ABSTRACTS
RESEARCH
CONFERENCE
VOLUME 8

November 29 and 30, 2004
Clarion Hotel
Fayetteville, Arkansas

DRAFT - September 12, 2013
2:00 PM

PROGRAM

Monday, November 30, 2004

10:00 ACPA Board Meeting
12:00 Registration

MODERATOR: Dr. Bob Scott, Extension Weed Specialist, University of Arkansas Cooperative Extension Service.

01:00 **Horses to Rags! Will the Pigs Be Next In Line For Glyphosate Resistance? What Will This Mean to Arkansas Agriculture?** K.L. Smith and R.C. Scott. Southeast Research & Extension Center, Division of Agriculture, Monticello, AR and Cooperative Extension Service, Division of Agriculture, Little Rock, AR.

01:15 **Effects of Tank Mixes of Roundup with Fungicides and Insecticides on Roundup Ready Soybeans.** Jarrod T. Hardke, Gus M. Lorenz, Adam Chappell, and Craig Shelton, University of Arkansas Cooperative Extension Service, Little Rock, AR.

01:30 **Residual Activity of Cotton Herbicides on Horseweed.** Grant Carter, Ron Talbert, and Marilyn McClelland, Crop, Soil, and Environmental Science, University of Arkansas, Fayetteville, AR.

01:45** **A Remarkable and Unprecedented Red Oak Borer Outbreak Linked to Widespread Oak Mortality in the Ozark National Forest.** Melissa K. Fierke and Fred M. Stephen, Dept. of Entomology, University of Arkansas, Fayetteville, AR

02:00 **Late-Season Herbicide Applications to Reduce the Annual Grass Seedbank.** Nathan V. Goldschmidt and Lawrence R. Oliver, Dept. of Crop, Soil and Environmental Sciences, University of Arkansas, Fayetteville, AR.

02:15 **Vegetative and Reproductive Characteristics of Italian, Rigid, Poison, and Perennial Ryegrass.** Mohammad T. Bararpour, Lawrence R. Oliver, and Nilda R. Burgos, Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

02:30** **Tomato Gene Expression Analysis and Comparison of Insect-responsive Genes Across Two Different Feeding Guilds.** Stephanie L. Hebert and Fiona L. Goggin, Dept. of Entomology, University of Arkansas, Fayetteville, AR

02:45** **Comparison of Wheat Herbicides for Control of Diclofop-resistant Italian Ryegrass.** C.E. Brewer, L.R. Oliver, and M.T. Bararpour, Dept. of Crop, Soil, and Environmental Sciences. Fayetteville,AR.

03:00 **Break**

MODERATOR: Dr. Ron Talbert, Weed Scientist, Dept. of Crop, Soil and Environmental Sciences, University of Arkansas, Fayetteville.

03:15** **Differential Tolerance of Grain Sorghum Cultivars to Glyphosate Drift.** Jason L. Alford, Lawrence R. Oliver, Ken L. Smith and Mohammad T. Bararpour. Dept. of Crop, Soil, and Environmental Sciences and Cooperative Extension Services, University of Arkansas, Fayetteville and Monticello, AR.

03:30* **Herbicide Carryover Resulting in Injury to Vegetable Crops.** Colleen M. Thomas, Brian Ottis, Ronald E. Talbert. Dept. Crop, Soil and Environmental Science, University of Arkansas, Fayetteville, AR.

03:45 **Planting Date Matters in Clearfield Rice Outcrossing.** Nilda R. Burgos, Vinod K. Shivrain, David R. Gealy, and Howard Black, Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR and USDA-ARS, DBNRRC, Stuttgart, AR.

04:00* **Biology and Control of the Raspberry Crown Borer *Pennisetia marginata*, in Arkansas Blackberries.** Jacquelyn A. McKern, Donn T. Johnson and Barbara A. Lewis, Dept. of Entomology, University of Arkansas, Fayetteville, AR.

04:15 **Postemergence Goosegrass Control in Bermudagrass Turf.** John W. Boyd, Dept. of Crop, Soil and Environmental Sciences, University of Arkansas Cooperative Extension, Little Rock, AR.

04:30* **Perfomance of CL161, Wells, and XL8 in Competition with Barnyardgrass: Implications for Management.** Brian V. Ottis, Andrew T. Ellis, and Ronald E. Talbert, Dept. of Crop, Soil and Environmental Sciences, University of Arkansas, Fayetteville, AR.

04:45 **Use of Foliar Insecticides for Corn Borer Management on Arkansas Field Corn.** Paul McLeod, Justin Hensley, Jason Kelley and Andy Vanguilder.

05:00 **Break-even Analysis and Seleccion Indices for Food-grade Soybean Production.** Juan Carlos Mayta, Pengyin Chen, and Michael Popp, CSES, University of Arkansas.

05:15* ***Bean Pod Mottle Virus* & *Soybean Mosaic Virus*: Interactions.** L. Mozzoni, P. Chen, Dept. of Crop, Soil & Environmental Sciences and R. Gergerich, Dept. of Plant Pathology, University of Arkansas**.**

05:30 **Adjourn**

Tuesday, November 30, 2004

MODERATOR: Nilda Burgos, Weed Scientist, Dept. of Crop, Soil and Environmental Sciences, University of Arkansas, Fayetteville, AR.

08:00 **Can We Still Grow Conventional Soybeans in Arkansas?** Chris Tingle, Dwayne Beaty, Trey Reaper and Alan Beach, University of Arkansas Cooperative Extension Service, Little Rock, AR.

08:15** **Evaluation of the Amino Sugar-N Based Soil Test in Arkansas Rice and Wheat Production.** W.J. Ross, R.J. Norman, J.T. Bushong, N.A. Slaton, and C.E. Wilson, Jr., Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

08:30 **Evaluation of Yield Monitors for On-farm Cotton Variety Testing.** Matt L. Cordell, William C. Robertson, and Frank E. Groves, University of Arkansas, Division of Agriculture.

08:45 **Thrips Management in Cotton with In-furrow and Seed Treatment Insecticides in Northeast Arkansas.** Glenn Studebaker, University of Arkansas Cooperative Extension Service, Northeast Research and Extension Center, Keiser, AR

09:00 **Influence of TRIMAX (imidacloprid) Insecticide on Growth, Development and Yield of Cotton**. Gabe Horn and Derrick Oosterhuis, University of Arkansas, Fayetteville, AR and Alan Hopkins, Bayer CropScience, Greenbrier, AR

09:15 **Factors Affecting Glyphosate-Resistant Horseweed Response to Ignite**. Griff Griffith, Marilyn McClelland, Ron Talbert, Ken Smith, and Jim Barrentine, Dept. of Crop, Soil and Environmental Sciences, University of Arkansas, Fayetteville, AR.

09:30** **Potassium Uptake from Soil Solution and Exchangeable K Pools by Rice on a Calhoun Silt Loam and Sharkey Clay.** Cecilia J. Baquireza*, Nathan A. Slaton, Richard J. Norman, Kristofor R. Brye, Russell E. DeLong, and Bobby R. Golden, Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

09:45 **Break**

10:00* **Postemergence Herbicide Programs for Control of Non-Traditional Broadleaf Weeds in Rice.** A.T. Ellis, B.V. Ottis, and R.E. Talbert, Dept. of Crop, Soil and Environmental Sciences, University of Arkansas, Fayetteville, AR.

10:15* **The Influence of Preflood and Midseason Nitrogen Rates on Grain Yield of 'Francis' Rice.** Bobby R. Golden, Nathan A. Slaton, Richard J. Norman, and Russell E. DeLong.

10:30 **Efficacy of Selected Insecticides for Control of Tarnished Plant Bug, Lygus lineolaris, in Southeast Arkansas - 2004.** Chuck Capps, Jeremy K. Greene, Gus M. Lorenz, and Glenn E. Studebaker, Cooperative Extension Service, Division of Agriculture, University of Arkansas, Dept. of Entomology.

