirteen different herbicides with residual activity, applied at labeled rates for control of Palmer amaranth over 8 weeks at Fayetteville, AR and Keiser, AR. Approximately 5,000 seeds of known glyphosate-resistant Palmer amaranth seeds and 3,000 barnyardgrass seeds were sown and lightly incorporated into the soil in 1-m^{-2} areas at Fayetteville and Keiser, respectively. Herbicides were applied immediately after seeds were planted and activated with irrigation. Visible control ratings were taken every other week, or as the control plots had a new flush of seedlings, for 8 weeks. Plots were compared against an untreated check plot. After ratings were taken, an application of Ignite and Roundup WeatherMax was applied over-the-top to rid the area of live plants. For many row crops the time for canopy closure is 40 to 60 days, or earlier if the crop is planted in narrow rows, which is also the approximate length of time for control for most residual herbicide programs. At 39 days after treatment (DAT) Prefix (*S*-metolachlor + fomesafen), Envive (chlorimuron + flumioxazin + thifensulfuron), Reflex (fomesafen), Valor (flumioxazin), Camix (*S*-metolachlor + mesotrione), Boundary (*S*-metolachlor + atrazine), and Authority MTZ (sulfentrazone + metribuzin) were all considered effective with control ratings of 81 to 99% for Palmer amaranth. Assuming normal growing conditions and when canopy closure occurs around 40 days, these herbicides are all viable options for residual weed control. With wide-row crops or crops that require a longer time for canopy closure, herbicides Prefix, Envive, or Relfex may be the best choices because they control Palmer amaranth 84% at nine weeks after treatment. Boundary, Authority MTZ, Prowl H_2O, Camix, Corvus, and Dual II Magnum were all effective in controlling barnyardgrass 7 weeks after treatment.

CONTROL OF GLYPHOSATE RESISTANT PALMER AMARANTH IN LIBERTY-LINK SOYBEAN.
David L. Holshouser*, Amro Ahmed; Virginia Tech, Blacksburg.

ABSTRACT

Glyphosate resistant Palmer amaranth (*Amaranthus palmeri*) has been confirmed in Virginia; therefore, aggressive weed management programs are needed. Herbicide efficacy experiments were established in 2009 and 2010 in a field heavily infested with Palmer amaranth to determine effective control programs in soybean. In this field, glyphosate applied at 0.84, 0.84, and 1.68 kg ae ha^{-1} at 1, 3, and 5 weeks after planting (WAP) provided less than 75 and 30% control in 2009 and 2010. Glufosinate applied 0.45 kg ai ha^{-1} at 1 and 3 WAP or applied at 0.45 kg ai ha^{-1} following a preemergence herbicide provided greater than 95% control. Glufosinate applied at 0.74 kg ai ha^{-1} 3 WAP gave greater than 85 and 95% control in 2009 and 2010, respectively. Glufosinate weed control programs offers an effective alternative to Palmer amaranth control, especially where glyphosate resistant weeds are present.

WEED CONTROL IN SOYBEAN WITH VALOR XLT, GANGSTER, AND V-10233.

Donnie Miller, Donna Lee, and Marcie Mathews; LSU AgCenter, St. Joseph, LA.

ABSTRACT

A field study was conducted in 2010 at the Northeast Research Station near St. Joseph, LA to evaluate PRE weed control and phytotoxicity with V-10233 in soybean. 'TV49R17' soybean was planted on May 26. Soil type was a silt loam with pH 6.8. PRE applied treatments included Valor SX @ 2 oz/A, Valor XLT @ 3 oz/A, Gangster FR @ 0.4 oz/A plus Gangster V @ 2 oz/A, V-10233 @ 3 and 3.2 oz/A, Authority Assist @ 5 oz/A, Prefix @ 1 qt/A, and Authority First @ 3.2 oz/A. Parameter measurements included weed control & phytotoxicity 28, 42, and 56 d after treatment (DAT) and soybean yield. A maintenance application of Maddog Plus @ 32 oz/A plus Stalwart @ 1.5 pt/A occurred after the final rating. No visual injury was observed at any rating interval. At 28 d after treatment (DAT), V-10233 @ 3 oz/A resulted in 94, 68, 100, 95, 100, 96, 93, and 91% control of hemp sesbania, sicklepod, pitted morningglory, entireleaf morningglory, redroot pigweed, large crabgrass, yellow nutsedge, and barnyardgrass, respectively. With the exception of yellow nutsedge control with Gangster (100 vs 93%) and V-10233 @ 3.75 oz/A (99 vs 93%) weed control with V-10233 @ 3 oz/A was equal or greater than all other treatments. At 42 DAT, V-10233 @ 3 oz/A resulted in 81, 49, 99, 94, 100, 96, 89, and 96% control of respective weeds previously mentioned. With the exception of sicklepod control with Gangster (73 vs 49%) control with V-10233 @ 3 oz/A was equal to or greater than all other treatments. At 56 DAT, results followed similar trends to those observed at earlier evaluation intervals. Soybean yield following PRE application of V-10233 at 3 oz/A averaged 15 bu/A, which was greater than or equal to yield recorded for other treatments evaluated.

TOLERANCE OF STS SOYBEAN TO REDUCED RATE APPLICATION OF GRASP, LONDAX, PERMIT, AND REGIMENT. **Donnie Miller, Donna Lee, and Marcie Mathews; LSU AgCenter, St. Joseph, LA.**

ABSTRACT

A field study was conducted in 2010 at the Northeast Research Station near St. Joseph, LA to determine the tolerance of STS soybean to reduced rate PRE and POST application of commonly used Sulfonylurea rice herbicides. ¡®Pioneer STS 95Y50¡¯ soybean was planted on June 15. Soil type was a clay loam with pH 7.1. Treatments included a factorial arrangement of herbicide (Permit, Londax, Regiment, or Grasp), herbicide rate (0x, ¨öx, ¨ùx, or ¨ûx), and application timing (PRE or V2-V3 growth stage). Rates utilized were reduced accordingly from 1x rates of 1, 1, 0.6, or 2.3 oz/A for Permit, Londax, Regiment, or Grasp, respectively. Parameter measurements included visual injury and crop height 14 and 28 d after treatment and soybean yield. Crop height measurements were converted to a percent reduction from the 0x rate, which was not included in height reduction analysis. Averaged across application timing, Regiment and Grasp resulted in 33 to 48% visual injury 14 d after treatment (DAT), which was equal regardless of rate applied. Permit and Londax resulted in no visual injury. Averaged across herbicide rates, all herbicides applied PRE resulted in no visual injury. When applied POST, Regiment and Grasp resulted in 71 and 60% visual injury, respectively, while no injury was observed with Permit and Londax. Results were similar at 28 DAT injury ratings with greatest injury observed with Regiment and Grasp. At 14 DAT, averaged across herbicide rates, Permit and Londax resulted in equal and minimal reduction in soybean height regardless of application timing. Regiment and Grasp, however, resulted in a height reduction of 49 and 48%, respectively, when applied POST compared to 8 and 3% when applied PRE. At 28 DAT, averaged across application timings, greatest height reduction ranging from 25 to 52% was observed with Regiment and Grasp regardless of rate applied. Averaged across herbicide rates, Regiment and Grasp applied POST resulted in height reduction of 84 to 60%, respectively, which was greater than all other treatments and timings (3 to 9%). Averaged across application timings, Permit and Londax resulted in yields (21 to 28 bu/A) similar to the nontreated control, regardless of rate applied. Regiment resulted in similar yield to the nontreated control at the ¨ùx (18 bu/A) and ¨ûx (15.3 bu/A) rates, but not at the ¨öx rate (12.3 bu/A). Grasp resulted in similar yield to the nontreated control at the ¨öx (13 bu/A) and ¨ùx (15 bu/A) rates. Averaged across rates, Regiment and Grasp resulted in yield of 6 and 4 bu/A, respectively, when applied POST, compared to at least 21 bu/A for all other herbicides and application timings.

FARM TYPOLOGY FOR INTEGRATED WEED MANAGEMENT IN RICE IN VENEZUELA.
Marjorie Casares* and Aida Ortiz, Universidad Central de Venezuela.

NO ABSTRACT.

SEASON-LONG CONTROL OPTIONS FOR GLYPHOSATE-RESISTANT PALMER AMARANTH.
T.H. Koger*, Mississippi State University, Mississippi State; T.W. Eubank, Delta Research and Extension Center, Mississippi State University, Mississippi State.

NO ABSTRACT.

RESPONSE OF AN ARKANSAS BARNYARDGRASS POPULATION TO ALS-INHIBITING HERBICIDES. **M.J. Wilson*, J.K. Norsworthy, D.B. Johnson, R.C. Scott, and J.D. DeVore; University of Arkansas, Fayetteville.**

ABSTRACT

Barnyardgrass (*Echinochloa crus-galli*) is the most problematic weed in Arkansas rice, infesting almost all of the Arkansas rice acreage. Barnyardgrass can cause lodging, poor grain quality, and >70% yield reduction in season-long competition with rice. Barnyardgrass has evolved resistance to some of the most common rice herbicides such as propanil (Stam), quinclorac (Facet), and clomazone (Command). Imazethapyr (Newpath), an acetolactate synthase (ALS)-inhibiting herbicide is used extensively in Clearfield rice. Other ALS-inhibiting herbicides, including penoxsulam (Grasp) and bispyribac (Regiment), are also used in rice, which has increased the risk of the evolution of ALS-resistant barnyardgrass. In early 2009, an ALS-resistant barnyardgrass biotype was documented in Arkansas. Therefore, a greenhouse experiment was conducted in Fayetteville, AR, to evaluate the level of resistance possessed by the resistant biotype against three ALS-inhibiting herbicides currently labeled in rice. The trial consisted of ten rates of imazethapyr, penoxsulam, and bispyribac from 1/32 to 32x the labeled rate for the resistant biotype and 1/128 to 4x the labeled rate for a susceptible biotype. Each treatment consisted of twenty single-plant replicates per rate, and plant death was recorded 21 days after treatment. Percent control of the resistant biotype at the labeled rate was bispyribac 10%, penoxsulam 0%, and imazethapyr 25%. The susceptible biotype was controlled 100% with all herbicides at the labeled rate. The dose needed to kill 50% of the resistant biotype 0.042 lb ai/A for bispyribac, 0.202 lb ai/A for penoxsulam, and 0.097 lb ai/A for imazethapyr; for the susceptible biotype, bispyribac at 0.011 lb/A, penoxsulam at 0.007 lb/A, and imazethapyr at 0.011 lb/A. All herbicides failed to provide effective control of the resistant biotype at the labeled (1X) rate.

EFFECT OF CARRIER VOLUME ON SORGHUM (*SORGHUM BICOLOR*) RESPONSE TO SIMULATED DRIFT OF NICOSULFURON. **M.A. Matocha*, C.A. Jones; Texas AgriLife Extension Service, College Station, Commerce, TX.**

ABSTRACT

Field research was conducted to determine the effect of simulated drift of nicosulfuron on the growth and yield of conventional grain sorghum. Herbicide rates represented 25, 12.5, and 6.3% of the use rates of the 52 g ai/ha nicosulfuron (13, 6.5, and 3.3 g ai/ha), respectively. Nicosulfuron was applied in a constant carrier volume of 224 L/ha and in proportional carrier volumes of 56, 28, and 14 L/ha for the 25, 12.5, and 6.3% rates, respectively, which maintained a constant herbicide concentration in the carrier. Four weeks after treatment sorghum height was reduced at least 71% by the 25% herbicide rate at both carrier volumes. The 6.3% herbicide rate applied at 14 L/ha reduced sorghum height 14.3% compared to nontreated. Sorghum yield was reduced 14.6 to 100% compared to the nontreated. The 25% herbicide rate at both carrier volumes resulted in 100% yield reduction. The 6.3% herbicide rate applied at 224 L/ha reduced sorghum yield by 55.4% while the same rate applied at 14 L/ha reduced sorghum yield 14.6%. The proportional carrier volume resulted in less yield reduction than other herbicide treatments only at the lowest herbicide rate.

PALMER AMARANTH (*AMARANTHUS PALMERI* S. WATS.) MANAGEMENT IN GLYTOL™ + LIBERTYLINK® COTTON. **Jacob D. Reed*, Texas AgriLife Research; Peter A. Dotray, Texas Tech University, Texas AgriLife Research, Texas AgriLife Extension, Lubbock; and J. Wayne Keeling, Texas AgriLife Research, Lubbock.**

ABSTRACT

The most common weed in cotton fields on the Texas High Plains is Palmer amaranth (*Amaranthus palmeri*). Weeds that are difficult to control with glyphosate are now becoming more common across the region because of long-term glyphosate use. Cotton varieties containing both GlyTol® and LibertyLink® traits will be commercialized as GlyTol® + LibertyLink® (GL) cotton in 2011. GL technology offers producers the potential to manage weeds in cotton with over-the-top applications of two herbicides with two different mechanisms of action. Field trials were conducted in Lubbock, TX in 2010 to determine optimum tank-mix and sequential applications of glyphosate and glufosinate in GL cotton to control Palmer amaranth. In order to determine optimum tank-mix applications, two tank-mix trials were conducted. The first included glyphosate and glufosinate applied at varying tank-mix rates (1X:1X, 1X:0.75X, 1X:0.5X, 1X:0.25X and 1X:0X for each herbicide). The second included glyphosate and glufosinate applied at an overall 1X rate but varying proportions of each (1X:0X, 0.75X:0.25X, 0.5X:0.5X, 0.25X:0.75X, and 0X:1X). 1X rate of glyphosate corresponded to 0.84 kg ae ha^{-1} while 1X rate of glufosinate corresponded to 0.58 kg ai ha^{-1}. All treatments were applied postemergence (POST) to 5-10 cm weeds and to 13-25 cm weeds. A third trial evaluated sequential applications of glyphosate and glufosinate in an overall weed management system. All treatments included a preplant incorporated (PPI) application of pendimethalin at 2.3 L ha^{-1}. Early-post (EPOST) and mid-post (MPOST) treatments of glyphosate at 0.84 kg ae ha^{-1} and glufosinate at 0.58 kg ai ha^{-1} were applied in all possible sequential combinations. PPI and POST herbicide applications were made using a tractor-mounted compressed-air or a backpack CO2-presurized sprayer calibrated to deliver 93.5 L ha^{-1}. For all experiments, FM 9250GL was planted on May 19 on 76.2 cm rows and treated with aldicarb at 0.54 kg ai ha^{-1}. Plots were 4.1 x 9.1 m with three replications. Weed control was visually estimated based on a standard scale of 0 to 100% where 0 = no weed control and 100 = complete weed control. In the systems trial, the middle two rows of each plot were mechanically harvested with a John Deere 7445 two-row cotton stripper and cotton lint weights recorded. Results indicated that tank-mixes of glyphosate and glufosinate reduced control of Palmer amaranth compared to glyphosate alone. When applied to 5-10 cm weeds, tank-mix combinations of both herbicides were less effective controlling Palmer amaranth (85-92%) than glyphosate (99%). Control of 13-25 cm weeds declined with tank-mixes (57-72%) compared to glyphosate (92%). Proportional tank-mix combinations on 5-10 cm weeds provided less effective Palmer amaranth control (90-96%) than glyphosate (100%) and control declined (55-63%) on 13-25 cm weeds compared to glyphosate (100%). Sequential applications of glyphosate and glufosinate, regardless of the sequence, effectively controlled Palmer amaranth, although treatments with glyphosate as part of the application sequence were more effective than treatments with only glufosinate. End-of-season control across all systems ranged from 92-100%. Cotton lint yields were similar across treatments. These results indicate that tank-mixes of glyphosate and glufosinate reduce Palmer amaranth control and that sequential applications of these two herbicides are a better option.

IVYLEAF MORNINGGLORY (*IPOMOEA HEDERACEA* (L.) JACQ.) MANAGEMENT IN GLYTOL® + LIBERTYLINK® COTTON. **Peter A. Dotray*, Texas Tech University, Texas AgriLife Research, Texas AgriLife Extension Service, Lubbock; Jacob D. Reed, Texas AgriLife Research; and J. Wayne Keeling, Texas AgriLife Research, Lubbock.**

ABSTRACT

GlyTol® plus LibertyLink® cotton is expected to be released in 2011. Field experiments were conducted from 2008 to 2010 to examine ivyleaf morningglory [*Ipomoea hederacea* (L.) Jacq.] control following tank-mix combinations of glyphosate and glufosinate-ammonium when holding the rate of glyphosate (Roundup PowerMax) at 1X (0.84 kg ae/ha) and varying the rate of glufosinate-ammonium (Ignite 280) (1X (0.58 kg ai/ha), 0.75X, 0.5X, 0.25X, 0X). Applications were made to 5- to 10-cm or 13- to 25-cm ivyleaf morningglory in separate field experiments. A second study examined ivyleaf morningglory control following different proportions of glyphosate and glufosinate-ammonium (1X + 0X, 0.75X + 0.25X, 0.5X + 0.5X, 0.25X + 0.75X, 0X + 1X) in order to achieve a cumulative rate of 1X. A third study examined ivyleaf morningglory control following a sequential application of glyphosate followed by (fb) glyphosate, glyphosate fb glufosinate-ammonium, glufosinate-ammonium fb glyphosate, or glufosinate-ammonium fb glufosinate-ammonium. These sequential applications were made to plots with or without prometryn (Caparol) applied preemergence (PRE). All applications were made using either a tractor-mounted compressed-air sprayer or CO_2-pressurized backpack sprayer calibrated to deliver 93 or 140 L/ha at 4.8 km/hr using 110015 or 11002 TT flat fan nozzles. In 2008, glyphosate or glufosinate-ammonium alone at 1X controlled 5- to 10-cm ivyleaf morningglory 58 and 85%, respectively, 14 days after application (DAA). When these herbicides were applied in tank mixture at their 1X rates, ivyleaf morningglory was controlled 79%. As the tank mix rate of glufosinate-ammonium decreased to 0.75X, 0.5X, or 0.25X, control declined to 70%, 63%, and 52%, respectively. In 2010, glyphosate or glufosinate-ammonium alone at 1X controlled 5- to 10-cm ivyleaf morningglory 47 and 85%, respectively, 14 DAA. When these herbicides were applied at 1X in tank mixture, ivyleaf morningglory was controlled 78%. As the tank-mix rate of glufosinate-ammonium decreased to 0.75X, 0.5X, or 0.25X, control declined to 77%, 73%, and 68%, respectively. Reduced control but similar trends were observed in both years when applications were made to 13- to 25-cm ivyleaf morningglory. In the proportions experiment, the 1X rate of glyphosate or glufosinate-ammonium controlled 5- to 10-cm ivyleaf morningglory 53 and 98%, and 13- to 25-cm ivyleaf morningglory 53 and 93%, respectively. When these herbicides were applied in tank mixture to 5- to 10-cm ivyleaf morningglory, increasing the rate of glufosinate-ammonium resulted in increased ivyleaf morningglory control. When these tank mix combinations were applied to 13- to 25-cm ivyleaf morningglory, control improved when compared to the 1X rate of glyphosate applied alone, but control was less effective than the 1X rate of glufosinate-ammonium applied alone. In the sequential applications experiment, glyphosate fb glyphosate or glufosinate-ammonium fb glufosinate-ammonium controlled ivyleaf morningglory 72 and 99% without prometryn PRE or 79 and 100% following prometryn PRE. Glyphosate fb glufosinate-ammonium or glufosinate-ammonium fb glyphosate controlled ivyleaf morningglory 100 and 69% without prometryn and 100 and 82% with prometryn. At a second location where no prometryn was used, glyphosate fb glyphosate or glufosinate-ammonium fb glufosinate-ammonium controlled ivyleaf morningglory 75 and 98%. At both locations, yield following all glyphosate and glufosinate-ammonium sequential applications were greater than the non-treated control regardless of the use of prometryn PRE. In summary, GlyTol® plus LibertyLink® cotton has shown exceptional tolerance to glyphosate and glufosinate-ammonium. Previous research suggests that tank-mix combinations of glyphosate and glufosinate-ammonium may be antagonistic on Palmer amaranth (*Amaranthus palmeri* S. Wats.) relative to the control obtained from glyphosate applied alone; therefore, sequential applications of glyphosate and glufosinate-ammonium will likely be the recommendation for weed control in this new transgenic cotton system. The sequential herbicide order will likely be dependent on the weed species, weed size, weed density, presence of herbicide resistant weeds, environmental conditions at application, and individual grower production practices. The anticipated launch of GlyTol® plus LibertyLink® in 2011 will be a valuable tool for cotton growers.

PREPLANT BURNDOWN WEED MANAGEMENT AND COTTON RESPONSE TO SAFLUFENACIL.
J. Wayne Keeling*, Jacob D. Reed; Texas AgriLife Research, Lubbock.

ABSTRACT

Saflufenacil (Sharpen™) is currently registered as a preplant burndown treatment prior to cotton planting and during the fallow period following harvest. Previous studies have shown saflufenacil can effectively control kochia (*Kochia scoparia*), Russian thistle (*Salsola iberica*) and horseweed (*Conyza canadensis*) when applied as a preplant burndown (PPBD) and Palmer amaranth (*Amaranthus palmeri*), morningglory (*Ipomoea* spp.), and volunteer cotton (*Gossypium hirsutum*) when post-directed (PDIR). There are concerns that saflufenacil injury to cotton can occur when organophosphate or carbamate insecticides are applied in-furrow at planting. Studies were conducted in 2010 near Lubbock, TX to 1) evaluate saflufenacil in combination with other herbicides for PPBD weed control, 2) compare saflufenacil PPBD application rates and dates and combinations with in-furrow insecticides for effects on stand establishment and cotton growth, and 3) determine weed efficacy and crop response to saflufenacil applied PPBD or PDIR. In all trials, treatments were arranged in a randomized complete block design with three replications. Treatments were applied with a backpack CO2 sprayer calibrated to deliver 10 GPA. Dry ammonium sulfate and methylated seed oil (1%) were added to all saflufenacil treatments. Annual weeds evaluated in the PPBD trial included Russian thistle and kochia. Saflufenacil was applied alone at 1 and 2 oz/A, as well as 1 oz saflufenacil tank-mixed with glyphosate, dicamba, or 2,4-D 42 days before planting (DBP). Cotton planted in these plots received an in-furrow seed treatment of aldicarb or phorate at planting and was compared to no in-furrow treatment. To evaluate cotton crop response to various saflufenacil rates and timings, saflufenacil was applied 42, 28, and 14 DBP at 1 and 2 oz/A at two locations. Visual injury was estimated at two timings after planting. Cotton injury was also evaluated for saflufenacil applied at 1 and 2 oz/A in a normal PDIR manner and with the hoods raised slightly to simulate a "sloppy" PDIR treatment. Saflufenacil applied 42 DBP controlled kochia and Russian thistle 95-100%. The addition of 2,4-D, dicamba, or glyphosate was not needed to achieve effective control. No cotton injury was observed when saflufenacil was applied 42 DBP at 1 oz/A, but injury (27-32%) was observed when saflufenacil was applied at 2 oz/A at this timing. Saflufenacil applied at 1 oz/A 14 or 28 DBP injured cotton 30-38%. The use of in-furrow insecticides at planting did not affect cotton response to saflufenacil applied 42 DBP. Saflufenacil applied PDIR controlled volunteer glyphosate-tolerant cotton 92-95% with no injury to planted cotton when applied at 1 oz/A. Slight injury (5-10%) was observed with "sloppy" PDIR treatments, with increased injury at the 2 oz rate.

REALM Q - A NEW POSTEMERGENCE HERBICIDE FOR CORN. **Helen A Flanigan*, Mick F Holm, Michael T Edwards E. I. DuPont, Wilmington, DE.**

ABSTRACT

Rimsulfuron + mesotrione herbicide has been tested as a contact plus residual, with or without a tank-mix partner of glyphosate on corn. This product has a built-in safener, which will enable use under more weather conditions, across more hybrids and with various adjuvants. It is a dry formulation, water-dispersible granule, tested postemergence at .3 oz ai. rimsulfuron + 1.25 oz ai mesotrione oz ai per acre. It can be applied after corn emergence, but before corn exhibits 7 or more collars or is taller than 20 inches. It was tested at 34 locations in 2010. Weed control and crop response was evaluated in one and two pass herbicide systems. Excellent control was achieved with rimsulfuron + mesotrione tank mixes on most grasses and broadleaves, including veletleaf, Palmer amaranth, waterhemp, common ragweed, common lambsquarters, barnyardgrass, giant foxtail, yellow foxtail, green foxtail, broadleaf signalgrass and large crabgrass. Full registration was received in the first quarter of 2011.

SUMMARY OF WEED MANAGEMENT STRATEGIES IMPLEMENTED IN THE BENCHMARK STUDY. **B. Young, University of Southern Illinois, Carbondale; D.L. Jordan*, North Carolina State University, Raleigh; M.D. Owen, Iowa State University, Ames; R. Wilson, University of Nebraska, Scottsbluff; S. Weller, Purdue University, West Lafayette, IN; and D. Shaw, Mississippi State University, Starkville .**

ABSTRACT

Information extracted from a larger data set that involves a six-state research called the Benchmark study is present to facilitate a better understanding of weed management strategies and their impact on weed population dynamics and herbicide usage. The following information summarizes research conducted from 2006-2009 with farmers in North Carolina in continuous cotton and continuous soybean. Farmers were asked to split fields in half and manage weeds as they normally would on one side (considered the farmer approach) while on the other side of the field farmers followed university recommendations (considered the university approach). The percentage of the total number of herbicide applications (pooled over active ingredients and years of the study) was determined for each method or timing of herbicide application which included preplant burndown (PPL), preemergence (PRE), early postemergence (EPOST), mid POST, late POST, and lay by application in cotton and PPL, PRE, and POST application in soybean. The percentage of total applications (pooled over method and timing of application) was determined for each mode of action (MOA). Data for crop yield and economic return were compared using a t-test with farm cooperator serving as replications. The diversity of MOA using the university approach included a higher percentage of chloroacetamide, dinitroaniline, and substituted urea families of herbicides. These herbicides are often applied PRE, and based on the percentage of total applications during the growing season, the most notable difference between the university approach and the farmer approach was the higher percentage of applications at the PRE timing for the university approach. Although glyphosate dominated the percentage of applications for both farmer and university approaches, the percentage of applications in the university approach was lower than in the farmer approach. Results of the more diverse herbicide MOA facilitated by investment in PRE herbicides increased yield and economic return. Greater diversity of herbicide MOA was noted using the university approach where a higher percentage of PPO inhibitors (difenylether or N-phenylphthalimide) and cell division inhibitors (pendimethalin) were applied compared with the farmer approach. As was noted with cotton, although a high percentage of applications included glyphosate, the percentage was down somewhat using the university approach compared with the farmer approach. In terms of application timing, this increase in diversity was generally noted in an increase in PRE herbicide applications using the university approach. As was noted with cotton, a more diverse and aggressive herbicide program at planting resulted in higher yield and greater net returns. Results from the Benchmark study specifically in North Carolina with continuous cotton and continuous soybean demonstrates that increasing the frequency of PRE applications often translates into higher crop yield and that even though herbicide cost increases, benefits of increased yield most likely will be reflected in higher economic return. The increase in yield with the more intensive herbicide program is most likely associated with minimizing weed interference early in the season during the critical weed-free period for these crops in addition to minimizing weed interference later in the season. Increasing the diversity of herbicide MOA is essential in managing herbicide resistance, and PRE herbicides used in these crops often provide a potential alternative MOA compared with traditional POST programs that have been in place for many years and whose repeated use has led to development of herbicide-resistant weed biotypes.

CONFIRMATION OF ALS-RESISTANT CHEAT IN OKLAHOMA. **Jon-Joseph Armstrong*, Oklahoma State University, Stillwater.**

ABSTRACT

Cheat (*Bromus secalinus*) is a winter annual grass weed commonly found in winter wheat fields in Oklahoma and throughout the Great Plains region. During the 2009 and 2010 growing seasons, several producers reported cases of unsatisfactory control of cheat with applications of propoxycarbazone, an ALS-inhibiting herbicide. ALS-inhibiting herbicides had been used extensively in these fields for several years, indicating that herbicide-resistance may be responsible for the poor weed control. Seed samples were collected from four fields and grown in the greenhouse to test for resistance to multiple ALS-inhibiting herbicides. A cheat sample with known susceptibility to ALS-inhibiting herbicides was also evaluated. Propoxycarbazone, pyroxsulam, and sulfosulfuron were applied at rates corresponding to one, two, and eight times the standard labeled rates. Imazamox was also applied at the standard labeled rate. At three weeks after treatment, all of the herbicides provided at least 77% control of the susceptible cheat sample. However, control of the suspected-resistant samples was less than 55% for propoxycarbazone, pyroxsulam, and sulfosulfuron even when applied at rates equivalent to eight times the standard labeled rate. Imazamox applied at the standard labeled rate provided the greatest level of control among all treatments for three of the four suspected-resistant samples; however, none of the resistant samples were fully controlled. Results from this trial confirm the presence of cheat in Oklahoma with resistance to multiple ALS-inhibiting herbicides.

ECONOMIC EVALUATION OF HERBICIDE SELECTION AND APPLICATION TIMING IN ROUNDUP READY FLEX AND LIBERTY LINK COTTON ROTATIONS. **G. M. Griffith*, J. K. Norsworthy, University of Arkansas, Fayetteville; and T. Griffin, University of Arkansas, Little Rock.**

ABSTRACT

Historically, cotton has been produced under intensive-tillage monoculture system and was among the most erosive row crops in the Southern United States. A shift to conservation tillage systems in the Midsouth in the mid 1990s was facilitated by the introduction of glyphosate-resistant crops and the ability to use a total postemergence (POST) herbicide program consisting of glyphosate applied alone. Reduced tillage practices and use of a single mode of action (MOA) has led to the evolution of multiple glyphosate-resistant species. Managing herbicide resistance is now a focal point of many weed scientists around the world. Effective weed control programs need to alleviate the intense selection pressures associated with using a single MOA and also provide acceptable control of glyphosate-resistant species. Technologies such as the Liberty Link® (LL) cotton system are being used along with different herbicide rotations to help manage glyphosate-resistant species and enhance agricultural sustainability. Incorporating a residual herbicide in a cotton weed control program applied either preemergence (PRE), POST, or post-directed (PD), may broaden the weed spectrum and provide extended weed control. Rotating Roundup Ready Flex® (RRF) and LL cotton systems allow producers to alleviate selection pressures associated with applying a single MOA. The adoption rate of these management strategies prior to an "instance" of local resistance evolution has been inconsistent. It is hypothesized that convenience and economic feasibility of incorporating such strategies are of concern to the producer. The overall objective of this study was to evaluate the economic returns and "breakeven" price ratios of herbicide, seed, and technology costs associated with herbicide programs in LL and RRF cotton rotations over a 3-yr period. Research was conducted in a 15-acre cotton field at the Northeast Research and Extension Center at Keiser, AR, in 2007, 2008, and 2009. The experimental design was a split-plot with cotton rotation as the main plot and herbicide program as the sub-plot. There were four 3-year cotton rotations: (1) LL-LL-LL, (2) LL-RR-LL, (3) RR-RR-RR, and (4) RR-LL-RR. Each year, either ST 4554 B2/RRF or Fibermax 1735 B2/LL was planted. The three herbicide programs were: (1) a total POST with no residual herbicides (P-P-P) consisting of either glufosinate at 0.53 lb ai/A or glyphosate at 0.78 lb ae/A (1X rate of each) applied to 1- to 3-lf cotton, followed by (fb) 5- to 6-lf cotton, fb ≥10-lf cotton at LAYBY, (2) a residual PRE (R-P-P) of S-metolachlor at 1.25 lb ai/A + fluometuron at 2.0 lb ai/A, fb either glufosinate or glyphosate at the 1X rate at 5- to 6-lf cotton, fb ≥10-lf cotton at LAYBY, (3) a residual PRE + LAYBY (R-P-R) consisting of S-metolachlor + fluometuron PRE, fb either glufosinate or glyphosate POST at the 1X rate at 5- to 6-lf cotton, fb a residual of flumioxazin at 0.063 lb ai/A + MSMA at 2.0 lb ai/A at ≥10-lf cotton at LAYBY. All cotton was maintained in a manner similar to Arkansas producers and irrigated as needed during the growing season. Enterprise budgets were created using Mississippi State Budget Generator v6.0. Input prices used to generate 2009 Crop Production Budgets for Farm Planning by the University of Arkansas' Division of Agriculture were selected for this study to reflect current input prices. Expected lint yields from each of the 12 systems were converted to gross revenue and adjusted for input and fixed costs to calculate returns above variable and fixed costs. Sensitivity analysis of herbicide, seed, and technology costs were conducted to determine breakeven price ratios with which the producer would be indifferent between two systems.