10:45* **Evaluation of Several Indices of Potentially Mineralizable Soil Nitrogen.** J. T. Bushong, R. J. Norman, C. E. Wilson Jr., N. A. Slaton, E. E. Gbur, and W. J. Ross, Dept. of Crop Soil and Environmental Sciences, University of Arkansas, Fayetteville, AR.

11:00 **Effects of Tank Mixes with Roundup and Insecticides on Roundup Ready Flex Cotton.** Jarrod T. Hardke, Gus M. Loretz, Adam Chappell, and Craig Shelton, University of Arkansas Cooperative Extension Service, Little Rock, AR.

11:15 **Standardizing Baseline Susceptibility of *Helicoverpa zea* and *Heliothis virescens* for Cry1Ac Resistance Monitoring**. Ibrahim Ali, Sakantala Sivasupramaniam, Carlos Blanco, and R. G. Luttrell. Dept. of Entomology, University of Arkansas, Fayetteville, AR; Monsanto Company, St. Louis, MO; and USDA Southern Field Crops Insect Management Laboratory, Stoneville, MS.

11:30** **Relationship of Pheromone Trap Captures of the Tobacco Budworm, *Heliothis virescens*, and the Bollworm, *Helicoverpa zea*, to Surrounding Crop Structure and Insect Scouting Records on a Land Company in Southeastern Arkansas**. Clint Allen, R. G. Luttrell, and James Patterson, Dept. of Entomology, University of Arkansas, Fayetteville, AR.

11:45* **Using Early Season Soybean as a Trap Crop for Stink Bugs in Arkansas**. John Smith, R. G. Luttrell, and Jeremy Greene. Dept. of Entomology, University of Arkansas, Fayetteville, AR; Cooperative Extension Service, University of Arkansas Monticello, Monticello, AR

12:00* **Reliance on Predators in Making Cotton Aphid Treatment Decisions** Adam Chappell, Tim Kring, Gus Lorenz

12:30 Scholarship Recipients
Graduate Paper Awards

* Denotes MS
** Denotes Ph.D.

01:00 **ADJOURN**

Horses to Rags! Will the Pigs Be Next in Line for Glyphosate Resistance?
What Will This Mean to Arkansas Agriculture?
K.L. Smith and R.C. Scott, Southeast Research & Extension Center, Division of Agriculture, Monticello, AR and Cooperative Extension Service, Division of Agriculture, Little Rock, AR.

Effects of Tank Mixes of Roundup with Fungicides and Insecticides on Roundup Ready Soybeans
Jarrod T. Hardke, Gus M. Lorenz, Adam Chappell, Craig Shelton, University of Arkansas Cooperative Extension Service, Little Rock, AR

Field experiments were conducted in 2004 at a single location in Arkansas to evaluate potential weed control interactions when Roundup WeatherMax was applied with several insecticides and fungicides. No treatments significantly differed from the treatment of Roundup WeatherMax alone. However, several treatments did differ significantly from one another. Roundup WeatherMax alone was rated at 86.67% control. The highest rating was observed when Roundup WeatherMax was applied with Stratego, with a rating of 98.33% control, followed closely by WeatherMax applied with Stratego + Lorsban, with a rating of 95.00% control. Tilt, Quadris, Folicur, Lorsban, Asana XL, and Quadris + Karate Z in combination with Roundup WeatherMax controlled weeds 14 DAT no more than 91.67% and no less than 86.67% control, which was less than when WeatherMax was applied with Stratego and Stratego + Lorsban, but greater than or equal to the rating of WeatherMax applied alone.

The lowest control rating was observed when Roundup WeatherMax was tank mixed with Karate Z, (80.00% control) and with Headline + Asana XL (78.33% control) at 14 DAT when compared with Roundup WeatherMax applied alone (86.67% control).

Residual Activity of Cotton Herbicides on Horseweed.
Grant Carter, Ron Talbert, and Marilyn McClelland, Dept. Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

A Remarkable and Unprecedented Red Oak Borer Outbreak Linked to Widespread Oak Mortality in the Ozark National Forest.
Melissa K. Fierke and Fred M. Stephen, Dept. of Entomology, University of Arkansas, Fayetteville, AR

The Ozark National Forest in Arkansas, Missouri and Oklahoma is experiencing widespread oak mortality coinciding with increased populations of red oak borer, *Enaphalodes rufulus* (Haldeman)(Coleoptera: Cerambycidae), a native long horned wood-boring beetle. Red oak borer has an unusual two-year life cycle with synchronous emergence in odd numbered years and though it is endemic to areas throughout the northeastern U.S., it has not been indicted as a causal organism in other oak decline mortality events. Intensive sampling of 24 northern red oak, *Quercus rubra* L., ranging from apparently healthy to recently dead trees reveal populations that are deviating extraordinarily from normal levels of 1 or 2 insects per tree to an average of 98 live larvae per tree (range 0-577). Insect populations are kept at endemic population levels by either biotic or abiotic variables. Biotic variables include limited food resources, predators, parasites or disease organisms while abiotic include environmental variables, e.g. climate. At this point in time, we have not conclusively determined why this normally innocuous beetle has escaped from historic populations levels. Some stand and site variables that appear to be associated are percent northern red oak and stand aspect. Other variables that are being investigated are presence/importance of *Armillaria* root-rot species, tree-insect interactions and tree defense mechanisms. We are studying the biology and ecology of red oak borer in an attempt to understand mortality and survival as well as adult behavior. This research should help us understand better the causes and the repercussions of this outbreak and subsequent tree mortality, which is changing tree species composition, increasing fuel loads and decreasing biomass and carbon sequestration in this forest system.

Late-Season Herbicide Applications to Reduce the Annual Grass Seedbank. Nathan V. Goldschmidt and Lawrence R. Oliver, Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

Vegetative and Reproductive Characteristics of Italian, Rigid, Poison, and Perennial Ryegrass.
Mohammad T. Bararpour, Lawrence R. Oliver, and Nilda R. Burgos; Dept. of Crop, Soil and Environmental Sciences, University of Arkansas, Fayetteville, AR.

Weed identification at the seedling stage is the key to select the most effective herbicides. Resistance in ryegrass (*Lolium* species) is one of the most economically important example of herbicide resistance in world agriculture, and diclofop-resistant ryegrass is the number one weed problem in Arkansas wheat. Field studies were conducted in 2002 and 2003 at the Agricultural Experiment Station, Fayetteville, to determine morphological differences among *Lolium* species: Italian (*L. multiflorum*), rigid (*L. rigidum*), poison (*L. temulentum*), and perennial (*L. perenne*). Greenhouse seedlings (20 days old) transplanted 1.5 m apart in the field on November 12 (2001) and 22 (2002). The experimental design was a randomized complete block with ten replications. During the growing season, plant height, plant growth habit, plant color, and node color were recorded. At maturity, plant height and number of tillers and spikes were recorded. Two spikes from each plant were collected to measure spike and spikelet length, awn length, number of spikelets/spike, number of seed/spike, number of seed/spikelet, and number of seed/plant.

At vegetative stage, poison ryegrass (erect), with a wider leaf blade (10 to 11 mm), and perennial ryegrass (prostrate), with very narrow leaf blade (2 mm), can be distinguished from Italian (erect) or rigid (prostrate) ryegrass, which have leaf blades (5 to 6 mm) wider than perennial but narrower than poison ryegrass. Although it is difficult to distinguish Italian ryegrass from rigid ryegrass at the vegetative stage of growth, it is easy to distinguish them at the reproductive stage. At reproductive stage, Italian ryegrass and poison ryegrass seed had awns, but perennial and rigid ryegrass seed did not. Poison ryegrass glume (21 mm) was longer than the spikelet (15 mm), whereas Italian ryegrass glume (10 mm) was shorter than the spikelet (21 mm). Poison ryegrass awns (> 10 mm) were at least two times longer than Italian ryegrass awns (< 5 mm).