EFFECT OF LOW RATES OF IMAZOSULFURON AND HALOSULFURON ON SOYBEAN. **S. S. Rana*, J. K. Norsworthy, D. B. Johnson, G. Griffith, S. Bangarwa, University of Arkansas, Fayetteville; and R. C. Scott, University of Arkansas, Little Rock.**

ABSTRACT

In the southern U.S., soybean is prone to drift of rice herbicides since the two crops are grown in close proximity. Therefore, field trials were conducted to determine the sensitivity of non-sulfonylurea-tolerant (non-STS) (cv. AG 4703) and sulfonylurea-tolerant (STS) (cv. DK 4866) soybean cultivars to imazosulfuron and halosulfuron. Imazosulfuron is a new herbicide from Valent U.S.A that is to be registered for rice in 2011. Soybean was treated at VC and V6 growth stages with 1/4, 1/8, 1/16, 1/32, 1/64, 1/128, and 1/256X the anticipated labeled rate of imazosulfuron (0.3 lb ai/A) and the labeled rate of halosulfuron (0.047 lb ai/A). Imazosulfuron and halosulfuron did not cause significant injury to STS soybean, but non-STS soybean was injured regardless of herbicide or application timing. Injury to non-STS soybean plants from imazosulfuron and halosulfuron was in the form of stunting and purple veins. One to two weeks after treatment (WAT) of non-STS soybean, imazosulfuron at 0.075 lb/A (1/4X rate) caused 85 and 80% injury when applied at the VC and V6 growth stages, respectively. A comparable rate of halosulfuron (1/4X rate) applied at the same growth stages caused 73% and 54% injury, respectively. Over time, non-STS soybean recovered from injury symptoms caused by both herbicides. Injury from the 1/4X rates of halosulfuron and imazosulfuron applied at the VC and V6 growth stages of non-STS soybean was less than 3 and 14%, respectively, at 13 WAT. Height reduction from the two herbicides applied at the VC growth stage did not differ significantly at any rate. Soybean height was reduced more by imazosulfuron than halosulfuron applied at the V6 growth stage at the 1/8 and 1/4X rates. Height of plants treated with imazosulfuron was reduced more than nontreated plants at the 1/16, 1/8, and 1/4X rates applied at the VC growth stage and at 1/32, 1/16, 1/8, and 1/4X rates applied at the V6 growth stage. Yields didn't differ among halosulfuron and imazosulfuron treatments at either application timings. Producers growing soybean near rice would have less risk of injury if they plant STS-soybeans. Non-STS soybean can be severely injured with 1/4X rates of either imazosulfuron and halosulfuron, although this research shows evidence that non-STS soybean can overcome fairly severe injury with time.

RICE TOLERANCE TO PREFLOOD APPLICATIONS OF GRASP XTRA. **Jason A. Bond* and Timothy W. Walker; Mississippi State University Delta Research and Extension Center, Stoneville.**

ABSTRACT

Grasp Xtra is a premix containing an 8.2:1 ratio of Grandstand R (triclopyr) and Grasp (penoxsulam). Field observations in 2009 suggested that Clearfield ® (CL; imidazolinone-tolerant) rice cultivars were more tolerant to applications of Grasp Xtra than non-CL cultivars. With the continued introduction of new rice cultivars to the market, an inconsistent herbicide response could become problematic for producers. Research was initiated at the Mississippi State University Delta Research and Extension Center in Stoneville in 2010 to evaluate the tolerance of five CL and non-CL rice cultivars to Grasp Xtra applied at one and two times the labeled application rate. Treatments were arranged as a two-factor factorial within a randomized complete block experimental design with four replications. A long grain CL cultivar 'CL151', medium-grain CL cultivar 'CL261', long-grain CL hybrid 'CLXL729', non-CL long-grain cultivar 'Cocodrie', and non-CL medium-grain cultivar 'Neptune' were drill-seeded on April 29, 2010, at recommended seeding rates. Treatments included Grasp Xtra at 0.3 and 0.6 lb ai/A applied three days prior to flooding. All Grasp Xtra applications included methylated seed oil at 1.67% v/v. A control which received no Grasp Xtra treatment was included for each cultivar. Chlorosis, stunting, and root injury were visually estimated on a scale of 0 to 100% (0 = no injury and 100 = total plant death) at 14 and 28 d after treatment (DAT) by comparing treated plots with control plots for the respective cultivar in the same replication. Additionally, Greenseeker® was used to measure red-NDVI 28 d after application as an objective measurement of rice injury. Rough rice yields were adjusted to 12% moisture content. NDVI and rough rice yield data were converted to a percent of the control for the respective cultivar in each replication by dividing data from the treated plot by that in the control plot and multiplying by 100. Data were subjected to ANOVA with means separated by Fisher's Protected LSD test at $P \leq 0.05$. Chlorosis 14 and 28 DAT was similar for all cultivars, and no chlorosis was detected 28 DAT. By 28 DAT, only CL151 and Cocodrie exhibited greater stunting following Grasp Xtra at 0.6 compared with 0.3 lb/A. For both rates of Grasp Xtra, long- and medium-grain CL cultivars were stunted less than long- and medium-grain non-CL cultivars 14 DAT. Although stunting was similar for medium-grain CL and non-CL cultivars 28 DAT, it was higher for long-grain non-CL cultivars than CL cultivars. Root injury 14 DAT was similar following both rates of Grasp Xtra for all cultivars except CLXL729, which was injured more by the higher rate. At 28 DAT, only Neptune was injured more by Grasp Xtra at 0.6 lb/A. Medium-grain CL and non-CL cultivars exhibited similar root injury 14 and 28 DAT. Pooled across rice cultivar, NDVI expressed as a percent of control for each cultivar was higher following Grasp Xtra at 0.3 lb/A compared with Grasp Xtra at 0.6 lb/A. This indicates that the higher rate of Grasp Xtra was more injurious than the lower rate. Pooled across Grasp Xtra rates, no differences in NDVI were detected among CL rice cultivars. Furthermore, NDVI was greater for long- and medium-grain CL cultivars than non-CL cultivars. Rough rice yields were not impacted by Grasp Xtra rate. Pooled across Grasp Xtra rates, rough rice yields were reduced for CL151 and Neptune. Rough rice yield of Neptune was impacted more by Grasp Xtra than CL261. Severe reductions in root mass may occur from Grasp Xtra, particularly when soil pH is high. This could complicate rice management by delaying flood or compounding difficulties with rice water weevil. Although root injury ranged from 35 to 71% 14 DAT, most cultivars were able to overcome the injury and still produce excellent yields. Differences in tolerance to applications of Grasp Xtra were detected among non-CL cultivars as well as CL cultivars. Stunting, root injury, and NDVI data indicated that long-grain CL cultivars were more tolerant to Grasp Xtra than Cocodrie. However, Cocodrie rough rice yield was not impacted by Grasp Xtra. Furthermore, no differences were detected for stunting (28 DAT) or root injury (14 and 28 DAT) between CL261 and Neptune, but rough rice yield of Neptune was reduced 11% compared with the control.

PALMER AMERANTH CONTROL IN KENTUCKY CONDITIONS. **B. P. Patton, M. Barrett, W. W. Witt; University of Kentucky, Lexington.**

ABSTRACT

Palmer amaranth (*Amaranthus palmeri*) is a new weed problem in Kentucky and one for which we have no state-based control information. We conducted a study to examine a number of herbicide programs for its management in soybean. The experimental site chosen was suspected of having a glyphosate-resistant Palmer amaranth population. We compared preemergence herbicides alone, single applications of postemergence herbicides, multiple applications of postemergence herbicides, and combinations of preemergence and postemergence herbicides for managing this weed. Our results show that a preemergent herbicide was a foundation for excellent Palmer amaranth control. Although, it should be noted that there was essentially no rainfall from shortly after the preemergent treatments were applied until late in the season. While there was rainfall to activate the soil-residual herbicides, Palmer amaranth germination and soil herbicide degradation throughout the season may have been reduced under these conditions. Among the single active ingredients applied preemergence, sulfentrazone or flumioxazin gave the best control. Spartan (0.396 lb/A sulfentrazone) provided better control than Authority First (0.18 lb/A sulfentrazone plus cloransulam). And, while metribuzin alone gave only 67% control, the combination of metribuzin with 0.25 lb/A sulfentrazone (Authority MTZ) resulted in 90% control. Comparing single postemergence applications, only Ignite (glufosinate) provided control (88-97%) on a par with the preemergence treatments. Adding a second postemergent application of Flexstar (fomesafen) increased Palmer amaranth control from 67% with a single application to 88%. A third Flexstar postemergence application provided 93% control. Combinations of a preemergence herbicide followed by a soil active herbicide applied over the soybean canopy 2 or 4 weeks after planting (WAP) consistently increased control over post applications alone at the 2 or 4 WAP timings. Metribuzin followed by metolachlor 4 WAP, metolachlor followed by fomesafen 2 WAP, and metolachlor followed by fomesafen 4 or 6 WAP resulted in 93, 98, and 95% control, respectively. While the Palmer amaranth in the field was reported to be glyphosate resistant, multiple glyphosate applications controlled 77% of the weed population. However, the remaining Palmer amaranth resulted in a population sufficient enough to reduce soybean yield. There may be multiple herbicide programs that can give effective Palmer amaranth control; most will include multiple herbicides and/or multiple herbicide applications. This study will need to be repeated to determine the consistency of these results.

EFFECTS OF CROP DENSITY ON YIELD AND WEED POPULATIONS IN GEORGIA GROWN CORN . **Brian T. Scully and Theodore M. Webster; USDA-ARS, Tifton, GA.**

ABSTRACT

Over the last twenty years much of the US corn production has primarily been grown on 92 cm and 76 cm row spacing. With the increased use of hybrids with upright leaf architecture, herbicide and insect resistance there is sufficient flexibility in the cropping system to warrant examination of “Narrow-Row” production. The purpose of this research was to determine if narrow row corn production conveyed any yield advantage on the U.S. southeastern Coastal Plain, and to asses any changes in weed cover under different plant configurations. Two corn hybrids including Dekalb ‘DK69-43’ and Pioneer ‘P31G97’ were grown for two years (2009 and 2010) on the Coastal Plain of southern Georgia. Experiments were designed as an augmented randomized complete block with a treatment structure that used three population densities (47,880, 71,750, and 143,500 plants/ha) and two contrasting configurations within each population density, including: 1) 92 X 23 cm *vs* 46 X 46 cm; 2) 92 X 15 cm *vs* 46 X 30 cm; and 3) 92 X 8 cm *vs* 46 X 15 cm. Averaged over two years, corn yields on the 46 cm narrow row configurations were 5.6%, 14.5% and 17.7% higher than 92 cm standard row spacing across the three planting densities. This yield increase for the Coastal Plain is considerable higher than the 2.0% to 4.0% increases acquired in the Midwest Corn Belt or the 8.0 to 10.0% yield increases obtained in Michigan and Minnesota. Weed ground cover was also influenced by all main effects including corn population density, row spacing, and hybrid. Higher population densities reduced weed cover significantly as did the 46 cm narrow row configuration, which closed canopy sooner than the standard 92 cm row spacing. Between the two hybrids, weed cover was significantly reduced under the canopy of P31G97 as compared to DK69-43

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OBSERVATIONS CONCERNING HERBICIDE RESISTANT WEEDS IN KENTUCKY. **James R. Martin*, University of Kentucky, Princeton; Jonathan D. Green and William W. Witt, University of Kentucky, Lexington.**

ABSTRACT

Seven weedy biotypes have been confirmed with herbicide resistance in Kentucky compared with ten to 18 biotypes reported in neighboring states. The species, type of resistance, and year of confirmation in Kentucky are as follows: 1) horseweed (*Conyza Canadensis*) EPSP, 2002; 2) Italian ryegrass (*Lolium multiflorum*), ACCase, 2004; 3) johnsongrass (*Sorghum halepense*), ACCase, 1991; 4) johnsongrass, ALS, 2006; 5) smooth pigweed (*Amaranthus hybridus*), Photosystem II, 1987; 6) smooth pigweed, ALS, 1992; and 7) smooth pigweed, multiple resistance of Photosystem II plus ALS, 2000. There is mounting concern among Kentucky growers about glyphosate resistant issues. Problems with glyphosate-resistant corn are increasing either as volunteer plants or as unwanted stands in replanting situations. Other weeds suspected of resistance to glyphosate but not confirmed in Kentucky are common ragweed (*Ambrosia artemisiifolia*), waterhemp (*Amaranthus*) spp., and palmer amaranth (*Amaranthus palmeri*). One reason Kentucky has fewer documented cases of herbicide resistance is related to the rotation system often used in grain crops. A common rotation in Kentucky involves three crops over a period of two years. Corn is planted in the spring of the first year followed by fall planted wheat. Soybeans are planted the second year in early to mid June after wheat harvest. This rotation accounts for approximately 27% of soybean acres, 33% of corn acres, and nearly 75% of wheat acres in KY. Most of the remaining corn and soybean acres are grown in rotation with one another, while the remaining wheat acres are grown as a cover crop after tobacco or used for silage or hay in rotation to corn. Although the three-crop rotation system does not prevent development of herbicide resistance, it helps by contributing to overall weed management. For example, the use of either a spring burndown herbicide treatment or preplant tillage in corn breaks the life cycle of such cool-season annual weeds as common chickweed (*Stellaria media*), henbit (*Lamium amplexicaule*), purple deadnettle (*Lamium purpureum*), or Italian ryegrass before they mature. A competitive wheat stand prevents or delays emergence of such annual weeds as common ragweed and horseweed. In addition to glyphosate, other herbicide chemistries, such as atrazine in corn and thifensufuron in wheat, are used in the two-year rotation. These herbicides may limit development of certain weeds that can overlap in the transition between crops.

MANAGEMENT PROGRAMS FOR GLYPHOSATE-RESISTANT PALMER AMARANTH (*AMARANTHUS PALMERI*) IN COTTON. **J.G. Stokes* and M.W. Marshall; Clemson University, Blackville.**

ABSTRACT

Palmer amaranth, characterized by its rapid growth, high reproductive capabilities, and tolerance to drought, is a major weed in cotton fields in Southern US. The efficiency of traditional control options of this weed has declined due to development of resistance to glyphosate- and ALS-herbicides. The objectives of our studies were to optimize various preemergence and postemergence herbicide programs for the management of glyphosate-resistant Palmer amaranth. In addition, the length of residual Palmer amaranth control provided by various soil applied herbicides was characterized. Phytogen Widestrike 375RR Flex cotton was seeded at 2 different locations- Clemson University Edisto Research and Education Center (EREC) located near Blackville, SC, and at Pee Dee Research and Education Center (PDREC) located near Florence, SC. Experimental design consisted of a randomized complete block with individual plot sizes of 12.7 by 40 ft. Each plot was replicated four times. Preemergence (PRE) herbicides were applied at time of planting and postemergence (EPOST) herbicides were applied three weeks after planting at a carrier volume of 15 GPA. Preemergence treatments include Staple (2.1 oz/A), Prowl H2O (2.0 pt/A), Reflex (1.0 pt/A), Direx (1.0 pt/A), Cotoran (1.0 qt/A). Postmemergence treatments include Dual Magnum (1.0 pt/A), Roundup PowerMAX (22 oz/A), Ignite (29 oz/A), Staple (2.5 oz/A). Palmer amaranth visual control ratings were collected 14 and 28 days after treatment (DAT) on a 0 to 100% scale with 0 indicating no control and 100% equal to complete control. Cotton injury ratings and weed control data were analyzed using ANOVA and means separated at the P = 0.05 level. Preemergence control of Palmer amaranth declined across all treatments over time, particularly at PDREC where soil seedbank populations were higher. Reflex PRE plus combination(s) of Staple, Direx, or Prowl H2O PRE obtained the highest level of control of Palmer amaranth at both locations. Direx PRE provided similar levels of control as Reflex PRE when tank mixed with Prowl and Staple PRE. Direx PRE could serve as a rotational herbicide with Reflex PRE. Staple EPOST provided excellent control of Palmer amaranth. In this study, few differences were observed in Palmer amaranth control achieved in each preemergence program. Most treatments provided 95% control through the first rating and 90% control through the second rating. These studies emphasized the importance of a foundation preemergence herbicide in a grower's herbicide program. All treatments had little or no negative impact on the cotton yield. This data underscores the importance of preemergence followed by postemergence plus soil residual herbicide program in managing herbicide resistant Palmer amaranth.

CONFIRMATION OF MULTIPLE HERBICIDE RESISTANT PALMER AMARANTH (*AMARANTHUS PALMERI*) BIOTYPES IN SOUTH CAROLINA. **J.G. Stokes and M.W. Marshall*, Clemson University, Blackville.**

ABSTRACT

Herbicide resistant Palmer amaranth has remained as one of the most troublesome concerns in cotton production in South Carolina. A survey of the distribution of ALS- and glyphosate-resistant Palmer amaranth in South Carolina was initiated in 2008 and continued in 2010. County extension agents collected seed from suspected grower fields in fall of 2008. Seedheads from each location were composited, dried, and cleaned. Palmer amaranth seed was planted in the greenhouse and grown to the 4-leaf stage. At the 4-leaf stage, plants were sprayed with glyphosate at 0, 22, and 44 oz/A, and thifensulfuron at 0, 0.33, and 0.66 oz/A. At 21 days after treatment, plants were visually scored (YES = plant survival or resistance; NO = plant death or susceptibility) to determine activity of glyphosate and thifensulfuron. In the dose response study, three biotype populations were planted in the greenhouse in 10 by 10 cm pots. At the 4-leaf growth stage, plants were sprayed with following rates of glyphosate: 0, 0.25, 0.5, 1, 5, 10, and 50 X where X equals 0.75 lb ae/A rate. Separately, plants were also treated with thifensulfuron at 0, 0.25, 0.5, 1, 10, 50, 100, and 1000X where X equals 0.33 oz/A. Significant number of survey sites (20 counties surveyed to date have resistance to one or both herbicide families) was confirmed to have both ALS- and glyphosate-resistance (27 out of 35 fields sampled). In the dose-response study, all three biotypes exhibited some levels of glyphosate resistance in the 1X to 5X rate range. At rates above 5X, the three biotypes did not exhibit high levels of glyphosate-resistance. A growth reduction starting at 2X was observed in all three biotypes. In contrast to glyphosate study, all three biotypes exhibited high levels of resistance to thifensulfuron (up to 10X rate). Between 10X and 50X, Palmer amaranth dry matter accumulation was inhibited by thifensulfuron. In conclusion, ALS- and glyphosate-resistance continues to spread across the major crop producing areas of South Carolina. Several indirect reports in 2010 indicate that glyphosate-resistance is now spreading across the piedmont region (upstate) of South Carolina. According to greenhouse testing, Palmer amaranth biotypes contained high levels of ALS-resistance and moderate levels of glyphosate-resistance. More testing is needed between the 1X and 5X rates of glyphosate on these biotypes.

HERBICIDE PROGRAMS FOR OPTIMUM® GAT® SOYBEANS IN THE SOUTHERN STATES .
Michael T. Edwards*, Richard M. Edmund, and David W. Saunders, DuPont Crop Protection, Pierre Part, LA.

ABSTRACT

Weed control programs designed for use on soybeans containing the Optimum® GAT® trait were evaluated by DuPont, university, and contract investigators in 2009 and 2010. Integrated herbicide programs making use of preemergence, postemergence, and 2-pass weed control strategies were compared to standard treatments Data collected from 22 internal DuPont locations in 2009 and 13 locations in 2010 indicate excellent performance of new DuPont™ Diligent™, Traverse™, and Freestyle™ herbicides when compared to standard treatments. Seed products with the Optimum® GAT® trait will be available for sale pending regulatory approvals and field testing. New DuPont herbicides for the Optimum® GAT® trait are developmental products for which labels have not yet been filed with the EPA.

RYEGRASS CONTROL IN NORTHEAST TEXAS WHEAT. **Curtis A. Jones*, Texas A&M University, Commerce; James S. Swart, Texas AgriLife Extension; Amy D. Braley, Texas A&M University Commerce.**

ABSTRACT

Annual ryegrass (*Lolium multiflorum*) is the most damaging weed in winter wheat in the Northern Texas Blacklands. The objective of this experiment was to evaluate the efficacy of herbicide programs for control of annual ryegrass in winter wheat. On April 1, all herbicide treatments were better than the untreated check. Axiom at 8 oz followed by (fb) Hoelon or Osprey and Axial XL + Amber provided 92% control of ryegrass were significantly better than Axiom at 8 oz., Hoelon, Osprey, Olympus Flex, Amber which provided less than 72% control. Axiom at 8 oz. provided 72% ryegrass control was better than Osprey, Olympus Flex, and Amber providing less than 55% control. The final ryegrass control rating on June 8, all herbicide treatments were better than the untreated check. Axiom at 8 oz fb Hoelon, Olympus Flex, or Osprey, Axiom at 10 oz., Axial + Amber, Axial, and Amber fb Axial provided at least 88% control of ryegrass were superior to Hoelon, Osprey, Olympus Flex, and Amber which provided less than 70 % control. Hoelon a 43 oz/A was significantly better than Hoelon at 32oz (69% vs 50%). Yields followed the same trends as weed control ratings. Wheat treated with Axial XL + Amber and Axiom fb Hoelon yielded at least 61 bu/A than wheat treated with Hoelon, Osprey, Olympus Flex and Amber which yielded less than 45 bu/A. All herbicide treatments produced significantly more grain than the untreated plots (19 bu/A). Bushel weight differences followed the same trends as yield.

GLYPHOSATE-RESISTANT WATERHEMP IN MISSISSIPPI. V.K. Nandula, C.H.Koger, J.A. Bond, T.W. Eubank, R.C.Bond*, Mississippi State University, Stoneville; and K.N. Reddy, USDA-ARS, Stoneville, MS.

ABSTRACT

A waterhemp population in a glyphosate-resistant soybean field located in southern Washington County, Missisippi was suspected to be resistant to glyphosate. Seed from this population was collected in the summer of 2008 and 10-cm tall plants screened with glyphosate at 0.84 kg ae/ha. Plants that survived 3 wk after treatment (WAT) were allowed to randomly cross with each other to produce the second generation seed. Preliminary screening experiments indicated that the second generation plants survived a glyphosate treatment of 0.84 kg/ha. Dose response experiments were conducted on 5- to 8-cm tall waterhemp plants by treating with glyphosate at 0, 0.21, 0.42, 0.84, 1.68, and 3.36 kg/ha. Percent control ratings were recorded 3 WAT. A susceptible population was included for comparison. GR_{50} (glyphosate dose required to cause a 50% reduction in growth of treated plants) values of the resistant (R) and susceptible (S) populations were 1.28 and 0.28 kg/ha glyphosate indicating a five-fold level resistance in the R population compared to the S population. The S population accumulated more shikimate than the R population, measured via a leaf-disc assay. Among several non-glyphosate herbicide chemistries evaluated for efficacy on the R population, only 2,4-D and mesotrione provided more than 90% control 3 WAT.

HERBICIDE CONTROL OPTIONS FOR FAILED STANDS OF CORN (*ZEA MAYS*) AND SOYBEAN (*GLYCINE MAX*). **R.C. Storey*, D.B. Reynolds, J.T. Irby, and C.L. Smith; Mississippi State University, Mississippi State .**

ABSTRACT

Herbicide tolerant crop acreage has steadily increased since 2000. During that time interval, there have been situations where growers have had failed crop stands such as in 2007 when many hectares of corn were destroyed across the mid-south due to an early season freeze. Prior to the use of herbicide tolerant crops, producers would typically apply glyphosate to control the failed crop stands; however, with glyphosate tolerant crops, that is no longer an option. The two options now are tillage or finding the correct alternate herbicide mixture to control the failed crop stands. Tillage could be costly due to tillage operations as well as delaying planting dates. Spraying may be the most economical option. Therefore finding the best herbicide mixture to control these failed crop stands is necessary. Paraquat and glufosinate applied alone or applied with tank mixing partners are two herbicide options that could be used to control these failed crop stands. Two experiments were conducted in 2010 at the Blackbelt Experiment Station in Brooksville, MS. The soil consists of a silty clay loam. The corn variety planted was Dekalb DKC 67-23 RR planted at a low rate of 69,190 seeds/ha to achieve a failed corn stand. The soybean variety planted was Pioneer 95Y70 RR/STS planted at a low rate of 284,171 seeds/ha to achieve a failed soybean stand. The two experiments were arranged as randomized complete block designs with each treatment being replicated four times. Treatments evaluated for the control of failed corn stands included paraquat (Gramoxone Inteon) at 0.70 kg ai/ha, paraquat + atrazine (Aatrex 4L) at 0.56 kg ai/ha, paraquat + diuron (Direx 4L) at 0.56 kg ai/ha, paraquat + metribuzin (Sencor 4F) at 0.14 kg ai/ha, paraquat + linuron (Linex 4L) at 0.56 kg ai/ha, and paraquat + simazine (Princep 4L) at 0.56 kg ai/ha. All paraquat rates were the same for each tank-mix treatment at 0.70 kg ai/ha. Glufosinate treatments consisted of glufosinate (Ignite 280 SL) at 0.70 kg ai/ha along with the same tank mix partners and rates as the paraquat treatments. Treatments evaluated for the control of failed soybean stands include paraquat at 0.70 kg ai/ha, paraquat + sulfentrazone + metribuzin at 0.126 + 0.189 kg ai/ ha (Authority MTZ), paraquat + suflufenacil (Sharpen) at 0.037 kg ai/ha, paraquat + S-metolachlor + fomesafen at 1.22 + 0.24 kg ai/ha (Prefix), paraquat + S-metolachlor 1.42 kg ai/ha (Dual Magnum), and paraquat + lactofen at 0.14 kg ai/ha (Cobra). All paraquat rates were the same for each treatment at 0.70 kg ai/ha. Glufosinate (Ignite 280 SL) treatments consisted of glufosinate at 0.59 kg ai/ha, glufosinate + sulfentrazone + metribuzin at 0.126 + 0.189 kg ai/ ha (Authority MTZ), glufosinate + suflufenacil (Sharpen) at 0.037 kg ai/ha, glufosinate + S-metolachlor + fomesafen at 1.22 + 0.24 kg ai/ha (Prefix), glufosinate + S-metolachlor at 1.42 kg ai/ha (Dual Magnum), glufosinate + lactofen at 0.14 kg ai/ha (Cobra). All glufosinate rates were the same for each treatment at 0.59 kg ai/ha. Applications were made using a covered boom system at a delivery volume of 140 L/ha. Visual ratings were taken 7, 14, and 28 days after application. Acceptable control was achieved in both corn and soybean experiments. Paraquat + metribuzin provided the best control at 7 and 14 days after the application for the corn experiment at 79 and 97%. In the soybean experiment, glufosinate + lactofen exhibited the best control of 96 and 97%, 7 and 14 days after the application. Both experiments show that optimum control can be achieved with the right herbicide tank mixture.

WEED CONTROL AND PEANUT RESPONSE TO POST APPLIED PYROXASULFONE. **Rand M. Merchant* and Eric P. Prostko; The University of Georgia, Tifton.**

ABSTRACT

Pyroxasulfone is a new, broad-spectrum, residual herbicide being developed for use in field corn, soybean, and wheat. Weed species particularly susceptible to pyroxasulfone include Palmer amaranth (*Amaranthus palmeri*) and Texas millet (*Urochloa texana*). These are two of the most common and troublesome weeds in peanut (*Arachis hypogaea*). The objective of this research was to evaluate weed control and peanut tolerance to POST applied pyroxasulfone. Three field trials were conducted at the University of Georgia Ponder Research Farm near Tifton, GA in 2010. In Trial 1, pyroxasulfone at 240 or 480 g ai/ha was tank-mixed with Gramoxone Inteon (paraquat) + Storm (acifluorfen + bentazon) and/or Cadre (imazapic) under weedy conditions. A NIS (80/20) at 0.25% v/v was included with all Gramoxone treatments and COC (Primary) at 1% v/v was included with all Cadre treatments. In Trial 2, pyroxasulfone at 240 or 480 g ai/ha was applied at 9, 30, 60, and 90 days after planting (DAP) under weed-free conditions. A NIS (80/20) at 0.25% v/v was included with all treatments. In Trial 3, pyroxasulfone at 240 g ai/ha was applied 22 DAP in combination with either Gramoxone Inteon, Gramoxone Inteon + Basagran (bentazon), Gramoxone Inteon + Storm, Cadre, or Cobra (lactofen) under weed-free conditions. A NIS (80/20) at 0.25% v/v was included with all treatments. In each trial, a randomized complete block design with three replications per treatment was used. Herbicides were applied with a CO_2-powered backpack sprayer calibrated to deliver 15 GPA using 11002DG nozzle tips. Data were subjected to ANOVA and means separated by Fisher's Protected LSD Test (P= 0.10) when appropriate. In Trial 1, a single application of pyroxasulfone in combination with Gramoxone Inteon + Storm and/or Cadre did not provide season-long control of weeds, especially Palmer amaranth. However, sequential applications of pyroxasulfone with Gramoxone Inteon + Storm followed by Cadre provided > 90% weed control. In Trial 2, pyroxasulfone caused significant peanut injury when applied at 9 DAP. Injury was greater at the 480 g ai/ha rate. However, yields were not reduced by any timing or rate of pyroxasulfone. In Trial 3, when averaged over tank-mix partners, pyroxasulfone caused a significant increase in peanut injury (+8%) at 6 days after treatment (DAT). However by 29 DAT, pyroxasulfone had no effect on peanut injury. Peanut yields were not reduced by pyroxasulfone rate or tank-mix partner.

TEMPERATURE EFFECTS ON PERENNIAL RYEGRASS AND ANNUAL BLUEGRASS RESPONSE TO AMICARBAZONE. **D.H. Perry*, J.S. McElroy, R.H. Walker; Auburn University, Auburn.**

ABSTRACT

Amicarbazone is a new herbicide being labeled for annual bluegrass (*Poa annua*) control in creeping bentgrass (*Agrostis stolonifera*) and perennial ryegrass (*Lolium perenne*). The objective of this research was to evaluate the effects of temperature and amicarbazone on the visual and physiological characteristics of perennial ryegrass and annual bluegrass. A growth chamber study was conducted at the Auburn University Plant Science Research Center in Auburn, Alabama. 'Goalkeeper' perennial ryegrass was seeded at 896 kg/ha and annual bluegrass was seeded at 45 kg/ha into 10 cm^2 plastic pots. The soil medium was 90:10 (v/v) Wickham sandy loam : Fafard potting mix (pH – 6.0). Pots were watered daily until both species were established at which time pots were watered as necessary to prevent wilting. Plants were fertilized once per week with Miracle-Grow® (24-8-16) and mown at 2.5 cm until treatments were initiated. Plants were grown for eight weeks under greenhouse conditions and acclimated in their respective growth chambers for one week prior to treatment. One growth chamber was programmed for 14/4˚C day/night conditions while the other was programmed for 24/12˚C day/night conditions. Both growth chambers emitted 500 µmol/m^2/s for 12 h per day. Pots were organized in randomized complete blocks with four replications within each chamber. The study was analyzed as a factorial with five treatments across two temperatures and two turf species. Treatments included amicarbazone at 0, 0.13, 0.26, or 0.53 kg/ha and bispyribac-sodium at 0.07 kg/ha. A nonionic surfactant was added to herbicide treatments at 0.25% v/v. Herbicides were applied in an enclosed spray chamber at 280 L/ha with an 8002E nozzle. Visual injury was rated at 2 and 4 weeks after treatment (WAT) on a percentage scale (0-100%) where 0 equaled no injury and 100 equaled complete death of the turf. Photochemical yield (Φ_{PSII}) was measured utilizing a pulse-modulated chlorophyll fluorometer at 0, 24, 48, 72, 168, 336, 504, and 672 hours after application (HAA). Three Φ_{PSII} measurements were recorded for each pot by holding the light probe at approximately 45˚ directly above the turf canopy. The saturation pulse width and modulation intensity were set to 0.8 s and 6, respectively. Measurements were standardized relative to the nontreated. Clipping yields were collected at 2 and 4 WAT by removing all foliage 2.5 cm above the soil surface. Clippings were oven-dried at 62˚C for 72 h and weighed. Clipping data are presented as a percentage of the nontreated pots. Normality of data was confirmed using PROC GLIMMIX in SAS®. Data were subjected to ANOVA using PROC MIXED in SAS to investigate interactions between herbicide, temperature, and/or grass species. A significant herbicide rate by temperature and herbicide rate by turfgrass interaction was detected for Φ_{PSII} data. The 0.13 and 0.26 kg/ha rates of amicarbazone initially reduced Φ_{PSII} greater for annual bluegrass at 14/4˚C than 24/12˚C. Injury significantly increased with increasing herbicide rates as temperature increased from 14/4 to 24/12˚C. The 0.53 kg/ha amicarbazone rate injured annual bluegrass 35% at 24/12˚C with 76% perennial ryegrass injury at the same temperature 4 WAT. Clipping weights of annual bluegrass and perennial ryegrass decreased as amicarbazone rates increased for each temperature regime. Perennial ryegrass clipping weights were reduced greater than annual bluegrass clipping weights 2 and 4 WAT. Amicarbazone activity increased as temperature increased from 14/4 to 24/12˚C, regardless of grass species. Based on these results, temperature may have a significant impact on amicarbazone visual and physiological effects to annual bluegrass and perennial ryegrass.