At maturity, Italian ryegrass had the highest number of tillers (173), spikes (149), spikelet/spike (25), seed/spikelet (12), and seed/plant (44, 700); and poison ryegrass had the lowest number of tillers (43), spikes (31), spikelet/spike (18), seed/spikelet (6), and seed/plant (3,348). Perennial ryegrass had 129 tillers, 71 spikes, 20 spikelet/spike, 8 seed/spikelet, and 11,360 seed/plant; and glume (11 mm) was shorter than spikelet (14 mm). Rigid ryegrass had 81 tillers, 72 spike, 14 spikelet/spike, 7 seed/spikelet, and 7, 056 seed/plant; and glume (133 mm) was shorter than spikelet (16 mm). Perennial ryegrass flowered 3 weeks later than the other species. Our previous ryegrass population studies showed that morphological variability exists among Arkansas diclofop-resistant Italian ryegrass.

Tomato gene expression analysis and comparison of insect-responsive genes across two different feeding guilds.
Stephanie L. Hebert and Fiona L. Goggin, Dept. of Entomology, University of Arkansas, Fayetteville, AR

Many studies of plant resistance have focused on plant responses to pathogens or chewing insects, but few have addressed the response to piercing-sucking insects. Chewing insects, such as the beet armyworm, cause extensive mechanical damage to the plant, and induce many defense-related genes, including some genes that overlap with the plant's response to mechanical wounding. Piercing-sucking insects, such as aphids, cause much less mechanical damage, and have been shown to induce multiple signaling pathways, including those induced by chewing insects and those induced by pathogens such as viruses, bacteria, or fungi. In this study, tomato (*Lycopersicon esculentum*) was used to identify genes that are differentially expressed when challenged with insects from two distinct feeding guilds: piercing-sucking insects (the potato aphid, *Macrosiphum euphorbiae*), and chewing insects (the beet armyworm, *Spodoptera exigua*). Tissue samples were collected at 12 and 24 hours and control plants (no insect challenge) were compared to samples challenged by either aphid or armyworm separately by microarray analysis with the TOM1 cDNA array (Boyce Thompson Institute, Cornell University), which represents approximately 25% of the tomato genome and includes over 400 defense-related genes. This experiment identified numerous genes in tomato that were either up- or down-regulated in response to either aphid or armyworm feeding.

Comparison of Wheat Herbicides for Control of Diclofop-resistant Italian Ryegrass.
C. E. Brewer, L R. Oliver, and M. T. Bararpour. Dept. of Crop, Soil, and Environmental Sciences, Fayetteville, AR.

Wheat herbicide trials were established at the Arkansas Area Research and Extension Center in Fayetteville, AR in 2002 and 2003 to compare the efficacy of herbicides available to Arkansas producers. These trials were conducted in conventional-tilled Taloka silt-loam soil. The plot areas contained a uniform natural infestation of diclofop-resistant Italian ryegrass (*Lollium multiflorum*) and were fallow each previous year.

Several combinations of herbicides, application timings, herbicide rates, and herbicide tank-mixtures were evaluated for crop injury, weed control, and crop yield. To better ascertain the advantages of these herbicide options an economic analysis consisting of returns above herbicide cost was performed.

The highest crop yield corresponded with the greatest Italian ryegrass control throughout the growing season. Conventional herbicide programs for full-season weed control rely on a preemergence (PRE) herbicide application. However, the results from this study indicate that by 6 weeks after emergence (WAE), an application of flufenacet + metribuzin (Axiom) at 1 to 2 leaf wheat will provide 85% control of Italian ryegrass which is greater than a PRE application of chlorosulfuron + metsulfuron (Finesse). Flufenacet + metribuzin applied at 2 to 3 leaf wheat followed by flucarbazone at 2 to 3 leaf Italian ryegrass will provide season long weed control without the use of a PRE application. Chlorosulfuron + metsulfuron PRE required an additional spring application of mesosulfuron (Osprey) to achieve greater than 80% control of Italian ryegrass. Mesosulfuron applied at 4 leaf to 2 tiller ryegrass provided 80% control of Italian ryegrass at 20 WAE, but there was significant yield loss caused by early-season weed interference. Applications of mesosulfuron earlier in the season failed to consistently control late-season emergence of Italian ryegrass. This data indicates that mesosulfuron requires a sequential application or a tank mix partner with longer residual weed control for maximum Italian ryegrass control.

Returns above herbicide cost indicate that the yield increase gained from the control of Italian ryegrass more than compensates for the cost of these herbicide programs. Although these data do not reflect the actual net return, they can serve as a basis for making sound weed management decisions.

Differential Tolerance of Grain Sorghum Cultivars to Glyphosate Drift. Jason L. Alford, Lawrence R. Oliver, Ken L. Smith and Mohammad T. Bararpour. Dept. of Crop, Soil, and Environmental Sciences and Cooperative Extension Services, University of Arkansas, Fayetteville and Monticello, AR.

Herbicide Carryover Resulting in Injury to Vegetable Crops.
Colleen M. Thomas, Brian Ottis, Ronald E. Talbert. Dept. Crop, Soil and Environmental Science, University of Arkansas, Fayetteville, AR.

Identifying herbicides that are safe for use in vegetable crops as well as identifying herbicides that do not carryover and cause injury to vegetable crops in rotation is important to create more options for the vegetable grower.

Separate field studies with warm-season crops (corn ‘Merit’, cowpea ‘Early Scarlet’, snap bean ‘Benton’, summer squash ‘Early Prolific’, muskmelon ‘Hales Best’, cucumber ‘Marketmore’ and transplanted processing tomato “7569”) and cool-season crops (cabbage ‘Blue Dynasty’, collard ‘Champion’, kale ‘Dwarf Siberian, mustard ‘Savannah’, spinach ‘F380’ and turnip ‘Alamo’) were conducted at the Arkansas Agricultural Research and Extension Center, Fayetteville, Arkansas in 2004 to evaluate the persistence of 14 herbicides at 0, 1 and 2X rates of application in lb ai/A. For warm season crops clopyralid at 0.18 and 0.36, flumioxazin at 0.1 and 0.2, mesotrione at 0.19 and 0.38, flufenacet at 0.3 and 0.6, prosulfuron at 0.027 and 0.054, cloransulam at 0.016 and 0.032, and S-metolachlor at 1.3 and 2.6; for both warm and cool season crops imazamox at 0.03125 and 0.0625, halosulfuron at 0.047 and 0.094, sulfentrazone at 0.375 and 0.75; and for cool season crops, imazethapyr at 0.0625 and 0.125, clomazone at 0.75 and 1.5 and rimsulfuron at 0.0625 and 0.125 were included. The experimental design is a randomized complete split-split block with four replications with herbicide as the main plot, herbicide rate as sub plots and rows of crops as the sub-sub plots. With warm-season crops: herbicides were applied on the surface of the soil May 15 and the warm season crops planted into a freshly rotary tilled seedbed, starting at the time of herbicide application and at one month intervals through September. With cool–season crops: herbicides were applied on the surface of the soil July 15 and the crops planted August 15, September15 and October 18. Crops were visually rated for injury 3 to 4 weeks after planting.

Herbicide activity on all of the warm season crops had dissipated by one month for S-metolachlor at both rates and activity was very slight at both rates of flufenacet and cloransulam. After two months, activity had totally dissipated for both rates for clopyralid, flumioxazin, imazamox and mesotrione and very slight activity at both rates for halosulfuron. At three months halosulfuron dissipated completely. At four months, sulfentarazone and prosulfuron at both rates still persisted.

Herbicide activity on all of the cool season crops persisted at one month with the exception of clomazone in turnip. After two months, activity had totally dissipated for imazamox. Clomazone and rimsulfuron totally dissipated in all crops except spinach. Herbicides still persisting after two months at both rates were imazethapyr, fomesafen, sulfentrazone and halosulfuron.