***POA ANNUA* RESPONSE TO ZINC SULFATE AT THREE DIFFERENT PH LEVELS.** **C.L. Bristow*, J.S. McElroy, E.A. Guertal; Auburn University, Auburn.**

ABSTRACT

Poa annua L., annual bluegrass, is a problematic weed in turfgrass due to its clumping growth habit, prolific seedhead production, and unsightly color. With the increase of herbicide-resistant populations, additional control options beyond chemical control could benefit turfgrass managers. Research indicates that lowering soil pH can decrease *P. annua* germination. Other research in similar grass crops indicates that zinc is toxic to seedlings. The goal of this research was to determine the interactions between zinc and soil pH and their effects on annual bluegrass. Greenhouse studies were conducted at the Plant Science Research Center in Auburn, AL in 2010. Daytime and nighttime temperatures were approximately 20 and 24°C, respectively. *Poa annua* was grown from seed (50/pot) in pots containing a Marvyn loamy sand soil. The study was a three by five factorial randomized complete block design. There were three soil pH levels (6.8, 7.5, 7.7) and five zinc treatments (0, 34, 67, 101, 134 kg Zn/ha), replicated four times. Soil pH was adjusted using calcium hydroxide ($Ca(OH)_2$). Zinc sulfate heptahydrate ($ZnSO_4 \cdot 7H_2O$) was used as the zinc source. Seed and zinc were evenly broadcast over the soil surface. Germination cloth was placed over pots for the first week to maintain even surface moisture for germination. Total number of seedlings in each pot was accessed every 7 days for 28 days. Data were subjected to ANOVA. Means were separated using Fisher's protected LSD (P=0.05). All zinc treatments at a soil pH of 6.8 reduced *P. annua* seedling survival 28 days after treatment (DAT). Zinc applied at 67 kg/ha or less at pH 7.5 or 7.7 did not reduce seedling survival 28 DAT. Zinc applied at 101 and 134 kg/ha at pH 6.8 reduced seedling survival 50-59%. Seed germination decreased with increasing zinc levels at pH 6.8, when compared to the control. Injury symptoms at all pH levels included stunting and chlorosis, which first appeared in the leaf tips and moved towards the base of the plant. Results from this study indicate that *P. annua* toxicity to zinc decreases as soil pH increases. Data suggests that *P. annua* can be reduced by applying zinc at a soil pH of 6.8 and possibly lower. Greenhouse and field studies will be continued to further evaluate these findings.

EFFECTS OF NITROGEN AND *RHIZOBIUM* INOCULATION ON WHITE CLOVER CHARACTERISTICS AND CONTROL. **James D. McCurdy* and J. Scott McElroy; Auburn University, Auburn, AL.**

ABSTRACT

Understanding the effects of inoculation and nitrogen fertilization upon clover morphology may lead to a more integrated approach of controlling clover within turfgrass. An experiment was initiated April 5, 2010 at Auburn University in an environmentally controlled greenhouse. Temperatures were monitored and maintained between 25 and 32°C. The experiment was conducted as a completely random design with a two-by-six factorial treatment arrangement replicated four times. Factorial levels were seed treatment (inoculated vs. un-inoculated) by N-rate (0, 0.6, 1.2, 2.4, 4.8, and 9.6 g N m^{-2}) applied monthly as $CaNO_3$ for three months. Pots were simultaneously fertilized with a modified 6x, N free, Hoagland's solution, including minors, to prevent nutrient deficiencies.

Seeds of white clover were inoculated with a peat-based inoculant containing the clover specific *Rhizobium leguminosarum* biovar *trifolii*. Inoculant was applied dry directly to seeds according to specimen label. As a control, finely ground peat-moss was applied to un-inoculated seeds. Seeds (approximately 25) were sown into 90 cm^2, 700 cm^3 plastic pots containing a Wickham sandy loam soil (fine-loamy, siliceous, subactive, thermic Typic Hapludult). Soil for the study was excavated at 5 to 20 cm depth from a centipede grass (*Eremochloa ophiuroides*) site which had been fumigated with methyl bromide three years prior and had no recent (within three years) history of legume growth. Soil was screened to remove debris and was mixed thoroughly. One month after germination, clover seedlings were thinned to five per pot. Plants received overhead mist irrigation daily and supplemental irrigation as necessary. Plants were mown with a rotary mower (5.1 cm) on a bi-weekly basis until two weeks before final harvest.

Three months after the initial fertilization, foliar growth was harvested at soil level, and roots were gently shaken and washed free of soil. Nodules were removed for counting, and all root matter was dried to obtain dry weights (DW). Plant foliage was dried in a plant press, and leaf area was measured. Foliar DW, trifoliate leaf number, and the length of three randomly sub-sampled petioles were recorded. In addition foliar-, nodule-, and root-samples were analyzed for total Carbon (C) and N by dry combustion analysis. Data were analyzed using PROC Mixed within SAS. Data were normally distributed. Differences were determined by "Type 3 Tests of Fixed Effects," with *p*-value less than 0.05 indicating a significant effect.

Neither inoculation by N-rate interaction or inoculation main effect was observed. Only root DW differed due to N-rate, increasing from 250 to nearly 500 mg pot^{-1} as rate increased. Foliar DW as well as petiole length, leaf -area, -count, and -size were unaffected by N-rate. Percent C and N of roots, nodules, and foliage were similar to those reported within previous literature.

COMPETITIVE RESPONSE OF KHAKIWEED TO MOWING HEIGHT. **A.J. Hephner*, T. Cooper, L. Beck, J.B. Rotramel, and G.M. Henry; Texas Tech University, Lubbock.**

ABSTRACT

Khakiweed (*Alternanthera pungens* HBK.) is one of the most troublesome weed species in managed turfgrass, especially in the arid and semi-arid regions of the southern United States. Tolerance to salinity and soil compaction has led to the increased occurrence of khakiweed in home lawns, golf courses, and athletic fields. Currently, only two postemergence herbicides are labeled for the control of khakiweed in bermudagrass turf. Anecdotal evidence suggests that khakiweed pressure is often greater when managed at higher mowing heights (> 5.0 cm). Therefore, examination of the growth and spread of khakiweed under various mowing heights may provide clues to improved cultural control tactics. Field experiments were conducted at the Quaker Research Farm in Lubbock, TX during the summer of 2010 to observe the competitive response of khakiweed to different mowing heights. Cup cuttings (10.2 cm) of khakiweed were removed from naturally occurring populations located in the rough at Meadowbrook Golf Course in Lubbock, TX. Plugs were transplanted into bare ground on the trial site on June 14, 2010. Four cores were transplanted (18.3 cm apart) down the center of each plot measuring 1.5 x 3.0 m. Plants were arranged in a randomized complete block design with four replications. Cores were allowed to acclimate for two weeks to encourage rooting prior to the initiation of the trial. Mowing treatments were initiated on June 30, 2010. All treatments were mowed three times a week and consisted of three mowing regimes: 1.27, 2.54, and 5.08 cm. A non-mowed check was included for comparison. Plots maintained at 1.27 cm were mowed with a walk-behind reel mower, while plots maintained at 2.54 and 5.08 cm were mowed with a walk-behind rotary mower. Irrigation was supplied daily with an automated irrigation system to deliver 5.0 cm/week. Plant diameter measurements were recorded bi-monthly for the duration of the trial. Two diameter measurements were taken perpendicular to each other (the first measurement was taken in the largest diameter) and averaged to obtain the reported diameter of a plant at each sampling time. Data were subjected to analysis of variance (ANOVA) and means were separated using Fisher's Protected LSD at the 0.5 significance level. Regressions were used to explain the relationship of measured responses over time. Khakiweed plant diameters were similar (55.75 to 61.87 cm) 4 WAIT regardless of mowing height. Differences in plant diameter were more evident 12 WAIT. Non-mowed plants exhibited diameters of 80.8 cm 12 WAIT. Khakiweed plants maintained at 5.08 and 2.54 cm exhibited diameters of 71.73 and 66.7 cm, respectively; while plants maintained at 1.27 cm exhibited diameters of 57.74 cm 12 WAIT.

WEED PRESSURE IN RESPONSE TO MULCHING MEDIA DURING TURF ESTABLISHMENT. **T. Cooper*, A. Holbrook, T. Williams, A.J. Hephner, and G.M. Henry; Texas Tech University, Lubbock.**

ABSTRACT

Turfgrass establishment on the Texas High Plains is often compromised by enhanced desiccation from wind, high temperatures, and reduced water inputs. Application of mulching media (i.e. cotton gin trash, wheat straw, and hydro-mulch) at time of seeding may increase seed germination through buffering and insulation. However, cotton gin trash and other mulching media may increase weed competition due to the presence of crop or weed seed. Field experiments were conducted in 2008 to evaluate the effectiveness of Texas cotton stripper trash and industry standards (hydro-mulch and wheat straw) as mulching media for the establishment of bermudagrass (*Cynodon dactylon*) and buffalograss (*Buchloe dactyloides*). The site consisted of a Brownfield Sandy Clay Loam (loamy, mixed, superactive, thermic Arenic Aridic Paleustalfs) tilled to a depth of 10 cm and graded prior to seeding. A starter fertilizer (7 N - 7 P_2O_5 - 7 K_2O) at a rate of 48.5 kg N/ha was applied at seeding. 'Sahara' common bermudagrass (unhulled) and 'Topgun' buffalograss (unhulled) were examined at 97.5 and 195 kg/ha, respectively. Mulch treatments were applied immediately after seeding and consisted of no mulch, unrefined (non-ground) stripper trash at 6,515 kg/ha, wheat straw at 4,600 kg/ha, or hydro-mulch at 2,244 kg/ha. Plots were maintained with a rotary mower at a height of 5.0 cm throughout the length of the study. Percent bermudagrass and buffalograss establishment and % weed cover were visually evaluated monthly using a scale of 0 (no cover) to 100% (complete cover). Data were subjected to analysis of variance and means were separated using Fisher's Protected LSD at the 0.05 significance level. Bermudagrass establishment was greatest with no mulch (92%) followed by hydro-mulch (84%), wheat straw (70%), and gin trash (59%) 12 weeks after initial treatment (WAIT). Weed pressure was highest in bermudagrass plots mulched with gin trash (33%) and wheat straw (23%). Buffalograss establishment was greatest with hydro-mulch (55%) 12 WAIT. All other treatments exhibited less than 18% buffalograss cover. Weed pressure was highest in buffalograss plots mulched with wheat straw (69%) followed by gin trash (55%), no mulch (33%), and hydro-mulch (19%) 12 WAIT.

INTERSPECIFIC COMPETITION BETWEEN CREEPING BENTGRASS AND COMMON BERMUDAGRASS. **T. Cooper*, A.J. Hephner, L. Beck, J.B. Rotramel, and G.M. Henry; Texas Tech University, Lubbock.**

ABSTRACT

Golf courses located in the transition zone often utilize both cool-season and warm-season turfgrass species. Creeping bentgrass putting greens in these regions are surrounded by bermudagrass roughs, often creating problems with bermudagrass encroachment. Currently, no herbicides are labeled for the control of bermudagrass on creeping bentgrass putting greens. Significant differences in shoot density exist between creeping bentgrass cultivars. Turfgrass breeders continue to select for denser creeping bentgrass cultivars in order to alleviate weed pressure and create superior putting surfaces. Therefore, investigation into the ecological interactions between creeping bentgrass and common bermudagrass may provide clues for cultural management. Research was conducted at the Texas Tech Horticultural Greenhouses in Lubbock, TX during the winter of 2010. Mature sod of three creeping bentgrass cultivars ('PennLinks', 'Dominant Plus', and 'SR 1020') were transplanted on December 3, 2010 into 3 L pots filled with a Brownfield Sandy Clay Loam (loamy, mixed, superactive, thermic Arenic Aridic Paleustalfs) and allowed to acclimate for two weeks to encourage rooting prior to trial initiation. A 10.2 cm cup-cutter was used to remove 'Sahara' common bermudagrass cores from a fairway at LakeRidge Country Club. Cores were transplanted into the center of each pot by removing a core of bentgrass and replacing it with a bermudagrass core. Creeping bentgrass pots were mowed three times weekly with handheld grass sheers to a height of 0.32 cm to simulate a golf course putting green. Plants were watered daily with an automated irrigation system calibrated to deliver approximately 5.0 cm of water/week. Fertilizer (16N-10.5P-9.9K) was applied at transplant at a rate of 24.4 kg N/ha and monthly thereafter for the duration of the trial. Greenhouse conditions were maintained at day/night temperatures of 32/26 °C. Natural light was supplemented with artificial light at 400 µmol/m/s photosynthetic photon flux in a 12-h day. The trial was arranged in a randomized complete block design with four replications of treatments. At the conclusion of the trial pots will be placed in a walk-in cooler to initiate bermudagrass dormancy and visually differentiate the two species. Digital photographs will be taken at the conclusion of the trial (June 2011) with a Nikon 10.0 megapixel camera mounted on a portable light box. Pictures will be digitally analyzed using WinCam 2007 software to determine % bermudagrass encroachment. Data will be subjected to analysis of variance (ANOVA) and means will be separated using Fisher's Protected LSD at the 0.05 significance level. Future research will include examining the competitiveness of several creeping bentgrass cultivars (range of shoot densities) with bermudagrass encroachment.

DITHIOPYR PLUS ISOXABEN FOR BROADLEAF WEED AND CRABGRASS CONTROL IN BAREGROUND AND ESTABLISHED TURF . **A.L. Alexander*, M.W. Melichar, D.L. Loughner; DowAgroSciences LLC, Indianapolis, IN.**

NO ABSTRACT.

F9001 - A NEW PREEMERGENCE HERBICIDE MIXTURE FOR WEED CONTROL IN TURF.

B. Walls, J. Walter and A. Alexander*, D. Loughner ; FMC Professional Solutions, Philadelphia, PA and Dow AgroScience, Indianapolis, IN.

ABSTRACT

F9001 (Sulfentrazone + Dithiopyr) is a new herbicide being developed for preemergence control of annual grasses, sedges and broadleaf weeds in turf. Optimum control of most species is obtained when F9001 is applied prior to weed germination. Additionally F9001 has also shown early post-emergent control of crabgrass (Digitaria spp.), goosegrass (Eleusine indica), and sedges (Cyperus spp.). Turfgrass tolerance and weed control were evaluated in the northeast, midwest and transition zone of the United States during 2009 and 2010. Warm and cool season turfgrasses showed excellent tolerance to F9001. Both sprayable and granular fertilizer formulations have been evaluated at rates of 0.375 lbs ai/a to 0.875lbs ai/a. Primary weeds controlled included large and smooth crabgrass, goosegrass, sedges and kyllinga (Kyllinga spp.), as well as many broadleaf weeds. F9001 provided excellent preemergence crabgrass control in studies at 120 days after treatments from all rates evaluated. Excellent control of crabgrass and goosegrass was observed from higher rates of F9001 when applied at the 1-2 tiller stage of growth for both grasses. F9001 is expected to be registered by USEPA in late 2010.

TALL FESCUE AND PERENNIAL RYEGRASS RE-SEEDING INTERVALS FOR AMICARBAZONE.
Matthew T. Elmore*, James T. Brosnan, University of Tennessee, Knoxville; Patrick E. McCullough, University of Georgia, Griffin; and Gregory K. Breeden, University of Tennessee, Knoxville.

ABSTRACT

The photosystem II-inhibiting herbicide amicarbazone exhibits efficacy against annual bluegrass (*Poa annua* L.) and safety to cool-season turfgrasses when applied in spring. Re-seeding desirable turfgrass species into voids created after annual bluegrass eradication by amicarbazone may be necessary. In 2010, experiments were initiated at the University of Tennessee (Knoxville, TN) and the University of Georgia (Griffin, GA) to evaluate the effects of residual amicarbazone on tall fescue (*Festuca arundinacea* Schreb.) and perennial ryegrass (*Lolium perenne* L.) establishment.

Separate tall fescue and perennial ryegrass establishment experiments were conducted from March to June 2010 at each location. Plots (1 x 1.8 m) arranged in a randomized complete block design with four replications were treated with amicarbazone (0.1, 0.2 or 0.4 kg ha^{-1}) + NIS (0.25 % v/v) or bispyribac-sodium (0.1 kg ha^{-1}) at 0, 2, 4, or 6 weeks before seeding (WBS). Treatments were applied with CO_2-powered sprayers calibrated to deliver 280 or 375 L ha^{-1} in TN and GA, respectively. An untreated check was included for comparison. One week prior to seeding, glyphosate (2.2 kg ha^{-1}) was applied at each location to eradicate existing vegetation. On the day of seeding, all plots were scalped to 3.8 cm, vertically mowed, and seeded with 'Titan' tall fescue or 'Manhattan IV' perennial ryegrass at 380 kg ha^{-1}. A 10-10-10 fertilizer was applied 4 weeks after seeding (WAS) at each location.Tall fescue and perennial ryegrass cover were evaluated as a percent of the untreated at 2 and 4 WAS in GA and 2, 4 and 8 WAS in TN.

Tall fescue and perennial ryegrass cover averaged 96% of the untreated control for all treatments applied 2, 4 and 6 WBS. No differences in turfgrass cover were detected among herbicide treatments applied 2, 4 and 6 WBS at either location on any rating date. Significant reductions in tall fescue and perennial ryegrass cover were observed 4 WAS at both locations for treatments applied 0 WBS. In GA, bispyribac-sodium and amicarbazone at 0.4 kg ha^{-1} applied 0 WBS reduced perennial ryegrass cover to 58% of the untreated control 4 WAS; however, amicarbazone applied 0 WBS at 0.1 and 0.2 kg ha^{-1} did not significantly reduce cover compared to the untreated control. In TN, bispyribac-sodium applied 0 WBS reduced perennial ryegrass cover to 44% of the untreated control 4 WAS; however, no amicarbazone treatment applied at 0 WBS reduced perennial ryegrass cover. Trends observed with tall fescue cover 4 WAS were similar to those observed with perennial ryegrass at each location. Responses illustrate that amicarbazone can be safely applied at rates up to 0.4 kg ha^{-1} at 2, 4 or 6 WBS and up to 0.2 kg ha^{-1} 0 WBS perennial ryegrass and tall fescue. When applied at 0.4 kg ha^{-1} 0 WBS, amicarbazone may reduce tall fescue and perennial ryegrass establishment similar to bispyribac-sodium at 0.1 kg ha^{-1}.

COMPARING *POA ANNUA* MANAGEMENT STRATEGIES FOR PUTTING GREENS: HERBICIDES VERSUS GROWTH REGULATORS. **Alexandra Williams*, Michael Barrett, David Williams, A.J. Powell, University of Kentucky, Lexington.**

ABSTRACT

Annual bluegrass (*Poa annua*) is an aggressive weed in intensively managed turf. Annual bluegrass reduces the aesthetics, surface quality, uniformity, and the functionality of golf course putting greens. Current practices to manage this weed in bentgrass putting greens rely upon plant growth regulators. However, herbicides for this use are also under development. To compare these approaches, a field experiment was conducted with various herbicide and plant growth regulator (PGR) application regimens for annual bluegrass control on a bentgrass (*Agrostis stolonifera*) variety ¡°L-93¡± soil-based putting green. The study was initiated in April 2009 at the University Club of Kentucky, in Lexington, using a randomized complete block design of the following treatments: bispyribac-sodium (12.5 g a.i./ha), bispyribac-sodium (25 g a.i./ha), HM9930 (cumyluron), paclobutrazol (140 g a.i./ha or 280 g a.i./ha), fluprimidol (91 g a.i./ha or 182 g a.i./ha), fluprimidol (96 g a.i/ha) plus trinexapac-ethyl (36 g a.i./ha), and trinexapac-ethyl (96 g a.i./ha). One year after study initiation, all treatments, with the exception of fluprimidol plus trinexapac-ethyl and paclobutrazol, reduced annual bluegrass populations from the non-treated control. However, by June 2010, there were no differences in annual bluegrass populations between treated and non-treated plots. HM9930 treatments discolored bentgrass in both 2009 and 2010. Bispyribac-sodium treatments discolored the bentgrass in 2010 but not 2009. Color effects of both HM9930 and bispyribac-sodium were transitory. Trinexapac-ethyl improved bentgrass quality in 2010. The annual bluegrass population in the non-treated control increased between 2009 and 2010 and the efficacy of the treatments may become more apparent with time.

POSSIBLE UTILIZATION OF CLOVE OIL AND MEDIUM-CHAIN FATTY ACIDS FOR WINTER WEED CONTROL IN DORMANT BERMUDAGRASS. **Michael L. Flessner*, J. Scott McElroy, J. Jack Rose, Elizabeth A. Guertal; Auburn University, Auburn, AL.**

ABSTRACT

Clove oil and medium-chain fatty acids (MCFAs) are compounds known to have nonselective herbicidal activity. Hexanoic and octanoic acid are both MCFAs. These compounds are naturally occurring and breakdown quickly in the environment, making them environmentally safe. These compounds have potential to compete with synthetic herbicides as alternative weed control agents, but they are limited in use to non-selective weed control. Little research utilizing clove oil and MCFAs has been conducted in turfgrass. Since these compounds function as nonselective herbicides, research was conducted to evaluate weed control efficacy in a dormant turfgrass setting using bermudagrass ('Tifway' *Cynodon transvaalensis* x *C. dactylon*). Research was conducted at the Auburn University Turfgrass Research Unit in Auburn, AL. A randomized complete block design with three replications and plot sizes of 4.7 m^2 were utilized. Bermudagrass turf was not mown, irrigated, or fertilized as this is normal management for dormant turfgrass. Treatments included clove oil at 10 and 30 L ha^{-1}, hexanoic acid at 16.8 L ha^{-1}, octanoic acid at 16.8 L ha^{-1}, hexanoic acid at 16.8 L ha^{-1} + clove oil at 10 L ha^{-1}, octanoic acid at 16.8 L ha^{-1} + clove oil at 10 L ha^{-1}, Scythe (Dow AgroSciences LLC, Indianapolis, IN) at 3.2 kg ai ha^{-1}, and Trimec Classic (PBI Gordon Crop., Kansas City, MO) at 4.0 L ha^{-1}. A non-treated check was also included. Treatments were applied in a 280 L ha^{-1} spray volume. Weed species evaluated included henbit (*Lamium amplexicaule*), common chickweed (*Stellaria media*), and annual bluegrass (*Poa annua*). Visual percent control ratings were taken at 8 and 15 days after application (DAA) where 0 = no plant injury and 100 = complete plant death. For discussion purposes, weed control greater than 70% was considered acceptable weed control. Data were subjected to ANOVA and means were separated using LSD at an alpha level of 0.05. Clove oil (30 L ha^{-1}) and octanoic acid were the only non-combination treatments to control some weeds acceptably. However, clove oil (10 L ha^{-1}) in combination with octanoic acid improved control. This treatment resulted in satisfactory weed control that was equal to or better than the standard, Trimec Classic. Clove oil + octanoic acid resulted in greater than 80% weed control for all species evaluated, at 8 DAA. Weed control from clove oil + ocatanoic acid was slightly less 15 DAA but was still considered acceptable. Octanoic acid 15 DAA was the only treatment that resulted in some selectivity between weed species evaluated; Henbit was more sensitive than annual bluegrass. Annual bluegrass was the most tolerant of the treatments overall; this fact may indicate that grasses are less sensitive to clove oil and MCFAs. Hexanoic acid, Scythe, or clove oil (10 L ha^{-1}) applied alone and the combination of hexanoic acid + clove oil resulted in unsatisfactory weed control at all rating dates. No bermudagrass injury was observed from any treatment and no green-up delays were observed in the spring.

EFFECTS OF QUINCLORAC AND SULFENTRAZONE ON CRABGRASS AND COCK'S COMB KYLLINGA CONTROL. **Michael L. Flessner* and J. Scott McElroy; Auburn University, Auburn, AL.**

ABSTRACT

Crabgrass (*Digitaria* spp.) and cock's comb kyllinga (*Kyllinga squamulata*) are both summer annual weeds common in warm-season turfgrasses in the Southeastern United States. Both weeds can escape control from pre-emergence herbicides. Therefore, turfgrass managers utilize post-emergence herbicides such as quinclorac and sulfentrazone for control. Research was conducted to evaluate quinclorac and sulfentrazone for postemergence control of crabgrass and cock's comb kyllinga. Separate experiments were conducted for crabgrass and cock's comb kyllinga control, respectively. Research was conducted at the Auburn University Turfgrass Research Unit in Auburn, AL for cock's comb kyllinga control and at the E.V. Smith Research Center in Tallassee, AL for crabgrass control. A randomized complete block design with three replications and plot sizes of 4.7 m^2 were utilized for both experiments. Treatments were applied in a 280 L/ha spray volume. Both experiments included the treatments Solitare 75DF (quinclorac + sulfentrazone; FMC, Philadelphia, PA) at 0.75 and 1.0 lb ai/a, Drive XLR8 (quinclorac; BASF, Research Triangle Park, NC) at 0.75 lb ai/a, and Q4 (quinclorac + sulfentrazone + 2,4-D + dicamba; PBI Gordon, Kansas City, MO) at 8 pt/a, in addition to a nontreated check. Treatments for the crabgrass experiment were applied at 1 to 4 leaf, 1 to 2 tiller, 3 to 5 tiller, and >6 tiller stages of crabgrass. Cock's comb kyllinga control treatments also included Dismiss 4F (sulfentrazone; FMC, Philadelphia, PA) at 0.375 lb ai/a and were applied to mature weeds. Visual percent control data were collected where 0 = no plant injury and 100 = complete plant death. Data were subjected to ANOVA and means separated using LSD with an alpha level of 0.05. Crabgrass was best controlled when treatments were applied at the 1 to 4 leaf and 1 to 2 tiller stages. Solitare at 1.0 lb ai/a controlled 1 to 4 leaf crabgrass better than at 0.75 lb ai/a [75 compared to 45%; 60 days after application (DAA)]. Both rates of Solitare resulted in similar control when applied at other crabgrass stages. Q4 provided acceptable crabgrass control (63%) when applied at the leaf stage, but control was not acceptable (less than 20%) from other application timings. Drive XLR8 provided excellent crabgrass control at the leaf (70%) and 1-2 tiller (67%) application timings. Q4 had significantly less cock's comb kyllinga control (23%, 56 DAA) compared to Dismiss (60%) and Solitare (55%), due to a much lower rate of sulfentrazone included in the product. The combination of sulfentrazone + quinclorac does not provide any additional crabgrass control compared to quinclorac alone or cock's comb kyllinga control compared to sulfentrazone alone. However, the combination product (Solitare) does provide a broader spectrum of weed control compared to the stand alone products Dismiss and Drive XLR8.

POSTEMERGENCE GOOSEGRASS CONTROL WITH HERBICIDE COMBINATIONS IN BERMUDAGRASS AND SEASHORE PASPALUM. **F.C. Waltz*, P.E. McCullough; University of Georgia, Griffin.**

ABSTRACT

Goosegrass (*Eleusine indica*) is a summer annual adapted to frequent mowing and can become a problematic weed in turfgrass. The objectives of this study were to evaluate late season treatments of foramsulfuron and sulfentrazone applied with or without nicosulfuron as alternatives to diclofop for goosegrass control in bermudagrass and seashore paspalum. The experiment was conducted at the Griffin City Golf Course and the University of Georgia in Griffin, GA. All herbicides were applied to a common bermudagrass rough with goosegrass and a seashore paspalum fairway without goosegrass. All treatments were applied either once or twice on a three week interval with initial treatments made on August 18, 2010. Treatments were visually evaluated for goosegrass control and turfgrass injury. Two applications of nicosulfuron at 0.1 kg ai/ha + sulfentrazone at 0.42 kg ai/ha gave the best combination of goosegrass control (approximately 80%), bermudagrass safety, and seashore paspalum safety as an alternative to diclofop. Although seashore paspalum was injured up to 30% after the second application, bermudagrass and seashore paspalum fully recovered. Results suggest two applications of nicosulfuron + sulfentrazone at the aforementioned rates may be an alternative treatment to control diclofop resistant goosegrass in Georgia.

DIFFERENTIAL ABSORPTION AND TRANSLOCATION OF MESOTRIONE IN KENTUCKY BLUEGRASS (*POA PRATENSIS* L.) AND ANNUAL BLUEGRASS (*POA ANNUA* L.). **Adam Smith*, Matthew Goddard, and Shawn D. Askew, Virginia Tech, Blacksburg.**

ABSTRACT

Mesotrione is a HPPD inhibiting herbicide recently registered for use in turfgrass in the United States. It provides PRE and POST weed control in select cool and warm season turfgrasses. Susceptible plants express white discoloration when treated with mesotrione. Turfgrass tolerances vary and herbicide selectivity is due to differential absorption rates and herbicide metabolism. Annual bluegrass is severely injured by mesotrione, while Kentucky bluegrass is one of the most tolerant turfgrass species. Research has evaluated plant response to mesotrione under different environmental conditions, but none have examined absorption and translocation in turfgrass species. Using radiolabeled ^{14}C mesotrione, laboratory experiments were conducted to investigate interspecific absorption and translocation differences in mesotrione activity between annual and Kentucky bluegrass when ^{14}C mesotrione is applied to plant foliage and roots. Experiments were initiated on July 10 and September 16, 2009. The experiments were arranged in a split-split plot design with the main plots being harvest timings (0.17, 4, 24, 48, 96, 144 hrs), sub-plots being a 2x2 factorial containing plant species (annual vs. Kentucky bluegrass) and two mesotrione applications (leaf applied vs. root applied), and sub-sub plots being plant partitions (treated foliage, treated root, other foliage, other roots, root exudates). ^{14}C was extracted from treated plants and analyzed with a liquid scintillation spectrometer. Annual bluegrass absorbed more mesotrione than Kentucky bluegrass. In both species, mesotrione absorption was less through the roots than through foliage. Root absorbed mesotrione was often found in root exudates, whereas foliage absorbed mesotrione was found to translocate to foliage other than the treated leaf. Annual bluegrass had a 4 and 2-fold increase in foliar absorption (46 and 50%), when compared to Kentucky bluegrass (11 and 29%). These interspecific differences in absorption and translocation may play a role in explaining mesotrione tolerance in Kentucky bluegrass and susceptibility in annual bluegrass.