Planting Date Matters in Clearfield Rice Outcrossing

Nilda R. Burgos, Vinod K. Shivrain, David R. Gealy, and Howard Black
Dept. of Crop, Soil, and Enivonmental Sciences, University of Arkansas, Fayetteville; DBNRRC, USDA-ARS, Stuttgart, AR

Clearfield® rice, which is resistant to the imidazolinone herbicide Newpath® (imazethapyr), provides the best technology thus far for red rice management. Its use is rapidly increasing in the southern U.S. where red rice is a problem. Sustainability of this technology depends on the extent by which the development of herbicide-resistant red rice can be mitigated. Herbicide-resistant red rice could ensue from 1) gene flow between Clearfield® rice and red rice and 2) selection pressure from Newpath herbicide. While selection pressure would take time, successful gene transfer from rice to red rice could happen after one season if synchronization in flowering occurs. Several factors contribute to the overlap of flowering between cultivated and weedy species. This research aimed to evaluate the effect of planting date on the synchronization of flowering between rice and red rice. CL121, CL161, and Stuttgart strawhull red rice were planted at the Rice Research and Extension Center (RREC), Stuttgart, AR in 2002 to 2004 at 6 timings starting from mid-April up to about the third week of May at weekly intervals. Of these two cultivars, CL161 is more recent and widely used. The Clearfield® cultivars were drill-planted in 9-row plots, 10 ft long, with Clearfield® rice planted in the outermost rows and red rice planted every other row. Each rice cultivar was replicated four times at each planting date. Early planted rice and red rice took longer to flower than later planted ones. CL121 flowered earlier than CL161 and therefore had more overlap in flowering with strawhull red rice for all planting dates. The earliest planting date resulted in the most overlap in flowering between either cultivar of Clearfield® rice and red rice. Preliminary tests of seed samples also showed greater numbers of resistant red rice progenies from the earliest planted crop compared to later plantings. In locations similar to Stuttgart, delaying the planting of CL161 until the end of April can minimize the potential for outcrossing with strawhull red rice.

Biology and Control of the Raspberry Crown Borer, *Pennisetia marginata,* in Arkansas Blackberries.

Jacquelyn A. McKern, Donn T. Johnson and Barbara A. Lewis, Dept. of Entomology, University of Arkansas, Fayetteville, AR 72701

The raspberry crown borer, *Pennisetia marginata* (Harris), is a serious pest of blackberries in the U.S. causing loss of vigor and yield. Insecticide efficacy and life history studies were conducted in Arkansas. Only azinphosmethyl is labeled against this pest. Soil and crown drench treatments at a rate of 3785 liters/ha (400 gal/A) were applied on either 24 October 2003 or 6 May 2004 in a randomized complete block (5-plant plots, 5 replicates). Crowns were dissected in June 2004 to count the number of larvae. The applications in October for Bifenthrin, chlorpyrifos and azinphosmethyl treated plots had significantly less larvae per crown than novaluron, nematode (*Steinernema feltia*) and the control plots. The applications in May had no significant difference in the number of larvae when compared to the control. To study the duration of the lifecycle in Arkansas blackberries, 10 plants were dissected every two weeks beginning in April and ending in October when a 0 count was obtained. The life cycle requires one year in Arkansas. Larvae pupate in September, adults emerge and lay eggs in September and early October, most of the eggs hatch by late October and larvae bore into lower canes to over winter.

Postemergence Goosegrass Control in Bermudagrass Turf.

John W. Boyd, Dept. of Crop, Soil and Environmental Sciences, University of Arkansas Cooperative Extension, Little Rock, AR.

Four trials were conducted during 2004 to evaluate old and new herbicides for postemergence goosegrass (*Eleusine indica*) control. One trial was located on a fairway maintained at War Memorial Golf Course in Little Rock. Two trials were conducted on a fairway at Oak Hills Golf Course in DeWitt. The fourth study was on the driving range at Pleasant Valley Golf Course in Little Rock. All locations were maintained at a 0.5 inch height of cut. The experimental design was a randomized block with four replications. Plots were 5 ft by 10 ft. Herbicides were applied at 30 gallons per acre with water as a carrier. Split applications were 8 days apart. All ratings reported were taken at 8 weeks after initial treatment (WAIT) and are an average of two locations. One application of metribuzin + MSMA (0.33 + 2.0 lb/ai/a) averaged 94% control while metribuzin followed by metribuzin (0.33 fb 0.33 lb/ai/a) averaged 97%. Two applications of diclofop (0.5 fb 0.5 lb/ai/a) and (0.75 fb 0.75 lb/ai/a) gave 89 and 99% control, respectively. A tank mix of diclofop + metribuzin (0.75 + 0.33 lb/ai/a) provided 94% control. Two applications of foramsulfuron at either 0.03 or 0.04 lb/ai/a resulted in 96% control. A single application of metribuzin + foramsulfuron (0.33 + 0.03 lb/ai/a) controlled 85% of the goosegrass. Tank mixing foramsulfuron + diclofop (0.03 + 0.5 lb/ai/a) resulted in 98% control but increasing the rate of diclofop in the tank mix to 0.75 lb/ai/a caused a drop in control to 55%, perhaps due to antagonism. A single application of mesotrione at 0.125, 0.188 or 0.25 lb/ai/a failed to control goosegrass. Two applications of mesotrione at 0.25 lb/ai/a gave an average of 80% goosegrass control. Repeat applications of mesotrione at the lower rates did not provide acceptable control. Foramsulfuron and diclofop produced no bermudagrass injury. Mesotrione produced white bermudagrass and the discoloration persisted from one to two weeks after treatment. Metribuzin caused 20 to 40% bermudagrass discoloration which persisted from two to three weeks after treatment.

Performance of CL161, Wells, and XL8 in competition with barnyardgrass: implications for management.

Brian V. Ottis, Andrew T. Ellis, and Ronald E. Talbert. Dept. of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR.

New rice cultivars have been released that have yield potential greater than 10,000 kg/ha. However, in order to achieve high yields it is important to have the proper fertility, seeding rate, and weed control. It is not well understood how these new, high-yielding cultivars respond to varying weed control levels and seeding rates. The most recent research established barnyardgrass threshold levels of 5 to 10 plants/m^2 using older cultivars. The University of Arkansas recommends seeding rates that will produce between 160 to 215 plants/m^2.

Studies were established in 2002, 2003, and 2004 at the Rice Research and Extension Center at Stuttgart, AR, to evaluate the innate competitive abilities of three new rice cultivars. Representatives from each of the three classes of long grain rice were selected. 'Wells' represented conventional long grain rice, 'CL161' represented semi-dwarf, imidazolinone-tolerant rice, and 'XL8' represented hybrid, long-grain rice. A randomized complete block design with four replications was used. Treatments were arranged in a factorial arrangement, with factors consisting of three rice cultivars, four plant populations (54, 108, 216, and 432 plants/m^2) and four levels of barnyardgrass control (25, 50, 75, and 100%). Seeding rates were established based on seed counts and germination percentage of the respective cultivars.

Weed control was managed with timely herbicide applications in an effort to achieve the above control levels. Plant populations were verified by stand counts after rice emergence. Harvest index, panicles/m row, and combine yield from each plot were also collected. Ground cover was also evaluated within 100% control plots to determine canopy closure using a digital camera as another factor of competitive ability. Grain yield was measured and adjusted to 12% moisture prior to analysis. Statistical analysis was done using SAS.

Results showed that yield increased as barnyardgrass control increased. Wells produced the highest overall yields, and CL161 produced the lowest yields. Stand density was not significant for yield nor harvest index, indicating that optimum yields can be obtained at low plant densities, as long as weed control is maintained. CL161 and XL8 achieved maximum yield at 90 and 88% barnyardgrass control, respectively, while Wells did not achieve maximum yield until 100% control was achieved. Although yield potential for CL161 and XL8 was not as high as that of Wells, CL161 and XL8 were able to achieve maximum yields with lower levels of barnyardgrass control.

Canopy closure data indicated that all three cultivars achieved complete canopy closure approximately 8 wk after emergence. Early in the season, XL8 established canopy at a faster rate that CL161 or Wells, indicating that XL8 may have a competitive edge early in the season compared to CL161 and Wells.