TROUBLESOME WEED MANAGEMENT IN SOUTHERN TURFGRASS WITH THIENCARBAZONE, IODOSULFURON, AND DICAMBA . **R.E. Strahan*, J.S. Beasley, S.M. Borst; Louisiana State University AgCenter, Baton Rouge.**

ABSTRACT

Iodosulfuron, thiencarbazone, and dicamba, combined in premix called Celsius, is a new herbicide from Bayer released in 2010. The herbicide has both broadleaf and grass activity and good safety in southern turfgrass species such as St. Augustinegrass (*Stenotaphrum secundatum*) and centipedegrass (*Eremochloa ophiuroides*). Dollarweed (*Hydrocotile*) and dichondra (*Dichondra repens*) are low-growing broadleaf weeds that infest weakened turfgrass. Dallisgrass (*Paspalum dilatatum*) is ranked as the number two weed problem in Louisiana turf and has become an increasingly serious weed due to the loss of MSMA and lack of effective chemical control alternatives. These three species are among the most common perennial weeds infesting turfgrass systems in the Southeastern United States. Four separate field experiments were conducted at the Burden Research Center in Baton Rouge, LA in 2010 to evaluate Celsius activity on dollarweed, dichondra, and dallisgrass in mixed southern turfgrass species. For dollarweed, a spring and fall study was conducted. The spring dollarweed study was initiated on May 1, whereas, the fall study was initiated on October 25. The dichondra study was initiated on October 25. The dallisgrass trial began on June 7. Herbicides were applied with a CO_2 pressurized backpack sprayer equipped with 11003 XR flat fan nozzles that delivered 30 GPA at 23 psi. For the dollarweed trials, treatments included Celsius at 3 different rates, 3.6, 5.0, 7.2 oz/A, and 3.6 fb 3.6 oz/A (3 weeks after the initial), atrazine at 32 oz/A, Speed Zone Southern (2,4-D, dicamba, mecoprop, carfentrazone) at 60 oz/A, Speed Zone Southern + atrazine at 60 and 32 oz/A, respectively and an untreated check. The dichondra trial treatments included Celsius at 5.0, 7.2 oz/A, and 3.6 fb 3.6 oz/A (3 weeks after the initial), Speed Zone Southern at 60 oz/A, and atrazine at 32 oz/A. The dallisgrass trial treatments were Celsius at 3.6, 5.0, 7.2 oz/A, and 3.6 fb 3.6 oz/A (3 weeks after the initial), and MSMA fb MSMA at 2 lb/A. The experiments were conducted in 4 separate areas at Burden Research Center on marginal quality non-irrigated centipedegrass/St. Augustinegrass mix with a heavy natural population of weeds tested. The dallisgrass trial was conducted in an area with near 100% dallisgrass coverage with very little desirable turfgrass present. All plots in the trials were mowed as needed to maintain 2.5 inch height. Plot size was 4 ft x 7 ft. Visual ratings of percent weed control and turf injury data were collected weekly. The experiment was conducted as a randomized complete block with 4 replications. Data were subjected to analysis of variance (P=0.05) and means were separated using Fisher's LSD. For the spring dollarweed study, Celsius applied at 3.6, 5.0, and 7.2 oz provided 60 to 75% dollarweed control 58 DAT. Celsius applied twice at 3.6 oz/A controlled 85% of the dollarweed. Speed Zone Southern and atrazine controlled dollarweed 80%. A tank-mix of Speed Zone Southern + atrazine provided 100% control. When the study was repeated in the fall, Celsius at 3.6, 5.0, and 7.2 oz provided 70 to 85% dollarweed control 63 DAT. Celsius applied twice at 3.6 oz/A controlled 95% of the dollarweed. In the fall dichondra study, Celsius applied at 5.0 and 7.2 oz/A provided 35 and 50% control 63 DAT. Celsius applied twice at 3.6 oz/A controlled 70% of the dichondra. Speed Zone Southern and atrazine controlled dichondra 80% and 90%, respectively. Dallisgrass control did not exceed 35% control with a single application of Celsius regardless of rate used in the dallisgrass study. However, Celsius applied twice at 3.6 oz/A controlled 50% of the dallisgrass when applied 3 weeks apart, 45 days after the initial treatment. MSMA applied twice provided 80% control.

EFFECTS OF METHIOZOLIN RATES ON CREEPING BENTGRASS (*AGROSTIS STOLONIFERA* L.) PUTTING GREEN TURF. **Brendan M.S. McNulty*, and Shawn D. Askew, Virginia Tech, Blacksburg.**

ABSTRACT

Only two herbicides, bensulide and oxadiazon, are labeled to control annual bluegrass preemergence on golf putting greens and no herbicides registered for postemergence annual bluegrass control on golf putting greens. Methiozolin (MRC-01) is a new herbicide being developed by the Moghu Research Center (Daejeon, South Korea). It is in the isoxazoline class of chemistry and offers pre- and postemergence control of annual bluegrass while remaining safe to putting green turf. The mode of action is believed to be a cell wall biosynthesis inhibitor. Golf putting greens are maintained at mowing heights between 2 and 5 mm and creeping bentgrass under this management is subject to wide fluctuations in rooting depth and sensitivity to crop protection chemicals. To insure tolerance to any new herbicide, a range of rates must be tested on different putting green environments and creeping bentgrass varieties. Four studies were conducted in 2010 at Virginia Tech in Blacksburg, VA and at Hanover Country Club near Richmond, VA. Blacksburg trials were initiated on L 93, Declaration, and A4 creeping bentgrass while the Hanover trial was on L 93 creeping bentgrass. All treatments were arranged in randomized complete block design with three replicates, and were applied using a CO2 pressurized backpack sprayer calibrated at 280 L/ha. Treatments included; methiozolin at 500, 1000, 1500, 2000, 3000, and 4000 g ai/ha, bensulide at 9000 g ai/ha, and a nontreated check (NTC). Blacksburg trials were initiated on April 16, 2010 and the Hanover trial was established on March 30, 2010. Ratings included creeping bentgrass cover, injury, and normalized difference vegetative index (NDVI) as well as cover of annual bluegrass. All rates of methiozolin did not injure any variety of creeping bentgrass in the Blacksburg trials, while significant injury was observed at Hanover Country Club. At 4 weeks after application, methiozolin at 3000 and 4000 g ai/ha injured L 93 creeping bentgrass 32 and 46% respectively. At the same rating date, methiozolin at 4000 g ai/ha significantly reduced NDVI compared to the other rates and the NTC. This location effect was most likely due to record high temperatures that occurred at this golf course location during the season. This extreme heat and drought may have exacerbated the effects of the herbicide. These studies show that methiozolin is safe at extreme rates to a variety of creeping bentgrass cultivars and can be applied at the labeled rate with little concern of phytotoxicity.

TIMING HAND REMOVAL OF PURPLE NUTSEDGE FOLLOWING APPLICATIONS OF SULFOSULFURON AND HALOSULFURON IN LANDSCAPE BEDS. **R.E. Strahan*, J.S. Beasley, Y. Chen, S.M. Borst, S. Crnko; Louisiana State University AgCenter, Baton Rouge.**

ABSTRACT

Purple nutsedge (*Cyperus rotundus*) is one of the most common and persistent weeds infesting residential and commercial landscape plantings. The presence of the weed significantly reduces the overall quality and aesthetics of properties. Halosulfuron and sulfosulfuron are two postemergent sulfonylurea herbicides that control purple nutsedge and are registered for selective use in landscape beds. However, due to the mode of action of these herbicides weed destruction typically takes up to 4 weeks. In order to satisfy clientele that demand the removal of purple nutsedge, some landscape maintenance contractors are hand removing purple nutsedge within a few days after halosulfuron or sulfosulfuron applications. Although hand pulling may temporarily satisfy clientele by removing the weed from the landscape bed, there may not be enough time elapsed for sufficient herbicide translocation into purple nutsedge tubers and the soil/mulch disturbance may stimulate more germination. Research was conducted at Burden Center in Baton Rouge, LA in 2010 to determine the effects of hand removal following herbicide application on the control and re-infestation of purple nutsedge in landscape beds. The experiments were conducted in a mulched area allowed to infest over several years with a natural population of purple nutsedge. The research site averaged 56 purple nutsedge plants/ft^2 at study initiation and had near 100% weed coverage. Treatments in the study included hand removal only, halosulfuron applied at 1.33 oz/A, sulfosulfuron applied at 2.0 oz/A, halosulfuron fb hand removal 1, 3, or 7 days after spray (DAS), sulfosulfuron fb hand removal 1, 3,or 7 DAS and an untreated check. Herbicides were applied with a CO_2 pressurized backpack sprayer equipped with a single 8008 even fan nozzle that delivered 60 GPA at 30 psi. At the designated period, purple nutsedge shoots were completely removed by hand leaving plots void of all emerged plants. The study was initiated on August 20, 2010. Plot size was 3 ft x 3 ft. Visual ratings of percent purple nutsedge control were determined weekly and plot re-infestation was recorded every two weeks. The experiment was conducted as a randomized complete block with 3 replications. Data were subjected to analysis of variance (P=0.10) and means were separated using Fisher's LSD. Halosulfuron and sulfosulfuron provided 90 and 95% purple nutsedge control 30 days after treatment (DAT). Results of the spray-only treatments were similar to control observed with sulfosulfuron followed by (fb) hand removal 3 DAS and 7 DAS and halosulfuron fb hand removal 7 DAS (75 to 88%). Purple nutsedge re-infestation was 0.2 and 0.1 plants/$foot^2$ for halosulfuron and sulfosulfuron, respectively. Plots where the purple nutsedge was only hand removed were quickly re-infested and resulted in an average of 15 purple nutsedge/$foot^2$ 30 DAT. By 60 DAT, halosulfuron and sulfosulfuron provided 72 and 79% control and averaged less than 0.5 nutsedge plants/ foot2. All halosulfuron and sulfosulfuron treatments including hand removal 1, 3, 7 DAS provided better control than hand removal alone. Hand removal only plots averaged 22 plants/$foot^2$. All other treatments except herbicide spray only treatments had at least 6 plants/$foot^2$ (range of 6 to 16 purple nutsedge/$foot^2$). The untreated check averaged 65 purple nutsedge/$foot^2$. Hand removal as well as herbicide + hand removal treatments were better than the untreated check. Results of this study indicate that in the short term (<30 DAT) purple nutsedge may be removed by hand no earlier than 7 DAS with halosulfuron or sulfosulfuron without significantly reducing control. By 60 DAT, nutsedge re-infestation was significantly greater in plots that were spray + hand removal versus herbicide spray treatments alone.

MANAGEMENT TECHNIQUES FOR SMUTGRASS CONTROL IN BAHIAGRASS PASTURES. **N. Rana*, B.A. Sellers, University of Florida Range Cattle REC, Ona; J.A. Ferrell and G.E. MacDonald, University of Florida, Gainesville.**

ABSTRACT

Three field experiments were initiated in 2008 to evaluate the effect of long-term management strategies for smutgrass control in bahiagrass pastures. In the first experiment, the experimental design was a split-plot, with burn and no-burn as the main plot factors and hexazinone application, glyphosate renovation or fall roller chopping as the subplot factors. In 2009, there was no effect of burning on smutgrass control, but the sub-plot factors, hexazinone (1.12 kg/ha) and fall roller chopping reduced smutgrass densities by 78% and 82%, respectively. In the second experiment, the experimental design was a randomized complete block, with 2X2 factorial arrangement of N-fertilization (0 and 56 kg/ha) and hexazinone (0 and 0.56 kg/ha). In year 1, the entire experimental area received a hexazinone application of 1.12 kg/ha followed by herbicide and fertilizer treatment in year 2. The initial hexazinone application resulted in a 94% reduction in smutgrass density. The treatments super-imposed over the initial hexazinone application did not result in any significant differences, however there is a trend for increased smutgrass density in plots that did not receive any further herbicide or fertilizer applications. The third experiment examined the effect of sequential applications of hexazinone in two directions one year after another at different rates. The experimental design was a split-plot design with hexazinone levels in year 1 (0.56, 0.84, 1.12, 1.4 kg/ha) as the whole plot factor and hexazinone levels in year 2 (0.28, 0.56, 0.84 kg/ha) as the sub-plot factor. A single hexazinone application of at least 0.84 kg/ha followed by a sequential application of 0.84 kg /ha hexazinone resulted in 100% smutgrass control 12 months after the sequential application. Data from this research indicate that the most currently recommendations for smutgrass control are satisfactory, but it is too early to determine if cultural inputs or if sequential hexazinone applications are beneficial for long-term smutgrass control.

BIOLOGICAL CONTROL OF INVASIVE LEGUMINOUS SHRUBS IN ECOSYSTEMS OF PUERTO RICO. **E. Valencia* and M. L. Lugo, University of Puerto Rico, Mayaguez .**

ABSTRACT

Pasture invasion by native and non-native weeds is a common problem throughout the southern USA and Puerto Rico, reducing forage availability by over 50%. Invasive shrub legume species on wet sites in Puerto Rico include albizia (*Albizia procera*), climbing mimosa (*Mimosa casta*) and catclaw (*M. pellita*; formerly *M. pigra*), and on the alkaline and dry sites, leucaena *(Leucaena leucocephala* Lam. De Wit) form thickets and limits grass growth. The use of intensive, short duration goat/sheep browsing (ISDGB) may be an efficacious, remunerative, and ecologically means of manipulating and controlling invasive shrub legumes, but there is limited information to support this theory. Studies were conducted at the Gurabo Agricultural Experiment Sation of the University of Puerto Rico from April 2006 to December 2008 on replicated paddocks of albizia mixed with guineagrass (*Panicum maximum* Jacq.) and *Paspalum virgatum* L. Paddocks were stocked with 6 mature goats and moved every 7 d (or until forage on offer was reduced to approximately 1,200 kg ha^{-1}; visual estimations). There was a 28% reduction in albizia trees 12-mo after the initiation of the study, with extensive damage on the bark of the trees. During the same period mature goats were rotationally stocked on catclaw mimosa and climbing mimosa. Goats consume basal leaves of catclaw but did little damage to branches or stems. However, a 90% reduction on climbing mimosa was observed. In the alkaline dry site, 15 yr-old trees of leucaena (>50%)-mixed with guineagrass were cut to ground level and 1-m regrowths were intensively stocked with 12 mature nannies for a 2-yr period. Goats were removed after all the leaves and twigs were consumed and re-sprouts were counted on 10 marked 2-m^2 areas 2-wks after goats were moved. Leucaena regrowth was not affected by ISDBG, but guineagrass was greatly reduced. In conclusion, goats can reduce plant population of albizia and completely eliminate climbing mimosa in pastures, but a combination of mechanical and long-term intensive goat browsing will be needed to reduce leucaena plant populations.

USING HYPO-HATCHET® TREE INJECTOR FOR ALBIZIA PROCERA CONTROL IN PASTURES.

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ABSTRACT

White siris [*Albizia procera* (Roxb.) Benth] is a nuisance weed in rangelands that causes economic losses in terms of lowering forage quality and pasture production. Herbicide injection has been a common practice used by rangeland managers to control nuisance trees in pastures. The Hypo-hatchet® tree injector appears to be an alternative tool for injecting herbicides to control white siris populations in managed pastures for livestock. Two separate herbicide mixtures, Tordon 101 (2,4-D and picloram) and Banvel (2,4-D and dicamba), were evaluated in white siris by using the Hypo-hatchet®. Both herbicides were evaluated at two separate studies conducted on two privately-owned farms in southwestern Puerto Rico. The first study was conducted in San Germán between August 2007 and July 2008 to evaluate the Hypo-hatchet® with Tordon 101 and Banvel at three rates 0%, 25% and 50% diluted in diesel fuel. Tordon 101 at 50% effectively controlled 97% of white siris trees. The second study took place in Lajas, between May 2009 and April 2010, to evaluate the amount of herbicide required to be injected according to trunk diameter at breast height (dbh). Several amounts were evaluated by using Tordon 101 at 50% diluted with water and applied with the Hypo-hatchet®. Results showed that Tordon 101 diluted in water at 50% was effective for controlling 96% of white siris trees and that dbh relates to the number of hacks required per tree.

GLYPHOSATE AND BORON APPLICATION EFFECTS ON SEED COMPOSITION AND SEED BORON IN GLYPHOSATE-RESISTANT SOYBEAN. **N. Bellaloui*, K.N. Reddy, A.M. Gillen, H.K. Abbas, USDA-ARS, Stoneville, MS; C. A. Abel, USDA-ARS, Ames, IA.**

ABSTRACT

Soybean seed is a major source of protein and oil in the world. Seed quality is determined by the content of protein and oil. Soybean seed contains five major fatty acids, saturated fatty acids (stearic and palmitic), and unsaturated fatty acids (oleic, linoleic, and linolenic). Both linoleic and linolenic acids are polyunsaturated fatty acids that are easily oxidized which leads to "off-flavors" in food. Therefore, to make soybean oil more stable, producers have traditionally hydrogenated the oil. The hydrogenation process produces trans fatty acids, which are undesirable because of their negative impact on human health. Monounsaturated fatty acids such as oleic acid are less susceptible to oxidation during refining, storage, and frying. Consequently, the food industry is becoming increasingly interested in producing soybean seed with high oleic acid and low linoleic and linolenic acids. Glyphosate (Gly) is a nonselective broad-spectrum herbicide used throughout the world for postemergence weed control. The effect of Gly on cationic nutrients such as Mn^{2+}, Zn^{2+}, Fe^{3+}, K^{+}, and Ca^{2+} has been previously studied. Results from these studies showed that Gly application decreased Fe, Mn, and Zn concentrations in plant tissues and reduced Gly effectiveness. This is because the cationic nutrients form Gly-cation complexes, leading to inactivation of Gly activity. Literature on the effect of Gly on anionic nutrients such as boric acid is scarce. Boric acid is a weak acid, and in aqueous solution pH<7, it occurs as undissociated boric acid (H_3BO_3); while at high pH, boric acid accepts hydroxyl ions from water and forms a tetrahedral borate anion $B(OH)_4^-$. Boron (B) exists in plants as borate anion (BO_3^{-3}), and its involvement in flowering set, seed set, and seed quality is well established. Therefore, the objective of this study was to evaluate the effect of tank-mixing of Gly-B on seed composition and seed B in soybean. A two-year field experiment was conducted in 2006 and 2008 at Stoneville, MS, U.S.A. Glyphosate was applied at a rate of 0.84 kg ha-1 at 4 weeks after planting (WAP) and 8 WAP. The treatments were: control (C), plants that received no Gly and no foliar B; Gly, plants that received Gly alone at 4 WAP and 8 WAP; B, plants that received B alone at 4WAP and 8WAP; and Gly-B, plants that received both Gly and B combined at 4 WAP and 8WAP. The results showed that application of Gly, Gly-B, or B increased seed protein and oleic acid concentrations. By contrast, seed oil and linolenic acid concentrations decreased under those treatments compared with the control. Gly-B combined or B treatment increased B concentration in leaves and seed. The results suggest that Gly-B tank mixing may not antagonize B uptake and translocation to leaves and seed. The results also showed that the inhibitory effect of Gly on nutrient uptake and translocation may depend on the ion species and form of the nutrient mixed with Gly. This research demonstrates that Gly-B application alters seed composition and B status in leaves and seed.

DENSITY DEPENDENT GROWTH AND REPRODUCTION IN BARNYARDGRASS (*ECHINOCHLOA CRUS-GALLI*) . **Muthukumar V. Bagavathiannan*, Jason K. Norsworthy, Pratap Devkota, University of Arkansas, Fayetteville; Kenneth L. Smith, University of Arkansas, Monticello.**

ABSTRACT

Knowledge on the density dependent growth and reproduction of barnyardgrass is vital for understanding the population dynamics of barnyardgrass and for parameterizing herbicide resistance simulation models for this species. An experiment was conducted at Fayetteville, AR, during the summer of 2010 to understand the density dependent response of barnyardgrass in soybean. The overall objective of this study was to quantify the response of barnyardgrass to a range of barnyardgrass densities in soybean and to establish density dependent relationships for key life-history attributes of barnyardgrass. The experiment was conducted in a completely randomized design with three replications. Soybean was planted at a rate of 30 seeds m^{-1} of row and with a spacing of 97 cm between rows. Barnyardgrass was established within soybean rows at densities of 1, 3, 5, 10, 15, 25, 50, 100, 250, and 500 plants m^{-2}. The plots were irrigated as needed and were kept free from other weeds. Wherever applicable, 25 seedlings were tagged at each density and monitored throughout the growing season for quantifying density dependent survival. Other variables measured included density dependent biomass production, fecundity, and the length of lifespan. In this study, seedling mortality was about 37% at the highest density (500 plants m^{-2}), and the density dependent effects were evident particularly at densities >50 plants m^{-2}. The biomass and seed production of barnyardgrass per plant were severely reduced at higher densities. The biomass production declined to 10% at 5 plants m^{-2} and to 0.5% at 500 plants m^{-2} whereas the seed production declined to 10% at 50 plants m^{-2} and to 1.5% at 500 plants m^{-2}. In addition, barnyardgrass plants matured faster at higher densities. Overall, the study was helpful in documenting density dependent responses of barnyardgrass, and these data will be useful in parameterizing population dynamic models for barnyardgrass.

EFFECTS OF DENSITY AND TIME OF REMOVAL OF *FIMBRISTYLIS MILIACEA* IN RICE YIELD .
Ana Victoria Nuñez*, Instituto Dominicano de Investigaciones Agropecuarias y Forestales (IDIAF), and J. Pablo Morales-Payan, University of Puerto Rico-Mayaguez.

ABSTRACT

Weed management is a vital component of the rice crop management. Globe fringerush (*Fimbristylis miliacea*) is among the commonly occurring weeds in rice fields in the Dominican Republic (DR). Research has been conducted in the DR to determine the effect of population density and time of removal of mixed weed species and with specific weeds such as red rice, but the effect of populations of *F. miliacea* had not been studied. The objective of this research was to assess the effect of initial density and time of removal of F. miliacea on the yield of rice. The research was conducted in Bonao, Dominican Republic, in 2003 and 2004. 'Prosequisa 4' rice was transplanted (16 plants per m square) in a vertisol clayish-loamy soil with no emerged weeds and known to have negligible natural densities of *F. miliacea*. The crop was managed according to local practices, except for weed management. The treatments were established in a completely randomized design with split plots and 4 replications. *F. miliacea* was sown at the desired densities: a check (weed-free always), 32, 96, 288, and 864 *F. miliacea* plants per m square (large plots). *F. miliacea* was later removed from the plots at 15, 30, 45, 60, 75, 90, 105, 120, and at rice harvest (135 d) after transplanting (small plots). Weeds of other species were removed after scouting the plots twice a week. Shoot dry weight of *F. miliacea* was determined every time of removal, and rice grain yield was determined at harvest. Regression analysis was conducted on the results. At all *F. miliacea* densities, yield was sharply reduced as weed removal was delayed in the season, with yield loss reached maximum values with weed removal near 60 d at the density of 32 plants per m square and at 90 d with the density of 864 plants per m square. Rice yield loss was correlated with a trend of increased shoot dry weight accumulation per unit area in *F. miliacea* up to 60-75 d after rice transplanting. Rice yield loss was as high as 60% when *F. miliacea* was allowed to grow alongside rice season-long at an initial density of 864 plants per m square, and typical *F. miliacea* densities in Dominican rice fields range from 100 to 1000 plants per m square. To prevent 10% yield loss, means of control of *F. miliacea* would have to be implemented to suppress the weed during the first 15 d of the season, if initial populations of *F. miliacea* are in the range of 32 to 864 plants per m square, which is within the typical densities found in the DR.

HERBICIDE-RESISTANT *FIMBRISTYLIS MILIACEA* IN RICE FIELDS OF GUÁRICO-VENEZUELA. **Aída Ortiz*, Lorena Villarreal, Luis López, Rosana Figueroa, Sandra Torres, Cástor Zambrano, and Marjorie Cásares, Universidad Central de Venezuela, and Albert Fischer, University of California-Davis.**

NO ABSTRACT.

EFFECT OF SIMULATED RAINFALL AMOUNT AND APPLICATION TIMING ON SWEET POTATO TOLERANCE TO DUAL MAGNUM. **Donnie Miller, Tara Smith, Teresa Arnold, Donna Lee, and Marcie Mathews; LSU AgCenter, St. Joseph and Chase, LA .**

ABSTRACT

A field study was conducted in 2010 at the Sweet Potato Research Station near Chase, LA to evaluate the impact of simulated rainfall, herbicide application timing, and Dual Magnum (s-metolachlor) rate on sweet potato growth, development, and yield. Rainfall simulators were constructed to place each nozzle approximately 214 cm above each row top. Industrial nozzles that approximated rainfall droplet size, angle, and velocity were used to deliver amounts of 1.3 or 5.1 cm to designated plots immediately after herbicide application. A factorial arrangement of simulated rainfall amount (1.3 or 5.1 cm), herbicide application timing (at planting, 5 d after planting, or 10 d after planting) and Dual Magnum rate (0, 1067 g ha, or 2135 g ha) replicated four times in a randomized complete block design was utilized. Plots were maintained relatively weed free by routine hoeing during the growing season. Parameter measurements included visual plant injury 14, 28, and 42 d after herbicide application. In addition, scoring measurement for root initiation, based on number observed from one plant per plot, was conducted at approximately 12 d (microscopic evaluation of plant anatomy) and 26 d (visual inspection) after planting. Machine harvest of plots was conducted 103 d after planting. Significant herbicide rate by simulated rainfall amount interaction was noted for root initiation data while significant herbicide rate by application timing interaction was noted for yield. Herbicide application timing did not influence storage root initiation. At 12 d after planting, averaged across herbicide application timing, storage root initiation with no herbicide averaged 0.9 and 1.5 for the 1.3 and 5.1 cm simulated rainfall amounts, respectively, and was not reduced with Dual Magnum at either rate. Comparing Dual Magnum rates, however, a reduction in storage root initiation was observed with the high rate (0.8 vs. 1.5) followed by 1.3 cm simulated rainfall but not the 5.1 cm simulated amount (1.2 vs 1.7). Similarly, at 26 d after planting, storage root initiation averaged 4.7 and 5.9 for no herbicide application, with no reduction observed with Dual Magnum. Again Dual Magnum at the highest rate resulted in lower storage root initiation at the 1.3 (5.6 vs 6.7) but not 5.1 (5.3 vs 6) cm rainfall amount when compared to the lower rate. Yield was not impacted by amount of simulated rainfall applied. Averaged across simulated rainfall amounts, U.S. #1 yield averaged 72, 79, and 87 bu/A where no herbicide was applied for at planting, 5, and 10 d after planting intervals, respectively, and was not reduced with Dual Magnum at either rate. Similarly, total yield (U.S. #1, canner, and jumbo) with no herbicide application averaged 145, 152, and 148 bu/A for these respective treatment intervals, with no reduction observed following Dual Magnum application. With respect to both U.S. #1 and total yield, yield was not reduced with the higher rate of Dual compared to the lower rate.

EVALUATION OF MATERIALS TO SUPPRESS WEEDS IN ZUCCHINI AND WATERMELON .

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ABSTRACT

Field research was conducted to determine the efficacy of selected herbicides to suppress the predominant weeds in zucchini squash and watermelon. The treatments were naptalam (3.5 kg/ha PRE), pendimenthalin (280 g/ha PRE, incorporated), clomazone (480 g/ha PRE, incorporated), metolachlor (1.12 kg/ha PRE), bensulide (5.6 kg/ha PRE, incorporated), ethalfluralin (900 g/ha PRE), halosulfuron (30 g/ha PRE), and a tank-mix of ethalfluralin (900 g/ha) and clomazone (480 g/ha). The most abundant weeds were *Echinocloa colonum*, *Portulaca oleracea*, *Boerhavia erecta*, *Cyperus rotundus* and *Cleome viscosa*. The highest levels of control were attained with the tank-mix of clomazone+ethalfluralin (suppressing *Echinocloa colonum* by 93%, *Portulaca oleracea* by 83%, and *B. erecta* by only 77%), and with halosulfuron(suppressing *Cleome viscosa* and *C. rotundus* by 95%). There was no detectable crop toxicity due to herbicides, and in general crop yield was higher as weed biomass accumulation per unit area was lower.

A 2010 SURVEY ON WEEDS ASSOCIATED TO FRUIT CROPS AND THEIR MANAGEMENT IN SOUTHERN PUERTO RICO. **Lester Lopez* and J. Pablo Morales-Payan, University of Puerto Rico-Mayaguez.**

ABSTRACT

Fruit crops account for 4% of all the value of the agricultural production of Puerto Rico and 17% of the value of food crops grown commercially in the state. Weed management is an important activity in fruit crop production, and periodic surveying on the state of practices and limitations is a valuable tool for teaching, research, and extension. The purpose of this survey was to gather current information from growers about weeds on economically important fruit crops in the southern region of Puerto Rico: avocado, mango, papaya, pineapple, and banana. Growers were interviewed to determine the most common weeds in their orchards, the weeds they considered troublesome to manage, the practices employed to manage weeds, and estimated percentage of weed management in the cost of crop production. In avocado, banana, and mango, troublesome weeds included *Rottboellia exaltata*, *Panicum maximum*, *Sorghum halepense*, *Cynodon dactylon*, *Digitaria sanguinalis*, *Cyperus rotundus*, *Ipomoea tiliacea*, *Amaranthus* spp., *Parthenium hysterophorus*, *Macroptillium lathyroides*, and *Sansevieria hyacinthoides*. In addition to those weeds, *Euphorbia heterophylla* was mentioned as troublesome in papaya, whereas in pineapple the only troublesome weeds mentioned were *Ipomoea tiliacea*, *Cyperus rotundus* and *Panicum maximum*. Paraquat and glyphosate were the most widely used herbicides in those crops, and in pineapple diuron, fluazifop-butyl and ametryn were also reported. Polyethylene mulching is frequently used in papaya, but not in the other fruit crops. Pruned portions of the crop plants and mowed weeds are used for mulching to suppress weeds. As a percentage of crop production cost, weed management in avocado is 10-30%, in mango 5-15%, in banana 15-30%, in papaya 10-20%, and in pineapple 20-70%. Most growers of mango, papaya, avocado and banana would use herbicides accepted for organic production even if the cost were up to 15% higher than the cost of conventional herbicides.

EFFECTS OF LEACHATES OF CONVOLVULACEAE WEEDS ON GERMINATION AND GROWTH OF PAPAYA (*CARICA PAPAYA*). **Eduardo Perez-Cruz* and J. Pablo Morales-Payan, University of Puerto Rico-Mayaguez.**

ABSTRACT

Many plants in the Convolvulaceae family are considered noxious weeds by the USDA and are common weeds in tropical regions throughout the world. Some exceptions to this generalization are *Ipomoea batatas* (which is grown for its edible tuberous roots) and a few plants in the *Ipomoea*, *Argyreia*, *Rivea*, *Merremia*, and *Turbina* genera, which are mostly used for ornamental purposes. Little is known about the effects of leachates of Convolvulaceae weeds on tropical fruit crops. The objective of this study was to investigate the allelopathic potential of four species of *Merremia* indigenous to PR on papaya seed germination and early seedling growth. The research was established in the University of Puerto Rico-Mayaguez Campus in 2010. Fresh foliage (30 g) of *Merremia dissecta*, *M. aegyptia*, *M. umbellata* and *M. quinquefolia* were separately blended with 1 L of water each, refrigerated overnight and strained to obtain the leachates. In the germination study, 'Red Lady' papaya seeds were placed on Petri dishes with filter paper and 20 ml of leachate of the *Merremia* species, or water only (control). A completely randomized design with 3 replicates was used. Germination was assessed every 3 days for 5 weeks, after which the leachates were washed and water was added to the Petri dishes. For the seedling growth study, 'Red Lady' papaya seeds were sown soil-filled 3.8-L polyethylene bags. The water or the weed leachates (150 ml per bag) were applied as a drench 10 d after papaya germination. The treatments were arranged in a randomized design using 25 seedlings per treatments. Seedling shoot height was measured weekly. Analysis of variance and separation of means (LSD, 5%) was conducted on the resulting data. None of the papaya seeds exposed to the weed leachates germinated. The reduction in vertical growth of papaya seedlings depended on the species of *Merremia* used to prepare the leachate. The *M. quinquefolia* leachate had the strongest effect, reducing height by 22%, while the leachates of *M. aegyptia* and *M. dissecta* reduced papaya seedling height by 12%. *M. umbellata* leachates reduced papaya seedling height by only 6%, which was not significant as compared to the control seedlings. Allelopathic effects from *Merremia* have been associated by other researchers to its content of phenolic compounds.

A 2010 SURVEY ON WEEDS ASSOCIATED TO FRUIT CROPS IN NORTHERN PUERTO RICO AND THEIR MANAGEMENT. **Luis de la Cruz*, J. Pablo Morales-Payan, and Agenol Gonzalez, University of Puerto Rico-Mayaguez.**

ABSTRACT

Weed management is an important activity in fruit crop production, and periodic surveying on current practices and limitations is a valuable tool for teaching, research, and extension. A survey was conducted among orange and pineapple growers in northern Puerto Rico in 2010 to gather information on weeds commonly found in orchards and considered troublesome, means of weed management used by growers, and the estimated portion of the cost of production dedicated to weed management. In orange, weeds reported by growers as troublesome were *Brachiaria mutica*, *Cissus sicyoides*, *Ipomoea tiliacea*, *Echinochloa colona*, *Panicum maximum*, *Mucuna pruriens*, *Commelina diffusa*, *Paspalum* spp., *Cyperus rotundus*, *Urena lobata*, *Colocasia* spp., *Paspalum conjugatum*, *Macroptilium lathyroides*, and *Desmodium* spp. In pineapple, troublesome weeds were *Sorghum halepense*, *Cynodon nlemfuensis*, *Cissus sicyoides*, and *Pueraria zizanoides*. Orange growers reported the use of glyphosate, 2,4-D amine, and paraquat while in pineapple bromacil, diuron, quizalofop-ethyl, fluazifop-buthyl, hexazinone, ametryn, glyphosate, and paraquat were reported. Trimmers and/or mowers, and manual weeding are also used in orange. Pruned parts of the crop and mowed weeds were utilized as mulch in orange but not in pineapple. The cost of weed management was 15 to 75% of the total cost of orange production, and 15-20% of the cost of pineapple production, depending on the grower. All the orange growers interviewed indicated they would prefer more ecologically friendly herbicides, with 30% stating they would use ecological alternatives if the cost were the same as for conventional products, and 60% being willing to pay between 10 to 30% more for ecological herbicides as compared to conventional herbicides. In contrast, in pineapple conventional herbicides would continue to be used if the cost of ecological herbicides were higher than that of conventional herbicides.

INJURY OF HERBICIDE SPRAY DRIFT ON MANGO (*MANGIFERA INDICA*). **Adamaris Lamourt-Cruz* and J. Pablo Morales-Payan, University of Puerto Rico-Mayaguez.**

ABSTRACT

Young trees of fruit crops may suffer drift injury when herbicides are applied near the trees and/or brought in contact with the crop by wind currents. Effects of commonly used herbicides such as glyphosate have been studied in fruit crops, but there is little research conducted on the effects of herbicides approved for use in organic systems (typically non-selective) when accidentally applied on the leaves of tropical fruit crops. The objective of this study was to determine the effect of simulated drift exposure of 1-year old mango trees (*Mangifera indica*) to a herbicide based on lemon grass oil (GreenMatch™, 50% concentration). The herbicide was dissolved in water to the concentrations of 0 (control) to 15% of commercial formulation in water. The solutions were sprayed on the mango trees and evaluated for toxicity. Crop toxicity was apparent within one hour of exposure at the highest rates, but within 24 hours all the treated plants showed severe leaf 'burning' symptoms and extensive leaf necrosis and finally plant death followed within one week after the herbicide appplication.

USE OF CLOMAZONE IN PLANTAINS (*MUSA ACUMINATA*). **M. de L. Lugo, M. Diaz and N. Acin; University of Puerto Rico, Agricultural Experiment Station, Gurabo, PR..**

ABSTRACT

Plantain (*Musa spp*) is a crop widely grown in Puerto Rico and throughout the tropics. In Puerto Rico the majority of producers rely only on glyphosate to control weeds; however, glyphosate is not efficient in controlling some weeds commonly found in plantain fields. The efficacy and phytotoxicity of clomazone for weed control in plantain were evaluated in two experiments. The first experiment evaluated rates of clomazone (1.12, 2.24, and 2.24 kg ai/ha with crop seed exposed) along with glyphosate as a control. The second experiment evaluated clomazone at 1.12 kg ai/ha at different times of application as well as glyphosate as a control. Predominant weeds were junglerice, purple nutsedge and wild poinsettia. All clomazone rates evaluated controlled more than 98% of grasses and maintained control up to two months. When clomazone at 1.12 kg ai/ha was applied 2 and 4 weeks after planting (WAP), grass control was more than 94%, whereas when applied at 6 WAP, control was 63%. In both trials, plantain yield and yield components were those expected for a commercial field. Clomazone is a herbicide for potential use in plantain.

EFFECTIVENESS OF HERBICIDE PROGRAMS COMPARED TO METHYL BROMIDE FOR WEED CONTROL IN PLASTICULTURE TOMATO. **P. Devkota*, J.K. Norsworthy, S.K. Bangarwa, S.S. Rana, D.B. Johnson, J. Wilson; University of Arkansas, Fayetteville.**

ABSTRACT

Tomato is the most important vegetable crop in terms of value of production in the United States. However, at present, commercial tomato production incurs a huge economic loss because of the mandated ban on further production and ordinary use of methyl bromide (MeBr). In the absence of MeBr, weeds are the major threat in tomato production, and effective weed control has been the most challenging task for profitable harvest. A field experiment was conducted at Fayetteville, AR, in summer 2010, to evaluate the effectiveness of herbicide programs as MeBr alternatives for yellow nutsedge (*Cyperus esculentus* L.), large crabgrass (*Digitaria sanguinalis* (L.) Scop.), and Palmer amaranth (*Amaranthus palmeri* S. Wats.) control in tomato production under the plasticulture system. The herbicide programs included S-metolachlor or imazosulfuron applied PRE followed by (fb) POST-applied trifloxysulfuron (T) + halosulfuron (H) at 4 wk after transplant (WATP). S-metolachlor was applied at 1600 g ai/ha, imazosulfuron was applied at 112, 224, and 336 g ai/ha, and each treatment was fb POST-applied T + H at 27 and 7.9 g ai/ha, respectively. In addition, a standard treatment of MeBr plus chloropicrin (67 and 33%, respectively) at 390 kg/ha, a non-treated weed-free (hand-weeded) check, and a non-treated weedy check were included for comparison. Crop injury and weed control ratings were recorded at 2, 4, 6, and 8 WATP. Marketable fruits were harvested, graded according to USDA standard, weighed, and subjected to yield analysis. Additionally, at the end of the season, five soil cores (0.075-m diameter and 0.15-m depth) were removed from each plot, washed, and obtained the viable yellow nutsedge tubers. Except imazosulfuron at the highest rate, tomato was not injured at 2 WATP. After the POST-applied herbicides, at 4 and 8 WATP, early season crop injury was significantly higher in S-metolachlor, imazosulfuron at 112, and 336 g/ha plots as compared to the weed-free check. PRE-applied S-metolachlor was as effective as MeBr in controlling large crabgrass (95%) and Palmer amaranth (98%), but no PRE treatments were effective for controlling yellow nutsedge (<65%). After applying the POST herbicides, yellow nutsedge control from S-metolachlor fb T + H (85%) was similar to that from MeBr. Palmer amaranth was also controlled as effectively as that of MeBr by S-metolachlor fb T + H (95%). However, by 8 WATP, no treatment was as effective as MeBr in controlling large crabgrass. Total marketable yield was highest (51,071 kg/ha) in the weed-free check. PRE-applied S-metolachlor fb POST-applied T + H provided marketable yield of 37,255 kg/ha, which was similar to yield provided by MeBr. Total yield of 15,201 kg/ha was obtained from the non-treated weedy check. At the end of the season, number of viable yellow nutsedge tubers/m^2 were 36 for MeBr; 54, 49, and 45 for imazosulfuron at 112, 224, and 336 g/ha PRE fb POST T + H, respectively; 98 for S-metolachlor PRE fb POST T + H; and 364 for the non-treated weedy check. Viable yellow nutsedge tuber densities for all treatments, except non-treated weedy check, were equivalent to MeBr plots. This experiment shows that a herbicide program consisting of PRE-applied S-metolachlor fb POST-applied T + H has potential for controlling yellow nutsedge and Palmer amaranth effectively and providing yield similar to that of MeBr in plasticulture tomato.

IMPACT OF WEED RESIDUES ON THE GROWTH OF YOUNG AVOCADO PLANTS. **J. Pablo Morales-Payan*, University of Puerto Rico-Mayaguez .**

ABSTRACT

Sorghum halepense, *Amaranthus dubius*, and *Cyperus rotundus* are among the most common weeds found growing in cleared land being prepared for fruit crop orchards in PR. Those weeds are known to release allelopathic compounds when their aerial parts are incorporated into the soil. The objective of this study was to assess the effect of weed residues incorporated in the soil on the short term growth of recently planted avocadoes, mimicking the scenario of weeds being plowed into the soil during soil preparation shortly before planting the crop in the orchard. The research was conducted in Mayaguez, PR, in 2009. Plastic containers with 4-gallon capacity were filled with loamy-clay soil from Lajas, PR, and amended with 0, 0.5, or 1.0 kg per m square of recently chopped leaf+stem biomass of *Sorghum halepense*, *Amaranthus dubius*, and *Cyperus rotundus*. One week later, in each container we planted one avocado transplant ('Wilson Popenoe' grafted onto 'Semil 34' half-sib rootstock 120 d earlier). Avocado shoot height and leaf area were determined 60 d after planting. ANOVA and separation of means by Tukey's test were performed on the resulting data. The presence of weed residues in the soil resulted in reduced height and leaf area in avocado. The extent of this effect was species- and rate-dependent. When 1 kg of weed biomass was incorporated in the soil, *C. rotundus* reduced avocado growth by 33%, *S. halepense* reduced it by 26%, and *A. dubius* reduced it by 21%, while incorporating 0.5 kg of biomass per m square resulted in nearly half the growth reduction from each weed species.

EFFECTS OF SOIL-APPLIED BIOSTIMULANTS ON THE GROWTH OF PURPLE NUTSEDGE . **J. Pablo Morales-Payan*, University of Puerto Rico-Mayaguez.**

ABSTRACT

Cyperus rotundus (purple nutsedge) is a troublesome weed in tropical horticulture, and is one of the first weeds to emerge alongside recently planted fruit crops. Soil-applied biostimulants are recommended to enhance early growth of recently planted fruit crops, but biostimulants may also promote growth in weeds near the crop. The objective of this research was to assess the effect of soil application of three biostimulants on the growth of *C. rotundus*. Experiments were conducted in Mayaguez, PR in 2009 and 2010. *C. rotundus* tubers were collected from Lajas, PR, and planted onto 3.8-L plastic containers filled with loamy-clay soil from Lajas, at a density of 4 viable tubers per container. The soil in the containers was watered as needed to keep it moist. The treatments were rates of the three biostimulants: An extract of the marine alga *Ascophyllum nodosum* (Stimplex®; Acadian SeaPlants, Canada), a blend of 4% free amino acids (MacroSorb Radicular®; BioIberica, Spain), and a blend of 4% low-molecular weight peptides (Inicium®; BioIberica, Spain), all at the rates of 0 to 10 ml per L of water. A drench of 150 ml of the aqueous solution was applied per container the day the tubers were planted and repeated 2 weeks later. The treatments were arranged in a completely randomized design with 8 replications. *C. rotundus* shoot weight and shoot number were determined 30 d after first biostimulant application. *C. rotundus* shoot weight increased as biostimulant rates were higher, reaching 50, 35, and 30% above the control when treated with Inicium®, MacroSorb® and Stimplex®, respectively. By enhancing the growth of *C. rotundus*, biostimulants may increase its competitiveness with the crop and negate the purpose of promoting crop growth. Hence, appropriate weed-suppression practices should be implemented when applying biostimulants to the soil.

ALLIGATOR WEED CONTROL IN RABBITEYE BLUEBERRIES. **Mark A. Czarnota, University of Georgia, Griffin.**

NO ABSTRACT.

WEED MANAGEMENT SYSTEMS IN BLACKBERRY (*RUBUS* SPP.) PRODUCTION. **Stephen L. Meyers*, Katherine M. Jennings, David W. Monks, Wayne E. Mitchem; North Carolina State University, Raleigh.**

ABSTRACT

Studies were initiated in December 2009 on 'Navaho' (Vale, NC) and 'Ouachita' (Bailey, NC) blackberry in three commercial plantings across NC. Treatments consisted of six herbicide programs using registered blackberry herbicides and Dual Magnum (a.i. *S*-metolachlor), a product in development and tolerance establishment in blackberry through the National IR-4 Program. Five programs consisted of a late fall application followed by (fb) a late spring application: Chateau 51DF (a.i. flumioxazin) 6 oz/A fb Chateau 6 oz/A, Simazine 4L (a.i. simazine) 2 qt/A fb Sinbar 80WP (a.i. terbacil) 2 lb/A, Sinbar 1.5 lb/A fb Surflan 4L (a.i. oryzalin) 2 qt/A plus Simazine 2 qt/A, Solicam 80DF (a.i. norflurazon) 2.5 lb/A fb Surflan 2 qt/A plus Simazine 2 qt/A, and Sinbar 1.5 lb/A fb Dual Magnum 7.62 EC 1 qt/A (a.i. S-metolachlor) plus Simazine 2 qt/A. The sixth treatment consisted of winter-applied Casoron 1.4 CS (a.i. dichlobenil) 2.8 gal/A. All applications were tank mixed with Firestorm 3L (a.i. paraquat) 2 pt/A with nonionic surfactant (0.25% v/v). A weedy check treatment was included for comparison. Plots consisted of 4 plants spaced 3 ft apart in rows 13 ft apart. All locations contained four replications. Two weeks prior to the first harvest, all berries on the center two plants in each plot were counted. At harvest, 30 ripe berries were collected from each plot and weighed to calculate individual berry weight. Individual berry weight was multiplied by the number of berries recorded to determine yield per plant. *Blackberry Injury.* In April, Solicam injury to blackberry as veinal chlorosis was observed and was 5% at Bailey and 30% at Vale. Injury was transient and did not differ from the check plot in later ratings. *Weed Control.* Weed control in March was excellent (98 to 100%) in all treatments at all locations. Likewise, in April, oxalis (*Oxalis stricta* L.) control was excellent (97 to 100%) in all treatments at Vale. Henbit (*Lamium amplexicaule* L.) control was excellent (> 99%) for Chateau fb Chateau, Solicam fb Surflan plus Simazine, and Casoron. However, Simazine fb Sinbar, Sinbar fb Surflan plus Simazine, and Sinbar fb Dual Magnum plus Simazine provided only 6 to 16% henbit control. At Bailey the predominant weed species in April and June was yellow nutsedge (*Cyperus esculentus* L.). In April, weed control at Bailey did not differ by treatment, was highly variable, and ranged from 48 to 100%. In June oxalis and large crabgrass (*Digitaria sanguinalis* (L.) Scop.) control at Vale ranged from 80 to 100% and 70 to 100%, respectively. Casoron provided less oxalis and large crabgrass control at Vale compared to other treatments (80 and 70%, respectively). A similar trend was observed at Bailey in June. *Blackberry Yield.* Primocane number, berry number, berry weight, and total yield did not differ by treatments and ranged from 4 to 6 primocanes/plant, 500 to 540 berries/plant, 0.28 to 0.30 oz/berry, and 153 to 168 oz/plant, respectively at Bailey and 4 to 6 primocanes/plant, 1,050 to 1,300 berries/plant, 0.30 to 0.35 oz/berry, and 329 to 410 oz/plant at Vale.

MANAGEMENT OPTIONS FOR CONTROL OF CHINESE SILVERGRASS (*MISCANTHUS SINENSIS* ANDERS.). **Joe Omielan*, University of Kentucky; Dustin Gumm, Kentucky Transportation Cabinet, Jackson; Mitch Blair, BASF Corporation; and William Witt, University of Kentucky.**

ABSTRACT

Chinese silvergrass is a tall non-native bunchgrass that is widespread in the eastern and southern parts of the United States. *Miscanthus sinensis* has become established along roadsides in the eastern regions of Kentucky. These infestations are a concern due to line of sight issues, potential for fire, and mowing costs. An initial study (2005) examined several herbicides available for grass control to evaluate their effectiveness on Chinese silvergrass. A follow-up study (2010) evaluated the timing of herbicide application and sequential herbicide applications on mowed and unmowed Chinese silvergrass stands. The first trial in 2005 evaluated the following products (active ingredients): Arsenal (imazapyr), Roundup Pro (glyphosate), Outrider (sulfosulfuron), Envoy (clethodim), Fusion (fluazifop + fenoxaprop), and Plateau (imazapic). All treatments contained adjuvants based on the product label. One year after the June, 2005 application, the Roundup, Arsenal and Roundup + Arsenal treatments provided 62 to 85% control while the other treatments did not control Chinese silvergrass. Selective control of roadside weeds is a goal that can be attained by choice of herbicides, timing of application, and in combination with mowing. The second pair of trials were established on unmowed and mowed Chinese silvergrass stands in 2010 on a roadside in eastern Kentucky. The efficacy of Roundup Pro and Roundup + Arsenal treatments applied once in summer or fall (flowering) and sequentially in summer and fall were evaluated. Envoy and Fusion treatments applied once or twice (4 weeks after first treatment) were also evaluated. Envoy showed greater control 33 DAT of the young leaf tissue at the mowed site than the Roundup and Roundup + Arsenal treatments.

CONTROL OF RUSSIAN OLIVE THROUGH CUT STUMP AND BASAL BARK HERBICIDE APPLICATIONS . **Ryan Edwards and K. George Beck, Colorado State University, Ft. Collins.**

ABSTRACT

Cut Stump and Basal Bark field trials were conducted on Russian Olive trees testing aminocyclopyrachlor (DPX-MAT 28 SL). For Cut Stump treatments, trees were cut down and herbicides applied using a backpack sprayer at 1 fluid ounce per inch of trunk diameter to the entire stump. Aminocyclopyrachlor was applied at 2.5, 5, 10 and 15% v/v and compared to 30% triclopyr ester, 20% triclopyr ester + 1% imazapyr, 10% aminocyclopyrachlor +1% imazapyr, and a no herbicide control. Basal Bark treatments were applied using a backpack sprayer at 1 fluid ounce per inch of trunk diameter, 6 inches above the soil surface. Herbicides were applied to either one side of the trunk (3-4 inches), or the entire trunk (greater than 4 inches). Aminocyclopyrachlor was applied at 5, 10 and 15% v/v and compared to 25% triclopyr ester, 20% triclopyr ester + 1% imazapyr, 10% aminocyclopyrachlor +1% imazapyr, and a no herbicide control. All treatments were mixed with Bark Oil Blue LT as a carrier. Both experiments were designed as a RCB, with nine replications (one tree per replicate). Visual control data were collected 1 year after applications, and data were analyzed by analysis of variance and means separated by LSD (á= 0.05). There were no statistical differences among Cut Stump treatments, but all treatments were different from the check. For Basal Bark, the 15% v/v solution of aminocyclopyrachlor was the most effective(98% control), while 30% v/v triclopyr ester + 1% v/v imazapyr was the least effective (76% control).

EVALUATION OF AMINOCYCLOPYRACHLOR FOR INVASIVE SPECIES CONTROL AND NATIVE PLANT TOLERANCE. **Anna Greis*, University of Florida, Gainesville; Greg MacDonald, University of Florida Agronomy Department, Gainesville; Jason Ferrell, University of Florida Agronomy Department, Gainesville; Brent Sellers, University of Florida Range Cattle Research and Education Center, Ona; Kimberly Bohn, University of Florida West Florida Research and Education Center, Milton.**

ABSTRACT

Aminocyclopyrachlor (MAT 28) is a synthetic auxin herbicide recently developed for noncrop weed management by DuPont. It possesses significant soil and foliar activity and is highly effective on a wide range of herbaceous and woody plants. It is currently unknown what affect this herbicide will have on non-target species, specifically the impact on desirable native plants. Therefore the objective was to determine if aminocyclopyrachlor can be used to control invasive species (particularly cogongrass – *Imperata cylindrica*) with minimal damage to native plants and could be an effective tool for invasive species management in Florida. In the greenhouse, native plants were grown from local seed and cogongrass was grown from rhizomes. Native plants evaluated were *Andropogon virginicus*, *Eragrostis elliottii*, *Eragrostis spectabilis*, *Liatris spicata*, *Pityopsis graminifolia*, *Sorghastrum secundum*, *Solidago fistulosa*, *Garberia heterophylla*, *Panicum anceps*, *Andropogon brachystachyus*, and *Aristida stricta*. Plants were treated post emergence with 0.018, 0.035, 0.07, 0.14, and 0.28 kg-ai/ha MAT 28 + NIS at 0.25%. Visual injury symptoms were evaluated 1, 2, 3, and 4 WAT with dry weight biomass recorded at 4 WAT. Cogongrass and native grasses were stunted only at the highest (0.28 kg/ha) rate while native forbs were severely injured at all rates. A cogongrass field study was conducted at a heavily infested cogongrass site in Hillsborough County, FL. Treatments evaluated included MAT 28 (0.28 kg/ha) + NIS at 0.25%, MAT 28 (0.28 kg/ha) + imazapyr (0.32 kg/ha and 0.64 kg/ha) + NIS at 0.25%, MAT 28 (0.28 kg/ha) + glyphosate (0.1.64 kg/ha and 3.28 kg/ha) + NIS at 0.25%, imazapyr (0.64 kg/ha), glyphosate (3.28 kg/ha), and an untreated check. Treatments were broadcast applied at 20 GPA carrier volume. Plots were evaluated for % injury every 3 months and root biomass (dry weight-grams) collected at 36 WAT. Imazapyr (92% control) and glyphosate (76% control) treatments provided better cogongrass control than MAT 28 (0% control) at 58 WAT. There appeared to be antagonism with the combined treatments that included MAT 28 with imazapyr or glyphosate. There was no significant difference in rhizome biomass between all treatments. Though not effective for cogongrass control, MAT 28 has potential for use in natural areas where native grasses are prevalent or desired and invasive forbs are the target species.

LESSONS LEARNED FROM EXOTIC PLANT MANGEMENT IN 8.5 SQUARE MILE AREA. J. Crossland, J. Savinon, J Morton, A Huebner.

ABSTRACT

The 8.5 Square Mile Area is part of the ModWaters project to improve quantity and quality of water to Everglades National Park. During construction of the project the US Army Corps of Engineers conducted exotic vegetation removal including treating over 1500 acres of natural areas for Florida Exotic Plant Pest Council Category I & II species including Cogongrass, Melaleuca, Luziola, Napier grass, Brazilian pepper, and several other species. Initial treatments and follow-up treatments wore conducted in varying environmental conditions including standing water and dry times. Changes in the hydroperiod of the project during construction created challenges in conducting vegetation management and efficacy of the treatments. Future ModWaters projects will be handled differently from the lessons learned during 8.5 SMA.

CONSEQUENCES OF INVASIVE GRASS CONTROL ON VEGETATION AND NUTRIENTS DYNAMICS WITHIN ABANDONED AGRICULTURAL LAND IN THE LAGUNA CARTAGENA NATIONAL WILDLIFE REFUGE, PUERTO RICO. **Roxanne M. Almodóvar Pérez*, Stefanie Whitmire and Jarrod M. Thaxton; University of Puerto Rico, Mayagüez.**

ABSTRACT

Non-native species invasions are widely regarded as a significant problem in ecosystem management and restoration. In particular, abandoned agricultural lands in the tropics tend to be dominated by invasive plants that are a potential barrier to restoration. Initial restoration approaches often focus on the direct removal of these species, which may have positive effects on some native biota, yet conversely yield unexpected changes to other ecosystem components, such as soil nutrient content. The goal of this project is to determine how invasive grass removal methods (e.g. bulldozing and mowing) alter the nitrogen (N) and phosphorus (P) cycles within abandoned agricultural land in the Laguna Cartagena National Wildlife Refuge in southwestern Puerto Rico. Three treatments (bulldozing, mowing and control) were randomly assigned to 10 x 20 m plots (3 replicates per treatment) within an invasive grass dominated area at the end of the dry season (April 2010). Grass biomass and soil nutrient content was assed prior to treatment establishment in March and April 2010. Average pretreatment grass biomass was similar across the plots (10.8 +/- 0.6 kg/m^2). Following application of the bulldozing and mowing treatments, plant root simulator probes were used to monitor nutrient flux from May to August 2010. Total N flux tended to be higher in bulldozed plots particularly in June 2010. P was highest on mowed plots during July 2010. Data on species cover as well as light availability were taken. Ground level light availability increased initially with grass removal, but then decreased to the level of controls by July 2010. Species percent cover increased going back to control levels. Plant species richness in grass removal plots (particularly bulldozed) almost doubled from June to July 2010, but decreased again in August. These results suggest that bulldozing may be the most effective method to control invasive grasses since nutrient flux tended to be higher in them, as well as plant species richness. However, further monitoring of grass re-establishment is needed.

INFLUENCE OF ENVIRONMENT ON BENGHAL DAYFLOWER (*COMMELINA BENGHALENSIS*) GROWTH AND REPRODUCTION. **Mandeep K.Riar*, T.W.Rufty, J.F.Spears, J.C.Burns; North Carolina State University, Raleigh.**

ABSTRACT

Benghal dayflower (*Commelina benghalensis*), also known as tropical spiderwort is a federal noxious weed and is a serious weed threat to US agriculture. Tolerance to glyphosate and the ability to produce both aerial and subterranean seeds and to regenerate from stem fragments make it extremely difficult to control. This weed is especially troublesome in the southern states of the U.S. However, there are reports of its northward movement which makes necessary to determine its potential geographic range. The purpose of this research was to determine the reproductive response of Benghal dayflower to high temperature and photoperiods and predict its potential northward range. Experiments were conducted in controlled environment at the NCSU Phytotron (Southeastern Plant Environment Laboratory). Large aerial seeds of Benghal dayflower were established at a constant 30/30°C day/night temperature. At the one-leaf stage, the seedlings were exposed to five different temperature and night interruption combinations. The treatments were 35/28°C, 30/22°C and 30/30°C day/night temperatures with 9h day and 15h night length without night interruption (-NI), 35/28°C and 30/22°C day/night temperatures with 9h day, 15h night length interrupted (+NI) with 3h incandescent light to suppress flowering. Flower initiation was recorded in each treatment and plants were harvested at 14-day intervals over a 56 day period. Plants were divided into aerial and subterranean structures at each harvest. Results show that Benghal dayflower plants had higher leaf area and vegetative biomass at 35/28°C, apparently reflecting its tropical origins. Plants also grew faster at the highest temperature and produced more leaves per plant, irrespective of night interruption. Interruption of a continuous night for 3h delays flowering by 3 days at 35/28°C and by 7 days at 30/22°C, suggesting a flowering suppression due to night interruption. Once flowering began, aerial spathe production was largely unaffected by photoperiod and temperature within this temperature range. Subterranean spathe production also was unaffected by photoperiod, but altered significantly ($P < 0.05$) by temperature. The results of these experiments show the large amount of phenotypic plasticity that Benghal dayflower possesses in the high temperature range. With the 30-35°C temperatures commonly experienced in North Carolina summers and the length of time they persist, it seems unlikely that environmental factors would limit invasion.

ELAEAGNUS ANGUSTIFOLIA INVADED MIDVALLEY, RÍO NEGRO, ARGENTINA DOCUMENTED HISTORY: FROM UNKNOWN TO WEED AND NOW FODDER RESOURCE. **M.G Klich*, Escuela de Veterinaria y Producción Agroindustrial, Universidad Nacional de Río Negro, Choele Choel, and Fernández, O.A. Departamento de Agronomía - CERZOS, Universidad Nacional del Sur, Bahía Blanca. ARGENTINA.**

ABSTRACT

The valleys known as High, Middle and Lower concentrate the most productive agricultural and cattle raising regions of Rio Negro province (Argentina). High, and Lower Valley have developed as agricultural zones but in the Mid Valley, excepting some intensively cultured zones, the lands are used for cattle breeding, and their natural grass vegetation constitute an important supply for bovine feeding, specially during summer time. *Elaeagnus angustifolia* L. (Russian olive) was introduced as an ornamental tree to the High Valley, but escaped cultivation and actually has become naturalized along all watercourses in the Río Negro valleys. When the first plants appeared on the river margins in Mid Valley (circa 1970), as nobody knew the species, no control methods were applied. The ecological conditions of the region and human unconscious participation, allowed the species to spread. Initial hydrochore dispersal is surely the way the first seeds arrived to Mid Valley because of the hydrologic characteristics of the Río Negro, the occasional flooding, and of the species fruit buoyancy capacity resulting from the presence of an aerenchyma and a pubescent cover. After germination of the introduced seeds, when no competitors were present, *E. angustifolia* seedlings developed fast, producing leaves and adventicious buds that facilitated the establishment. A plastic root system grew exploring the heterogeneous available underground space, obtaining soil resources while helping plant anchorage. About 1980 many young plants were already initiating their reproductive life. By seed dispersal, *E. angustifolia* introduced to neighbor grassland areas, and then began to reproduce throw root buds development forming satellite populations that colonize surrounding free zones. The species spread so that in some areas it replaced the previously existing woody plants. The adult individuals exhibit multiple relative branching patterns as adaptive responses to diverse tree competition and environmental conditions, leading to the many different successful allometryc forms. After diverse disturbing factors (cuts, fire, flooding) that affected plant aerial parts, *E. angustifolia* regenerated by means of shoot buds activation. The species possibility to adapt its propagation strategies to different environments, derived from natural conditions or disturbing factors, can be associated to its achievement to colonize and invade the valleys. Since 1990 land owners considered *E. angustifolia* as a weed because of the decrease in extensive cattle production resulted from the reduction of herbage offer due to shadowing by the high density of branches and leaves of the bush. The dense branching was also an undesirable characteristic because of difficulties in livestock management. As those were years favored with annual precipitations higher than the average, the summer bovine grassing use of valley land was below the grass offer and animals only browsed slightly the branches of *E. angustifolia*. Actually, after a four years long severe drought, *E. angustifolia* became an important animal fodder alternative and we began the study of its nutritional grassing quality.

ECOLOGY AND MANAGEMENT OF NATALGRASS (*MELINIS REPENS*). **C.A. Stokes, G.E. MacDonald*, C.Reinhardt Adams and K.A. Langeland; Departments of Agronomy and Environmental Horticulture, University of Florida, Gainesville 32611.**

ABSTRACT

Natalgrass (*Melinis repens* (Willd.) Zizka) is a species native to Africa that is invasive in Florida as well as many parts of the world with tropical or semi-tropical climates. Introduced to the U.S. in the mid-1800s, natalgrass was grown as a hay crop in Florida in the early 1900s. Although no longer cultivated, natalgrass remains widespread throughout much of the state. The restoration of native plant communities is a growing priority for land managers and the need for a comprehensive approach to natalgrass management is often necessary for successful restoration. To develop this management plan, more information is required about the longevity of the extensive seed deposits in infested areas as well as chemical options for pre-emergence control of this species. Natalgrass seed longevity was studied under field conditions. Seed burial tubes were constructed, buried and exhumed after periods ranging from 0 to 15 months to simulate the effects of seed burial and resurfacing from repeated cultivation. An initial decline in germination was observed after 3 months, with no further decline. These results indicate the onset of dormancy in natalgrass seeds after burial. This finding will be useful to land managers who plan to utilize tillage for natalgrass control, a practice that buries seeds. While mechanical cultivation readily controls natalgrass plants present at the time of cultivation, managers should expect seedling growth if buried seeds are returned to the surface. Seed longevity was also studied on the ground surface, where dense layers of seeds form in infested areas. Exclusion frames were placed over seed deposits to prevent further seed rain and germination under the frames was monitored for 12 months. After 1 month, high levels of germination occurred, but levels declined to 0 seedlings/m^2 within several months. This finding indicates that surface seed deposits are quickly depleted if land managers can prevent further seed production. In addition to these studies, a number of herbicides were tested in the greenhouse to determine potential for natalgrass control pre-emergence. Natalgrass seeds were placed on the soil surface in 8.9-cm square pots filled with field soil and irrigated. Herbicides were applied 24 hr after irrigation with a backpack sprayer at 0.0625, 0.125, 0.25, 0.5, 1, 2 and 4x rates. Herbicides used included imazapic, imazapyr, imazamox, hexazinone, sulfometuron, metsulfuron, pendimethalin and metolachlor. Pots were then placed in the greenhouse. Ten weeks after treatment, the number of seedlings in each pot was determined and all above-ground biomass was harvested, dried at 60 C for 4 days, and weighed. The total dry weight of harvested material from each pot was converted to a percentage of the average biomass per pot for the untreated controls. Nonlinear regression was used to describe the response of natalgrass to each herbicide and I_{50} and I_{90} values were calculated to determine the herbicide rates necessary to reduce natalgrass biomass by 50 percent and 90 percent, respectively. Metsulfuron does not appear to be a viable option for natalgrass control; the rate required to reduce natalgrass biomass by 50% is much greater than the maximum labeled rate. Hexazinone offered inconsistent control. Imazapyr, imazapic and imazamox did not provide the highest levels of control observed, but did appear to severely stunt emerging seedlings. Many native grass species in Florida are tolerant of these compounds. Sulfometuron provides moderate control at labeled rates, but required greater than the maximum labeled rate to provide 90% control. Metolachlor and pendimethalin both provided excellent control of natalgrass within labeled use rates.