Use of Foliar Insecticides for Corn Borer Management on Arkansas Field Corn.

Paul McLeod, Justin Hensley, Jason Kelly and Andy Vangilder.

Corn borers including the southwestern corn borer, *Diatraea grandiosella*, and the European corn borer, *Ostrinia nubilalis*, continue to negatively impact field corn production in eastern Arkansas. Larvae burrow into corn stalks and ear shanks causing lodging of stalks, loss of ears and reductions in yield. Corn borer management is generally justified in counties near the White and Mississippi Rivers. As of 2004, corn borer populations have not been detected in southwestern Arkansas. Corn borer management strategies include early planting, destruction of overwintering habitat (stalks), use of transgenic *Bt* cultivars, and insecticides applied to corn foliage in mid-season. During the past three years, studies have been undertaken by University of Arkansas staff to determine the effectiveness of *Bt* field corn and insecticides applied to foliage for corn borer management. *Bt* field corn continues to offer excellent protection against corn borers in Arkansas. Although corn borer damage has been reported in some commercial field corn, testing for the *Bt* protein in these fields has been negative and the probable reason for the damage is a mix up of conventional and *Bt* seed. Foliar insecticide applications during late June and early July have been effective in reducing damage form corn borers. In areas with large corn borer populations, the foliar sprays have, at times, significantly reduced stalk lodging and overwintering larvae numbers. Yields, however, have not been significantly increased.

Break-even Analysis and Seleccion Indices for Food-grade Soybean Production

Juan C. Mayta*, Pengyin Chen, Michael Popp

Specialty soybean markets have been increasing over the past decade mainly due to changes in consumer tastes and improved food processing technologies. Although specialty soybean production accounts for a small fraction of the nation's soybean market share, the soy food business is now a $4 billion industry in the U.S; specialty soybeans has specific physical or chemical characteristics designed to meet certain customers' needs. Further, characterization of product attributes in quantifiable economic terms would allow for increased market efficiency as communication among producers, marketing groups, processors and end users would be simplified. This increasing interest for 'value-added' traits by buyers, processors, and farmers imposes challenges to soybean breeders. In addition to incorporating these new traits into breeding lines, breeders would appreciate guidance on cultivar selection not only on the basis of yield, but also economic feasibility. The objective of this research is to determine some guidelines for specialty soybean cultivar selection by determining break-even yields, minimum premium prices, and other selection indices that would be required for soybean producers to think about adopting specialty soybean production. The types of specialty soybeans studied include large-seeded, small-seeded, high protein, and edible soybean. Advanced lines from each type were evaluated in at least five locations in Arkansas. The conventional cultivars Hutcheson, and Manokin, were used as the basis for comparison for the economic analysis. Estimated production costs, break-even yield, minimum premiums, and selection indeces for each type of specialty soybeans will be presented.

Bean pod mottle virus and *Soybean mosaic virus* Interactions

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Well characterized *Soybean mosaic virus* strains and *Bean pod mottle virus* isolates were tested for their reaction when double (mixed) inoculation was performed on differential *Glycine* genotypes. Interaction between the two viruses was observed because plants manifested a different pattern of symptoms than with single viral infection. Both synergistic and antagonistic responses were observed. A synergistic interaction gave rise to chimeric mosaic/necrosis symptoms in some mosaic-responding plant genotypes; however, other genotypes manifested a more severe pattern of mosaic symptoms. In the case of antagonistic reactions, a degree of interference between a mosaic-inducing and a necrosis-inducing strain was observed. In this case a late necrotic symptom prevailed in mix-inoculated plants, but not all the plants expressed necrosis.

Can We Still Produce Conventional Soybeans in Arkansas?

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Soybean production throughout the world has been revolutionized with the introduction of Roundup Ready soybeans. This trend has become increasingly evident in Arkansas as well. Since its inception in 1995, Arkansas treated 6% of the soybean acres with glyphosate. In 2003, it was estimated that 92% of the soybean acres in Arkansas was treated with glyphosate. This rapid adoption has led to the question, "Can we still produce conventional soybeans in Arkansas?"

When comparing the Roundup Ready and conventional production system used in the Arkansas Soybean Research Verification Program from 1997 to 2002, conventional soybean varieties have averaged 47 bushels per acre, while Roundup Ready varieties were lower and averaged 42 bushels per acre. One benefit to the Roundup Ready system is the reduced weed control costs. From 1997 to 2002, Roundup Ready production systems averaged $18.37 per acre in weed control costs, while conventional programs were much higher and averaged $30.96 per acre. However, when comparing these systems it is also important to consider seed costs. With the added technology fees, Roundup Ready soybean seed prices averaged $28.85 per acre and conventional seed costs averaged $15.56 from 1997 to 2002. Producers that chose to produce conventional soybeans, averaged 5 bushels more an acre and herbicide plus seed costs were an average $0.70 lower than Roundup Ready soybean production system.

Evaluation of the amino sugar-N based soil test in Arkansas rice and wheat production.

W.J. Ross, R.J. Norman, J.T. Bushong, N.A. Slaton, and C.E. Wilson, Jr.

Currently N fertility for rice and wheat production in Arkansas is based on criteria such as yield goal, cultivar, planting date, prior crop, and/or soil texture. With this approach, mineralization of soil N is not accounted for, and over or under application of N fertilizers could occur. Recently, it was reported that the amino sugar-N in the soil could be used to predict the amount of soil mineralizable N. The objective of this study was to evaluate the ability of the amino sugar-N quick diffusion method to predict the total N uptake of rice and wheat and ultimately the N fertility rates required by rice and wheat to optimize grain yield. Nitrogen fertilizer rate trials were conducted at multiple sites for both rice and wheat. Soil samples were collected at 10 cm depths prior to preflood and spring applications of N fertilizers for rice and wheat, respectively. Samples were analyzed for acid hydrolyzable amino sugar-N and amino sugar-N by quick diffusion. Both methods were correlated to total N uptake and grain yield and calibrated for the amount of fertilizer N required for a given soil N test to result in an optimum total N uptake to produce a maximum grain yield.

Evaluation of Yield Monitors for On-farm Cotton Variety Testing

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Yield monitors for cotton pickers are available from various aftermarket manufacturers. Deere and Company will make available a yield monitor utilizing microwave sensors on cotton pickers in 2005. Currently, yield monitors utilize optical sensing techniques to estimate seedcotton weight by monitoring light interception in air ducts. This method is fairly accurate once calibrated for a particular variety. The ability of light intercepting yield monitors to accurately estimate yields for different varieties are not well documented. However, the sole use of yield monitors to determine yields in replicated on-farm variety tests is not uncommon. The objective of this study is to compare yields estimated by currently available yield monitors and the John Deere microwave based technology to actual weights of seedcotton harvested from multiple on-farm replicated variety tests. Four on-farm replicated variety trials with a total of 22 entries will be utilized for this evaluation. Yield monitor data from each replication for each variety will be recorded and compared to actual weights derived from a boll buggy equipped with load cells.

Thrips Management in Cotton With In-Furrow and Seed Treatment Insecticides in Northeast Arkansas

Glenn Studebaker, Assistant Professor/Extension Entomologist, Northeast Research and Extension Center, University of Arkansas Cooperative Extension Service,

The efficacy of in-furrow and seed treatment insecticides for control of thrips in cotton was evaluated at the Northeast Research and Extension Center in Keiser, AR. Plots of PM1218 BG/RR were planted on May 24, 2004. Plots were 4 rows by 50 feet in length arranged in a randomized complete block design with 4 replications. Granular insecticides were applied in the seed furrow with the seed using an ALMACO belt-cone planter attachment on an international 4-row planter. Stand counts were made 2 weeks after emergence. Thrips were counted weekly after emergence for 4 weeks by removing 5 plants per plot and washing in alcohol to dislodge thrips. The alcohol was then filtered through grid-lined filter paper and both adult and larval thrips were counted under a dissecting microscope. Damage ratings were also taken weekly by visually rating each plot on a 1 to 5 scale, with 1 being equal to little or no damage and 5 begin equal to severe damage. Yields were taken at the end of the season by harvesting the center 2 rows of each plot with a 2-row cotton picker. All data was analyzed for significance (ANOVA) with Agriculture Research Manager statistical program.