FORMATION OF THE MISSISSIPPI COOPERATIVE WEED MANAGEMENT AREA: A NEW VISION FOR AN OLD PROBLEM. **Victor Maddox*, John Madsen, Mississippi State University, Mississippi State; and Randy Chapin, Mississippi Forestry Commission, Jackson.**

ABSTRACT

Invasive species are not an old issue in Mississippi. This was well indicated by the development of the regional Invasive Plant Atlas of the MidSouth (IPAMS) hosted at Mississippi State University. Still, it was apparent that more was needed and more people and agencies needed to be involved. An effort was initiated to organize state, local, and federal agencies, organizations, and NPO's in a concerted effort to educate the public and research and control invasive species in Mississippi. Although some cooperative weed management areas (CWMA) are local or regional within a state, the goal was to create a CWMA for the entire state of Mississippi. The Mississippi Department of Agriculture and Commerce's Bureau of Plant Industry (MDAC-BPI), Mississippi State University, and USDA Coastal Plains RC&D Council were three of the lead organizations involved in this effort. Following the development of a steering committee, by-laws for the organization were enacted in 2009 and by early 2010 the first slate of officers was elected. In accordance with the MS CWMA bylaws, Board Members include one representative from each of the cooperating agencies or organizations which signed the MOA (Memorandum of Agreement) with the MS CWMA. Currently, 43 agencies and organizations have signed the MOA and have a right to representation on the Board. The MS CWMA is non-profit and was established under the Mississippi Farm Bureau's 501(c)3 foundation. In 2010, the MS CWMA filed for 501(c)3 status with the IRS. Also in 2010, the MS CWMA developed a website (www.mscwma.org and www.mscwma.com) with assistance from the MDAC (webpage development) and the MS-Exotic Pest Plant Council (EPPC)(webpage development costs). The current Web master for the webpage is the MS-CWMA Coordinator. A MS CWMA display has been developed and was presented at the Southeast Association of RC&D Councils meeting in September. A Pulling Together Initiative (PTI) grant, which includes only statewide educational and organizational efforts in 2011, was been applied for in 2010 and is awaiting grantor response. Future plans may include control efforts depending upon funding gaps in other invasive species programs in Mississippi.

A COMPREHENSIVE PARTNERSHIP TO PRESERVE HERBICIDE AND TRAIT TECHNOLOGY.
Jayla Allen* and James Rutledge, Bayer CropScience, Research Triangle Park, NC.

ABSTRACT

Good stewardship practices enable growers to prevent, manage or delay the spread of weed resistance and protect all useful technologies. It is the right thing for crop production agriculture to preserve the utility of glyphosate and properly steward other technologies. Respect the Rotation is a proposed partnership among all sectors of the agricultural industry to establish a comprehensive initiative to drive industry-wide support for weed management stewardship to preserve trait and herbicide technology. Working together, the weed science, grower, consultant, government, and commodity communities can better steward weed management technology, preserve conservation tillage opportunities and promote sustainable and profitable row crop production.

AQUATIC WEEDS: A POCKET IDENTIFICATION GUIDE FOR THE CAROLINAS. **Bridget R. Lassiter, Robert J. Richardson*, and Gail G. Wilkerson; North Carolina State University, Raleigh.**

ABSTRACT

A new identification guide for common aquatic plants of the southern Mid-Atlantic region of the United States has been created by North Carolina State University. This guide is designed to be field portable; it is 3.5 by 6 inches in size with spiral binding at the top and will fit in a large pocket. The guide is printed on water resistant synthetic stock to provide field durability. Color photographs, comparison tables, line drawings, and text descriptions of approximately 60 species are included to aid users in identification. These species include selected algae, ferns, and vascular plants that are common and/or problematic. Both invasive species and common natives are included. This 125 page guide is available for purchase from NCSU for $16 individually or $15 per guide for bulk purchases.

ALTERING WEED POPULATIONS PRIOR TO TURFGRASS ESTABLISHMENT BY SOIL SOLARIZATION, FLAMING, AND PESTICIDES. **J.A. Hoyle*, J.S. McElroy, R.H. Walker; Auburn University, Auburn, AL.**

ABSTRACT

Emerging weeds are highly competitive during turfgrass establishment. Therefore, soil fumigants are often used to reduce weed seed populations. Alternative methods to soil fumigants are being explored because methyl bromide is phased out. Soil sterilization by solarization and soil-heating are possible alternatives for chemical fumigation. Traditionally soil sterilization techniques utilize transparent plastic mulch to cover the soil surface. This process confines radiant-heat below the plastic, consequently transferring heat to the soil. Alternative methods utilized in this study consist of intense heat from propane burners to raise soil temperatures and potentially reduce seed viability of weed seed populations. Soil-sterilization and flame heating experiments were conducted at Auburn University Turfgrass Research Unit to evaluate soil sterilization effectivenees prior to turfgrass establishment. Treatments for research trials were initiated on June 1, 2009, June 18, 2009, May 18, 2010 and June 15, 2010. Marvyn loamy sand soil was tilled and prepared for turfgrass seeded establishment. Treatments included soil-solarization (SOL), dazomet (389 kg ha^{-1}) (DAZ), flame-heating (SFL), and emerged-weed flaming (covered with germination cloth or uncovered). Germination cloth was applied or not applied to the soil surface of emerged-weed flaming plots. Germination cloth was used to stimulate weed emergence. Soil-solarization utilized 6 mm, clear, polyethylene plastic applied by hand. Flame-heating and emerged-weed flaming utilized a PL-8750 flame sanitizer (Flame Engineering Inc., LaCrosse, Kansas, USA) commonly employed for soil sanitation of poultry production houses. Flame heating is direct soil flaming to increase soil temperatures to kill weed seed. Emerged-weed flaming is employed similarly to flame-heating but allows weeds to emerge before treatment; thereby potentially depleting the weed seed bank by killed emerged weeds and seed heating. Dazomet was applied 21 days before turfgrass establishment. Soil-solarization treatment was applied 42 days prior to seeding. Flame-heating and emerged-weed flaming treatments were conducted 1 and/or 21 days prior to establishing turfgrass species. Seeding was conducted on July 18, 2009 and June 30, 2010; July 31, 2009 and July 7, 2010. Seeded turfgrass species included 'Zenith' zoysiagrass (*Zoysia japonica* Steud.), seashore paspalum (*Paspalum vaginatum* Sw.), and 'TifBlair' centipedegrass (*Eremochloa ophiuroides* (Munro) Hack.). Plant counts for old world diamond flower (*Oldenlandia corymbosa*), spotted spurge (*Chamaesyce maculata*), Virginia buttonweed (*Diodia virginiana* L.), and carpetweed (*Mollugo verticillatta*) were conducted 3 weeks after seeding turfgrass (WAS). Counts were transformed to percent change of number of weed species per m2 compared to the control. Data was analyzed by PROC MIXED in SAS® (v. 9.1.3). Each weed species responded to each treatment differently. Solarization decreased old world diamond flower, Virginia buttonweed, spotted spurge, and carpetweed 54, 94, 81, and 92%, respectively. Dazomet decreased old world diamond flower, Virginia buttonweed and carpetweed 78, 94 and 16%, respectively but increased spotted spurge 32%. Flame-heating decreased all weed species except carpetweed increasing the number of plants per m2 by 43%. All emerged-weed flaming regime treatments decreased all weed species compared to the control. Emerged-weed flaming conducted 1 day prior to seeding, emerged-weed flaming conducted 1 and 21 days prior to seeding, emerged-weed flaming covered conducted 1 day prior to seeding and emerged-weed flaming covered conducted 1 and 21 days prior to seeding decreased Virginia buttonweed 4, 55, 58 and 57%, respectively; old world diamond flower 85, 74, 77 and 93%, respectively; carpetweed 81, 76, 75 and 91%, respectively and spotted spurge 25, 59, 83 and 94%, respectively. Populations of old world diamond flower and Virginia buttonweed were decreased by all treatments. Each weed species responded differently to each type of thermal treatment. These results indicate soil sterilization by flaming could potentially be an acceptable means of reducing weed seed populations before seeded turfgrass establishment. Studies demonstrated a high potential for reducing weed populations utilizing emerged-weed flaming after covering with germination cloth.

DISSAPATION OF IMAZOSULFURON IN DRY-SEEDED RICE IN ARKANSAS. **J.K. Norsworthy, J. Mattice, G.M. Griffith, D.B. Johnson, M.J. Wilson; University of Arkansas, Fayetteville.**

ABSTRACT

Imazosulfuron is a sulfonylurea herbicide that is being developed by Valent for use in U.S. rice. Experiments were conducted in 2009 to determine the rate of dissipation of imazosulfuron when applied as a preemergence application in dry-seeded rice. Imazosulfuron was applied preemergence at 0.2 and 0.4 lb ai/A and a nontreated control was included. The experiment was conducted at Stuttgart on a silt loam soil with pH 4.8, at Keiser on a clay soil with pH 6.6, and at Pine Tree on a silt loam soil with pH 7.4. Duplicate 7.6-cm diameter soil cores, ten total, were collected from each plot immediately after application and three additional time prior to flooding rice. Prior to application, 'Wells' rice was drill-seeded at 80 seed/m row. Seventy-two blank samples were fortified with imazosulfuron at 0.4 mg/kg of soil and recovery was 84.5%. Half-lives were generally similar between rates and ranged from about 3 days at Stuttgart to almost 12 days at Pine Tree. Dissipation of imazosulfuron appeared to be linked to soil pH, with it being more persistent at higher pH. Based on these findings, the residual weed control from imazosulfuron will likely be short-lived and it is unlikely that the compound will persist to sufficient amounts to cause carryover concerns into other agronomic crops.

TOLERANCE OF VEGETABLE CROPS TO FOMESAFEN RESIDUES IN IRRIGATION WATER.
Rakesh Jain*, Eric W. Palmer, Syngenta Crop Protection, Vero Beach Research Center, Vero Beach, FL; Donald J. Porter, Wenlin Chen, Syngenta Crop Protection, Greensboro, NC .

ABSTRACT

Fomesafen, the active ingredient in Reflex®, is an effective herbicide for broad-spectrum weed control in beans (snap and dry), cotton and soybean. Federal registration is also pending for use in potato, tomato, and pepper. Although fomesafen is not expected to be found in ground or surface water following labeled applications, the objective of this study was to determine vegetable crop response to any potential fomesafen residues in irrigation water. To determine the effect of overhead irrigation, tomato, pepper, cabbage, broccoli, lettuce, and cucumber seedlings were transplanted in pots filled with a potting mix (1:1 mixture of Vero Beach field soil and Fafard mix II) in the greenhouse. Obout 14 days after transplanting, the plants were irrigated overhead with ¼-inch water containing 0 to 560 ppb fomesafen using a spray chamber. Plants were assessed visually for injury on a scale of 0 to 100% at 8 and 19 days after irrigation. The effect of fomesafen residues in sub-irrigation water was measured on tomato, pepper, cabbage, broccoli, and lettuce seedlings transplanted in pots filled with a field soil (Myakka sand with 0.5% organic matter) in the greenhouse. About 14 days after transplanting, the plants were sub-irrigated with water containing fomesafen residues ranging from 0 to 140 ppb. Visible injury evaluations were taken 9 and 21 days after treatment. In another experiment, the response of vegetable crops to fomesafen residues in irrigation water was confirmed in a field trial using a lateral irrigation system. Tomato, pepper, cabbage, lettuce, and cucumber seedlings were transplanted in the field on raised beds not covered with plastic to maximize foliar and root exposure to irrigation water. After the crops were established, they were irrigated with ¼-inch water containing approximately 70 ppb fomesafen. A total of three irrigations were applied at weekly intervals and plants were evaluated visually at 6-8 days after each irrigation and 16 days after the final irrigation. No injury was observed on tomato, pepper, cabbage, and broccoli at 560 ppb fomesafen in overhead irrigation or 140 ppb fomesafen in sub-irrigation, the highest concentrations tested in the greenhouse. Lettuce and cucumber seedlings were slightly less tolerant to fomesafen showing injury symptoms at 140 ppb in overhead irrigation and 70 ppb in sub-irrigation. In the field, no injury was observed on tomato, pepper, cabbage, lettuce, or cucumber seedlings following overhead irrigation three times with water containing fomesafen residues ranging from 49 to 69 ppb. These results confirm that no injury would occur to vegetable crops from fomesafen residues at concentrations as those tested in the field.

ROLE OF GLYPHOSATE AND FUNGICIDE INTERACTIONS ON HORSEWEED AND GIANT RAGWEED CONTROL. **Laura Berrios*; University of Puerto Rico, Jessica Shafer, William Johnson and Steve Hallett; Purdue University.**

ABSTRACT

Glyphosate is the most extensively used herbicide in the world and the selection pressure caused by its repeated use has resulted in the evolution of glyphosate resistant weeds. Several mechanisms of resistance have been proposed, including target-site mutations, limited absorption or translocation, and detoxification of the herbicide. At low concentrations glyphosate favors diseases and may promote diseases in different crops. This study will examine the relationship between the presence of Glyphosate Synergistic Fungi (GSI) and the effectiveness of glyphosate at lethal doses on Horseweed (Conyza canadensis) and Giant ragweed (Ambrosia trifida). Along with other simultaneous experiments, glyphosate resistant (GR) and glyphosate susceptible (GS) giant ragweed plantules were planted in the same soil using Cone-tainers ® in the greenhouse. Five different treatments were used: 1)Ridomil® (Metalaxl-M) for control of Oomyces (Pythium spp., Phytophtora spp.), 2) Topsin® (Thiophanate-methyl) against Fusarium spp, 3)Prostar® (Flutolanil) versus Rizoctonia spp., 4) a mix of the three and 5)untreated control. These fungicides were applied weekly and 14 days after being planted half of each biotype was sprayed with glyphosate. The importance of plant pathogens to the efficacy of the herbicide was observed in GS giant ragweed. After the GS plants were continuously drenched with fungicide and after being exposed to glyphosate they survived. The same was not observed in the horseweed. Experiments are still ongoing, therefore more results will be available at the completion of all treatments.

PERFORMANCE OF DOW AGROSCIENCES HERBICIDE TOLERANT TRAIT TECHNOLOGY IN SOYBEANS . **R.B. Lassiter*, N. Carranza, A.T. Ellis, J.M. Ellis, R.B. Haygood, E.F. Scherder, D.M. Simpson, Dow AgroSciences LLC, Indianapolis, IN..**

ABSTRACT

Dow AgroSciences has introduced two new herbicide tolerance traits, commonly referred to as Dow AgroSciences Herbicide Tolerance (DHT) traits. One of these traits, DHT2 is currently being developed in soybeans (Glycine max L.). The DHT2 trait is a synthetic gene developed by Dow AgroSciences from *Delftia acidovorans*. In plants, this gene produces an enzyme that metabolizes several herbicides having an aryloxy-alkanoate moiety, including Phenoxy auxins (e.g., 2,4-D, MCPA). DHT2 soybean events with low to high expression levels have been tested in the field. A total of 70 field trials were conducted across the U.S. during 2009 and 2010 to characterize tolerance of DHT2 soybeans to 2,4-D PRE and POST applications, glufosinate POST applications, and 2,4-D + glufosinate POST applications. Robust tolerance to preemergence or single postemergence or sequential postemergence applications of 2,4-D at 1120, 2240 and 4480 g ae/ha have been observed regardless the level of expression. Soybean growth, development, maturity and yield of individual events are equivalent to isolines. DHT2 soybean exhibited excellent tolerance to POST applications of glufosinate applied at V2, V6, and R2 growth stage, and tolerance to 2,4-D + glufosinate was equivalent to that observed from glufosinate alone. This technology will allow 2,4-D to be applied from burndown through the R2 growth stage in DHT2 soybean. The DHT2 trait stacked with glyphosate tolerance traits in soybean will improve and enhance the performance of glyphosate and glufosinate cropping systems, improve the control of "hard to kill" broadleaf weeds, reduce selection pressure for glyphosate resistance, and sustain the glyphosate cropping system.

SUSPECTED ENDOTHALL TOLERANT HYDRILLA IN FLORIDA. **Sarah Berger*, Greg MacDonald, University of Florida, Gainesville.**

ABSTRACT

Hydrilla verticillata (L.f.) Royle is the most managed aquatic weed in Florida. This submersed plant grows rapidly to overtake waterbodies, impeding flood control, inhibiting recreational use, and displacing native vegetation and wildlife. Hydrilla was previously controlled with fluridone herbicide until widespread resistance developed and was documented in the early 2000s. Endothall herbicide, a contact herbicide, is now the primary management option for resource managers in Florida. The mechanism of action is unknown but increased cell leakage and subsequent necrosis have been documented. Aquathol™ (dipotassium salt) and Hydrothol™(dimethylalkylamine salt) formulations of endothall are available with Aquathol™ accounting for 98% of endothall use. In 2010, two lakes in Central Florida received large-scale Aquathol™ applications and lack of hydrilla control was observed for the first time. As a result, suspected endothall tolerant plants were collected from these lakes for more detailed analysis. This analysis utilized ion leakage which proved to be a quick and relatively easy method for evaluating endothall tolerance. Plants were treated with Aquathol™ or Hydrothol™ formulations and conductivity was recorded for 7 days following treatment to quantify ion leakage for both the suspected tolerant hydrilla population and a known susceptible hydrilla population. Treatment rates for Aquathol™ and Hydrothol™ ranged from 0.25 to 8.33ppm, which is up to two times the use rate of endothall. Major differences were observed between the two populations when exposed to Aquathol™. The tolerant hydrilla population showed only 12% leakage at rates two times the maximum label rate. The tolerant population also exhibited a differential response to the Hydrothol™ formulation, although the level was not as great as Aquathol™. The ion leakage method was able to quickly determine differences in cell leakage between accessions of hydrilla and will be a useful tool for future analysis of suspected endothall tolerant populations.

HYDRILLA VERTICILLATA **(L. F.) ROYLE IN THE DOMINICAN REPUBLIC. ONE SPECIES, THREE ECOSYSTEMS AT RISK.** **Natalia Ruiz-Vargas*, National Botanic Garden, Dominican Republic; and Omar S. Reynoso, Ministry of the Environment, Dominican Republic.**

NO ABSTRACT.

CULTURAL TECHNIQUES TO MANAGE PARA GRASS IN WETLANDS. **Sushila Chaudhari*, Brent A. Sellers, Greg MacDonald, University of Florida, Gainesville, FL; and Steve Rockwood, Florida Fish & Wildlife Commission, Fellsmere, FL.**

ABSTRACT

Non-native para grass (*Brachiaria mutica*) is no longer used as a forage and has invaded Florida wetlands. Our goal is to implement weed management strategies to improve wetland ecosystem health by reducing the potential of para grass invasion via an integrated approach using both cultural and herbicide inputs. Field experiments conducted in 2008-2009 revealed that burning followed by immediate flooding resulted in 62% para grass control, and was not significantly different to burned and flooded para grass control that was initially treated with glyphosate or imazapyr. Therefore, cultural and/or mechanical inputs may be an additional tool to control para grass. Our objectives were to examine the impact of burning and cutting followed by flooding on para grass re-growth, and to study the effect of water depth and duration on para grass stolon re-growth after simulated roller-chopping. In the first greenhouse experiment, twelve plants were cut 1 cm above the soil surface and additional 12 plants were burned with a propane burner. Plants were either watered daily (control), or were subjected to water treatments; water level even with the soil surface (saturated) or inundated with 44 cm water (flooded). Burning plants and subjecting them to either saturated or flooded conditions resulted in at least 88% less biomass 5 weeks after treatment (WAT) than clipping plants and subjecting them to the same conditions. These results suggest that para grass can tolerate cutting with and without flooding, and burning without flooding, but cannot survive if flooding occurs after burning. In the second greenhouse experiment, simulated roller-chopping was performed by cutting para grass stolons into one, two or three node segments and planted into flats. Flats from each node segment were either watered daily (control), or were placed in water troughs to maintain the water level up to soil saturation (saturated), or were inundated with 54 cm water (flooded). At 3, 7, 14, 28, and 42 days after planting, 4 flats of each node section were removed from both saturated and flooded water treatments and placed onto benches and watered daily. Results from the regression analysis revealed that in order to reduce para grass biomass by 90%, at least 17 days of flooding or 29 days of saturated conditions are required. In conclusion, burning followed by flooding is an effective treatment for removal of para grass. Since roller chopping is sometimes used for vegetation control in wetland ecosystems, para grass infested areas should be chopped and flooded or saturated for at least 17 or 29 days, respectively.

POST-DIRECTED APPLICATION OF POTENTIAL ORGANIC HERBICIDES FOR BELL PEPPERS.
Charles L. Webber III*, USDA-ARS, Lane, OK; James W. Shrefler, Oklahoma State University, Lane, OK; Lynn P. Brandenberger, Oklahoma State University, Stillwater, OK.

ABSTRACT

Organic pepper (*Capsicum annuum* L.) producers need appropriate herbicides that can effectively provide post-emergent weed control. Research was conducted in southeast Oklahoma (Atoka County, Lane, OK) to determine the impact of a potential organic herbicide on weed control efficacy, crop injury, and yields. The experiment included Scythe® (57% pelargonic acid) applied post-directed at 3, 6, and 9% v/v application rates, plus an untreated weedy-check and an untreated weed-free check with 4 replications. Bell pepper, cv. 'Jupiter', was transplanted on May 28, 2010 into raised 91-cm centered beds. The primary weeds included smooth crabgrass (*Digitaria ischaemum* (Schreb.) Schreb. ex Muhl.), cutleaf groundcherry (*Physalis angulata* L.), and spiny amaranth (*Amaranthus spinosus* L.). Scythe® was post-directed applied on June 16 and then reapplied 8 days later (June 25). Smooth crabgrass (55.6%) and cutleaf groundcherry (66.3%) control peaked at 1 day after treatment (DAT) with the 9% application rate. Scythe® at 9% v/v rate also resulted in the greatest crop injury at 1 DAT (13.75%). The sequential application of Scythe® did not significantly increase grass or broadleaf control. Although weed control and crop yields increased as application rates increased, the less than satisfactory weed control produced significantly lower pepper yields that the weed-free treatment.

STS POLYMORPHISM OF RED RICE (*ORYZA SATIVA*) ACCESSIONS FROM ARKANSAS.
T.M. Tseng*, N.R. Burgos, University of Arkansas, Fayetteville; A. Lawton-Rauh, C. Climer, Clemson University, Clemson; and V.K. Shivrain, University of Arkansas, Fayetteville.

ABSTRACT

Red rice is a serious threat to the rice industry because of its deleterious effect on rice yield and quality. This weed is widespread in the southern U.S. rice-producing states and continues to be a major constraint to production wherever it occurs. Red rice belongs to the same species as cultivated rice (*Oryza sativa* L.) and is highly competitive with the crop. Competition results in significant yield losses and reduction of rice grain quality. Red rice hybridizes with cultivated rice at low rates, thus, enhanced crop traits such as herbicide resistance can escape into weed populations by gene flow. Red rice populations are phenologically and morphologically diverse and genetic introgression and several agroecological factors contribute to their diversification and persistence. The objective of this study is to determine the genetic diversity of blackhull red rice populations from three rice growing zones in Arkansas. Twenty sequence tagged site (STS) gene fragments, distributed across all 12 chromosomes, were used to estimate genetic diversity. Seventeen accessions were included, representing different maturity periods and plant heights. Relationships among these accessions are estimated by preliminary best fit phylogenetic trees using the ten informative STS loci. A total of 40 single nucleotide polymorphisms (SNPs) were identified across the 20 loci for the seventeen accessions of blackhull red rice used in this study. Ten out of 20 loci are polymorphic and the average pairwise nucleotide sequence diversity (π) and polymorphism (θ) estimates are highest between the "early" and "intermediate" maturing group (0.00180 and 0.00173); "tall" and "short" height group (0.00169 and 0.00162); and from "central" and "northeast" zones (0.00130 and 0.00135). The highest sequence divergence estimates (K) were observed between the "late" and "intermediate" maturing group (0.00150), "short" and "intermediate" height group (0.00197), and the "northeast" and "southeast" zone group (0.00148). Overall, the comparison of these nucleotide sequence diversity estimates in blackhull red rice accessions from Arkansas is higher versus sequence variation in these same loci within strawhull red rice accessions from Arkansas. Further in-depth analyses of divergence population genetics in red rice biotypes are in progress that will utilize 28 additional STS loci and will entail population structure and phylogeographic model-fitting by incorporating genus-wide sampling of the same loci.

EXPLORATION OF METABOLIC-BASED RESISTANCE IN HERBICIDE-RESISTANT ITALIAN RYEGRASS (*LOLIUM PERENNE SSP. MULTIFLORUM*). **Reiofeli A. Salas*, Nilda R. Burgos, Carlos E. Schaedler, Ed Allan Alcober, Robert Scott; University of Arkansas, Fayetteville.**

ABSTRACT

Plants metabolize certain herbicides via the activity of a large group of enzymes belonging to the cytochrome P450 family. Metabolism-based resistance is usually due to selection of individuals with elevated P450 activity on the herbicide. The purpose of this experiment is to determine if P450-mediated enhanced metabolism possibly exists in selected herbicide-resistant Italian ryegrass populations. Six ryegrass populations (AR08-10, Des03, GA01, NC01, NC03, and NC04) with different resistance patterns to glyphosate, ALS- and ACCase herbicides were evaluated. Cytochrome P450 inhibitors malathion (0.89 lb ai/A) and 1-aminobenzotriazole (100 µM) were applied 30 min before applying the 1x rate of either glyphosate, diclofop, pinoxaden, mesosulfuron, and pyroxsulam. The hypothesis is that if cytochrome P450-mediated metabolism is involved in herbicide resistance, the application of an appropriate P450 inhibitor would increase herbicide activity and potentially overcome the resistance. Each population was treated with the corresponding herbicides it expresses resistance to. Each herbicide was applied with or without the P450 inhibitor. All treatments were applied with nonionic surfactant, 1% by volume. A nontreated check was also provided for each population. The herbicides were applied to 3-4 leaf seedlings, at a spray volume of 24.35gpa. The experiment was conducted twice in a completely randomized design with a factorial combination of herbicide and inhibitor treatments. There were 3 replicates for every treatment with 5 plants per replicate. Visual injury, mortality and biomass reduction were evaluated at 4 wk after treatment (WAT). AR08-10 was resistant to diclofop (7% control), mesosulfuron (45% control) and pyroxsulam (55% control). Des03 was the only population with resistance to glyphosate and was also moderately resistant to diclofop (80% activity). Both P450 inhibitors had no effect on the activity of these herbicides on AR08-10 and Des-03. GA-01 was also resistant to ALS herbicides mesosulfuron and pyroxsulam and with low level resistance to diclofop. The full rate of diclofop controlled GA-01 88%. Resistance to ALS inhibitors was high, with 18% activity for both herbicides. Malathion improved the activity of mesosulfuron on GA-01 to about 50%, but had no effect on other herbicides. NC-01 was resistant to diclofop and mesosulfuron. ABT and malathion did not improve the activity of these herbicides on NC-01. NC-03 was resistant to all herbicides, except glyphosate. The activity of pinoxaden was improved to 60 and 68%, respectively, by ABT and malathion while the activity of pyroxsulam was improved only by malathion. NC-04 was resistant to diclofop, mesosulfuron and pyroxsulam. Malathion improved the activity of diclofop and mesosulfuron on NC-04, but not pyroxsulam; ABT had no effect. Overall, malathion elicited the most response in improving herbicide activity. Because this increased activity, whenever it occurred, did not completely overcome the resistance to any herbicide, this indicates that P450-mediated metabolism is partially responsible for resistance in some cases. In many cases, metabolism-based resistance may not be involved at all. Alternatively, herbicide metabolism may still be a factor, but with other monooxygenases or enzyme families. Glyphosate, for example, is metabolized in some plants by the GOX enzyme and ALS inhibitor herbicides are metabolized by different P450 families in ryegrass or other species. This experiment provides direction for follow-up research on various herbicide-resistant ryegrass populations. The downstream goal is to generate more informed decisions on resistance management.

COMPETITIVE ABILITY OF ALS-RESISTANT *FIMBRISTYLIS MILIACEA* WITH RICE . **Carlos E. Schaedler*, Universidade Federal de Pelotas, Brazil; Nilda R. Burgos, Ed Allan L. Alcober, Reiofeli A. Salas, University of Arkansas, Fayetteville; and Jose A. Noldin, Universidade Federal de Pelotas, Brazil.**

ABSTRACT

Fimbristylis miliacea (FIMMI) is one of the most troublesome weeds in rice fields in southern Brazil. Usually, this weed is controlled by herbicides in irrigated rice fields. However, the application of herbicides with the same mechanism of action for many years, in the same area, has resulted in selection of herbicide-resistant biotypes. A major question associated with herbicide resistance is that resistant plants may exhibit different fitness than its susceptible counterparts, depending on the physiological mechanisms involved in acquiring resistance. The objective of this study was to evaluate the above- and below-ground competitive abilities of ALS-resistant or susceptible *F. miliacea* with rice. Experiment was conducted at the University of Arkansas, Fayetteville in the summer of 2010, arranged in a split-plot design, with four replicates. The treatments tested were the combinations of 3 species (*F. miliacea* resistant and susceptible biotypes, and rice) as main-factor, and four competition conditions (no competition, competition for soil resources and solar radiation, competition for soil resources alone, and competition for solar radiation alone), as sub-factor. The response variables evaluated were leaf area, shoot dry mass, root dry mass and plant height. Tiller number was also evaluated, but only for rice. All variables were evaluated at 36 days after planting. The data were analyzed using ANOVA ($p<0.05$) and when significant, Fischer`s test was used to compare treatment means. The interaction effect of biotype combination and competition partitioning on root dry mass of resistant and susceptible FIMMI was significant. The susceptible biotype FIMMI 13 was taller than the resistant biotype FIMMI 10 when both were competing with rice; however, no difference was observed between the FIMMI biotypes when competiting with each other. Rice produced the lowest number of tillers, leaf area, and dry biomass when growing without FIMMI competition. This indicates that intraspecific competition among rice plants is stronger than interspecific competition with FIMMI. This is reasonable because FIMMI is a much smaller plant than rice. Rice grew tallest and had the highest dry mass when competiting with the resistant biotype FIMMI 10, above and below ground or below ground alone. Therefore, the ALS-resistant FIMMI biotype was less competitive with rice than the susceptible biotype. Because these populations were not near isolines, we cannot conclude that the difference in competitive ability was a physiological penalty for the resistance trait. Further experimentation is needed to address that question. In farmers` fields, though, which are dominated by resistant populations, rice yields are significantly reduced for lack of weed control. Integrating chemical alternatives with agronomic tools such as the use of competitive varieties should be an effective strategy for this less competitive ALS-resistant FIMMI biotype.

WEED MANAGEMENT STRATEGIES IN *ERYNGIUM FOETIDUM* (SHADON BENI). **Ravindra Persaud, Wendy–Ann P. Isaac, Maudvere Bradford*, The University of The West Indies, St. Augustine, Trinidad.**

ABSTRACT

Weed control is frequently a severe limiting factor in Shadon beni (*Eryngium foetidum*) production in Trinidad. This study evaluated six weed management treatments in Shadon beni at the University Field Station (UFS), located at Valsayn, Trinidad. Six weed management treatments evaluated included: untreated check; chemical (paraquat); hand weeding; black plastic mulch; bermuda grass (*Cynodon dactylon* L.) mulch (3-5cm thickness) and banana leaf mulch (3-5 cm thickness). Hand weeding; black plastic mulch; bermuda grass mulch and banana leaf mulch respectively gave acceptable weed control up to eight weeks after planting (at harvesting), while the untreated check and paraquat started to lose its efficacy at fourteen and thirty five days respectively after planting, especially with broadleaf weeds. There were significant differences between hand weeding, black plastic mulch, bermuda grass mulch and banana leaf mulch for the suppression of grass and broadleaf weeds, while sedges results differed. Broadleaf weed populations were consistently much greater than the grasses and sedge weeds and composed about 53% of the weed flora in the experiment while grasses and sedges accounted for 23% and 24% of the total weed flora respectively. Results of this study indicate that bermudagrass mulch can be used effectively as a weed management treatment in Shadon beni production.