All treatments gave significant control of thrips over the untreated check for up to 28 days after planting. Thrips populations reached a high of 40 thrips per 5 plants on the untreated check at 28 DAP. The numbered compound KC7911230 had the highest yields in the test numerically, however, these were not significant at the $p=0.5$ alpha level.

Influence of Trimax (imidacloprid) on Growth, Development and Yield of Cotton.

Gabe Horn and Derrick Oosterhuis, University of Arkansas, Fayetteville, AR and Alan Hopkins, Bayer CropScience, Greenbrier, AR

TRIMAX contains 4.0 lb of imidacloprid per gallon in a soluble concentrate formulation. The product was introduced to cotton growers in most U.S. cotton-growing regions in 2002. Subsequent to the product launch, special emphasis was placed on obtaining data to support previous observation of improved plant health and yield. Data reported by Oosterhuis and Brown of the University of Arkansas were particularly interesting since they represent some of the first attempts to elucidate the plant physiological and biochemical effects of

TRIMAX on cotton. Results from Oosterhuis, Gonius and Brown in 2002 and 2003 support observations of improved plant health and yield.

Research presented in this paper include data from two replicated experiments conducted in Lonoke County Arkansas near Scott. The basis for each experiment was to evaluate multiple and single applications of TRIMAX Insecticide during the early squaring period. Both trials were planted with Stoneville cultivar '5599BR' on the same date. TEMIK 15 G was used at 5 lb/A in both experiments. Experiment A was considered non-nematode infested and Experiment B was infested with root-knot nematodes. Treatments in "Experiment A" were replicated four times and treatments in "Experiment B" were replicated eight times.

Pre-bloom insect populations were monitored with drop-cloth samples and very few economically-important insects were observed in either experiment. Early-season plant mapping was conducted at first bloom and late-season mapping was conducted at physiological maturity. Yield data were collected by hand harvesting on 6 row feet in each plot was and supplemented with machine harvest.

Early-season plant mapping indicated very strong trends for improved square development where TRIMAX was used in either experiment. More total fruiting positions were observed on TRIMAX-treated plants and improved square retention was observed on first, second and third fruiting positions. A trend for improved square retention was also documented in three different plant horizons (fruiting nodes 1-5, 6-10 and 11-15) for TRIMAX-treated plants compared to untreated plants.

In Experiment A, early-season data indicated about 95% square retention following three applications of TRIMAX compared to 85% total square retention in the untreated. By late season, total fruit retention was only 42% and 40% for the same treatments, respectively. A similar trend was observed in Experiment B. These trends indicate that improvement in early-season square retention was lost due to unexplainable fruit shed during peak bloom. Yield data tended to reflect late-season plant mapping data. Although excellent yield was observed from all treatments (1300 to over 1500 pounds of lint/A), no significant yield differences were observed in either experiment. Early-season plant mapping data indicated a strong trend for improved plant development when TRIMAX was used in single or multiple sprays during the squaring period. Improvement in number of total fruit and increased retention of early-season fruit were observed in early season data. However, these experiments emphasize the importance of good growing conditions and/or proper management to retain early-season fruit necessary to maximize cotton yields.

Factors Affecting Glyphosate-Resistant Horseweed Response to Ignite

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Glyphosate-resistant horseweed has been an increasing problem for producers across the Mid-South. As of July 1, 2004, the resistant population is present in at least six counties in Arkansas and has shown no sign of slowing down. Glyphosate typically has been used as the herbicide of choice for preplant weed control in conservation-tillage cotton, but its overuse has led to glyphosate-resistant horseweed. Glufosinate (Ignite®) appeared very promising because it, like glyphosate, can be applied anytime before cotton emergence and can be applied to the crop if Liberty-Link cotton is used. However, in experiments throughout Arkansas in 2004, control of glyphosate-resistant horseweed was erratic. Some plants were controlled, but regrowth often occurred with others. We hypothesized that erratic control was probably caused by plant size or environmental conditions around the time of glufosinate application. Greenhouse and growth chamber studies were initiated to evaluate these effects on control of glyphosate-resistant horseweed.

An experiment was established as a split-plot design with four replications. Main plots were temperature regime, subplots were plant size, and sub-subplots were glufosinate rates. For temperature regimes (environments), plants were placed in a cool (45/75° F day/night) or warm (58/79° F) chamber 1 week before glufosinate was applied and were placed in a cool or warm chamber after the application. Temperature designations in the growth chambers were: CC, CW, WC, and WW. Plants in the greenhouse were considered a fifth environment. Plants were grown from seed, and sizes at glufosinate application were 11- leaf, 45- leaf, and 54- leaf (25, 55, and 75 d after emergence, respectively). Glufosinate was applied at 20, 30, and 40 oz product/A (0.26, 0.39, and 0.52 lb ai/A) with a backpack sprayer (15 gal/A output volume; Teejet 80015 flatfan nozzles; 28 psi). Plants were rated weekly for 4 weeks after herbicide treatment on a scale of 0 to 100%, in which 0 represents no control and 100 = death of plants. Data were analyzed by analysis of variance appropriate for a split plot design, and means were separated with a protected LSD at P = 0.05.

Results of the greenhouse and growth chamber studies show that glufosinate provided 100% control of 11-leaf rosette glyphosate-resistant horseweed 3 WAT, regardless of environment or rate. However, the larger horseweed plants (45- and 54-leaf) were controlled only 75% 1 WAT, and because of regrowth, control at 4 WAT was only 32%. The response of the 45- and 54-leaf horseweed plants did not differ among rates and environments in the growth chamber. These larger plants (45- and 54-leaf) were controlled better in the greenhouse than in the growth chamber (16 to 31%). Ignite at 20 oz/A provided 57% control in the greenhouse, but only 43% control in the growth chamber. The 30 oz/A rate controlled horseweed 86% in the greenhouse compared to 48% in the growth chamber. The 40 oz/A rate controlled 100% of the horseweed plants in the greenhouse, but control in the growth chamber was only 55%. The higher level of control in the greenhouse, compared to the growth chamber, is probably due to the lower light intensity in the growth chamber, and studies are being conducted to evaluate the effects of light intensity on Ignite activity.

Potassium Uptake from Soil Solution and Exchangeable K Pools by Rice on a Calhoun Silt Loam and Sharkey Clay

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Rice (*Oryza sativa* L.) is not highly susceptible to K deficiency, but the incidence of K deficiency has increased during the past 15 years in Arkansas. The dynamics of K availability and uptake by rice grown on different soil textures has not been adequately researched. The objectives of this experiment were to characterize the seasonal patterns of i) aboveground K uptake by flood-irrigated rice and ii) K concentrations in the soil solution and exchangeable K pools on two soil textures.

Experiments were established in 2004 on a Calhoun silt loam and Sharkey clay. Lysimeters, with silica flour packed around the ceramic cup, were installed at nine sites (replicates) within each experiment. 'Wells' rice was drill seeded at each site and managed according to University of Arkansas Cooperative Extension Service recommendations. Beginning at flooding whole-plant, soil (0 to 10 cm), and soil solution samples were collected weekly for 8 weeks. Data were analyzed as a split-plot design with site (soil texture) as the main plot factor and sample time (weeks after flooding) as the subplot factor. The Fishers Protected Least Significant Difference (LSD) procedure ($p = 0.05$) was used to compare treatment means when appropriate.

The site by sample time interaction significantly affected soil solution K, Mehlich-3 soil K, and rice K concentrations. For each soil, soil solution K concentrations (6.7 to 7.3 mg K/L) were greatest 1 week after flooding. By week 2, soil solution K concentrations of the Calhoun silt loam were declining, but remained constant for the Sharkey clay. For both soils, soil solution K concentrations declined numerically during each week after week 2 and reached consistently low concentrations (1.2 to 1.7 mg K/L) during weeks 5 through 8 that were statistically similar. Soil solution K concentrations were similar for both soils during all weeks except week 2 when the Sharkey clay (6.6 mg K/L) contained significantly greater soil solution K compared with the Calhoun silt loam (4.4 mg K/L). Mehlich-3 K was constant (341-368 mg K/kg soil) for the duration of the season on the Sharkey clay and always greater than the concentrations for the Calhoun silt loam (33-82 mg K/kg). By 3 weeks after flooding, Mehlich-3 K from the Calhoun silt loam had declined significantly compared with the initial concentration. Potassium concentrations of whole rice plants showed similar trends to that described for Mehlich-3 soil K.

Data suggest that soil solution, Mehlich-3, and rice tissue K concentrations tend to be lower and decline more rapidly for silt loam soils compared with clay soils. Clay soils have a greater buffering capacity, which provides sufficient plant-available K to maintain rice tissue K concentrations late in the season.

Postemergence Herbicide Programs in Rice for Control of Non-Traditional Broadleaf Weeds

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Cutleaf groundcherry (*Physalis angulata*), pitted morningglory (*Ipomoea lacunosa*), sicklepod (*Senna obtusifolia*), and Palmer amaranth (*Amaranthus palmeri*) are considered non-traditional because they are typically not a problem in rice weed management and are controlled in the flood. They do pose a threat to rice weed management on levees and parts of the field where the flood is not constant. Because of the declining water table, water management tools, such as intermittent and furrow irrigation, may replace full season-flood, which would allow these weeds will to compete with the rice crop. Experiments were conducted in summer 2004 to evaluate the performance of several postemergence broadleaf rice herbicides on sicklepod, cutleaf groundcherry, and pitted morningglory at the Rice Research and Extension Center, Stuttgart, AR, and University of Arkansas Pine Bluff Experiment Station, Lonoke, AR. A separate experiment was conducted on a natural population of Palmer amaranth at the Arkansas Agricultural Research and Extension Center, Fayetteville, AR. Herbicides included were Permit (halosulfuron), Ultra Blazer (acifluorfen), Aim (carfentrazone), Facet (quinclorac), Basagran (bentazon), Regiment (bispyribac sodium), Newpath (imazethapyr), Grandstand (triclopyr), Stam (propanil), Grasp (penoxsulam), and IR 5878.

At Stuttgart and Lonoke, weeds were sown in rows perpendicular to the drilled rice rows. Postemergence applications were made at two separate timings, an early postemergence (EP) and late postemergence (LP). All applications were applied using a CO^2 backpack sprayer calibrated to deliver 10 gallons per acre. Weed heights at the EP application were 2.5 to 5 cm and at LP, they ranged 30 to 35 cm. A standard rate for each herbicide application was used as found in the MP-44 as recommended for other broadleaf weeds. Visual ratings on weeds were taken at 1 week intervals starting 7 days after treatment (DAT) to 6 weeks after treatment (WAT) of the EP. Visual ratings were recorded on a scale of 0 to 100 percent with 0 representing no injury and 100 representing plant death. The natural population of Palmer amaranth was very vigorous, and visual ratings were taken 4 weeks after EP applications and 2 weeks after LP applications as the weeds had recuperated fully from injury by that time.

EP treatments of Aim, Facet, Newpath, Stam, Regiment, and Ultra Blazer all controlled cutleaf groundcherry > 80%. Aim, Grandstand, Newpath, Stam, and Ultra Blazer applied LP controlled cutleaf groundcherry > 80%. Pitted morningglory treated EP was controlled at > 80% by Aim, Facet, Grandstand, Newpath, Permit, Stam, Regiment, and Ultra Blazer. Pitted morningglory was controlled > 80% with of Aim, Facet, Grandstand, and Newpath applied LP. Facet and Stam applied EP controlled sicklepod 100%, but other treatments gave < 70% control. Facet and Granstand were the only treatments to control sicklepod 90% at the LP timing. Palmer amaranth was controlled 90% by Aim, 80% by Grasp, 80% by Newpath, 100% by Stam, and 80% by Regiment. Palmer amaranth at the LP timing was controlled < 40% with all herbicides.

The Influence of Preflood and Midseason Nitrogen Rates on Grain Yield of 'Francis' Rice

Bobby R. Golden*, Nathan A. Slaton, Richard J. Norman, and Russell E. Delong

Nitrogen fertilization recommendations for stiff-strawed rice (*Oryza sativa* L.) cultivars emphasize the need for adequate preflood N rates and management. Recent research has shown that rice receiving adequate preflood N shows little or no positive response to supplemental N at midseason. The primary objective of this research was to determine how the grain yield of 'Francis' rice fertilized with a range of preflood N rates responds to midseason N-fertilizer rate.

Studies were conducted on silt loam soils at the Pine Tree Branch Station in 2003 (PTBS03) and 2004 (PTBS04), at the Rice Research and Extension Center in 2003 (RREC03), and at a farm in Poinsett County (PC04) in 2004. Francis rice was drill seeded following soybean at each location. Nitrogen fertilizer was applied using three strategies: the single preflood (PF), 2-way split (2WS), and 3-way (3WS) split strategies. All methods received identical preflood N rates (as urea) that ranged from 0 to 150 lb N/acre in 30 lb N/acre increments. At beginning internode elongation, the SPF, 2WS, and 3WS strategies received 0, 45, or 90 lb N/acre as urea, respectively. When 90 lb N/acre was applied to the 3WS, N was applied as 45 lb N/acre in two applications one week apart. Grain yield was determined by harvesting the middle five rows of each plot. Grain yields were adjusted to 12% moisture content. Each experiment was as a randomized complete block with a 5 (preflood N) x 3 (midseason N) factorial treatment structure and was compared to an unfertilized control. Locations were analyzed separately.

The preflood x midseason N rate interaction significantly affected grain yield only for the PC04 site. The interaction between preflood and midseason N rates showed that grain yields increased as preflood N rate increased up to 90 lb N/acre and tended to decrease with additional N. When 30 or 60 lb N/acre was applied preflood, grain yield increased as midseason N rate increased, but application of midseason N had no benefit when preflood N rate was >60 lb N/acre.

The main effects of preflood and midseason N rates were significant for all remaining site-years, except PTBS03 where only the main effect of the preflood N rate was significant. Grain yield generally increased as preflood N rate increased, peaked, reached a plateau, and sometimes declined at the highest preflood N rate. When averaged across midseason N rates, near maximum grain yields were produced by preflood N rates of 60 to 150 lb N/acre at PTBS03, 90 to 120 lb N/acre at RREC04, and 90 to 150 lb N/acre at PTBS04.

At RREC03, applications of 45 or 90 lb N/acre at midseason, averaged across preflood N rates, produced similar yields that were significantly greater compared with no midseason N. At PTBS04, grain yields, averaged across preflood N rates, increased incrementally as midseason N rate increased.

Data suggest that the optimum preflood N rate for Francis rice grown on silt loam soils is 90 to 120 lb N/acre. Francis response to midseason N was inconsistent among site-years. Since the need for midseason N cannot be accurately monitored perhaps the best fertilization strategy is to apply the optimum preflood N rate followed by 45 lb N/acre at midseason.

Efficacy of Selected Insecticides for Control of Tarnished Plant Bug, *Lygus lineolaris*, in Southeast Arkansas - 2004.

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Efficacy trials were conducted in 2004 to determine the effectiveness of new and existing chemistries in controlling the tarnished plant bug (TPB), *Lygus lineolaris.* In early-season trials, industry standards such as acephate (Orthene), dicrotophos (Bidrin), and oxamyl (Vydate), provided adequate control of TPB, as did newer chemistries such as thiamethoxam (Centric) and acetamiprid (Intruder), and newly formulated compounds such as imidacloprid (Trimax). Some numbered compounds and bifenthrin (Capture, Discipline), a pyrethroid, provided control of TPB in these early-season trials as well.