POPULATION DYNAMICS OF *CYPERUS ROTUNDUS* IN MULCHED AND NON-MULCHED WATERMELON MANAGED ORGANICALLY. **Mabel Vega-Almodovar*, J. Pablo Morales-Payan, Sonia Martinez-Garrastazu, Elvin Roman-Paoli, Bryan Brunner, Luisa Flores, and Juan Toro, University of Puerto Rico-Mayaguez.**

ABSTRACT

Purple nutsedge (*Cyperus rotundus*) is one of the most problematic weeds in vegetable crops. There is little information generated from research conducted in Puerto Rico regarding the effect of crop protection inputs and practices on organic systems. An experiment was conducted in Summer 2007 at the Agricultural Experiment Station of the University of Puerto Rico, in Lajas, PR, to determinate the effect of mulching on weed management in organic watermelon. Transplanted 'Crimson Sweet' was used. The experimental units were plots mulched and non-mulched with shredded shoots of the grass *Hypharrenia rufa*. Weekly evaluations were conducted to determinate purple nutsedge density on the soil beds, and tuber number, and tuber and root-rhizome weight were determined extracting one cubic foot of soil from the beds shortly after harvesting the watermelons. On average, in mulched plots purple nutsedge density was lower (as much as 30%)than in non-mulched plots. Tuber number and weight were significantly lower in mulched plots than in non-mulched plots, but root-rhizome biomass was not significantly different in mulched and non-mulched plots. In mulched plots watermelon fruit number and weight were 70 and 62% higher than in non-mulched plots, respectively.

FLAZASULFURON: A NEW HERBICIDE FOR WEED CONTROL IN FLORIDA CITRIS. **M. Singh; Department of Horticulture, University of Florida, Citrus Research and Education Center, Lake Alfred, FL and M. Grove; ISK Biosciences Corp. Spring, TX.**

ABSTRACT

Flazasulfuron (SL-160) is a new sulfonylurea herbicide developed by ISK Biosciences. It can provide both contact and residual control of broadleaf weeds in citrus. Field studies in grower's fields at Haines City, Dundee and Frostproof, FL were conducted to 1) evaluate the efficacy of SL-160 alone and in combination with other herbicides and 2) evaluate the phytotoxicity of SL-160 on citrus. At all location two separate studies on efficacy and phytotoxicity were conducted and all plots were arranged in a randomized complete block with four replications. For the efficacy study treatments included an untreated control, SL-160 at 2.85 oz/a, SL-160 at 2.85 oz/A + Roundup Pro 32 fl oz/A, SL-160 at 4 oz/A + Roundup Pro at 48 fl oz/A, SL-160 at 2.85 oz/A + Direx at 77 fl oz/A, and Solicam at 3 lb/A + Direx 77 lb/A. The phytotoxicity study was conducted on grapefruit (Frostproof), sweet oranges (Dundee) and tangerines (Haines City) and treatments were an untreated check and SL-160 at the rates of 2.85, 5.7 and 11.4 oz/A. All treatments in both studies and at all locations were applied using a tractor mounted sprayer fitted with 8002 nozzle and an off center flat spray nozzle. The sprayer was set to deliver 20 gpa at 40 psi. Efficacy ratings were done at 15 to 75 days after treatment (DAT) using 0-100 rating scale where 0 was no control while 100% was complete control. Phytotoxicity ratings on citrus were done from 15 to 75 DAT using the 0-100% rating scale where 0 was no injury to 100 was complete death. Excellent control of broadleaf weeds at all locations was consistently achieved with the application of SL-160 (4 oz/A) + Roundup Pro (48 fl oz/A). Tank mix of SL-160 with Roundup Pro and Direx provided greater control of all broadleaf weeds than SL-160 alone. Florida pusley control at 15 DAT with all tank mix treatments ranged from 54 to 84% and declined to 63 to 78% by 75 DAT. Spanishneedles control with all tank mix treatments ranged from 81 to 90% at 15 DAT and declined to 55 to 88 % by 75 DAT. Grass control was excellent with the different tank mix treatments compared to SL-160 alone. SL-160 alone provided 10% control of Texas panicum (10%) at 15 DAT and declined to 1 % by 75 DAT. Guinea grass control with SL-160 alone ranged from 14 to 31% at 15 DAT and declined to 5% by 75 DAT. Injury on grapefruit (3 to 15%) and sweet orange (3-10%) was observed at 45 DAT while injury on tangerine (4-19%) was observed at 60 DAT. SL-160 at the recommended rate of 2.85 oz/A injured grapefruit at 45 DAT and tangerine at 60 DAT but not sweet orange. Overall, grapefruit was sensitive while sweet orange was tolerant to SL-160.

FREQUENCY AND DEGREE OF RESISTANCE TO GLYPHOSATE IN PALMER AMARANTH POPULATIONS FROM ARKANSAS. **E.A.L Alcober*, N.R. Burgos, T.M. Tseng, R.A. Salas, L.E. Estorninos, C.E. Schaedler; University of Arkansas, Fayetteville.**

ABSTRACT

Resistance to glyphosate in Palmer amaranth (*Amaranthus palmeri*) is a combined impact of the degree of selection pressure and the nature of cropping systems. Over a short period of time, glyphosate-resistant Palmer amaranth has spread rapidly over 23 counties in Arkansas. Thus, 38 populations were collected from Arkansas representing different ecological zones, geographical locations and cropping systems. Each population is composed of 10-20 plants sampled separately. A greenhouse bioassay experiment was conducted to determine the frequency and degree of glyphosate resistance within these Palmer populations. From each individually sampled plant, 100 offsprings were grown in individual cells in trays and sprayed with 840 g ae/ha glyphosate at three-to-four-leaf stage. Plant response, in terms of injury, was visually evaluated 21 DAT. Each seedling was scored separately, and categorized according to the level of injury. Plants with 0 to 10% injury were classified as highly resistant (HR); greater than 10 to 99% were moderately resistant (MR). Only the Crawford population was susceptible out of 38 populations. Thirteen (13) populations, with >50% HR offsprings, were from fields in soybean and cotton production systems for over 5 years. Stf-A, Cra-B, Lee-B, Mis-B, and Lin-D populations with >50% HR offsprings were growing with glyphosate-resistant crops for at least 5 years. The frequency of MR plants ranged from 2 to 77 % per population. It is important to note that even fields with relatively low frequency of MR plants, e.g. 2% of the population, will be composed of predominantly MR plants in the next crop cycle, because these plants escape the glyphosate application and will be the parents of succeeding generations. With high seed production per surviving plant, the spread of resistant individuals is exponential from year to year. Effective weed control program is needed to prevent exponential increase of glyphosate-resistant plants. This data can be used to refine existing models for glyphosate resistance evolution and spread in Palmer amaranth.

EVALUATION OF GREENMATCH FOR WEED SUPPRESSION IN ORGANICALLY-MANAGED TAHITI LIME. **Carlos Flores-Torres* and J. Pablo Morales-Payan, University of Puerto Rico-Mayaguez.**

ABSTRACT

Research was conducted to evaluate the efficacy of a herbicide accepted for use in organic systems (GreenMatch EX, based lemon grass oil) to suppress weeds in Tahiti lime (*Citrus latifolia*) orchards. The study was conducted at the UPR Research Station in Lajas, in southwestern Puerto Rico, using a 5-year old orchard. Weeds typically found in the orchard include *Cyperus rotundus*, *Ipomoea tiliacea*, *Trianthema portulacastrum*, *Macroptillium lathyroides*, *Amaranthus dubius*, *Echinochloa colona*, *Sorghum halepense*,*Panicum maximum*, *Eleusine indica*, *Leptochloa filiformis*, and *Digitaria sanguinalis*. The herbicide was sprayed on the weeds growing under the tree canopy when the weeds were 2, 4 or 6 inches tall, at the concentrations of 0 (control), 5%, 10%, 15% and 20%. Treated weeds showed 'burning' symptoms by 8 hours after treatment, with progressive weed deterioration until by 24 hours after treatment all the treated weeds were dead. No toxic effects were observed in the Tahiti lime trees. These results show that lemon grass oil may be used efficaciously to rapidly suppress weeds commonly found in citrus orchards in southern Puerto Rico, and may be a valuable tool for organic fruit crops growers in tropical locations.

Weed Survey – Southern States

Aquatic, Industrial, Nursery and Container Ornamentals, Power Lines, and Rights-Of-Way

Theodore M. Webster

Chairman

Information in this report is provided by the following individuals:

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Oklahoma	Joe Armstrong Rich Hendler	Doug Montgomery
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Virginia	Jeffrey Derr	

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

	States		
Ranking	**Florida**	**Kentucky**	**Missouri**
Ten Most Common Weeds			
1	Filamentous algae	Filamentous algae	Filamentous algae
2	Duckweed spp.	Pondweed spp.	Duckweed spp.
3	Torpedograss	Duckweed spp.	Pondweed spp.
4	Hydrilla	Cattail spp.	*Phragmites australis*
5	Waterhyacinth	Water primrose	Cattail spp.
6	Water lettuce	Naiad spp.	Water primrose
7	Cattail	Watershield	Waterlily spp.
8	Proliferating spikerush	Chara spp.	Spikerush
9	Bladderwort	Waterlily spp.	Naiad spp.
10	Mosquito fern	*Phragmites australis*	
Ten Most Troublesome Weeds			
1	Hydrilla	Duckweed spp.	Filamentous algae
2	Algae spp.	Algae spp.	*Phragmites australis*
3	Torpedograss	Chara spp.	Duckweed spp.
4	Crested floating heart	Watershield	Spikerush
5	Hygrophilla	Pondweed spp.	Pondweed spp.
6	East Indian hygrophilla	Naiad spp.	Naiad spp.
7	Rotala	Waterlily spp.	Cattail spp.
8	Waterhyacinth	*Phragmites australis*	Water primrose
9	Waterlettuce	Water primrose	Waterlily spp.
10		Cattail spp.	

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

	States	
Ranking	North Carolina	Puerto Rico
Ten Most Common Weeds		
1	Algae	Water lettuce
2	Duckweed	Flatsedge spp.
3	Cattail spp.	Water hyacinth
4	Pondweed spp.	Alligatorweed
5	Naiad spp.	Smartweed spp.
6	Watermeal	Torpedograss
7	Alligatorweed	Coontail
8	Primrose spp.	Sesbania spp.
9	Parrotfeather	Cattail spp.
10	*Egeria densa*	Dumbcane
Ten Most Troublesome Weeds		
1	Hydrilla	Water hyacinth
2	Alligatorweed	Water lettuce
3	Filamentous algae	Cattail spp.
4	Watermeal	Hydrilla
5	Parrotfeather	Giant salvinia
6	*Phragmites australis*	Smartweed spp.
7	*Egeria densa*	Torpedograss
8	Primrose spp.	Alligatorweed
9	Milfoil spp.	Dumbcane
10	Spikerush spp.	Flatsedge spp.

Table 2. The Southern States 10 Most Common and Troublesome Weeds in Industrial Areas.

	States		
Ranking	Alabama	Florida	Kentucky
Ten Most Common Weeds			
1	Johnsongrass	Crabgrass spp.	Large crabgrass
2	Crabgrass spp.	Goosegrass	Johnsongrass
3	Broomsedge	*Cyperus* spp.	Giant foxtail
4	Cogongrass	Dogfennel	Dandelion
5	Fall panicum	Florida/Brazilian pusley	Musk thistle
6	Dallisgrass	Bermudagrass	Horseweed
7	Smutgrass	Common ragweed	Common teasel
8	Resistant-Ryegrass	Spotted spurge	Broomsedge
9	Horseweed	Spanish needle	Tall fescue
10	Lespedeza	Cogongrass	White clover
Ten Most Troublesome Weeds			
1	Johnsongrass	Cogongrass	Johnsongrass
2	Crabgrass spp.	*Cyperus* spp.	Horseweed
3	Broomsedge	Lantana	Musk thistle
4	Cogongrass	Bamboo	Kudzu
5	Fall panicum	Florida/Brazilian pusley	Canada thistle
6	Dallisgrass	Dogfennel	Broomsedge
7	Smutgrass	Chinese tallow	Tall fescue
8	Resistant-Ryegrass	Saltbush	Bermudagrass
9	Horseweed	Broomsedge	Dandelion
10	Lespedeza	Privet spp.	Common teasel

Table 2. The Southern States 10 Most Common and Troublesome Weeds in Industrial Areas.

	States	
Ranking	North Carolina	Puerto Rico
Ten Most Common Weeds		
1	Crabgrass spp.	Guinea grass
2	Bermudagrass	Talquezal
3	Bahiagrass	Wild tamarind (*Leucaena leucacephala*)
4	Dallisgrass	Dallisgrass
5	Broomsedge spp.	Catclaw
6	Vaseygrass	Mesquite
7	Goosegrass	Sour paspalum
8	Morningglory spp.	Sedge spp.
9	Honeysuckle spp.	Venezuelan grass
10	Spurge spp.	Tall albizia
Ten Most Troublesome Weeds		
1	Bermudagrass	Guinea grass
2	Dallisgrass	Sour paspalum
3	Crabgrass spp.	Venezuelan grass
4	Bahiagrass	Catclaw
5	Vaseygrass	Mesquite
6	Privet spp.	Sedge spp.
7	Bramble spp.	Talquezal
8	Honeysuckle spp.	Dallisgrass
9	Johnonsgrass	Tall albizia
10	Thistle spp.	Morningglory spp.

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Nursery and Container Ornamentals.

	States		
Ranking	Alabama	Florida	Georgia
Ten Most Common Weeds			
1	Spotted spurge	*Chamaesyce* spp.	Bittercress spp.
2	Eclipta	*Oxalis* spp.	Woodsorrel spp.
3	Bittercress	*Digitaria* spp.	Spurge spp.
4	*Oxalis* spp.	*Cyperus/Kyllinga* spp.	*Phyllanthus* spp.
5	Longstalk phyllanthus	*Richardia* spp.	Eclipta
6	Liverwort	*Gamochaeta* spp.	Mulberry weed
7	Hawksbeard	*Youngia japonica*	Yellow nutsedge
8	Chickweed spp.	*Cardamine* spp.	Purple nutsedge
9	Crabgrass spp.	Goosegrass	Crabgrass spp.
10	Common groundsel	Common chickweed	Cudweed spp.
Ten Most Troublesome Weeds			
1	Spotted spurge	*Chamaesyce* spp.	Bermudagrass
2	Eclipta	*Oxalis* spp.	Eclipta
3	Bittercress	*Cyperus/Kyllinga* spp.	*Phyllanthus* spp.
4	Liverwort	*Eclipta prostrata*	Bittercress spp.
5	Longstalk phyllanthus	*Cardamine* spp.	*Oxalis* spp.
6	*Oxalis* spp.	Benghal dayflower	Spurge spp.
7	Hawksbeard	*Parthenium hysterophorus*	Mulberry weed
8	Chickweed spp.	*Richardia* spp.	Yellow nutsedge
9	Crabgrass spp.	*Phyllanthus* spp.	Purple nutsedge
10	Common groundsel	*Fatoua villosa*	Florida betony

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Nursery and Container Ornamentals (continued).

	States		
Ranking	Kentucky	Louisiana	Missouri
	Nursery Ornamentals		
Ten Most Common Weeds			
1	Large crabgrass	Spurge spp.	Field bindweed
2	Giant foxtail	*Oxalis* spp.	Yellow woodsorrel
3	Yellow nutsedge	*Phyllanthus* spp.	Spurge spp.
4	Johnsongrass	Bittercress spp.	Common purslane
5	Common chickweed	Crabgrass spp.	Common bermudagrass
6	Hairy galinsoga	Sedge spp.	Goosegrass
7	Dandelion	Mulberry weed	Common lambsquarters
8	Purple deadnettle	Dogfennel	Henbit
9	Smooth pigweed	Sowthistle	Giant foxtail
10	Ivyleaf morningglory	Asiatic hawksbeard	*Amaranthus* spp.
Ten Most Troublesome Weeds			
1	Yellow nutsedge	Bittercress spp.	Field bindweed
2	Johnsongrass	Spurge spp.	Spurge spp.
3	Dandelion	*Phyllanthus* spp.	Common bermudagrass
4	Nimblewill	*Oxalis* spp.	Yellow woodsorrel
5	Purple deadnettle	Mulberry weed	Goosegrass
6	Horsenettle	Sedge spp.	Common purslane
7	Prickly lettuce	Eclipta	Common lambsquarters
8	Large crabgrass	Dogfennel	Henbit
9	Giant foxtail	*Ludwigia* spp.	*Amaranthus* spp.
10	Common chickweed	Doveweed	Giant foxtail

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Nursery and Container Ornamentals (continued).

	States	
Ranking	North Carolina	Puerto Rico
Ten Most Common Weeds		
1	Spotted spurge	Goosegrass
2	Hairy bittercress	Junglerice
3	Yellow nutsedge	Silver bush – *Peperonia*
4	Oxalis spp.	*Veronica cinerea*
5	Long stalked phyllanthus	Sedge spp.
6	Eclipta	Spurge spp.
7	Dogfennel	*Oxalis* spp.
8	Crabgrass and goosegrass	Hairy bittercress – (*Cardamine flexuosa*)
9	Bermudagrass	Guineagrass
10	American burnweed	*Cynodon* spp.
Ten Most Troublesome Weeds		
1	Hairy bittercress	Sedge spp.
2	Spotted spurge	Spurge spp.
3	Liverwort	Goosegrass
4	Yellow nutsedge	Silver bush – *Peperonia*
5	Eclipta	Junglerice
6	Long stalked phyllantus	*Cynodon* spp.
7	Doveweed	Hairy bittercress – (*Cardamine flexuosa*)
8	Dogfennel	*Oxalis* spp.
9	Horsenettle	Guineagrass
10	Morningglory spp.	*Veronica cinerea*

Table 3. The Southern States 10 Most Common and Troublesome Weeds in Nursery and Container Ornamentals (continued).

	States	
Ranking	Virginia	Virginia
	Container Ornamentals	Field Ornamentals
Ten Most Common Weeds		
1	Spotted spurge	Large crabgrass
2	Flexuous bittercress	*Amaranthus* spp.
3	*Oxalis* spp.	Common lambsquarters
4	Common groundsel	Giant foxtail
5	Eclipta	Common ragweed
6	Crabgrass spp.	Common chickweed
7	Sowthistle spp.	Dandelion
8	Horseweed	Buckhorn plantain
9	Common chickweed	Henbit
10	Annual bluegrass	Horseweed
Ten Most Troublesome Weeds		
1	Eclipta	Mugwort
2	Flexuous bittercress	Yellow nutsedge
3	Spotted spurge	Bermudagrass
4	*Oxalis* spp.	Bindweed spp.
5	Common groundsel	Canada thistle
6	Long-stalked phyllanthus	Morningglory spp.
7	Yellow nutsedge	Wild garlic
8	Sowthistle spp.	Horsenettle
9	Tasselflower	Dayflower spp.
10	Doveweed	Horseweed

Table 4. The Southern States 10 Most Common and Troublesome Weeds of Utility Rights-of-Way.

	States		
Ranking	Alabama	Florida	Kentucky
Ten Most Common Weeds			
1	Pine spp.	Oak spp.	Sumac spp.
2	Sweetgum	Sweet gum	Sweetgum
3	Privet	Maple spp.	Black locust
4	Red maple	Cherry spp.	Wild black cherry
5	Box elder	Sumac	Eastern red cedar
6	Hackberry/Sugarberry	Wax myrtle	Redbud
7	Hickory spp.	Pine spp.	Musk thistle
8	Oak spp.	Saw palmetto	Trumpetcreeper
9	Sassaphras	Persimmon	Honeysuckle
10	Persimmon	Blackberry	Common milkweed
Ten Most Troublesome Weeds			
1	Cogongrass	Cogongrass	Sweetgum
2	Privet	Oak spp.	Black locust
3	Box elder	Vines (all spp.)	Kudzu
4	Hackberry/Sugarberry	Wax myrtle	Russian olive
5	Sweetgum	Melaleuca	Eastern red cedar
6	Hickory spp.	Australian pine	Honeysuckle
7	Wax myrtle	Pine spp.	Japanese knotweed
8	Yaupon	Chinese tallow	Multiflora rose
9	Baaccharis	Mimosa	*Alianthus* spp.
10	Pine spp.	Brazilian pepper	Wild black cherry

Table 4. The Southern States 10 Most Common and Troublesome Weeds of Utility Rights-of-Way (continued).

	States		
Ranking	Missouri	North Carolina	Oklahoma
Ten Most Common Weeds			
1	Oak spp.	Sweetgum	Hackberry
2	Ash spp.	Pine spp.	Elm spp.
3	Cutleaf teasel	Oak spp.	Oak spp.
4	Sumac spp.	Maple spp.	Locust spp.
5	Shagbark hickory	Kudzu	Willow spp.
6	Bush honeysuckle	Sumac spp.	Pine spp.
7	Blackberry spp.	Black cherry	Cedar spp.
8	Multiflora rose	Locust spp.	Soapberry
9	Eastern red cedar	Bramble spp.	Mulberry
10	Olive spp.	Privet spp.	Cottonwood/Sycamore
Ten Most Troublesome Weeds			
1	Olive spp.	Kudzu	Elm spp.
2	Bush honeysuckle	Sumac spp.	Willow spp.
3	Ash spp.	Pine spp.	Cedar spp.
4	Multiflora rose	Sweetgum	Box elder
5	Shagbark hickory	Oak spp.	Pine spp.
6	Oak spp.	Black cherry	Soapberry
7	Blackberry spp.	Locust spp.	Hackberry
8	Eastern red cedar	Hickory spp.	Locust spp.
9	Sumac spp.	Maple spp.	Bois d’arc
10	Cutleaf teasel	Bramble spp.	Persimmon

Table 4. The Southern States 10 Most Common and Troublesome Weeds of Utility Rights-of-Way (continued).

	States
Ranking	Puerto Rico
Ten Most Common Weeds	
1	Tropical kudzu
2	*Mikania cordifolia*
3	Tall albizia
4	Pudding vine (*Cissus*)
5	Itchweed (*Mucuna pruriens*)
6	*Thunbergia fragrans*
7	Dioscorea
8	Wild balsam apple
9	Morningglory spp.
10	African tulip tree (*Spathodea campanulata*)
Ten Most Troublesome Weeds	
1	Pudding vine (*Cissus*)
2	Tropical kudzu
3	Morningglory spp.
4	*Thunbergia fragrans*
5	Itchweed (*Mucuna pruriens*)
6	Dioscorea
7	Tall albizia
8	*Mikania cordifolia*
9	Wild balsam apple
10	African tulip tree (*Spathodea campanulata*)

Table 5. The Southern States 10 Most Common and Troublesome Weeds in Highway Rights-of-Way

	States		
Ranking	Alabama	Florida	Kentucky
Ten Most Common Weeds			
1	Crabgrass spp.	Spanish needle	Johnsongrass
2	Ryegrass spp.	Smutgrass	Poison hemlock
3	Johnsongrass	Carolina geranium	Common teasel
4	Vaseygrass	Wild radish	Amur honeysuckle
5	Thistle spp.	Vaseygrass	Musk thistle
6	Buckhorn plantain	Common ragweed	Japanese knotweed
7	Broomsedge	Dogfennel	Kudzu
8	Pine spp.	Pigweed spp.	Foxtail spp.
9	Sweetgum	False ragweed	Chicory
10		Matchweed	Wild carrot
Ten Most Troublesome Weeds			
1	Cogongrass	Cogongrass	Canada thistle
2	Johnsongrass	Brazilian pepper	Japanese knotweed
3	Vaseygrass	Australian pine	Amur honeysuckle
4	Broomsedge	Mimosa	Johnsongrass
5	Thistle spp.	Sweet gum	Kudzu
6	Ryegrass spp.	Privet spp.	Common teasel
7	Sweetgum	Tropical soda apple	Musk thistle
8	Horseweed	Lantana	Chinese silvergrass
9	Chinese privet	Southern sida	Kochia
10		Johnsongrass	Purple loosestrife

Table 5. The Southern States 10 Most Common and Troublesome Weeds in Highway Rights-of-Way (continued).

	States	
Ranking	Missouri	North Carolina
Ten Most Common Weeds		
1	Goldenrod spp.	Crabgrass spp.
2	Aster spp.	Dallisgrass
3	Cutleaf teasel	Johnsongrass
4	Sumac spp.	Henbit
5	Poison hemlock	Carolina geranium
6	Tall ironweed	Broomsedge
7	Spotted knapweed	Horseweed
8	Eastern red cedar	Dock spp.
9	Johnsongrass	Dogfennel
10	Foxtail spp.	Dandelion spp.
Ten Most Troublesome Weeds		
1	Johnsongrass	Broomsedge
2	Poison hemlock	Dallisgrass
3	Spotted knapweed	Goldenrod spp.
4	Cutleaf teasel	Dandelion spp.
5	Tall ironweed	Kudzu
6	Eastern red cedar	Japanese knotweed
7	Sumac spp.	Johnsongrass
8	Goldenrod spp.	Dogfennel
9	Aster spp.	Bramble spp.
10	Foxtail spp.	Vaseygrass

Table 5. The Southern States 10 Most Common and Troublesome Weeds in Highway Rights-of-Way (continued).

	States	
Ranking	Oklahoma	Puerto Rico
Ten Most Common Weeds		
1	Johnsongrass	Railroad grass
2	*Amaranthus* spp.	Smutgrass
3	Kochia	Guineagrass
4	Horseweed	Wild tamarind
5	Large crabgrass	Talquezal
6	Downy brome	*Hyparrenia rufa*
7	Annual ryegrass	Tall albizia
8	Hairy vetch	Thibet tree
9	Cereal grains	Sour paspalum
10	Common bermudagrass	*Paspalum millegrana*
Ten Most Troublesome Weeds		
1	*Amaranthus* spp.	*Hyparrenia rufa*
2	Switchgrass	Railroad grass
3	Kochia	Guineagrass
4	Annual ryegrass	Smutgrass
5	Field bindweed	Talquezal
6	Silver bluestem	*Paspalum millegrana*
7	Johnsongrass	Sour paspalum
8	Large crabgrass	Tall albizia
9	Common bermudagrass	Wild tamarind
10	Sowthistle spp.	Thibet tree

State Weed Publications

State: ALABAMA

Prepared by: Mike Patterson

Internet URL: http://www.aces.edu/pubs/

Source: Bulletin Room, Alabama Cooperative Extension System, #6 Duncan Hall, Auburn University, Auburn, AL 36849

Number	Title
CIRCULARS	
ANR-48	Weed Control in Lake and Ponds
ANR-65	Kudzu: History, Uses, & Control
ANR-104	Controlling Smutgrass in Alabama Pastures
ANR-322	Weed Control in Home Gardens
ANR-453	Christmas Tree IPM
ANR-465	Weed Control for Commercial Nurseries
ANR-616	Weeds of Southern Turfgrasses ($15.00)
ANR-715	Cotton Defoliation
ANR-811	Conservation Tillage for Corn in Alabama
ANR 854	Weed Control in Residential Landscape Plantings
ANR-908	Moss and Algae control in Lawns
ANR-909	Tropical Soda Apple in Alabama
ANR-951	Weed Control Around Poultry Houses and Other Farm Building
ANR-975	Poisonous Plants of the Southern United States ($4.00)
ANR-1058	Brush Control
ANR-1128	Weed Identification for Horticulture Crops
ANR-1241	Wanted Dead Not Alive: Cogongrass

INFORMATION SHEETS

2004IPM-2	Commercial Vegetable IPM
2004IPM-8	Peach IPM
2004IPM-11	Apple IPM
2004IPM-22	Weed Control in Commercial Turfgrass
2004IPM-27	Pecan IPM
2004IPM-28	Forage Crops IPM
2004IPM-223	Noncropland IPM
2004IPM-360	Peanut IPM
2004IPM-413	Soybean IPM
2004IPM-415	Cotton IPM
2004IPM-428	Corn IPM
2004IPM-429	Grain Sorghum IPM
2004IPM-453	Christmas Tree IPM
2004IPM-458	Small Grain IPM
2004IPM-478	Small Fruit IPM
2004IPM-590	Chemical Weed Control for Home Lawns
2004IPM-978	Alfalfa IPM

State: ARKANSAS

Prepared by: Bob Scott, John Boyd, and Ken Smith

Internet URL: http://pubs4sale.uaex.edu/

Order from: Dr. Bob Scott, Box 391, 2301 South University, University of Arkansas Cooperative Extension, Little Rock, AR 72204

[1]Bernadette Hinkle, Box 391, Little Rock, AR 72203

Number	Title
PUBLICATIONS	
FSA 2149	Ryegrass Identification Keys
FSA 2152	Prevention and Control of Glyphosate Resistant Pigweed in Roundup Ready Soybean and Cotton (color)
FSA 2155	Sod Farm Weed Control (color)
FSA 3054	Musk Thistle (color)
FSA 6123	Nursery Series: Weed Control in Container Nurseries
FSA 6124	Woody Plant Control in Landscapes
FSA 6127	Nursery Series: Weed Control in Field Nurseries
FSA 6137	Weed Control in Landscape Plantings
MP-44	Recommended Chemicals for Weed and Brush Control in Arkansas
MP-1691	Weeds of Arkansas Lawns, Turf, Roadsides, and Recreation Areas: A Guide to Identification ($5.00)
MP-370	Turfgrass Weed Control for Professionals
FSA-2080	Pasture Weed and Brush Control
FSA-2109	Home Lawn Weed Control

A weed control chapter is included in each of the following publications:

MP-192	Rice Production Handbook
MP-197	Soybean Production Handbook

MP-214	Corn Production Handbook
-----	Grain Sorghum Production Handbook
-----	Technology for Optimum Production of Soybeans

Information fact sheets for weed problems in commodity groups such as rice, soybean, forage, cotton, etc. are published as necessary. Color posters of weeds in Wheat, Pastures, and Lawns I and II are also available.

State:	Florida
Prepared by:	Jay Ferrell, Ken Langeland, William Stall, and Brian Unruh
Internet URL:	http://edis.ifas.ufl.edu/publications.html
Order from:	Extension Weed Specialist, Agronomy Department, 303 Newell Hall, P.O. Box 110500, University of Florida, Gainesville, FL 32611-0500
1	Dr. W. M. Stall, Extension Vegetable Weed Specialist, 1255 Fifield Hall, Univ. of Florida, Gainesville, FL 32611-0690
2	Dr. D. P. H. Tucker, Extension Citrus Management Specialist, IFAS-AREC, 700 Experiment Station Road, Lake Alfred, FL 33850
3	Dr. K. A. Langeland, Extension Aquatic Weed Specialist, Center for Aquatic Plant Research, 7922 NW 71st Street, Gainsville, FL 32606
4	Dr. B. R. Unruh, 1523 Fifield Hall, Gainsville, FL 32611
5	University of Florida Publications, P.O. Box 110011, Gainesville, FL 32611-0011

Number	Title
SS-AGR-001	Weed Control in Tobacco
SS-AGR-002	Weed Control in Corn
SS-AGR-003	Weed Control in Peanuts
SS-AGR-004	Weed Control in Cotton
SS-AGR-005	Weed Control in Soybeans
SS-AGR-006	Weed Control Sorghum
SS-AGR-007	Weed Control in Small Grains Harvested for Grain
SS-AGR-008	Weed Control in Pastures and Rangeland
SS-AGR-009	Weed Control in Sugarcane
SS-AGR-010	Weed Control in Rice
SS-AGR-012	Florida Organo-Auxin Herbicide Rule
SS-AGR-014	Herbicide Prepackage Mixtures
SS-AGR-015	Diagnosing Herbicide Injury
SS-AGR-016	Approximate Herbicide Pricing

SS-AGR-17	Brazilian Pepper-Tree Control
SS-AGR-22	Identification and Control of Bahiagrass Varieties in Florida
SS-AGR-50	Tropical Soda Apple in Florida
SS-AGR-52	Cogongrass (Imperata cylindrica) Biology, Ecology and Control in Florida
SS-AGR-80	NATURAL AREA WEEDS: Skunkvine (Paederia foetida)
SS-AGR-100	Principles of Weed Management
SS-AGR-101	Applications Equipment and Techniques
SS-AGR-102	Calibration of Herbicide Applicators
SS-AGR-108	Using Herbicides Safely and Herbicide Toxicity
SS-AGR-109	Adjuvants
SS-AGR-164	Natural Area Weeds: Air Potato (*Dioscorea bulbifera*)
SS-AGR-165	Natural Area Weeds: Carrotwood (*Cupaniopsis anacardioides*)
SS-AGR-21	Natural Area Weeds: Old World Climbing Fern (*Lygodium microphyllum*)
SS-ORH-0044	2003 University of Florida's Pest Control Recommendations for Turfgrass Managers
AGR-72	Labeled Aquatic Sites for Specific Herbicides
AGR-79	Florida Department of Environmental Protection Aquatic Plant Management Permits
A-87-63	Application Procedure for Use of Grass Carp for Control of Aquatic Weeds
A-87-73	Biology and Chemical Control of Algae
A-87-103	Biology and Chemical Control of Duckweed
A-87-113	Chemical Control of Hydrilla
A-87-123	Florida DNA Aquatic Plant Control Permit Program
ENH-84	Weed Control Guide for Florida Lawns
ENH-88	Activated Charcoal for Pesticide Deactivation
ENH-90	Pesticide Calibration Formulas and Information
ENH-94	Metric System Conversion Factors
ENH-100	Response of Turfgrass and Turfgrass Weeds to Herbicides
ENH-124	Pest Control Guide for Turfgrass Managers

FS WRS-7	Tropical Soda Apple: A New Noxious Weed in Florida
HS-88	Weed Management in Apples
HS-89	Weed Management in Blackberries
HS-90	Weed Management in Blueberries
HS-91	Weed Management in Grapes
HS-92	Weed Management in Nectarines
HS-93	Weed Management in Peaches
HS-94	Weed Management in Pears
HS-95	Weed Management in Pecans
HS-96	Weed Management in Plums
HS-97	Susceptibility of Weeds to Herbicides
HS-107	2001 Florida Citrus Pest Management Guide
HS-1881	Weed Management in Commercial Citrus
HS-1891	Weed Control in Cold or Brassica Leafy Vegetables
HS-1901	Weed Control in Cucurbit Crops
HS-1911	Weed Control in Eggplant
HS-1921	Weed Control in Okra
HS-1931	Weed Control in Bulb Crops
HS-1941	Weed Control in Potato
HS-1951	Potato Vine Dessicants
HS-1961	Weed Control in Strawberry
HS-1971	Weed Control in Sweet Corn
HS-1981	Weed Control in Sweet Potato
HS-1991	Weed Control in Pepper
HS-2001	Weed Control in Tomato
HS-2011	Weed Control in Carrots and Parsley
HS-2021	Weed Control in Celery
HS-2031	Weed Control in Lettuce, Endive, and Spinach

HS-7061	Estimated Effectiveness of Recommended Herbicides on Selected Common Weeds in Florida Vegetables

CIRCULAR, BOOKS, AND GUIDES

SS-AGR-20	2009 Weed Management Guide in Agronomic Crops and Non-Crop Areas
2805	Families, Mode of Action and Characteristics of Agronomic, Non-Crop and Turf Herbicides
4592	Weed Control Guide for Florida Citrus
676	Weed Control in Centipede and St. Augustinegrass
678	Container Nursery Weed Control
707	Weed Control in Florida Ponds
8524	Weed Control in Sod Productions
1114	Weed Management for Florida Golf Courses
-----5	Florida Weed Control Guide ($8.00)
DH-88-054	Turfgrass Weed Control Guide for Lawn Care Professionals
DH-88-074	Commercial Bermudagrass Weed Control Guide
SM-445	Aquatic and Wetland Plants of Florida ($11.00)
SP-355	Identification Manual for Wetland Plant Species of Florida ($18.00)
SP-375	Weeds in Florida ($7.00)
	Florida Weeds Part II ($1.00)
SP-795	Weeds of Southern Turfgrasses ($8.00)
SP-242	Control of Non-native Plants in Natural Areas of Florida

State: GEORGIA

Prepared by: Stanley Culpepper, Tim R. Murphy, and Eric Prostko

Internet URL: http://pubs.caes.uga.edu/caespubs/pubs/html (use for print-on-demand publications

http://www.gaweed.com/ (contains weed science slide presentations, some publications, etc.)

http://www.georgiaturf.com (contains weed science popular articles related to turfgrasses, weed identification, etc.)

Order from: [1]Ag. Business Office, Room 203, Conner Hall, The University of Georgia, Athens, GA 30602 Make check payable to: Georgia Cooperative Extension Service

The University of Georgia Cooperative Extension Service is currently in the process of switching to a print-on-demand system for Extension publications. Unless noted by an asterisk (*) the publications shown below are not available at this time through the print-on-demand system. Hard copies of these publications may be obtained by contacting one of Georgia weed scientists listed above.

Number	Title
LEAFLETS	
263	Renovation of Home Lawns
400	Musk Thistle and Its Control
418	Use of Sterile Grass Carp to Control Aquatic Weeds
425	Florida Betony Control in Turfgrass and Ornamentals
CIRCULARS	
713	Commercial Blueberry Culture
796	Roadside Vegetation Management
823	Controlling Moss and Algae in Turf
855	Wild Poinsettia Identification and Control*
865	Tropic Croton Identification and Control in Cotton and Peanut

EXTENSION BULLETINS

654	Weed Control in Noncropland
829	Principles and Practices of Weed Control in Cotton
978	Weed Control in Home Lawns
984	Turfgrass Pest Control Recommendations for Professionals
986	Forest Site Preparation Alternatives
996	Commercial Watermelon Production
998	Conservation Tillage Crop Production in Georgia
1004	Herbicide Use in Forestry
1005	Georgia Handbook of Cotton Herbicides
1006	Weed Control in Ponds and Small Lakes
1008	Weed Facts: Texas Panicum
1009	Weed Facts: Morningglory Complex
1010	Weed Facts: Sicklepod and Coffee Senna
1019	Cotton Defoliation and Crop Maturity
1023	Herbicide Incorporation
1032	Forestry on a Budget
1043	Weed Facts: Yellow and Purple Nutsedge
1049	Perennial Weed Identification and Control in Georgia
1069	How to Set Up a Post-Emergence Directed Herbicide Sprayer for Cotton
1070	Forage Weed Management
1072	Weed Facts: Florida Beggarweed
1093	Guide to Field Crop Troubleshooting
1100	Peanut Herbicides for Georgia
1118	Non-Commercial Weed Control Methods
1125	Weed Management in Conservation Tillage Cotton
1135	Intensive Wheat Management in Georgia
1138	Conservation Tillage for Peanut Production

1144	Commercial Production of Vegetable Transplants

SPECIAL BULLETINS

281	Georgia Pest Control Handbook ($15.00)*

MISCELLANEOUS

Pub. 46	2009 Georgia Peach Spray and Production Guide
Pub. 377	2009 Georgia Tobacco Growers Guide
Pub. 380	2009 Cotton Production Package
Hdbk. No. 11	Peach Growers Handbook ($25.00)
1	Pecan Pest Management Handbook ($20.00)
1	Weeds of Southern Turfgrasses ($8.00)
1	Poisonous Plants of the Southeastern United States ($4.00)
7611	Weeds of the Southern United States ($3.00)
8391	Identification and Control of Weeds in Southern Ponds ($3.00)*

State: KENTUCKY

Prepared by: J.D. Green

Internet URL: http://www.ca.uky.edu/agc/pubs/pubs.htm

Order from: Dr. J.D. Green, Extension Weed Control Specialist, Plant and Soil Sciences Department, 413 Plant Science Building, University of Kentucky, Lexington, KY 40546-0312

Dr. James R. Martin, Extension Weed Control Specialist, University of Kentucky Research and Education center, P. O. Box 469, Princeton, KY 42445

Number	Title
AGR-6	Chemical Control of Weeds in Kentucky Farm Crops
AGR-12	Weeds of Kentucky Turf
AGR-78	Weed Control Recommendations for Kentucky Bluegrass and Tall Fescue Lawns and Recreational Turf
AGR-139	Herbicide Persistence and Carryover in Kentucky
AGR-140	Herbicides with Potential to Carryover and Injure Rotational Crops in Kentucky
AGR-148	Weed Control Strategies for Alfalfa and Other Forage Legume Crops
AGR-172	Weed Management in Grass Pastures, Hayfields, and Fencerows
ID-2	Some Plants of Kentucky Poisonous to Livestock
ID-36	Commercial Vegetable Crop Recommendations
ID-125	A Comprehensive Guide to Wheat Management in Kentucky ($10.00)
ID-139	Comprehensive Guide to Corn Management in Kentucky ($10.00)

State: LOUISIANA

Prepared by: Dearl Sanders

Internet URL: http://www.lsuagcenter.com/nav/publications/pubs.asp

Order from: LSU AgCenter Communications, Publications Office, P.O. Box 25100, Baton Rouge, LA 70894

Number	Title
PUBLICATIONS	
1565	Louisiana's Suggested Chemical Weed Control Guide for 2004 ($4.00)
1618	Prescribed Burning in Louisiana Pinelands ($1.00)
2314	Controlling Weeds in Sugarcane ($0.50)
2398	Aquatic Weed Management Herbicides ($0.50)
2410	Aquatic Weed Management Control Methods ($0.50)
2472	Aquafacts: Algal Blooms in Fish Production Ponds ($0.50)
2476	Aquafacts: Grass Carp for Aquatic Vegetation Control ($0.50)
2500	Herbicide Application for the Small Landowner ($0.50)
2740	Control Weeds in Soybeans with Pre and Postemergence Chemicals in 2004 ($1.00)
2746	2009 Controlling Weeds in Cotton ($1.00)
2778	Nonchemical Weed Control for Home Landscapes ($0.50)
2820	Louisiana Sugarcane Burning ($1.00)
8909	Conservation Tillage Systems for Energy Reduction – Preplant Weed Control in Cotton ($0.50)
RIS 105	Guidelines for Managing Winter Vegetation in Northeast Louisiana

State: MISSISSIPPI

Prepared by: John D. Byrd, Jr.

Internet URL: http://www.msucares.com/pubs/index.html

Order from: Dr. John Byrd, Plant & Soil Sciences, Box 9555, Mississippi State, MS 39762-9555

Dr. Andy Londo, Forestry Department, Box 9681, Mississippi State, MS 39762-9632

Mr. Herb Willcutt, Agric. & Bio. Engineering, Box 9632, Mississippi State, MS 39762-9632

Dr. Nathan Buehring, Delta Research & Extension Center, P.O. Box 68, Stoneville, MS 38776

HADSS, c/o AgRenaissance Software LLC, P.O. Box 68007, Raleigh, NC 27613

Number	Title
INFORMATION SHEETS	
6731	Control of Fish Diseases and Aquatic Weeds
803	Grain and Forage Sorghum Weed Control
875	Cotton Postemergence and Layby Herbicides
945	Forages Weed Control in Pastures
962	Soybean Preplant Foliar and Preplant Incorporated
963	Soybean Preemergence Weed Control
1024	Soybean- Management Strategies for Sicklepod
1025	Aquatic Weed Identification and Control—Bushy Pondweed and Coontail
1026	Aquatic Weed Identification and Control—Willows and Arrowhead
1027	Aquatic Weed Identification and Control—Cattail and Spikerush
1028	Aquatic Weed Identification and Control—Pondweed and Bladderwort
1029	Aquatic Weed Identification and Control—Fanwort and Parrotfeather
1030	Aquatic Weed Identification and Control—Frogbit and Watershield
1031	Aquatic Weed Identification and Control—Burreed and Bulrush
1032	Aquatic Weed Identification and Control—White Waterlily and American Lotus

1033	Aquatic Weed Identification and Control—Duckweed and Water Hyacinth
1034	Aquatic Weed Identification and Control—Hydrilla and Alligatorweed
1035	Aquatic Weed Identification and Control—Algae
1036	Aquatic Weed Identification and Control—Methods of Aquatic Weed Control
1037	Aquatic Weed Identification and Control—Smartweed and Primrose
1500	Flame Cultivation in Cotton
1527	Peanut Weed Control Recommendations
1528	Kenaf Weed Control Recommendations
1580	Nonchemical Weed Control for Home Owners
1619	Cotton Preplant and Preemergence Weed Control
-----	Tropical Soda Apple in Mississippi
-----	Tropical Soda Apple in the United States
-----	Management Strategies for Tropical Soda Apple in Mississippi

PUBLICATIONS

475	Corn Weed Control Recommendations
461	Commercial Pecan Pest Control- Insects, Diseases and Weeds
553	Weed Science for 4-H’ers
10053	Christmas Tree Production in Mississippi
10064	Calibration of Ground Spray Equipment
1091	Garden Tabloid
1100	Soybeans Postemergence Weed Control
12175	Rice Weed Control
12773	Forest Management Alternatives for Private Landowners
1322	Establish and Manage Your Home Lawn
1344	Weed Control in Small Grain Crops
1532	2009 Weed Control Guidelines for Mississippi ($7.00)

1664	Disease, Insect and Weed Control Guide for Commercial Peach Orchards
1744	Weed Control in Home Lawns
1907	Herbicide Resistance Prevention and Detection
1934	Weed Response to Selected Herbicides
1962	Pesticides – Benefits and Risks
2036	Organic Vegetable IPM Guide
2166	Poisonous Plants of the Southeastern United States

TECHNICAL NOTES

MTN-SG3	Weed Control in Christmas Tree Plantations
MTN-7F3	An Overview of Herbicide Alternatives for the Private Forest Landowner
MTN-8F3	Tree Injection: Equipment, Methods, Effective Herbicides, Productivity, and Costs
MTN-11F3	Effective Kudzu Control

COMPUTER SOFTWARE

-----6	Mississippi HADSS ($95.00)

State: MISSOURI

Prepared by:

Internet URL: http://outreach.missouri.edu/main/publications.shtml

Order from: Extension Publications, 2800 Maguire, University Of Missouri, Columbia, MO 65211
Add $1.00 for shipping and handling with each order.

Number	Title
MP171	Missouri Pest Management Guide: Corn, Soybean, Wheat
MP581	Weed and Brush Control Guide for Forages, Pastures, and Non-Cropland in Missouri ($5.00)
MP686	Using Reduced Herbicide Rates for Weed Control in Soybeans ($1.00)
G4251	Cotton Weed Control ($0.75)
G4851	Waterhemp Management Practices and Alternatives in Missouri ($0.75)
G4872	Johnsongrass Control
G4875	Control of Perennial Broadleaf Weeds in Missouri Field Crops ($0.75)
NCR614	Early Spring Weeds of No-Till Production

State: NORTH CAROLINA

Prepared by: Joe Neal, David Ritchie, and Fred Yelverton

Internet URL: http://ipm.ncsu.edu/ncpmip

http://www.turffiles.ncsu.edu/AllPublications.aspx

Order from: Dr. Fred Yelverton, Department, Box 7620, North Carolina State University, Raleigh, NC 27695-7620

Dr. J.C. Neal, Department of Horticulture, Box 7609, North Carolina State University, Raleigh, NC 27695-7609

Communication Services, N.C. State University, 3210 Faucette Dr., Box 7603, Raleigh, NC 27695-7603

Dr. David Ritchie, Department of Horticulture, Box 7609, North Carolina State University, Raleigh, NC 27695-7609

HADSS, c/o AgRenaissance Software LLC, P.O. Box 68007, Raleigh, NC 27613

Number	Title
PUBLICATIONS	
AG-1	2009 North Carolina Agricultural Chemicals Manual ($24.00)
AG-187	2009 Flue-Cured Tobacco Guide
AG-208	Identifying Seedling and Mature Weeds in Southeastern United States ($7.00)
AG-331	2009 Peanut Information
AG-348	Turfgrass Pest Management Manual: A Guide to Major Turfgrass Pests and Turfgrasses ($12.00)
AG-367	Tall Fescue Lawn Maintenance Calendar
AG-371	Agricultural Chemicals for North Carolina Apples
AG-376	2009 Burley Tobacco Guide
AG-381	Centipedegrass Lawn Maintenance Calendar
AG-408	2009 Pest Control for Professional Turfgrass Managers
AG-417	2009 Cotton Information
AG-429	Bermudagrass Athletic Field Maintenance Calendar

AG-430	Tall Fescue and Kentucky Bluegrass Athletic Field Maintenance Calendar
AG-431	Bermudagrass Lawn Maintenance Calendar
AG-432	Zoysiagrass Lawn Maintenance Calendar
AG-437	Weed Management in Small Ponds
AG-438	Weed Control in Irrigation Water Supplies
AG-442	Using Activated Charcoal to Inactivate Agricultural Chemical Spills
AG-449	Hydrilla, A Rapidly Spreading Aquatic Weed in North Carolina
AG-456	Using Grass Carp for Aquatic Weed Management
AG-540	St. Augustinegrass Lawn Maintenance Calendar
AG-541	Carpetgrass Lawn Maintenance Calendar
AG-562	Organic Lawn Care: A Guide to Lawn Maintenance and Pest Management for North Carolina
AG-580	Small Grain Production Guide
AG-594	North Carolina Corn Production Guide
AG-1461	Peach and Nectarine Spray Schedule
AG-5722	Integrated Orchard Management Guide for Commercial Apples in the Southeast
B-414	Stock-Poisoning Plants of North Carolina ($5.00)
-----3	Southern Peach, Nectarine, and Plum Pest Management and Cultural Guide

INFORMATION LEAFLETS (http://www.ces.ncsu.edu/depts/hort/hil/index.html)

HIL205B1	Weed Control Options for Strawberries on Plastic
HIL3251	Peach Orchard Weed Management
HIL380	Orchard Floor Management in Pecans
HIL449	Weed Management in Conifer Seedbeds and Transplant Beds
HIL570	Greenhouse Weed Management
HIL644	Weed Management in Annual Color Beds
HIL647	Controlling Yellow Nutsedge in Landscape Plantings
HIL648	Postemergence, Nonselective Herbicides for Landscapes and Nurseries

HIL81011	Weed Control in Vegetable Gardens
HIL900	Musk Thistle
HIL901	Canada Thistle
HIL902	Mugwort
HIL903	Mulberry Weed
HIL904	Florida Betony
4	North Carolina HADSS ($95)

State: OKLAHOMA

Prepared by:

Internet URL: http://agweb.okstate.edu/pearl/

Videotapes: Agricultural Communications, Room 111, Public Information Building, Oklahoma State University, Stillwater, OK 74078

Publications: Central Mailing Services, Publishing and Printing, Oklahoma State University, Stillwater, OK 78078

Number	Title
CIRCULAR	
E-832	OSU Extension Agent's Handbook of Insect, Plant Disease, and Weed Control
E-943	Alfalfa Harvest Management Discussions with Cost-Benefit Analysis
E-948	Aerial pesticide Drift Management
E-949	Alfalfa Stand Establishment Questions and Answers
B-812	Hogpotato: Its Biology, Competition, and Control
F-2089	Alfalfa Stand Establishment
F-2586	Wheat for Pasture
F-2587	Bermudagrass for Grazing or Hay
F-2850	Eastern Redcedar and Its Control
F-2868	Eastern Redcedar Ecology and Management
F-2873	Ecology and Management of Western Ragweed on Rangeland
F-2874	Ecology and Management of Sericea Lespedeza
F-2776	Thistles in Oklahoma and Their Identification
F-2869	Management Strategies for Rangeland and Introduced Pastures
F-2875	Intensive Early Stocking
F-7318	Integrated Control of Musk Thistle in Oklahoma
FS-2774	Cheat Control in Winter Wheat
FS-9998	Clearfield Wheat Production Systems in Oklahoma

State: SOUTH CAROLINA

Prepared by: Bert McCarty

Internet URL: http://www.clemson.edu/public/

Order from: Bulletin Room, Room 82, Poole Agricultural Center, Clemson University, Clemson, SC 29634-0311

Number	Title
CIRCULAR	
463	Small Grain Production Guidelines for South Carolina
569	South Carolina Tobacco Grower's Guide
588	Peanut Production Guide for South Carolina
669	Canola Production in South Carolina
697	Turf Herbicide Families and Their Characteristics
698	Designing and Maintaining Bermudagrass Sports Fields in the United States
699	2004 Pest Control Recommendations for Professional Turfgrass Managers
702	Sod Production in the Southern United States
707	Southern Lawns
-----1	2009 Pest Management Handbook ($25.00)
BULLETINS	
150	Weeds of Southern Turfgrasses
LEAFLETS	
Forage No. 6	Weed Control in Bermudagrass
Forage No. 9	Weed Control in Tall Fescue
Forage No. 17	Weed Management in Perennial Pastures and Hay Fields

State: TENNESSEE

Prepared by: Neil Rhodes and Larry Steckel

Internet URL: http://www.utextension.utk.edu/weedcontrol/weedcontrol.html

Order from: Extension Mailing Room, P.O. Box 1071, University of Tennessee, Knoxville, TN 37901

Number	Title
PUBLICATIONS	
956	Managing Lawn Weeds: A Guide for Tennessee Homeowners
1197	Commercial Fruit Spray Schedules
1226	Weed Management in Ornamental Nursery Crops
1282	Commercial Vegetable Disease, Insect and Weed Control
1521	Hay Crop and Pasture Weed Management
1538	Chemical Vegetation Management on Noncropland
1539	Weed Management Recommendations for Professional Turfgrass Managers
1580	2009 Weed Control Manual for Tennessee Field Crops
1659	Weed Management in Annuals, Perennials and Herbaceous Ground Covers: Nursery Production and Professional Grounds Maintenance

State: TEXAS

Prepared by: Dr. Paul A. Baumann

Internet URL: http://tcebookstore.org/

Order from: Dr. Paul A. Baumann, Extension Weed Specialist, 349 Soil & Crop Sciences, Texas A&M

University, College Station, TX 77843-2474

Number	Title
B-1466	Chemical Weed and Bush Control – Suggestions for Rangeland
B-5038	Suggestions for Weed Control in Pastures and Forage Crops
B-5039	Suggestions for Weed Control in Cotton
B-5042	Suggestions for Weed Control in Corn
B-5045	Suggestions for Weed Control in Sorghum
B-6010	Suggestions for Weed Control in Peanuts
B-6139	Weed Control Recommendations in Wheat
L-1708	Wild Oat Control in Texas
L-2254	Common Weeds in Corn and Grain Sorghum
L-2301	Common Weeds in Cotton
L-2302	Common Weeds in West Texas Cotton
L-2339	Field Bindweed Control in the Texas High Plains
L-2436	Silverleaf Nightshade Control in Cotton in West Texas
L-5102	Perennial Weed Control During Fallow Periods in the Texas High Plains
B-6081	Herbicides: How They Work and The Symptoms They Cause
B-6079S	Como identificar malezas: Las estruccturas de la planta son la clave
B-6079	Weed Identification: Using Plant Structures as a Key
L-5205	Reducing Herbicides in Surface Waters- Best Management Practices
L-5204	Some Facts About Atrazina

L-5324 Protecting the Environment- Using Integrated Weed Management in Lawns

State: VIRGINIA

Prepared by: Scott Hagood and Shawn Askew

Internet URL: gopher://ext.vt.edu:70/11/vce-data

Order from: Virginia Polytechnic Institute and State University, Extension Distribution Center, Landsdowne St., Blacksburg, VA 24061

Number	Title
PUBLICATIONS	
456-016	Pest Management Guide for Field Crops
456-017	Pest Management Guide for Horticultural and Forest Crops
456-018	Pest Management Guide for Home Grounds and Animals

Herbicide Names and Manufacturers

Common or Code Name	Trade Name	Manufacturer
A		
acetochlor	Harness	Monsanto
	Surpass	Dow AgroSciences
acifluorfen	Ultra Blazer	BASF
acifluorfen + bentazon	Conclude Xact	BASF
alachlor	Micro-Tech	Monsanto
ametryn	Evik	Syngenta
amicarbazone		Bayer
aminopyralid	Milestone	Dow AgroSciences
asulam	Asulox	Bayer
atrazine	AAtrex / others	Syngenta / others
Atrazine + s-metolachlor + glyphosate	Expert	Syngenta
azafenidin		DuPont Ag Products
B		
BAS 625H	Aura	BASF
BAS 654		BASF
BAY FOE5043	Axiom	Bayer
benefin	Balan	Dow AgroSciences
bensulfuron	Londax	DuPont Ag Products
bentazon	Basagran	BASF, Micro Flo
bispyribac-sodium	Regiment, Velocity	Valent USA
bromacil	Hyvar X	DuPont Ag Products
bromoxynil	Buctril, Bronate	Bayer Crop Science
butroxydim	Falcon	
C		
carfentrazone	Aim, Shark	FMC
CGA-362622	Envoke, Monument	Syngenta
chlorimuron	Classic	DuPont Ag Products
Chlorimuron + metribuzin	Canopy XL	DuPont Ag Products
chlorimuron + sulfentrazone	Canopy Extra	DuPont Ag Products
chlorimuron + thifensulfuron	Synchrony	DuPont Ag Products
chlorsulfuron	Glean, Telar	DuPont Ag Products
chlorsulfuron + metsulfuron	Finesse	DuPont Ag Products
clethodium	Select, Envoy, Prism	Valent USA
clomazone	Command	FMC
clopyralid	Lontrel	Dow AgroSciences
	Stinger	

cloransulam	FirstRate	Dow AgroSciences
	Amplify	Monsanto
cyhalofop	Clincher	Dow AgroSciences

D

2,4-D	Several	Several
2,4-D + MCPP + dicamba	Trimec Classic	PBI Gordon
2,4-DB	Butoxone	Bayer Crop Science
	Butyrac	
DCPA	Dacthal	Amvac
dicamba	Banvel	Micro Flo
	Clarity Vanquish	BASF
		Syngenta
dicamba + diflufenzopyr	Distinct, Overdrive	BASF
dicamba + diflufenzopyr + nicosulfuron	Celebrity Plus	BASF
dicamba + 2,4-D	Weedmaster	BASF
dichlobenil	Casoron	Uniroyal
dichlorprop (2,4-DP)	Several	Bayer Crop Science
diclofop	Hoelon	Bayer Crop Science
diclosulam	Strongarm	Dow AgroSciences
dimethenamid	Frontier	BASF
dimethenamid-P	Outlook	BASF
diquat	Reglone, Reward	Syngenta
dithiopyr	Dimension	Rohm & Haas
diuron	Karmex	Griffin
	Direx	Griffin

E

endothall	Endothal	Pennwalt
ethalfluralin	Sonalan, Curbit	Dow AgroSciences
ethofumesate	Prograss	Bayer Crop Science

F

fenoxaprop	Puma, Ricestar, Whip	Bayer Crop Science
Flazasulfuon	Katana	ISK Bioscience
fluazifop-P	Fusilade DX	Syngenta
fluazifop + fenoxaprop	Fusion	Syngenta
flufenacet	Define	Bayer
flufenacet + metribuzin + atrazine	Axiom, Domain	Bayer Crop Science
flumetsulam	Python	Dow AgroSciences
flumetsulam + clorpyralid	Hornet	Dow AgroSciences

flumetsulam + clopyralid +2,4-D	Scorpion III	Dow AgroSciences
flumetsulam + metolachlor	Broadstrike SF + Dual	Dow AgroSciences
flumiclorac	Resource	Valent USA
flumioxazin	Valor	Valent USA
fluometuron	Cotoran,	Griffin
	Meturon	Griffin
Fluoroxypyr	Vista	Dow AgroSciences
Fluroxypyr + aminopyralid	Cleanweave	Dow AgroSciences
fluthiacet methyl	Action	Syngenta
	Appeal	KI USA
Fomesafen	Reflex	Syngenta
Fomesafen + metolachlor	Prefix	Syngenta
foramsulfuron + iodosulfuron		
	Equip	Bayer
fosamine	Krenite	DuPont Ag Products

G

glufosinate	Liberty	Bayer Crop Science
	Rely	Bayer Crop Science
	Ignite	Bayer Crop Science
glyphosate	Many	many

H

halosulfuron	Permit, Sempra	Monsanto
hexazinone	Velpar	DuPont Ag Products

I

imazamethabenz	Assert	BASF
imazamox	Beyond, Raptor	BASF
imazapic	Cadre, Plateau	BASF
imazapyr	Arsenal,	BASF
	Chopper,	BASF
	Stalker, Habitat	BASF
imazaquin	Scepter	BASF
	Image	BASF
imazethapyr	Pursuit	BASF
	NewPath	BASF
imazethapyr + imazapyr	Lightning	BASF
	Event	
isoxaben	Gallery	Dow AgroSciences
isoxaflutole	Balance	Bayer Crop Science

J-L

KIH-485		Kumiai
lactofen	Cobra	Valent USA

M

MON 3539		Monsanto
MCPA	Several	Several
mecoprop	Several	Several
mesosulfuron	Osprey	Bayer
mesotrione	Callisto, Tenacity	Syngenta
mesotrione + metolachlor	Camix	Syngenta
mesotrione + metolachlor + atrazine	Lumax	Syngenta
mesotrione + glyphosate	Halex GT	Syngenta
metham	Vapam	Amvac
methyl bromide	Bromo-gas	Great Lakes
metolachlor	Dual Magnum	Syngenta
	Pennant	Syngenta
metolachlor + atrazine	Bicep	Syngenta
metribuzin	Sencor	Bayer Crop Science
metribuzin + metolachlor	Turbo	Bayer Crop Science
metribuzin + trifluralin	Salute	Bayer Crop Science
metsulfuron	Ally, Escort	DuPont Ag Products
molinate	Ordram	Syngenta
MSMA	Several	Several

N

napropamide	Devrinol	Syngenta
nicosulfuron	Accent	DuPont Ag Products
nicosulfuron + rimsulfuron + atrazine	Basis Gold	DuPont Ag Products

nicosulfuron +	Steadfast	DuPont Ag Products
rimsulfuron		
norflurazon	Zorial, Solicam, Evital	Syngenta
		Syngenta

O

oryzalin	Surflan	Dow AgroSciences
oxadiazon	Ronstar	Bayer Crop Science
oxadiazon + prodiamine	Regalstar	Regal Chemical Company
oxasulfuron		Syngenta
oxyfluorfen	Goal	Dow
oxyfluorfen + oryzalin	Rout	The Scotts Company
oxyfluorfen + oxadiazon	Regal	Regal Chemical Company
oxyfluorfen + pendimethalin	Ornamental Herbicide II	The Scotts Company

P

paraquat	Gramoxone Max, Gramoxone Extra, Gramoxone Inteon, Starfire,	Syngenta
	Cyclone	
pelargonic acid	Scythe	Mycogen
pendimethalin	Prowl,	BASF
	Prowl H2O	BASF
	Pendulum	BASF
	Pentagon	Lesco

	Lesco PRE-M	The Scotts Company
	Corral	
penoxsulam	Grasp, Granite	Dow AgroSciences
picloram	Tordon	Dow AgroSciences
picloram + 2,4-D	Grazon P+D	Dow AgroSciences
picloram + fluoroxypyr	Surmount	Dow AgroSciences
pinoxaden	Axial	Syngenta
primisulfuron	Beacon	Syngenta
primisulforon + dicamba	NorthStar	Syngenta
prodiamine	Barricade, Factor	Syngenta
prohexadione	Apogee	BASF
prometryn	Caparol	Syngenta
	Cotton Pro	Griffin
propanil	Stam, Stampede	Dow
prosulfuron	Peak	Syngenta
prosulfuron + primisulfuron	Exceed	Syngenta
	Spirit	Syngenta
pyridate	Tough	Syngenta
pyrithiobac	Staple	DuPont
pyrithiobac + glyphosate	Staple Plus	DuPont

Q

quinclorac	Facet, Drive	BASF
	Paramount	BASF
quizalofop	Assure II	DuPont

R

rimsulfuron	Titus, Matrix	DuPont
rimsulfuron + thifensulfuron	Basis	DuPont

S

sethoxydim	Poast, Poast Plus, Vantage	BASF
simazine	Princep	Syngenta
sulfentrazone	Authority, Spartan	FMC
sulfentrazone + clomazone	Authority	FMC
	One-Pass	
sulfometuron	Oust	DuPont
sulfosulfuron	Monitor, Maverick, Outrider, Certainity	Monsanto

T-Z

tebuthiuron	Spike	Dow
tembotrione + safener	Laudis	Bayer
terbacil	Sinbar	DuPont
thiafluamide + V-1014270 + metribuzin	Axiom	Bayer
thiazopyr	Dimension	Dow
	Spindle, Visor	
thifensulfuron	Harmony GT	DuPont
thifensulfuron + tribenuron	Harmony Extra	DuPont
topremazone	Impact	AmVac

triasulfuron	Amber	Syngenta
triasulfuron + dicamba	Rave	Syngenta
tribenuron	Express	DuPont
triclopyr	Garlon	Dow
	Grandstand	
triclopyr +clopyralid	Redeem R&P	Dow
trifloxysulfuron	Envoke , Monument	Syngenta
trifluralin	Treflan	Dow
	Trifluralin	Dow /
trinexapac-ethyl	Primo	Syngenta
	Palisade	

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