In mid-to-late-season trials, tank-mixing pyrethroids with newer chemistries and organophosphates offered some enhanced control of TPB. Newer chemistries along with industry standards mentioned above provided adequate control of TPB in mid-to-late-season trials.

Evaluation of Several Indices of Potentially Mineralizable Soil Nitrogen

J. T. Bushong, R. J. Norman, C. E. Wilson Jr., N. A Slaton, E. E. Gbur Jr., and W. J. Ross

A simple routine soil test that accurately predicts the amount of soil N mineralized throughout the growing season has long been sought. Currently, N fertilizer recommendations are based upon criteria such as cultivar needs, soil texture, and/or previous crop and have not taken into account the N mineralized from the soil organic fraction. Inaccurate N fertilizer recommendations can have detrimental agronomic, economic, and environmental impacts. Over the years, numerous analytical methods have been proposed, but no one method has been widely accepted. Recently, it has been reported that the soil amino sugar-N concentration is a good predictor of mineralizable soil N. The objective of this study was to evaluate amino sugar-N along with other proposed N mineralization analytical methods as a means of predicting mineralizable soil N by comparing the methods with the amount of NH_4^+ mineralized after a 2 week anaerobic incubation. Approximately 50 agricultural soils with different characteristics were analyzed. The analytical methods evaluated were hydrolyzable amino sugar-N, the Illinois Soil N Test, acid permanganate extraction, ultraviolet spectrophotometry, and near infrared reflectance spectroscopy. Correlations between the afore mentioned analytical methods and anaerobic incubation using simple regression techniques will be presented.

Effects of Tank Mixes with Roundup and Insecticides on Roundup Ready Flex Cotton
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Field experiments were conducted in 2004 at a single location in Arkansas to evaluate potential weed control interactions when Roundup WeatherMax was applied with several insecticides. Only the Roundup WeatherMax-Karate Z mixture noticeably reduced weed control 5 days after treatment (DAT) when compared with Roundup WeatherMax applied alone (78.75 vs. 91.25% control), but this difference was not statistically different. Karate Z + Bidrin, Intrepid, Steward, Denim, or Mustang Max in combination with Roundup WeatherMax provided <87.50% weed control at 5 DAT which was not significantly less than when Roundup WeatherMax was applied alone (91.25%).

The Roundup WeatherMax-Denim mixture and Roundup WeatherMax-Orthene mixture did not significantly reduce weed control at 8 DAT when compared with Roundup WeatherMax applied alone (86.25 vs. 92.50% control).

Standardizing Baseline Susceptibility of *Helicoverpa zea* and *Heliothis virescens* for Cry1Ac Resistance Monitoring.
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Collaborative researches were conducted at University of Arkansas, Fayetteville, AR, Monsanto Co., St Louis, and USDA-ARS, Stoneville, MS to standardize the baseline susceptibility of *Helicoverpa zea* (Boddie) and *Helicoverpa virescens* F. for Cry1Ac resistance monitoring on cotton. Neonates from Monsanto laboratory strains of *H. zea* and *H. virescens* were exposed to lyophilized MVP II powder incorporated diet simultaneously at the three laboratories. Regressions for lethal concentration (LC) based on mortality, and molt-inhibiting concentration (MIC) based on mortality plus stunting (those neonates that failed to molt to second instars) were developed for each species tested at each laboratory.

Preliminary results of these comparative assays will be presented. We have methodically collected bioassay response data for more than 100 field colonies in Arkansas over the past three years. Our data suggest that colonies of *H. zea* collected from Bt crops and those collected later in the growing season tend to be less susceptible than those from non-Bt crops and those collected early in the growing season. Our historical reference is baseline information collected at Mississippi State University more than 10 years ago. Our comparative studies with Monsanto and the USDA will be important advances in standardizing these biological assay procedures as reliable estimates of field resistance levels.

Relationship of Pheromone Trap Captures of the Tobacco Budworm, *Heliothis virescens*, and the Cotton Bollworm, *Helicoverpa zea*, to Surrounding Crop Structure and Cotton Insect Scouting Records on a Land Company in Southeastern Arkansas
Clint Allen, R. G. Luttrell, and James Patterson, Dept. of Entomology, University of Arkansas, Fayetteville, AR

Pheromone traps are used to detect the presence and estimate adult populations of many insect species. In cotton production, pheromone trap captures of the tobacco budworm, *Heliothis virescens*, and bollworm, *Helicoverpa zea*, are used to alert consultants and farmers of increasing numbers of adults in a given area. Weather-related variables can influence the number of moths captured in a pheromone trap, such as wind speed and direction. The number of moths caught in a trap may also be influenced by the proximity and type of host crops surrounding a particular trap. The expanded use of pheromone trap captures as an index of potential field infestation is even more variable and potentially impacted by a wider range of environmental factors.

To study the potential value of pheromone trap captures of bollworm and tobacco budworm, we examined recent historical records on a large land company in southeastern Arkansas. Farm records were obtained for Pickens Land Company for the last 5 years. Records included: cotton insect scouting forms, pheromone trapping data, acreages and geographic location of crops grown on individual fields in a given year, and cotton yield records. The relationship of trap captures and the relative amount of different crops grown on the land company near pheromone sample sites in a given year was measured. Also, the relationship of moth captures and the percentage of Bt crops grown near the traps on the land company was analyzed. Insect scouting records were used to compare peak pheromone trap captures to numbers of insects found in cotton fields.

Using Early Season Soybean as a Trap Crop for Stink Bugs in Arkansas.

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Effective control of stink bugs is becoming increasingly important to profitable soybean production in Arkansas. Use of trap crops as an alternative control measure for stink bugs is documented in literature in Japan and several southern states. Studies in 2002 and 2003 in Southeastern Arkansas indicated that Group IV soybeans planted with cotton, corn, sorghum, and Group V or Group VI soybeans were preferred by stink bugs. Stink bugs were highly attracted to the Group IV soybeans, and remained there until maturation. Populations of stink bugs later developed in the surrounding crops, but only after the Group IV soybeans matured. In 2004, with support from the Arkansas Soybean Promotion Board, additional research was organized to investigate the value of using Group III and Group IV soybeans as a trap crop for stink bugs in Arkansas' diverse production system.

The ultimate goal of this work is to investigate the practicability of implementing early maturing soybeans as a trap crop in Arkansas. A series of field experiments was conducted in Southeast and Southwest Arkansas. These growing regions are comprised of differing landscapes and crop diversity, including relative acreages of cotton, rice, corn, and soybean. Plots were variable in size and within-field location, facilitating different research objectives being investigated. One of the questions examined in Southeast Arkansas was to determine effects of insecticide oversprays of stink bug populations in trap crops and resulting influence on surrounding crops. A second objective was to examine the influence of spatial scale and landscape diversity on the effectiveness of early maturing soybean trap crops for stink bug control. A third objective compared the spatial and temporal patterns of stink bugs in production fields of early maturing soybeans to adjacent crops of cotton, corn, and Group V and VI soybeans.

Preliminary data from 2004 suggested that trap crops did not control stink bug outbreaks in surrounding fields, although an effect on spatial patterns of stink bugs was detected at different intervals away from the trap crop. As indicated by earlier work, stink bugs again showed preference for early maturing soybeans over adjacent crops. Intercepting the movement from traps or other sources of population growth appears to be a critical issue. Within-field populations were highest on borders of fields, adjacent to suspected overwintering sites. Data analyses are still being conducted to gain better understanding of the trap crop's influence on stinkbug populations.

Reliance on Predators in Making Cotton Aphid Treatment Decisions.

Adam Chappell, Tim Kring, Gus Lorenz

The standard cotton aphid threshold used to make treatment decisions was modified to incorporate the presence of beneficial insects, particularly predaceous coccinellids. The new threshold relies on density estimates of coccinellids (adults and larvae) made by scouts at each field location where aphid samples are routinely taken. Preliminary work has shown application of the new threshold reduced insecticide applications by an average of one application per season. Current research is deploying this new threshold across eastern Arkansas.